DOE/EIS-0226
January 2010

Final Environmental Impact Statement for

Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center

The West Valley Site

Volume 1

(Chapters 1 through 11)

Availability of the Final EIS for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center

For further information on this Final EIS, or to request a copy of the EIS or references, please contact:

Catherine Bohan, EIS Document Manager
West Valley Demonstration Project
U.S. Department of Energy
Ashford Office Complex
9030 Route 219
West Valley, NY 14171
Telephone: 716-942-4159
Fax: 716-942-4703
E-mail: catherine.m.bohan@wv.doe.gov

Printed with soy ink on recycled paper

COVER SHEET

Co-Lead Agencies: U.S. Department of Energy (DOE)
New York State Energy Research and Development Authority (NYSERDA)

Cooperating Agencies: U.S. Nuclear Regulatory Commission (NRC)
U.S. Environmental Protection Agency (EPA)
New York State Department of Environmental Conservation (NYSDEC)

Involved Agencies: New York State Department of Health (NYSDOH)
New York State Department of Environmental Conservation (NYSDEC)

Title: *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (DOE/EIS-0226)

Location: Western New York Nuclear Service Center, 10282 Rock Springs Road, West Valley, New York 14171-0191 (Erie and Cattaraugus Counties)

For additional information on this Final Environmental Impact Statement (EIS) or for references, contact:

Catherine Bohan, EIS Document Manager
West Valley Demonstration Project
U.S. Department of Energy
Ashford Office Complex
9030 Route 219
West Valley, NY 14171
Telephone: 716-942-4159
Fax: 716-942-4703
E-mail: catherine.m.bohan@wv.doe.gov

For general information on the DOE National Environmental Policy Act (NEPA) process, contact:

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0103
Telephone: 202-586-4600, or leave a message at 1-800-472-2756

For general questions and information about NYSERDA, contact:

Paul J. Bembia, Program Director
West Valley Site Management Program
New York State Energy Research and Development Authority
Ashford Office Complex
9030 Route 219
West Valley, NY 14171
Telephone: 716-942-9960 x4900
Fax: 716-942-9961
E-mail: pjb@nyserda.org

For general information on the State Environmental Quality Review Act (SEQR) process, contact:

David A. Munro, Deputy Counsel
New York State Energy Research and Development Authority
17 Columbia Circle
Albany, NY 12203
Telephone: 1-866-697-3732
Fax: 518-862-1091
E-mail: dam@nyserda.org

Abstract: The Western New York Nuclear Service Center (WNYNSC) is a 1,351-hectare (3,338-acre) site located 48 kilometers (30 miles) south of Buffalo, New York and owned by NYSERDA. In 1982, DOE assumed control but not ownership of the 68-hectare (167-acre) Project Premises portion of the site in order to conduct the West Valley Demonstration Project (WVDP), as required under the 1980 West Valley Demonstration Project Act. In 1990, DOE and NYSERDA entered into a supplemental agreement to prepare a joint EIS to address both the completion of WVDP and closure or long-term management of WNYNSC. A Draft EIS was issued for public comment in 1996: the *Draft Environmental Impact Statement for*

Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center, also referred to as the 1996 *Cleanup and Closure Draft EIS*, DOE/EIS-0226D, January 1996. The 1996 Draft EIS did not identify a preferred alternative.

Based on decommissioning criteria for WVDP issued by NRC since the publication of the 1996 *Cleanup and Closure Draft EIS* and public comments on that EIS, DOE and NYSERDA issued the *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (also referred to as the *Decommissioning and/or Long-Term Stewardship EIS*) in December 2008, revising the 1996 Draft EIS. This *Decommissioning and/or Long-Term Stewardship EIS* has been prepared in accordance with NEPA and the State Environmental Quality Review Act (SEQR) to examine the potential environmental impacts of the range of reasonable alternatives to decommission and/or maintain long-term stewardship at WNYNSC. The alternatives analyzed in this EIS include the Sitewide Removal Alternative, the Sitewide Close-In-Place Alternative, the Phased Decisionmaking Alternative (Preferred Alternative), and the No Action Alternative. The analysis and information contained in this EIS are intended to assist DOE and NYSERDA with the consideration of environmental impacts prior to making decommissioning or long-term management decisions.

Phased Decisionmaking Alternative (Preferred Alternative): Under the Preferred Alternative, decommissioning would be accomplished in two phases: Phase 1 would include removal of all Waste Management Area (WMA) 1 facilities, the source area of the North Plateau Groundwater Plume, and the lagoons in WMA 2. Phase 1 activities would also include additional characterization of site contamination and scientific studies to facilitate consensus decisionmaking for the remaining facilities or areas. Phase 2 actions would complete decommissioning or long-term management decisionmaking according to the approach determined most appropriate during the additional Phase 1 evaluations. In general, the Phased Decisionmaking Alternative involves near-term decommissioning and removal actions where there is agency consensus and undertakes characterization work and studies that could facilitate future decisionmaking for the remaining facilities or areas. Phase 1 activities are expected to take 8 to 10 years to complete. The Phase 2 decision would be made no later than 10 years after issuance of the initial DOE Record of Decision and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. In response to public comments, the Preferred Alternative has been modified since the Revised Draft EIS was issued.

Public Comments: In preparing this Final EIS, DOE considered comments received during the scoping period (March 13 through April 28, 2003) and public comment period on the Revised Draft EIS (December 5, 2008 through September 8, 2009). Public hearings on the Revised Draft EIS were held in Albany, Irving, West Valley, and Buffalo, New York during the public comment period. In addition, a videoconference with the DOE Assistant Secretary for Environmental Management, the President of NYSERDA, and various stakeholders was held on September 4, 2009. Comments on the Revised Draft EIS were requested during the 9-month period following publication of the U.S. Environmental Protection Agency's (EPA's) Notice of Availability in the *Federal Register*. All comments, including late comments and those presented during the September 4, 2009 videoconference, were considered during preparation of this Final EIS.

This Final EIS contains revisions and new information based in part on comments received on the 2008 Revised Draft EIS. Vertical change bars in the margins indicate the locations of these revisions and new information. Volume 3 contains the comments received during the public comment period on the Revised Draft EIS including late comments, and DOE's and NYSERDA's responses to the comments. DOE will use the analysis presented in this Final EIS, as well as other information, in preparing its Record(s) of Decision (RODs) regarding actions to complete WVDP. DOE will issue ROD(s) no sooner than 30 days after EPA publishes a Notice of Availability of this Final EIS in the *Federal Register*. NYSERDA will use the analysis presented in this Final EIS, as well as other information, in preparing its Findings Statement, which will be published in the *New York State Environmental Notice Bulletin* no sooner than 10 days after the Final EIS is issued.

FOREWORD
THE VIEW OF THE NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

NYSERDA and DOE support the Phased Decisionmaking Alternative as the Preferred Alternative. The agencies agree that during the first phase of this alternative, important work would be conducted that the agencies believe is critical to keep the project moving toward completion. There is disagreement, however, regarding the level of additional analysis related to long-term performance assessment required to support the Phase 2 decisions.

DOE disagrees with many of the points raised in NYSERDA's View. At the core, differences between DOE and NYSERDA center on different views about the nature of analysis required for an EIS and the attendant level of acceptable risk associated with any uncertainties in that analysis as it relates to decisionmaking. The analysis in this EIS meets the requirements of NEPA and SEQR in that, when there is incomplete or unavailable information relevant to reasonably foreseeable significant adverse environmental impacts, this EIS (1) acknowledges the information limitation and its relevance to environmental consequence, (2) summarizes existing credible scientific evidence, and (3) presents an analysis using a theoretical approach that is generally accepted by the scientific community involved in such analyses. This Final EIS contains text boxes in the relevant subject matter areas that acknowledge the differences of opinion between DOE and NYSERDA. In general, DOE's position is that the agency spent much time and effort engaging highly qualified and respected experts in hydrology and hydrological transport, landscape evolution (erosion), human health and environmental risk analysis, and other technical fields, and stands behind the analyses performed for this EIS.

This Foreword to the Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center presents NYSERDA's differing opinion, its "View."

FOREWORD

The View of the New York State Energy Research and Development Authority on the Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center

Introduction

The New York State Energy Research and Development Authority (NYSERDA) would like to thank you for participating in this very important Environmental Impact Statement (EIS). This Final EIS presents alternatives for the critical next steps in the cleanup of the Western New York Nuclear Service Center and completion of the West Valley Demonstration Project (WVDP), and assesses the environmental impacts from those alternatives. It is important for the agencies and the public to be properly informed of the potential environmental impacts associated with each of these alternatives; and, it is equally as important for members of the public to provide their input to the agencies on the alternatives.

Because of the importance of the decisions that will soon be made regarding the next steps in the cleanup, NYSERDA requested the opportunity to present our agency's view on the analyses and results that are included in this Final EIS.

NYSERDA's Role in the West Valley EIS

NYSERDA owns the Western New York Nuclear Service Center on behalf of New York State, and is a joint lead agency with the U.S. Department of Energy (DOE) in this EIS process. NYSERDA and DOE are joint lead agencies because both agencies are planning to make decisions on the future of the West Valley site. Federal and state regulations require these decisions to be assessed through an EIS.

In terms of the EIS preparation, DOE managed and directed the EIS contractor (Science Applications International Corporation), and NYSERDA provided input on the EIS content, analyses and results through consultations with DOE.

The Preferred Alternative – An Approach to Allow Important Near-Term Work to Proceed

An interagency working group[1] was established by DOE in late 2006 to resolve a number of outstanding technical issues that were identified during agency reviews of early versions of the Draft EIS. The working group was tasked with finding ways to come to concurrence on almost 1,700 comments on the EIS, many of which were related to the long-term analysis of the site. The comments also included input from an independent Peer Review Group that was convened by DOE and NYSERDA in early 2006[2]. Although the interagency working group did not resolve all issues to the satisfaction of all participating agencies, the group did identify a preferred cleanup alternative that would allow the near-term removal of

[1] This interagency working group, called the Core Team, is composed of representatives from DOE, NYSERDA, U.S. Nuclear Regulatory Commission (NRC), New York State Department of Environmental Conservation (NYSDEC), U.S. Environmental Protection Agency (EPA) and New York State Department of Health (NYSDOH).
[2] This 2006 independent review group, known as the Peer Review Group, documented its findings in a report presented to NYSERDA and DOE dated April 25, 2006 (PRG, 2006). This report is available on the internet at http://www.nyserda.org/publications/westvalleypeerreviewgroup.pdf. Paper copies can be requested from NYSERDA at END@nyserda.org, or by calling Elaine DeGiglio at (716) 942-9960, extension 2423.

several very significant site facilities and areas of contamination (the Main Plant Process Building, the Low-Level Waste Treatment System Lagoons and the source area of the North Plateau groundwater plume). The alternative put forth by the interagency working group also included a period, of up to 30 years, for making decisions for certain other key facilities (e.g., the High-Level Waste [HLW] Tanks[3], the NRC-Licensed Disposal Area [NDA] and the State-Licensed Disposal Area [SDA]). This 30-year time period was considered necessary to allow for, among other things, improvements in the technical basis of the long-term performance analysis. The preferred alternative was presented in the Draft EIS, which was issued in December 2008.

In response to public comments over the length of time that could elapse between Phase 1 and Phase 2 decisions, DOE and NYSERDA have reconsidered the time frame for making Phase 2 decisions. As a result, the Phased Decisionmaking Alternative presented in this Final EIS specifies that the Phase 2 decisions would be made no later than 10 years after issuance of the initial DOE Record of Decision and NYSERDA Findings Statement documenting selection of the alternative.

NYSERDA continues to support the Phased Decisionmaking Alternative because it allows substantial facilities and contamination to be removed from the site in the near term. This removal work represents very important progress in the cleanup of the Western New York Nuclear Service Center and completion of the WVDP. The alternative also provides the opportunity to improve EIS long-term technical analyses so the agencies can be better informed when considering the decision with respect to the remaining facilities. Due to the very large costs associated with removing these facilities and the potential for significant long-term risk from leaving them in place, NYSERDA believes the long-term decision with respect to these facilities must be supported by a thorough and scientifically defensible long-term analysis. We also continue to believe that this scientifically defensible long-term analysis does not exist, even in this FEIS.

Independent Expert Review of the Draft and Final EIS

In the spring of 2008, NYSERDA convened a group of nationally and internationally recognized scientists to review a Preliminary Draft of the DEIS (PDEIS). These distinguished scientists, collectively called the Independent Expert Review Team (IERT), are experts in the disciplines of geology, erosion, groundwater hydrology, nuclear science and engineering, health physics, risk assessment, and environmental science and engineering (see the second-to-last section of this *Foreword* for a list of the members and their respective affiliations). The scope of their review was to assess the technical basis and scientific defensibility of the analyses presented in the PDEIS. The review was initiated in May 2008 and was completed in September 2008[4]. A final report was submitted to NYSERDA on September 23, 2008 (IERT, 2008).

In preparation for the issuance of the Final EIS in October 2009, NYSERDA convened a subteam of the IERT to review an early ("Pre-Concurrence") draft of the FEIS. This IERT subteam was tasked with reviewing the document to identify noteworthy changes since the Draft EIS (issued December 2008), and assessing the implications of these changes to the defensibility and outcome of the analyses.

While the IERT subteam acknowledged the additional work and effort put forth by DOE (and its contractor) to improve the analyses in the FEIS, they also concluded that many of the technical issues identified in the Preliminary Draft EIS, remain valid in the Final EIS. The results of the Independent Expert Review Team's review, along with NYSERDA staff's own review of this Final EIS, allowed

[3] The HLW Tanks are referred to in the EIS as "the Waste Tank Farm."
[4] The report from the Independent Expert Review Team is available on the internet at: http://www.nyserda.org/publications/westvalleyindependentreview.pdf. Paper copies can be requested at END@nyserda.org, or by calling Elaine DeGiglio at (716) 942-9960, extension 2423.

NYSERDA to develop an overall "view" on the Final EIS analyses and results. The NYSERDA "View" is presented below.

NYSERDA's View on the Final EIS Analyses and Results

NYSERDA's view on the Final EIS analyses and results is as follows:

1. **The Final EIS Analysis of Soil Erosion is Not Scientifically Defensible and Should Not Be Used for Long-Term Decisionmaking**

   The Final EIS soil erosion analysis, which is intended to show how soil erosion by water will impact the site and site facilities over the next 10,000 years, is not scientifically defensible and should not be used for long-term decisionmaking.

   The Final EIS presents the results from a computer program (also called a landscape evolution model) that is used to calculate changes to the existing land surface from soil erosion. The model uses mathematical equations and input parameter values (e.g., rainfall amount and intensity, soil type, vegetation, the slope of the land surface, etc.) to predict how the topography of the land will be shaped by natural erosion processes over very long time frames (i.e., thousands of years). These computer-predicted changes in the land surface were then combined with the conceptual designs for facilities that are proposed to be closed-in-place to determine how critical facilities and areas of contamination would be impacted by the computer-predicted erosion for each of the EIS alternatives.

   NYSERDA recognizes DOE's efforts in trying to develop a defensible erosion analysis, yet it is apparent that the science of landscape evolution modeling is still in its infancy. Although these models are used to recreate many complex individual processes, they necessarily represent nature in a very abstract, simplistic way. While current state-of-the-art landscape evolution models are capable of recreating very basic, gross aspects of a stream network or watershed, they admittedly cannot: (1) predict the location of streams, gullies, landslides, etc.; (2) address the wandering or meandering nature observed in local streams; or (3) explicitly account for the knickpoint erosion that is actively causing downcutting (downward erosion) of stream channels and advancement of gullies. As such, we cannot rely on the results from these models to make decisions regarding the long-term future of the West Valley site.

   The limited graphical information provided to support the long-term modeling results is incomplete and makes it impossible for the general public to distinguish, for example, between areas predicted to erode 25 centimeters or 1700 centimeters. Further, NYSERDA staff believe these results are not only unrealistic, but overly optimistic given the 10,000-year time frame. With the exception of one modeling scenario, the simulation results show **no gully erosion of the South Plateau over the next 10,000 years.** Even more astonishing, these results show streams surrounding the South Plateau filling in with sediment over the same time period. These results are wholly inconsistent with what is being observed at these locations today. The streams themselves are actively downcutting dramatically in some locations, and the stream valley walls contain actively eroding gullies. The modeling results for the North Plateau predict tremendous downcutting (up to 30 meters or 100 feet) on Quarry Creek, which borders the WVDP to the north, yet relatively little gully erosion protruding into the plateau. Again, this predicted landscape is not representative of observed site or regional topography. Where local streams have incised the landscape, deep gullies extend many hundreds of feet into the landscape on either side of the stream. These discrepancies suggest the modeling results are neither meaningful nor reliable.

Also included in the EIS are short-term erosion predictions, based on four separate commonly used computer models that have been used to provide perspective on the reasonableness of the landscape evolution predictions. The results from these models provide very little useful information with regard to erosion rates at the West Valley site because gullies are the principal surface erosion threat at the site, and none of the models are capable of predicting gully erosion.

After reviewing the erosion modeling presented in the Final EIS, the Independent Expert Review Team offered the following observations:

> "While the current version of the EIS (dated October 5, 2009) offers some refinements over the previous version (2008), especially with regard to modeling the surface processes, deficiencies still remain, and these include the following:
>
> (1) A serious disconnect exists between model parameterization and the hydrologic and geomorphic characteristics of the site;
>
> (2) No verification or validation of any models is presented in the context of comparing model output with actual field data;
>
> (3) Many of the model components, especially with regard to the gully erosion and landscape evolution, are unjustifiable and unsupported by scientific evidence; and
>
> (4) No uncertainty analysis of any model predictions is provided."

Based on the IERT subteam's recent review of the erosion modeling work, coupled with NYSERDA staff's review of the Final EIS, NYSERDA believes that the erosion modeling results presented in the Final EIS are unrealistic and not scientifically-based, and therefore should not be used for long-term decisionmaking. Accordingly, predictions of radiation doses to the public and all other site impacts that were calculated using the erosion models presented in this Final EIS should not be used to support long-term decisionmaking for the West Valley site cleanup. Until both lead agencies and the scientific community conclude that a defensible erosion analysis for the site is achievable and has been prepared, decisions will need to focus on actions that are not dependent on having scientifically defensible estimates of erosion impacts over thousands of years.

2. The Final EIS Analysis of Contaminant Transport by Groundwater Needs Improvement

The analysis of the potential for transport of contaminants by groundwater, as presented in Appendix E and Appendix G of the Final EIS, needs improvement.

The groundwater transport analyses are presented in the Final EIS in two appendices. Appendix E presents a description of three-dimensional groundwater flow-and-contaminant transport models that were used to estimate the flow of groundwater through the soils and bedrock beneath the site, and to assess the release and transport of contaminants by groundwater from any facilities and contamination that might be closed-in-place. Appendix G describes simpler, one-dimensional groundwater flow-and-contaminant transport models that were used in the calculations of impacts to the public that are presented in other sections in the DEIS.

NYSERDA recognizes the significant effort that was employed by DOE and its consultants to develop and run a three-dimensional flow-and-transport model for this site, and we note that this work represents an improvement over earlier groundwater modeling efforts. In its review of the 2008 Draft EIS, the IERT noted that "the general approach to groundwater flow and transport modeling described in Appendix E is acceptable but could be improved." The IERT also made specific recommendations to improve the model. The recommendations called for (1) a more comprehensive evaluation of uncertainties using a probabilistic approach, and (2) a more convincing demonstration that one-dimensional models in Appendix G are derived from and supported by the three-dimensional models presented in Appendix E.

After completing its review of the 2009 FEIS, the IERT subteam concluded that there are no substantive changes to the 2009 FEIS compared to the 2008 version. There continues to be no compelling argument for why the modelers have chosen to use simplified one-dimensional flow-and-transport models for the purposes of calculating long-term dose (as opposed to the three-dimensional model presented in Appendix E). Similarly, the IERT subteam believes that the deterministic analysis presented in the EIS may not be realistic or conservative. They concluded that it should be possible to propagate uncertainties in the model inputs using Monte Carlo methods to generate a probabilistic range of outcome. Unfortunately, the modelers chose not to perform such calculations.

The Final EIS uses a deterministic approach (i.e., single values are used for model inputs and model parameters), and asserts that these values are conservative[5]. NYSERDA shares the belief of the IERT—that additional documentation is needed to substantiate the assertion that the deterministic treatment of groundwater flow and transport is truly conservative. According to the IERT, the sensitivity analyses presented are a very small subset of the potentially important analyses, and do not provide a comprehensive evaluation of uncertainty in groundwater flow and transport.

Based on the IERT's review of the groundwater modeling work, and on NYSERDA staff's review of the same information, NYSERDA opposes using the groundwater modeling results presented in the Final EIS for long-term decisionmaking. Accordingly, predictions of radiation doses to the public and all other site impacts that were calculated using the groundwater modeling approach presented in the Final EIS should not be used to support long-term decisionmaking for the West Valley site cleanup.

3. **<u>The Final EIS Assumptions Used for the Performance of Engineered Barriers have not been Substantiated and may be Overly Optimistic</u>**

The assumptions used in the Final EIS analysis to predict the performance of engineered features such as caps, slurry walls, grout, and other engineered materials intended to keep contamination physically and chemically bound in place for tens of thousands of years, have not been substantiated and may be overly optimistic. Additional analysis and verification are required for the performance of engineered barriers that are used in the Final EIS site closure alternatives.

In the Final EIS analysis, the physical properties of engineered barriers are assigned a level of performance that is said to represent a degraded condition to account for barrier subsidence, cracking and clogging. The engineered barriers are then assumed to perform at that level, without further reduction in performance, for the duration of the analysis (100,000 years). An important factor for the physical performance of engineered barriers in the Final EIS is the assumption that the barriers used to protect the North Plateau facilities will not be physically disturbed by natural processes (e.g., erosion). Given the presence of significant erosion features (gullies and slumps) that are actively changing and impacting the North Plateau today, this assumption seems implausible, and if this assumption is going to be used in the Final EIS, it must be supported by convincing evidence. Our review of Appendix H shows that this assumption is based solely on the results of the Final EIS erosion modeling, and, as stated above, we believe this modeling is not scientifically defensible. Consequently, the assumption in the Final EIS that the engineered barriers would be physically stable for 100,000 years on the North Plateau is not adequately supported.

[5] *"Conservative" means that the values chosen would not likely lead to an underestimate of impacts.*

The chemical properties of engineered barriers (which are intended to chemically bind contaminants and prevent their migration) are also said to be assigned degraded values, and are then assumed to remain at that level for the 100,000-year-analysis period without further reduction in performance. The assumption that chemical properties of man-made engineered barriers will remain constant over tens of thousands of years is implausible. Even though a "natural" material may be stable and retain certain properties in one geologic and hydrologic setting, that same natural material may not be stable or retain those same chemical properties indefinitely in another setting, particularly when combined with other natural and man-made materials over time frames as long as 100,000 years. If the Final EIS is going to use this assumption, the Final EIS must also provide adequate references to properly support and defend this assumption.

The IERT noted that text had been added to supporting documents to this Final EIS (see *Sitewide Close-In-Place Technical Report)* stating that "erosion control installations in Western New York had been reviewed to gain a better understanding of the various types of structures used, the successes and failures, and the mechanisms for failure, for these structures." However, the IERT could not find where that information had been used to improve the analyses anywhere in the Final EIS or the supporting documents. They also noted that no engineered barrier uncertainties were accounted for in the Final EIS.

The sensitivity analysis information presented in Appendix H in the Final EIS shows that the assumptions used for engineered barriers in the long-term performance calculations, even in the "degraded" state, are critical to the outcome of performance for facilities that are closed-in-place. As such, it is very important that the Final EIS provide clear support for all assumptions used for engineered barriers, and provide additional information on the impacts from complete- and partial-barrier failure as well as on the importance of engineered barriers in each alternative's ability to meet the decommissioning criteria[6].

Based on the IERT's review of the engineered barrier assumptions, and based on NYSERDA staff's review of the Final EIS, NYSERDA has concluded that the assumptions used for engineered barriers in this Final EIS are not adequately supported, and may lead to underestimates of dose and other impacts. Accordingly, predictions of long-term radiation doses to the public and all other site impacts that were calculated based on the engineered barrier assumptions presented in this Final EIS should not be used to support long-term decisionmaking for the West Valley cleanup.

4. <u>The Uncertainties in the Final EIS Long-Term Performance Analyses are not Adequately Presented or Discussed</u>

The Final EIS does not address uncertainty in a manner that provides decisionmakers with information on the critical contributors to uncertainty, or the importance of uncertainty in site cleanup decisions.

All long-term analyses in the Final EIS are deterministic, which means that they use single models and single values for model input parameters. The IERT subteam, in their assessment of the Final EIS, concluded the following:

> "There have been no significant changes in the approach to uncertainty analysis from the 2008 review. The models are generally void of probability-based information that would be the basis for meaningful uncertainty analysis. The absence of a probability-based uncertainty

[6] *Under the WVDP Act, the U.S. Congress required the U.S. Nuclear Regulatory Commission to prescribe decommissioning criteria for the WVDP. Those criteria were issued by NRC in a "Policy Statement" that was published in the Federal Register on February 1, 2002.*

> analysis also greatly compromises any attempt at making the assessments risk-informed or having a high level of confidence in the quality of the dose modeling. The approach to considering uncertainty is based on alleged use of conservative assumptions. No attempt was made to quantify the uncertainties."

The IERT noted that the multiple sources of uncertainty inherent in this analysis are largely unacknowledged, and there is no systematic discussion of how uncertainty has been characterized. Impacts of uncertainties on decisionmaking are supposed to be accounted for by conservative choices in scenario selection and modeling, and by limited deterministic sensitivity analyses. In practice, however, the Final EIS does not demonstrate that the deterministic analysis is either conservative, or that it has appropriately incorporated or bounded uncertainty.

The IERT concluded that some potentially significant uncertainties have not been evaluated. In addition, assertions that other uncertainties have been conservatively bounded are not justified. Transparency of the long-term analysis is poor, and it is not possible to independently replicate the analyses or to otherwise understand how the results were derived. Given these observations, the IERT stated that the quantitative results of the long-term analysis presented should not be used to support decisionmaking associated with the Final EIS.

Based on the IERT's review of the treatment of uncertainty, and based on NYSERDA staff's review of the Final EIS, NYSERDA has concluded that the approach used to identify, analyze, and present uncertainty in the Final EIS is not adequate. The sensitivity analyses in Appendix H show that varying the values of certain important parameters could make the difference between whether an alternative meets the decommissioning criteria or fails to meet the criteria. Consequently, a more comprehensive and transparent analysis and presentation of uncertainty is needed to support long-term decisionmaking for the West Valley site cleanup.

5. <u>The Connection between the Final EIS Analyses and the Applicable Regulatory Framework Must be Strengthened</u>

The long-term analysis for the site, as described in Appendix D of the Final EIS, should be closely structured and clearly tied to the NRC's License Termination Rule (LTR). The LTR is the applicable regulatory framework for decommissioning the WVDP and for the termination of the 10 CFR 50 License.

The Final EIS identifies several regulations that were used to develop the framework for the long-term performance assessment analysis. One of these regulations is the License Termination Rule, which is the applicable regulatory framework for the West Valley Demonstration Project cleanup. Another regulation that was relied upon extensively in the development of the Final EIS analytical approach is 10 CFR 61 (Part 61), the NRC's Low Level Waste disposal regulations. We are concerned that using portions of the Part 61 guidance, absent other critical parts of the Part 61 regulations (such as the facility siting requirements), may result in a nonconservative performance assessment.

Part 61 requires a disposal site to be located in a geologic setting that is essentially stable, or alternatively, in an area where active features, events, and processes (such as erosion) will not significantly affect the ability of the site and design to meet the Part 61 performance objectives. The Part 61 performance assessment guidance is intended to be applied to a facility that is sited in accordance with the site suitability requirements. In such a setting, an engineered cap might not be substantially disturbed by natural processes, and it may be reasonable to assume that the cap would provide adequate protection to an intruder for the needed time period. At the West Valley site, however, the facilities were not sited in accordance with the Part 61 site suitability requirements, and as such, the Final EIS analysis should not take credit for site stability and the passive functioning of engineered barriers in perpetuity unless this assumption can be justified.

Although DOE has a standard approach for preparing National Environmental Policy Act (NEPA) documents, the LTR (and its implementing guidance, NUREG-1757), are directly applicable to the West Valley Demonstration Project decommissioning activities and alternatives, and the LTR requirements and guidance should form the framework for the Final EIS analysis. The NRC's West Valley Policy Statement prescribes the LTR as the decommissioning criteria for the WVDP, and states:

> "The environmental impacts from the application of the criteria will need to be evaluated for the various alternative approaches being considered in the process before NRC decides whether to accept the preferred alternative for meeting the criteria of the LTR. NRC intends to rely on the DOE/NYSERDA EIS for this purpose."

While DOE has stated that the Decommissioning Plan, not the EIS, is the proper document to conduct the LTR compliance analysis, it does not seem logical to prepare an EIS to assess the impacts from decommissioning actions that must meet the requirements of the NRC's LTR, and use regulations and guidance that are not part of the LTR regulatory framework to structure the analyses. As such, NYSERDA believes that the Final EIS analyses are not adequately framed to reflect the requirements of the NRC's analytical requirements for decommissioning. The Part 61 guidance should not be used as part of the analytical framework for the Final EIS unless there is a specific reason under the requirements of the LTR or WVDP Act to do so.

6. <u>The Final EIS Approach for Exhumation may be Overly Conservative</u>

The approach described in the Final EIS and its supporting documents for exhumation of the SDA, the NDA and the Waste Tank Farm appears to be overly conservative, and based on extreme conditions, rather than on conditions that are more likely to be encountered during exhumation. As a result, there is significant uncertainty in the cost estimates in the Final EIS for the exhumation of the Waste Tank Farm and the disposal areas.

The SDA and NDA exhumation processes are conducted using very large, hard-walled concrete secondary containment structures. Primary containment structures are located within the larger secondary containment structures. While this may be an effective approach to provide containment, it may also be more containment than what is ultimately needed to safely exhume some or all of the wastes. Further, the Final EIS assumes that 100 percent of the waste resulting from demolition of these massive containment structures must be disposed of as radioactive waste. We believe this assumption to be unnecessarily conservative.

An alternative approach to the use of hard-walled containment structures would be the use of Sprung Structures™, which consist of UV-resistant fabric and PVC membrane over an aluminum support system. Sprung Structures™ have lasted 15-20 years through harsh winters, and they can be fitted with the ventilation and air filtering systems that would be needed to contain contamination within the structure. Similar structures were used at the WVDP in the 1980s during the excavation of the solvent tanks from the NDA, and are currently employed in waste exhumation projects at Idaho National Laboratory and Los Alamos National Laboratory.

NYSERDA acknowledges DOE's efforts to clarify the large uncertainty of the cost for disposal of Greater than Class C (GTCC) wastes. It is projected that approximately 150,000 cubic feet of waste exhumed from the SDA and NDA will be classified as GTCC waste. The disposal cost for GTCC waste will not be known until there is a disposal facility for GTCC waste. In an effort to bound the costs for disposal of GTCC waste, DOE has included a range of costs based on the cost of disposal of TRU waste at the Waste Isolation Pilot Plant (WIPP) and an estimated cost for disposal at a high-level waste repository using cost for disposal at Yucca Mountain.

For the Waste Tank Farm, the IERT questioned the high cost of constructing and operating the Waste Tank Farm Waste Processing Facility. They suggested that by considering alternative exhumation approaches for the tanks, cost savings could be realized.

Based on the IERT's review of the exhumation approach, and based on NYSERDA staff's review of the Final EIS and supporting documents, we believe that the exhumation approaches in the Final EIS could be successful. It is however, recommended that current industry practices and innovations be applied in an effort to lower costs. NYSERDA acknowledges that DOE's revised approach reuses some modular components of the environmental containment to lower waste volumes but we believe these changes do not adequately address the issues previously identified. Significant uncertainty remains in the costs used in the Final EIS for disposing of exhumed waste from the SDA and NDA.

NYSERDA believes that the approach identified in the Final EIS for exhuming the disposal areas and Waste Tank Farm should be reassessed to determine whether less conservative, but still protective, methods of exhumation could be identified that would significantly reduce the cost of exhumation.

7. Current Methods for Assessing Nonradiological Risk from Transportation Have Limitations and are Likely to Overestimate Fatalities

NYSERDA recognizes the DOE's revisions to evaluating human health impacts from transportation. In previous versions of this EIS, DOE relied on national average accident fatality rates to determine the number of predicted fatalities from rail transportation under each decommissioning alternative. In the Final EIS, DOE uses state-specific fatality rates (published for the years 1994 to 1996) along the designated transportation routes shown in Figure J-2 of Appendix J. This change, which is consistent with previous DOE guidance on transportation risk assessment (DOE, 2002), resulted in a 50 percent reduction in predicted rail transportation fatalities in the Final EIS.

While the current approach for assessing nonradiological transportation risk is consistent with DOE guidance and other published DOE Environmental Impact Statements (e.g., the Yucca Mountain FEIS released in 2002), it does have limitations. In its evaluation of nonradiological risk from rail transportation, the Final EIS uses "railcar-kilometers" to assess the number of expected traffic accident fatalities. The main purpose for adopting this approach is that readily available data exists for State-specific accident rates provided in units of fatalities per railcar-kilometer. NYSERDA believes that a better measure for assessing impacts from rail transportation would be train-kilometers that would assume a single shipment consists of multiple railcars. The accident risk would be assigned to the entire train, rather than each individual railcar on the train. In regard to this issue, in 2008, the IERT offered the following observation:

> "The railcar-kilometer metric implies that one or a few waste laden railcars are part of a larger variable construct train. (See Saricks and Tompkins, 1999 cited in Appendix J of the 2008 DEIS for a discussion of variable-construct versus dedicated trains.) If these waste-laden railcars are a small part of a much larger train (Saricks and Tompkins estimate 68 cars in an average train), then the non-radiological risk is already inherently included in the train that would run whether the few additional waste-laden railcars were present or not. This is another difference between variable-construct train and truck risks – the truck would not travel if not for the waste cargo; the same is not true for variable-construct trains. One could argue that the incremental non-radiological rail transportation risk due to an additional waste-laden railcar is negligible."

To further illustrate the point that train-kilometers represent a more accurate measure, it has been reported that approximately half of all rail transportation injuries and fatalities occur at rail crossings in which the lead locomotive is involved in the collision (DOT, 1997). This would suggest that injury and fatality rates are independent of train length (Cashwell et al., 1986).

However, despite the arguments for expressing fatality rates in terms of train-kilometers, NYSERDA recognizes that this is not the common industry practice because statistics on train-kilometers are not readily available. As Saricks and Thompkins (1999) point out, converting a unit railcar rate to a unit train rate requires application of statistical information available only for trains of an average length (estimated to be 68 cars). They advise against this approach because they do not consider it to be statistically defensible. Other uncertainties associated with available transportation statistical data are summarized in Section J.11.5 of the Final EIS. Also mentioned in that section is the more recent trend (based on limited available data for the years 2000 through 2004) toward lower rail transportation fatality rates.

Given the limitations on available statistical data cited above, NYSERDA believes that the calculation of fatalities based on train-kilometers is not, at this time, defensible. Consequently, we believe that the rail fatality rates presented in the Final EIS are adequate for decisionmaking, but are likely to be overestimates of actual fatality rates. This conclusion is supported by the fact that, as stated in the Final EIS, in 50 years of moving radioactive and hazardous materials, DOE and its predecessor agencies have not incurred a single fatality.

8. <u>The Existing Long-Term Performance Assessment is not Adequate to Support the In-Place Closure of the Waste Tank Farm or any Other Facilities</u>

The Final EIS includes an analysis that attempts to quantify and present the impacts from the in-place closure of all major facilities on the site. Much of the discussion in this "View" presents NYSERDA's concerns with that long-term, in-place closure analysis. As discussed above, NYSERDA believes that the Final EIS long-term performance assessment for the in-place closure alternative is seriously flawed and scientifically indefensible. As such, the Final EIS long-term performance assessment should not be used to support a decision to close the Waste Tank Farm, or any other facilities, in place.

In response to public comments received on the Draft EIS, DOE has stated that they will seek public input prior to a Phase 2 decision regardless of the exact NEPA process utilized. NYSERDA also believes that before a decision is made to close the Waste Tank Farm in place, DOE should prepare and make available for public and agency comment, an EIS with a revised and scientifically defensible long-term performance assessment that would fully analyze, identify and disclose the impacts from this alternative.

NYSERDA's Quantitative Risk Assessment for the State-Licensed Disposal Area

NYSERDA's preferred alternative for the SDA is to manage the facility in place for up to 10 more years while we complete needed scientific studies and collect data to make an informed decision on the future of the SDA. At the end of the 10-year period (also referred to as "Phase 1" of the preferred alternative), NYSERDA, with input from the public and stakeholders, will make a decision to either continue active management of the site (under a State-issued permit and license), close-in-place or exhume part or all of the disposal area.

For implementation of Phase 1 of the preferred alternative, NYSERDA is required under the State Environmental Quality Review Act (SEQR) to identify and mitigate potential environmental impacts from that action. Through early discussions with DOE regarding the content of the EIS, NYSERDA learned that the EIS would not include a quantitative analysis of impacts from the in-place management of the SDA for the next several decades. To meet its requirements under SEQR, NYSERDA tasked Dr. B. John Garrick to provide the analysis needed to assess NYSERDA's preferred alternative for the SDA. Dr. Garrick, who is the current Chairperson of the U.S. Nuclear Waste Technical Review Board, and a former President of the Society for Risk Analysis, recommended that the SDA short-term analysis consist of a quantitative risk assessment (QRA).

The Quantitative Risk Assessment for the State-Licensed Disposal Area (QRA 2008) evaluates the risk from continued operation of the SDA for the next 30 years with its current physical and administrative controls. With the current change to the time period between Phase 1 and Phase 2 decisions (10 years versus 30 years) as identified in the Final EIS, NYSERDA determined that a 30-year analysis for the SDA would be bounding and conservative. The scope of this risk assessment is limited to quantification of the radiation dose received by a member of the public, represented by two potential receptors - a permanent resident farmer located near the confluence of Buttermilk Creek and Cattaraugus Creek, and a transient recreational hiker / hunter who traverses areas along Buttermilk Creek and the lower reaches of Frank's Creek.

The study evaluates potential releases of liquid, solid, and gaseous radioactive materials from the 14 waste disposal trenches at the SDA site. It examines a broad spectrum of potential natural and human-caused conditions that may directly cause or contribute to these releases.

The QRA includes detailed models for the mobilization, transport, distribution, dilution, and deposition of released radioactive materials throughout the environment surrounding the SDA site, including the integrated watershed formed by Erdman Brook, Frank's Creek and Buttermilk Creek.

Appendix P of this Draft EIS contains a summary of the QRA for the SDA, and the supporting models, data, and analyses for the QRA are available as a separate document from NYSERDA[7].

The Composition of the Independent Expert Review Team

NYSERDA selected a distinguished group of nationally and internationally recognized scientists and engineers to conduct an independent review of the Draft EIS for the West Valley Demonstration Project and the Western New York Nuclear Service Center. The basis of their selection was to select individuals who have distinguished themselves in the disciplines believed important to the scope of the review. The disciplines included on the IERT are geology, erosion, groundwater hydrology, nuclear science and engineering, health physics, risk assessment, and environmental science and engineering.

Dr. B. John Garrick, Chairman, U.S. Nuclear Waste Technical Review Board and an independent consultant in the nuclear and risk sciences, was named as the initial member and chairman of the Independent Expert Review Team. Dr. Garrick assisted NYSERDA in selecting the review team, and he had the responsibility for integrating the reviews and leading the preparation of the team's report. The full membership and their affiliations are listed below.

James T. Bell, Ph.D., Retired, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Sean J. Bennett, Ph.D., Professor, State University of New York at Buffalo. Buffalo, New York

Robert H. Fakundiny, Ph.D., New York State Geologist Emeritus, Rensselaer, New York

[7] The complete QRA report is available on the internet at http://www.nyserda.org/publications/sdaquantitativeriskassessment.pdf. Paper copies can be requested from NYSERDA at END@nyserda.org, or by calling Elaine DeGiglio at (716) 942-9960, extension 2423.

B. John Garrick, PhD., Chairman, U.S. Nuclear Waste Technical Review Board, Laguna Beach, California

Shlomo P. Neuman, Ph.D., Regents' Professor, University of Arizona, Tucson, Arizona

Frank L. Parker, Ph.D., Distinguished Professor, Vanderbilt University, Nashville, Tennessee

Michael T. Ryan, Ph.D., Principal, Michael T. Ryan Associates, Lexington, South Carolina

Peter N. Swift, Ph.D., Yucca Mountain Lead Laboratory Chief Scientist, Sandia National Laboratory, Albuquerque, New Mexico

Chris G. Whipple, Ph.D., Principal, ENVIRON International Corporation, Emeryville, California

Michael P. Wilson, Ph.D., Professor, State University of New York at Fredonia, Fredonia, New York

As a follow-up to their comprehensive review of the Draft EIS, a smaller team of experts (IERT subteam) reviewed critical chapters and appendices in the Final EIS. The purpose of this review was to identify substantive changes to the EIS (from the draft that was published in 2008), and assess the implications of these changes to the defensibility and outcome of the analyses. Members of the subteam included Drs. Bennett, Fakundiny, Garrick, Neuman, Ryan and Whipple.

References

Cashwell, J. W., et al., 1986, *Transportation Impacts of the Commercial Radioactive Waste Management Program*, SAND85-2715, Sandia National Laboratories, Albuquerque, N.M.

DOE (U.S. Department of Energy), 2002, *A Resource Handbook on DOE Transportation Risk Assessment*, DOE/EM/NTP/HB-01. DOE Transportation Risk Assessment Working Group Technical Subcommittee, July.

U.S. Department of Transportation, 1997, *Accident/Incident Bulletin No. 165*, Federal Railroad Administration, Washington, D.C., Aug.

IERT, 2008, *Independent Review of the Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*, Independent Expert Review Team, September 23, 2008.

PRG, 2006, *Peer Review of Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*, Peer Review Group, April 25, 2006.

QRA, 2008, *Quantitative Risk Assessment for the State-Licensed Disposal Area*, QRA Team, September 25, 2008.

Saricks and Tompkins, 1999, State-Level Accident Rates for Surface Freight Transportation: A Reexamination, ANL/ESD/TM-150, Center for Transportation Research, Argonne National Laboratory, U.S. Department of Energy, Argonne, Illinois, April 1999.

TABLE OF CONTENTS

TABLE OF CONTENTS

Volume 1
Chapters 1 through 11

Chapter 2
Proposed Action, Facility Description, Alternatives, and Comparison of Environmental Impacts

Chapter 3
Affected Environment

Chapter 4
Environmental Consequences

Chapter 5
Applicable Laws, Regulations, and Other Requirements

Chapter 6
Potential Mitigation Measures

Volume 2
Appendices A through R

Volume 3
Comment Response Document

LIST OF FIGURES

Chapter 4

LIST OF TABLES

Chapter 5

Chapter 6

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

A&PC	Analytical and Process Chemistry
ALARA	as low as is reasonably achievable
BCG	Biota Concentration Guide
CDDL	Construction and Demolition Debris Landfill
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CMS	Corrective Measures Study
dBA	decibels A-weighted
DCGL	Derived Concentration Guideline Limits
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	Environmental Assessment
ECL	Environmental Conservation Law
EDE	effective dose equivalent
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPRI/SOG	Electric Power Research Institute/Seismic Owners Group
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FTE	full-time equivalent
GTCC	Greater-Than-Class C waste
HDPE	high density polyethylene
HEPA	high-efficiency particulate air
HIC	high-integrity container
LCF	latent cancer fatality
LLW	low-level radioactive waste
LSA	Lag Storage Area
M&M	monitoring and maintenance
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	maximum contaminant level
MEI	maximally exposed individual
MLLW	mixed low-level radioactive waste
MMI	Modified Mercalli Intensity
NAAQS	National Ambient Air Quality Standards
NDA	NRC-licensed Disposal Area
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutant

NFA	no further action required
NFS	Nuclear Fuel Services, Inc.
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOL	New York State Department of Labor
NYSERDA	New York State Energy Research and Development Authority
PCB	polychlorinated biphenyl
PGA	peak horizontal ground acceleration
PM	particulate matter
PMF	probable maximum flood
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RFI	RCRA Facility Investigation
RH	remote-handled
ROD	Record of Decision
ROI	Region of Influence
SDA	State-Licensed Disposal Area
SEQR	State Environmental Quality Review Act
SPDES	State Pollutant Discharge Elimination System
STS	Supernatant Treatment System
SWMU	Solid Waste Management Unit
TAGM	Technical Assistance and Guidance Memorandum
TEDE	total effective dose equivalent
TRU	transuranic
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
VRM	Visual Resource Management
WIPP	Waste Isolation Pilot Plant
WMA	Waste Management Area
WNYNSC	Western New York Nuclear Service Center
WVDP	West Valley Demonstration Project
WVNSCO	West Valley Nuclear Services Company, Inc.
ºC	degrees Centigrade
ºF	degrees Fahrenheit

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Hectares	2.471	Acres	Acres	0.40469	Hectares
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1 [a]	Parts/million	Parts/million	1 [a]	Milligrams/liter
Micrograms/liter	1 [a]	Parts/billion	Parts/billion	1 [a]	Micrograms/liter
Micrograms/cubic meter	1 [a]	Parts/trillion	Parts/trillion	1 [a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,025.6	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Temperature					
Absolute					
Degrees C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.78533	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons (short)	Tons (short)	907.18	Kilograms
Metric tons	1.1023	Tons (short)	Tons (short)	0.90718	Metric tons
ENGLISH TO ENGLISH					
Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

a. This conversion is only valid for concentrations of contaminants (or other materials) in water.

METRIC PREFIXES

Prefix	Symbol	Multiplication factor
exa-	E	1,000,000,000,000,000,000 = 10^{18}
peta-	P	1,000,000,000,000,000 = 10^{15}
tera-	T	1,000,000,000,000 = 10^{12}
giga-	G	1,000,000,000 = 10^{9}
mega-	M	1,000,000 = 10^{6}
kilo-	k	1,000 = 10^{3}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}

DOE/EIS-0226
January 2010

Final Environmental Impact Statement for

Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center

The West Valley Site

A Summary and Guide for Stakeholders

Availability of the
Final EIS for Decommissioning and/or
Long-Term Stewardship at the West Valley Demonstration Project
and Western New York Nuclear Service Center

For further information on this Final EIS, or to request a copy of the EIS or references, please contact:

Catherine Bohan, EIS Document Manager
West Valley Demonstration Project
U.S. Department of Energy
Ashford Office Complex
9030 Route 219
West Valley, NY 14171
Telephone: 716-942-4159
Fax: 716-942-4703
E-mail: catherine.m.bohan@wv.doe.gov
www.westvalleyeis.com

Printed with soy ink on recycled paper

COVER SHEET

Co-Lead Agencies: U.S. Department of Energy (DOE)
New York State Energy Research and Development Authority (NYSERDA)

Cooperating Agencies: U.S. Nuclear Regulatory Commission (NRC)
U.S. Environmental Protection Agency (EPA)
New York State Department of Environmental Conservation (NYSDEC)

Involved Agencies: New York State Department of Health (NYSDOH)
New York State Department of Environmental Conservation (NYSDEC)

Title: *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (DOE/EIS-0226)

Location: Western New York Nuclear Service Center, 10282 Rock Springs Road, West Valley, New York 14171-0191 (Erie and Cattaraugus Counties)

For additional information on the Final Environmental Impact Statement (EIS) or for references, contact:

Catherine Bohan, EIS Document Manager
West Valley Demonstration Project
U.S. Department of Energy
Ashford Office Complex
9030 Route 219
West Valley, NY 14171
Telephone: 716-942-4159
Fax: 716-942-4703
E-mail: catherine.m.bohan@wv.doe.gov

For general information on the DOE National Environmental Policy Act (NEPA) process, contact:

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0103
Telephone: 202-586-4600, or leave a message at 1-800-472-2756

For general questions and information about NYSERDA, contact:

Paul J. Bembia, Program Director
West Valley Site Management Program
New York State Energy Research and Development Authority
Ashford Office Complex
9030 Route 219
West Valley, NY 14171
Telephone: 716-942-9960 x4900
Fax: 716-942-9961
E-mail: pjb@nyserda.org

For general information on the State Environmental Quality Review Act (SEQR) process, contact:

David A. Munro, Deputy Counsel
New York State Energy Research and Development Authority
17 Columbia Circle
Albany, NY 12203
Telephone: 1-866-697-3732
Fax: 518-862-1091
E-mail: dam@nyserda.org

Abstract: The Western New York Nuclear Service Center (WNYNSC) is a 1,351-hectare (3,338-acre) site located 48 kilometers (30 miles) south of Buffalo, New York and owned by NYSERDA. In 1982, DOE assumed control but not ownership of the 68-hectare (167-acre) Project Premises portion of the site in order to conduct the West Valley Demonstration Project (WVDP), as required under the 1980 West Valley Demonstration Project Act. In 1990, DOE and NYSERDA entered into a supplemental agreement to prepare a joint EIS to address both the completion of WVDP and closure or long-term management of WNYNSC.

A Draft EIS was issued for public comment in 1996: the *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center*, also referred to as the 1996 *Cleanup and Closure Draft EIS* (DOE/EIS-0226D), January 1996. The 1996 Draft EIS did not identify a preferred alternative.

Based on decommissioning criteria for WVDP issued by NRC since the publication of the 1996 *Cleanup and Closure Draft EIS* and public comments on that EIS, DOE and NYSERDA issued the *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (also referred to as the *Decommissioning and/or Long-Term Stewardship EIS*) in December 2008, revising the 1996 Draft EIS. The *Decommissioning and/or Long-Term Stewardship EIS* has been prepared in accordance with NEPA and the State Environmental Quality Review Act (SEQR) to examine the potential environmental impacts of the range of reasonable alternatives to decommission and/or maintain long-term stewardship at WNYNSC. The alternatives analyzed in the EIS include the Sitewide Removal Alternative, the Sitewide Close-In-Place Alternative, the Phased Decisionmaking Alternative (Preferred Alternative), and the No Action Alternative. The analysis and information contained in the EIS are intended to assist DOE and NYSERDA with the consideration of environmental impacts prior to making decommissioning or long-term management decisions.

Phased Decisionmaking Alternative (Preferred Alternative): Under the Preferred Alternative, decommissioning would be accomplished in two phases: Phase 1 would include removal of all Waste Management Area (WMA) 1 facilities, the source area of the North Plateau Groundwater Plume, and the lagoons in WMA 2. Phase 1 activities would also include additional characterization of site contamination and scientific studies to facilitate consensus decisionmaking for the remaining facilities or areas. Phase 2 actions would complete decommissioning or long-term management decisionmaking according to the approach determined most appropriate during the additional Phase 1 evaluations. In general, the Phased Decisionmaking Alternative involves near-term decommissioning and removal actions where there is agency consensus and undertakes characterization work and studies that could facilitate future decisionmaking for the remaining facilities or areas. Phase 1 activities are expected to take 8 to 10 years to complete. The Phase 2 decision would be made no later than 10 years after issuance of the initial DOE Record of Decision and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. In response to public comments, the Preferred Alternative has been modified since the Revised Draft EIS was issued.

Public Comments: In preparing the Final EIS, DOE considered comments received during the scoping period (March 13 through April 28, 2003) and public comment period on the Revised Draft EIS (December 5, 2008 through September 8, 2009). Public hearings on the Revised Draft EIS were held in Albany, Irving, West Valley, and Buffalo, New York during the public comment period. In addition, a videoconference with the DOE Assistant Secretary for Environmental Management, the President of NYSERDA, and various stakeholders was held on September 4, 2009. Comments on the Revised Draft EIS were requested during the 9-month period following publication of the U.S. Environmental Protection Agency's (EPA's) Notice of Availability in the *Federal Register*. All comments, including late comments and those presented during the September 4, 2009 videoconference, were considered during preparation of the Final EIS.

The Final EIS contains revisions and new information based in part on comments received on the 2008 Revised Draft EIS. Vertical change bars in the margins indicate the locations of these revisions and new information. Volume 3 contains the comments received during the public comment period on the Revised Draft EIS including late comments, and DOE's and NYSERDA's responses to the comments. DOE will use the analysis presented in the Final EIS, as well as other information, in preparing its Record(s) of Decision (RODs) regarding actions to complete WVDP. DOE will issue ROD(s) no sooner than 30 days after EPA publishes a Notice of Availability of the Final EIS in the *Federal Register*. NYSERDA will use the analysis presented in the Final EIS, as well as other information, in preparing its Findings Statement, which will be published in the *New York State Environmental Notice Bulletin* no sooner than 10 days after the Final EIS is issued.

A Message to Stakeholders

The *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (Final EIS) is an important step in the path forward for environmental cleanup at the Western New York Nuclear Service Center. It represents years of study and efforts by officials from the Federal Government and New York State, as well as site employees, elected officials, community members, and contractors. We want to extend our personal thanks to all personnel and stakeholders who contributed to this achievement.

As we move ahead with cleanup and site closure activities, it will be equally important that we maintain this collaborative environment and complete the work at West Valley in a cost-effective manner that is protective of the public health. As you know, there are many complexities involved in a long-term project of this type. The *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (Revised Draft EIS) analyzed those complexities and presented the results for public review and comment from December 2008 to September 2009. Many of you took advantage of the opportunity to provide comments on the Revised Draft EIS. All of those comments were taken into consideration in development of the Final EIS. Official responses to comments may be found in Volume 3, *Comment Response Document*, of the Final EIS.

This document, *A Summary and Guide for Stakeholders* provides an overview of the Final EIS. We hope it proves helpful to you in understanding the issues that concern you. It is also intended to help you quickly find the more detailed technical information you may want to review in the complete Final EIS.

Thank you for your participation in this process. We look forward to your continued involvement as we move toward a DOE Record of Decision and NYSERDA Findings Statement and implementation of cleanup and closure activities.

Catherine Bohan

Catherine Bohan
EIS Document Manager
U.S. Department of Energy

Paul J Bembia

Paul Bembia
Program Director
West Valley Site Management
New York State Energy Research
and Development Authority

Interested citizens attending a public hearing on the Revised Draft EIS, Ashford, New York, April 1, 2009

A Summary and Guide for Stakeholders

Table of Contents

List of Figures and Tables

Front-end Loader Moving Uncontaminated Soil and Debris

1. Introduction

This *Summary and Guide for Stakeholders (Summary)* is intended to facilitate review of the *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center (Decommissioning and/or Long-Term Stewardship EIS).* This *Summary* is a brief compilation of the major findings presented in the *Decommissioning and/or Long-Term Stewardship EIS* and provides guidance for locating more detailed information on specific topics in the full document.

Informing the public and fostering public participation has been an important goal throughout this EIS process. Section 7 of this *Summary* is a discussion of the public review opportunities and includes a summary of the comments received from stakeholders during the public comment period. Stakeholders typically include members of the general public; representatives of environmental groups, industry, educational groups, unions, and other organizations; and representatives of Congress, Federal agencies, American Indian Tribes, state agencies, and local governments. For the *Decommissioning and/or Long-Term Stewardship EIS*, stakeholders are the people or organizations who have an interest in or may be affected by activities at the Western New York Nuclear Service Center (WNYNSC).

Readers interested primarily in the major issues and results presented in the *Decommissioning and/or Long-Term Stewardship EIS* should find their information needs met by this *Summary*. Key information is presented about the Proposed Action, the proposed alternatives, the Preferred Alternative, and the potential short- and long-term impacts of implementing each of the alternatives, uncertainties in the analyses, potential mitigation measures, and public participation. In Section 6 of this *Summary*, readers who would like more detail on these and other topics are directed to the pertinent sections of the *Decommissioning and/or Long-Term Stewardship EIS* or its appendices. Technical terms have been avoided where possible or have been defined in the glossary. A glossary and a list of acronyms and abbreviations have been included in Section 8 of this *Summary*.

Federal and State Responsibility for the *Decommissioning and/or Long-Term Stewardship EIS*

The objective of an EIS is to foster better decisions by providing high-quality environmental information to decisionmakers and the public. The National Environmental Policy Act of 1969 (NEPA) requires Federal agencies to integrate environmental values into their

Brief History of the Western New York Nuclear Service Center

- The 68-hectare (167-acre) West Valley Demonstration Project Premises and 6.1-hectare (15-acre) State-Licensed Disposal Area (SDA) are part of the 1,351-hectare (3,338-acre) Western New York Nuclear Service Center, which is owned by the New York State Energy Research and Development Authority (NYSERDA).
- Licensed by the Atomic Energy Commission in 1966, the site was the home of the only operational commercial nuclear fuel reprocessing facility in the United States.
- Approximately 640 metric tons (705 tons) of spent nuclear fuel were reprocessed at the facility between 1966 and 1972, generating 2.5 million liters (660,430 gallons) of high-level radioactive waste.
- The facility was closed for modifications in 1972 and never reopened, leaving tanks of liquid high-level radioactive waste, a storage pool containing spent nuclear fuel, and a contaminated reprocessing building.
- In 1980, Congress passed the West Valley Demonstration Project Act, directing the U.S. Department of Energy (DOE) to conduct a demonstration project for solidification of the high-level radioactive waste at the site.
- High-level radioactive waste vitrification (solidification in a glass matrix) was completed in 2002; 275 canisters of glass waste were produced and are stored at the site pending offsite disposal.
- The West Valley Demonstration Project Act also directed DOE to:
  - Transport the solidified high-level radioactive waste as soon as feasible to an appropriate Federal repository for disposal;
  - Dispose of low-level radioactive waste and transuranic waste that is produced in the process of solidifying high-level radioactive waste; and
  - Decontaminate and decommission the tanks, facilities, material and hardware used in the solidification of the high-level radioactive waste in connection with the project.
- NYSERDA has continued to manage the SDA along with other, non-project areas from the early 1980s to the present.

DOE and NYSERDA are now implementing some specific cleanup activities and jointly preparing this EIS.

What Is the Proposed Action?

The Proposed Action in the EIS is the completion of the West Valley Demonstration Project and the decommissioning and/or long-term management or stewardship of the Western New York Nuclear Service Center.

Purpose and Need

What Does DOE Need To Do?

DOE needs to determine what, if any, material or structures for which it is responsible would remain on site, and what, if any, institutional controls, engineered barriers, or stewardship provisions would be needed.

What Does NYSERDA Need To Do?

NYSERDA needs to determine what, if any, material or structures for which it is responsible would remain on site and what, if any, institutional controls, engineered barriers, or stewardship provisions would be needed.

decisionmaking processes by considering the environmental impacts of their proposed actions and reasonable alternatives for implementing those actions. To meet this requirement, Federal agencies perform analyses consistent with the scope and significance of the potential impacts of the Proposed Action, as required by NEPA. An EIS presents analyses of the potentially affected environment, which includes the natural physical environment (air, water, noise, soils, geography, geology, and plant and animal life) and the relationship between humans and the environment (health, safety, jobs, schools, housing, aesthetics, and environmental justice).

New York State has similar requirements for preparing EISs under the State Environmental Quality Review Act (SEQR). SEQR requires all state and local government agencies to consider environmental impacts equally with social and economic factors in their decisionmaking processes.

The *Decommissioning and/or Long-Term Stewardship EIS* was prepared by the U.S. Department of Energy (DOE) and the New York State Energy Research and Development Authority (NYSERDA) to identify and assess the impacts of the alternatives proposed to meet DOE's responsibilities under the West Valley Demonstration Project (WVDP) Act and NYSERDA's areas of management responsibility for WNYNSC. Three cooperating agencies have been involved in reviewing the alternatives analyzed in the EIS: the U.S. Nuclear Regulatory Commission (NRC), the U.S. Environmental Protection Agency (EPA), and the New York State Department of Environmental Conservation (NYSDEC). The New York State Department of Health and NYSDEC are involved agencies under SEQR.

As part of the WVDP Act, NRC was charged with developing decommissioning criteria. In the "Decommissioning Criteria for the WVDP at the West Valley Site; Final Policy Statement," (NRC Policy Statement), NRC prescribes the requirements for decommissioning WVDP. The decommissioning criteria define the conditions that would allow WVDP to be used with specified restrictions or without restrictions on future use. If those conditions cannot be met, the NRC Policy Statement also defines the circumstances under which portions of the site could remain under long-term management or stewardship.

What Does the Final EIS Address?

The EIS includes analyses of potential environmental impacts associated with the range of reasonable alternatives for decommissioning and/or long-term stewardship of WNYNSC, as well as a No Action Alternative.

The EIS includes:

- Descriptions of the affected environment and impacts on human health and safety from normal releases and accidents, waste management, transportation, radiological releases during decommissioning, land use, visual resources, site infrastructure, geology, soils and seismology, water resources, noise, air quality, ecological resources, socioeconomics, and environmental justice.

- Results of impact analyses for each of the four alternatives
- Impacts of shipping waste
- Long-term impacts of continued onsite waste storage
- Uncertainties in the analyses due to incomplete or unavailable information
- The explanation and rationale for the DOE and NYSERDA Preferred Alternative

The scope of the Final EIS is detailed further in Section 2 of this *Summary*.

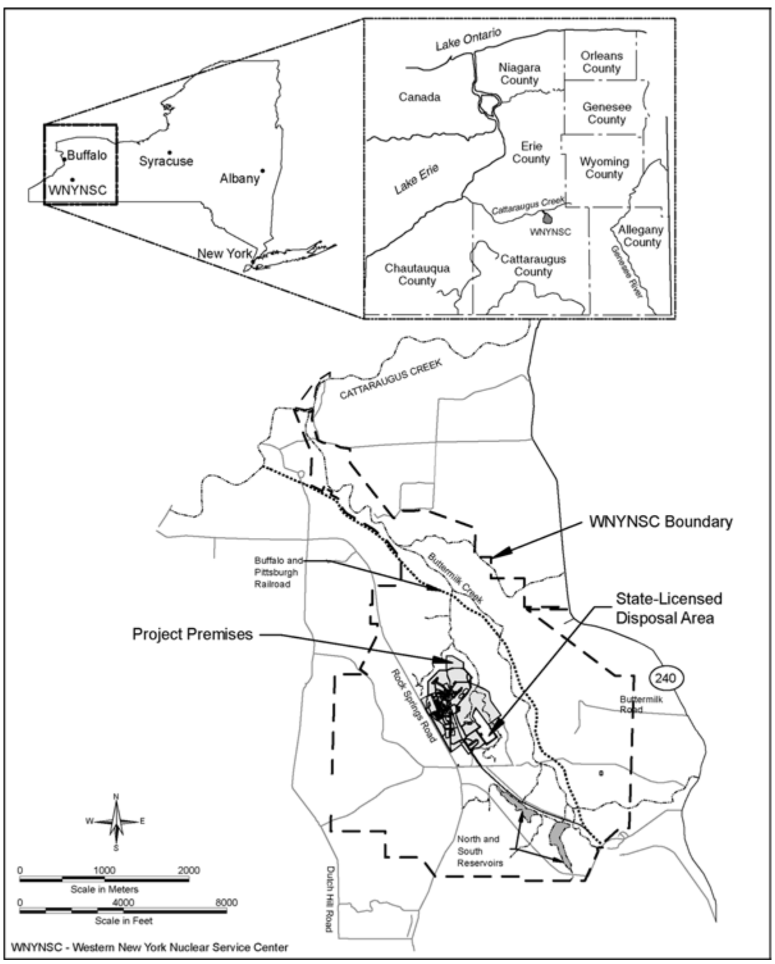
What Makes Up the Western New York Nuclear Service Center?

Figure 1 shows the location and boundaries of WNYNSC. *Figures 2 and 3* show the site divided into 12 Waste Management Areas (WMAs); (see Chapter 2, Section 2.3, of the *Decommissioning and/or Long-Term Stewardship EIS* for a more detailed description of the WMAs).

A WMA refers to a geographic unit on the site consisting of facilities and surrounding grounds, including soil, piping, tanks, stored or buried waste, other underlying materials, and associated soil or groundwater contamination within a geographic boundary. DOE manages WMAs 1 through 10, with the exception of WMA 8. NYSERDA manages WMAs 8, 11, and 12.

- WMA 1: Main Plant Process Building and Vitrification Facility Area
- WMA 2: Low-Level Waste Treatment Facility Area
- WMA 3: Waste Tank Farm Area
- WMA 4: Construction and Demolition Debris Landfill (a disposal system in which waste is buried between layers of earth)
- WMA 5: Waste Storage Area
- WMA 6: Central Project Premises
- WMA 7: NRC-Licensed Disposal Area (NDA) and Associated Facilities
- WMA 8: State-Licensed Disposal Area (SDA) and Associated Facilities
- WMA 9: Radwaste Treatment System Drum Cell Area

Figure 1. *The Western New York Nuclear Service Center*



- WMA 10: Support and Services Area
- WMA 11: Bulk Storage Warehouse and Hydrofracture Test Well Area
- WMA 12: Balance of Site
- Other geographic units of interest include the Cesium Prong and the North Plateau Groundwater Plume.

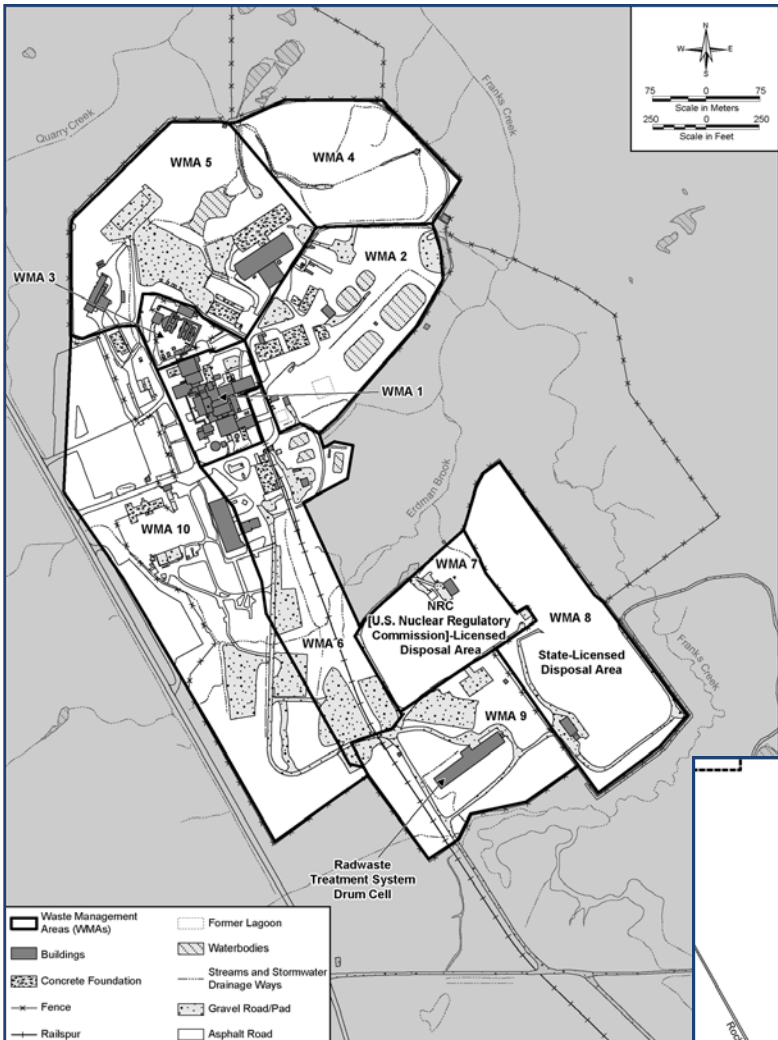


Figure 2. *Location of Waste Management Areas 1 through 10*

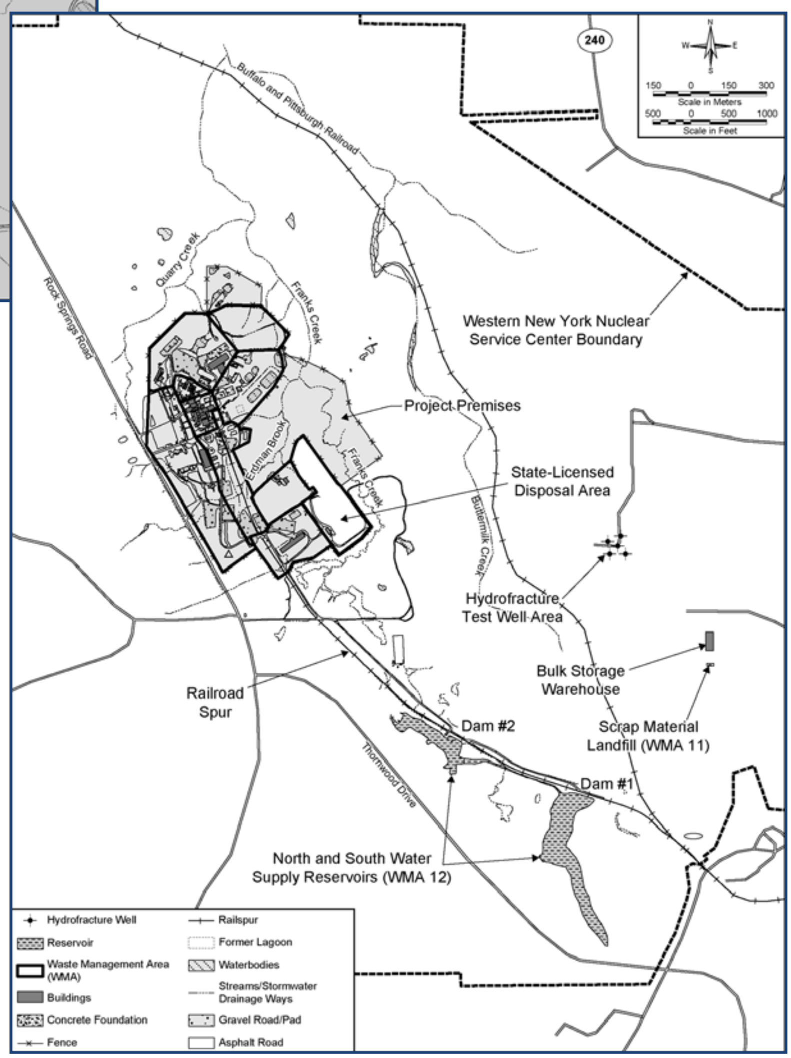


Figure 3. *Waste Management Areas 11 and 12 — Bulk Storage Warehouse and Hydrofracture Test Well Area and Balance of the Western New York Nuclear Service Center*

What Decisions Will Be Made?

The *Decommissioning and/or Long-Term Stewardship EIS* provides input to DOE and NYSERDA decisionmaking regarding actions to complete WVDP and to close or manage WNYNSC, including decommissioning the former spent nuclear fuel facility, the high-level radioactive waste storage tanks, the North Plateau Groundwater Plume, the Cesium Prong, and the NDA.

The EIS also provides analyses to support decisions regarding the decommissioning or continued management of the SDA.

The information and analyses in the EIS will help decisionmakers address questions such as:

- How and when would WNYNSC be decommissioned?
- What would be done with the waste; i.e., where would the waste be disposed?
- If the waste were stored on site pending disposal, how would it be managed?

The results of the analyses presented in the EIS will be considered by the decisionmakers along with mission, policy, cost, public input, regulatory requirements, and other relevant factors. DOE's decisions regarding its responsibilities at WNYNSC will be announced in a Record of Decision (ROD) to be issued after the Final EIS is published.

A ROD is a concise public document published in the *Federal Register* no sooner than 30 days after the publication of EPA's Notice of Availability of the Final EIS to present and explain agency decision(s) concerning the Proposed Action. The ROD identifies the alternatives considered in reaching the decision, the decision made, the environmentally preferable alternative(s), the factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm were adopted, and if not, why.

NYSERDA's decisions regarding its responsibilities at WNYNSC will be announced in the SEQR Findings Statement that will be published in the *New York State Environmental Notice Bulletin* no sooner than 10 days after issuance of the Final EIS. The Findings Statement is a written statement that considers the relevant environmental impacts presented in an EIS; weighs and balances them with social, economic, and other essential considerations; provides a rationale for the agency's decision; and certifies that SEQR requirements have been met.

What are the Changes from the Revised Draft EIS?

In preparing the Final EIS, DOE and NYSERDA made revisions to the Revised Draft EIS in response to comments received during the public comment period from Federal and state legislators, other Federal agencies, state and local government entities, American Indian Tribal governments, and the public. The descriptions of the proposed alternatives, in particular, the Phased Decisionmaking Alternative, have been revised to reflect the current preferred plan for their implementation. In addition, the EIS was revised to provide additional and updated environmental baseline information, to include the results of additional analyses, to correct editorial errors, and to clarify text. The EIS was also updated to reflect events that occurred, notifications that were made for other NEPA documents, and changes in applicable regulatory requirements or guidance since the Revised Draft EIS was issued for public comment in December 2008. The more important changes made to the EIS are summarized in the following paragraphs.

Incorporation of Updated Environmental and Site-Specific Information. The EIS was updated to include another year of environmental monitoring data for WNYNSC, primarily as provided in the *West Valley Demonstration Project Annual Site Environmental Report for Calendar Year 2007* and the Site Technical Reports. The near-field hydrologic analysis was revised to reflect the current understanding of the North Plateau slack-water sequence and Lavery till-sand unit and updated to incorporate design parameters for the as-installed NDA slurry wall and geomembrane cover.

Changes Made in Response to the NYSERDA View on the Revised Draft EIS. Changes were made in response to the NYSERDA View, which appears as the Foreword to both the Revised Draft and Final EISs. The View has been revised for the Final EIS, but additional analyses were performed by DOE between the Revised Draft EIS and the Final EIS to address issues raised in the initial View. In addition to revising the text in the EIS to incorporate new analyses and to clarify certain discussions, text boxes have been added to applicable sections of the EIS to indicate NYSERDA's view and DOE's response. Specifically, NYSERDA identified eight issues, five of which (Issue numbers 1, 2, 3, 4, and 8 in the View) related to the nature and use of the long-term performance assessment information. The remaining three presented NYSERDA's opinions that the connection between analyses in the Revised Draft EIS and the applicable regulatory framework needed to be strengthened (Issue 5), that the approach for exhumation of the SDA, NDA, and Waste Tank Farm described in the Revised Draft EIS may be overly conservative and based on extreme conditions (Issue 6), and that nonradiological fatalities from waste transportation rail accidents appeared to be overestimated (Issue 7). NYSERDA has revised the View for the Final EIS to reflect its current position based on the updated analyses and other relevant changes in the Final EIS.

Revised Description of Alternatives. The description of the Interim End State, the starting point for analyses in the EIS, has been updated to reflect new information about when activities to achieve the Interim End State are expected to be completed.

The descriptions of the proposed alternatives, in particular, the Phased Decisionmaking Alternative, have been revised to reflect the current plan for implementing each of these alternatives. For example, the discussion of monitoring and maintenance during decommissioning and for any post-decommissioning activities has been expanded for each of the alternatives.

The Phased Decisionmaking Alternative included in the November 2008 Revised Draft EIS allowed for a Phase 2 decision to be made anytime after the Phase 1 decision, but no later than 30 years from issuance of the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. In response to public comments that expressed concern over the length of time that could elapse between the Phase 1 and Phase 2 decisions, DOE and NYSERDA have reconsidered the timeframe for making a Phase 2 decision. As a result, the Phased Decisionmaking Alternative presented in the Final EIS specifies that a Phase 2 decision would be made no later than 10 years after issuance of the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. The overall effect of this change in the timeframe for making a Phase 2 decision is to eliminate the majority of monitoring and maintenance activities and avoid incurring their associated impacts. Specifically, monitoring and maintenance activities originally proposed for years 11 through 30 of Phase 1 would not occur, with the exception of monitoring and maintenance of the Interim

Storage Facility for high-level radioactive waste canister storage. Instead, Phase 2 actions would begin. The specific changes in the impacts are discussed qualitatively for each resource area in Chapter 2, Section 2.6, of the EIS, which summarizes and compares the impacts among the evaluated alternatives. The short-term impacts of the revised Phased Decisionmaking Alternative would generally be less than the impacts identified in Chapter 4 of the EIS, which are based on a decision 30 years after the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected.

In addition, NYSERDA has clarified that for the SDA, alternatives that will be considered for Phase 2 actions will include at least: complete exhumation, close-in-place, or continued active management consistent with SDA permit and license requirements. The impact analysis in Chapter 4 includes discussions of the potential impact of continued active management.

Differences of Opinion

NYSERDA and DOE support the Phased Decisionmaking Alternative. The agencies agree that under the first phase of this alternative, important work would be conducted that the agencies believe is critical to keep the project moving toward completion. There is disagreement, however, regarding the level of additional analysis related to long-term performance assessment required to support the Phase 2 decision.

DOE View. DOE acknowledges the uncertainty inherent in long-term (i.e., 10,000 to 100,000 years) performance assessment modeling. Chapter 4, Section 4.3.5, of the EIS contains a comprehensive list of uncertainties that affect the results of the long-term performance assessment of the site. DOE's analyses account for these uncertainties using state-of-the-art models, generally accepted technical approaches, existing credible scientific methodology, and the best available data in such a way that the predictions of peak radiological and hazardous chemical risks are expected to be conservative (i.e., the results are more likely to overstate rather than understate the actual future consequences). DOE believes the analyses and disclosure of uncertainties in the EIS fully complies with the requirements and spirit of NEPA. Furthermore, DOE believes the information in the EIS is adequate to support agency decisionmaking for all the reasonable alternatives.

NYSERDA View. As explained in the Foreword to the EIS, NYSERDA believes that the EIS technical analyses of soil erosion, groundwater flow and contaminant transport, engineered barriers, and uncertainty are not technically defensible for use in long-term decisions regarding WNYNSC cleanup. NYSERDA does not agree that the analyses are adequate to demonstrate that the predictions of peak radiological and chemical risk are conservative, and NYSERDA believes that a comprehensive analysis of uncertainty is needed.

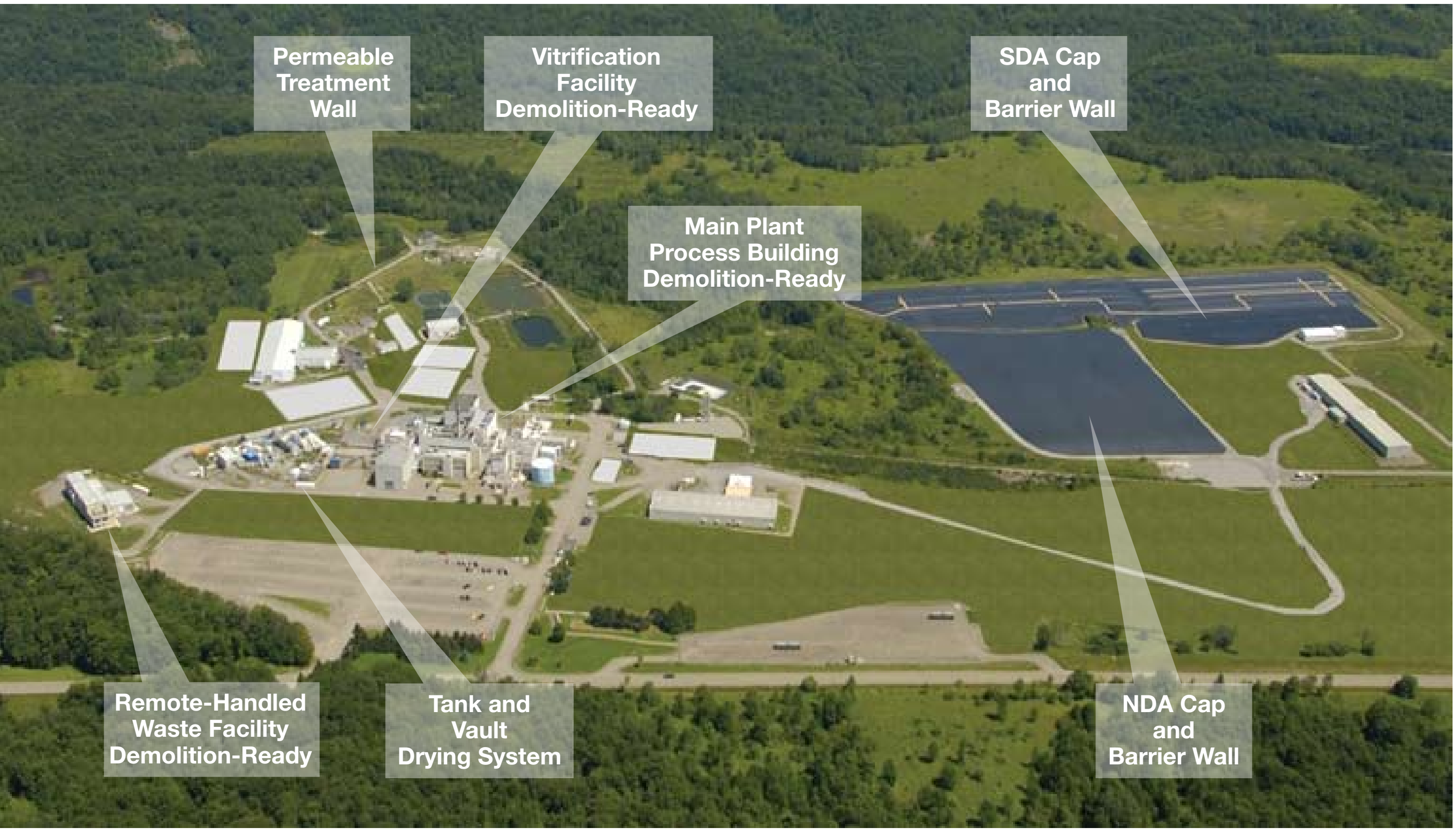

KOMAT
30728
WM

2. What Is the EIS Starting Point and What Are the Alternatives Analyzed?

The EIS Starting Point

While DOE and NYSERDA have been addressing the difficult challenges involved in planning for closure of WNYNSC, they have also continued to take action where possible to remove waste or facilities in order to achieve a site status referred to as the Interim End State, which is the starting point for analyses in this EIS. Activities to achieve the starting point are underway and will continue until completed. Major activities include:

- A number of minor, generally uncontaminated facilities will be closed, emptied of equipment, decontaminated as necessary, and demolished down to concrete foundations, floor slabs, or gravel pads.
- The Main Plant Process Building, with the exception of the area used for storing vitrified high-level radioactive waste canisters and the areas and systems that support high-level radioactive waste canister storage, will be decontaminated to a demolition-ready status. The 01-14 Building and the Vitrification Facility in WMA 1 and the Remote-Handled Waste Facility in WMA 5 will be decontaminated to a demolition-ready status.
- A tank and vault drying system will be installed at the WMA 3 Waste Tank Farm to dry the remaining heels in the waste storage tanks.
- A permeable treatment wall will be installed in WMA 2 to mitigate further North Plateau Groundwater Plume migration. The North Plateau Groundwater Plume and background soils were sampled for potential hazardous constituents. These samples were also analyzed for radionuclide content.
- Waste created by activities to achieve the EIS starting point eventually will be shipped off site for disposal, with the possible exception of potential non-defense transuranic waste.
- An upgradient barrier wall was installed, and a geomembrane cover was placed over the NDA in 2008 to help mitigate surface water infiltration.



The Project Premises and State-Licensed Disposal Area as Envisioned at the EIS Starting Point

Alternatives Analyzed in the EIS

Before any decisions can be made, DOE and NYSERDA must complete the EIS process, which includes the analysis of impacts on resource areas; comparison of impacts for each alternative considered, including the Preferred Alternative; and other data necessary to produce the Final EIS.

Four alternatives are analyzed in the EIS (see *Table 1* on page 14):

Sitewide Removal. Under this alternative, all site facilities as outlined in Chapter 2, Table 2–2, of the EIS would be removed; contaminated soil, sediment, and groundwater would be removed to meet criteria that would allow unrestricted release of WNYNSC; and all radioactive, hazardous, and mixed waste would be characterized, packaged as necessary, and eventually shipped off site for disposal. This alternative would generate waste for which there is currently no offsite disposal location (e.g., potential non-defense transuranic waste, commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste). This orphan waste would be stored on site until an appropriate offsite facility is available. Completion of these activities would allow unrestricted use of the site (i.e., the site could be made available for any public or private use). The Sitewide Removal Alternative includes temporary onsite storage of vitrified high-level radioactive waste canisters until they can be shipped off site.

Sitewide Close-In-Place. Under this alternative, most facilities would be closed in place. In other words, major facilities and sources of contamination such as the Waste Tank Farm, NDA, and SDA would be managed at their current locations.

Residual radioactivity in facilities with larger inventories of long-lived radionuclides would be isolated by specially designed closure structures and engineered barriers. These structures would be designed to meet regulatory requirements both to retain hazardous and radioactive constituents and to ensure they would be resistant to long-term degradation. This approach would allow large areas of the site to be released for unrestricted use. The NRC license for remaining portions of WNYNSC could be terminated under restricted conditions, or could be converted to a long-term license. For the SDA, in-place closure would require, as applicable, a regulatory variance or a postclosure permit or order in accordance with 6 NYCRR Parts 373 and 380. Facilities that are closed in place, and any buffer areas around them, would require long-term stewardship.

Phased Decisionmaking (the Preferred Alternative). Under this alternative, decommissioning would be completed in two phases. This alternative involves substantial removal actions in the first phase. In addition, during this first phase, this alternative provides for additional site characterization and scientific studies to facilitate consensus decisionmaking for the remaining facilities or areas. Thoughout the EIS process, the lead, cooperating, and involved agencies have striven for consensus and will continue to do so.

Phase 1 would include removal of the Main Plant Process Building and the source of the North Plateau Groundwater Plume. In addition, the lagoons and all facilities in WMA 2 (except the permeable treatment wall) would be removed. The Vitrification Facility, the Remote Handled Waste Facility, and a number of facilities in WMAs 5, 6, 9, and 10 would also be removed. Foundations, slabs, or pads from these facilities, as well as previously demolished facilities would also be removed. During Phase 1, several facilities would continue under active management. These facilities include the Waste Tank Farm and its support facilities, the Construction and Demolition Debris Landfill, the non-source area of the North Plateau Groundwater Plume, the NDA, and the SDA.

Phase 1 activities are expected to take 8 to 10 years to complete. During this 8- to 10-year period, the agencies would conduct a number of activities to help determine the best technical approach to complete decommissioning of the remaining facilities. These activities would include further characterization of site contamination and additional scientific studies.

Phase 1 activities would make use of proven technologies and available waste disposal sites to reduce the potential short-term health and safety risks from residual radioactivity and hazardous contaminants at the site. In order to facilitate interagency consensus while Phase 1 cleanup activities are progressing, additional studies would be conducted to possibly reduce technical uncertainties related to the decision on final decommissioning and long-term management of the balance of WNYNSC. In particular, these studies may address uncertainties associated with the long-term performance models, the viability and cost of exhuming buried waste and tanks, the availability of waste disposal sites, and technologies for in-place containment.

While the Phase 1 activities are being conducted, DOE and NYSERDA would assess the results of site specific studies as they become available, along with other emerging information such as applicable technology development. In consultation with NYSERDA and cooperating and involved agencies on this EIS, DOE would determine whether new information would warrant preparation of a Supplemental EIS. NYSERDA also would assess the results of site-specific studies and other information during Phase 1.

NYSERDA expects to prepare and issue for public comment an EIS, or to supplement the existing EIS, to evaluate Phase 2 decisions for the SDA and the balance of WNYNSC for which NYSERDA has responsibility.

The **Phase 2** decision would be made within 10 years of the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. NYSERDA and DOE will strive to make a comprehensive Phase 2 decision for the entire site that is protective of public health and safety and the environment. For WVDP, Phase 2 actions would complete decommissioning or long-term management decisionmaking according to the approach determined most appropriate during the additional Phase 1 evaluations for each remaining facility. For the SDA, alternatives that will be considered for Phase 2 actions will include at least: complete exhumation, close-in-place, and continued active management consistent with SDA permit and license requirements.

No Action. Under the No Action Alternative, no actions toward decommissioning would be taken. The No Action Alternative would involve the continued management and oversight of all facilities located on WNYNSC property as of the starting point for this EIS. The No Action Alternative does not meet the purpose and need for agency action, but analysis of the No Action Alternative is required under NEPA and SEQR.

Which Alternatives Were Considered But Eliminated from Detailed Analysis?

Indefinite Storage of Decommissioning or Long-term Management Waste in Existing or New Aboveground Structures. DOE and NYSERDA do not consider the use of existing structures or construction of new aboveground facilities at WNYNSC for indefinite storage of decommissioning or long-term management waste to be a reasonable alternative for further consideration because the indefinite storage of waste in this manner is inconsistent with the NRC License Termination Rule and Final Policy Statement on WVDP Decommissioning. Under the ROD for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE-EIS-0200-F), DOE decided that sites without appropriate disposal capacity such as WVDP would ship their low-level radioactive waste and mixed low-level radioactive waste to other DOE sites that have disposal capabilities for these wastes (65 FR 10061). This decision regarding using DOE sites does not preclude the use of commercial disposal sites.

Walk Away. The 1996 *Cleanup and Closure Draft EIS* analyzed an alternative that involved discontinuing all WNYNSC operations and essentially "walking away" from the site, its facilities, and the wastes stored there. The Walk Away Alternative, as defined in the *Cleanup and Closure Draft EIS,* is not a reasonable alternative for analysis in the EIS because it would not meet Federal and state legal requirements and would pose major health and safety issues to the public.

The Preferred Alternative identified and analyzed in an EIS is the alternative that an agency believes would best fulfill its mission and responsibilities after consideration of environmental, economic, technical, regulatory, and other factors.

Why Is Phased Decisionmaking the DOE and NYSERDA Preferred Alternative?

DOE and NYSERDA have identified the Phased Decisionmaking Alternative as the Preferred Alternative. The rationale for identifying the Phased Decisionmaking Alternative is as follows:

- Phase 1 of the Phased Decisionmaking Alternative would remove major facilities (such as the Main Plant Process Building and lagoons), thereby reducing or eliminating potential human health impacts associated with these facilities while introducing minimal potential for generation of new orphan waste (waste that cannot currently be disposed of in an established or a planned permanent disposal facility).
- Phase 1 would remove the source area for the North Plateau Groundwater Plume, thereby reducing the source of radionuclides that are a potentially significant contributor to human health impacts.
- Phase 1 would allow up to 10 years for collection and analysis of data and information on major facilities or areas (such as the Waste Tank Farm, NDA, and SDA), with the goal of reducing technical risks associated with implementation of the Sitewide Removal and Sitewide Close-In-Place Alternatives, because one of these alternatives, or a combination that could include continued active management of the SDA, could be selected for Phase 2.

Examples of the technical risks that could be reduced include how to address the Cesium Prong, reaching a determination regarding Waste Incidental to Reprocessing, and further evaluation of long-term impacts. Waste Incidental to Reprocessing refers to wastes resulting from reprocessing spent nuclear fuel that are not highly radioactive and do not need to be disposed of in a geologic repository in order to manage the risk that they pose. The Waste Incidental to Reprocessing would be managed under DOE regulatory authority in accordance with applicable laws and regulations.

The anticipated result of Phase 1 information gathering and analysis is to provide additional information to support decisionmaking for both the removal and in-place closure options for remaining facilities. It is also anticipated that, during Phase 1, progress would be made in identifying and developing disposal facilities for orphan wastes, thereby facilitating removal actions if they are selected as part of Phase 2 decisionmaking. Establishment of improved close-in-place designs or improved analytical methods for long-term performance assessment would facilitate close-in-place actions if they are selected as part of Phase 2 decisionmaking.

Table 1. Summary of Alternatives

	Sitewide Removal	Sitewide Close-In-Place	Phased Decisionmaking Phase 1 Activities (up to 10 years)	No Action
High-level Radioactive Waste Canisters	Storage in new Interim Storage Facility until shipped off site.	Storage in new Interim Storage Facility until shipped off site.	Storage in new Interim Storage Facility until shipped off site.	No decommissioning actions.
Main Plant Process Building	Decontamination, demolition and removal from site.	Decontamination. Rubble used to backfill underground portions of the Main Plant Process Building and Vitrification Facility, and to form the foundation of a cap.	Decontamination and removal from site.	No decommissioning actions.
High-level Radioactive Waste Tanks	Removal, including associated contaminated soil and groundwater in Waste Management Area 3.	Backfilled with controlled low-strength material. Strong grout placed between the tank tops and in the tank risers. Underground piping to remain in place and filled with grout. Closed in an integrated manner with the Main Plant Process Building, Vitrification Facility, and North Plateau Groundwater Plume source with a common circumferential hydraulic barrier and beneath a common robust multi-layer cap.	Remain in place, monitored and maintained with the Tank and Vault Drying system operating as necessary.	No decommissioning actions.
NRC-Licensed Disposal Area (NDA)	Removal.	Removal off site of liquid pretreatment system. Trenches and holes emptied of leachate and grouted. Buried leachate transfer line to remain in place. Existing NDA geomembrane cover replaced with a robust multi-layer cap.	Continued monitoring and maintenance.	No decommissioning actions.
State-Licensed Disposal Area (SDA)	Removal.	Leachate removed from disposal trenches and replaced with grout. Waste Storage Facility removed to grade. Existing SDA geomembrane cover replaced with robust multi-layer cap. Hydraulic barrier installed.	Active management.	No decommissioning actions.
North Plateau Groundwater Plume	Removal.	Plume source area closed in an integrated manner with the Main Plant Process Building, Vitrification Facility and Waste Tank Farm within a common circumferential barrier. Permeable treatment wall installed before decommissioning would remain in place. Non-source area allowed to decay in place.	Removal of source area. Permeable treatment wall installed before decommissioning would remain in place.	No decommissioning actions.
Cesium Prong	Removal.	Restrictions on use until sufficient decay has taken place.	Managed in place.	No decommissioning actions.

Lagoon 2. Storage Basin for Low-level Radioactive Wastewater Prior to Treatment.

Lagoon 3. Storage Basin for Treated Wastewater Awaiting Discharge to Erdman Brook through the State Pollutant Discharge Elimination System (SPDES) - Permitted Discharge.

Slurry Wall Being Constructed in NRC-Licensed Disposal Area

3. How Do the Alternatives Compare?

Each of the four alternatives considered in the EIS has the potential to produce short-term impacts on one or more resource areas. Alternatives that would leave residual radioactivity and/or contamination on site also have the potential for local long-term impacts on resource areas.

Comparisons of the proposed alternatives are based on both short- and long-term impacts. Five resource areas where meaningful impact differences could occur are used to compare short-term impacts: land use (land available for reuse), socioeconomics (employment), human health and safety, waste management, and transportation. For comparative analyses of long-term impacts, the projected radiation dose to future hypothetical individuals and populations is identified as a meaningful difference among the alternatives; that is, long-term risks are dominated by radiological rather than chemically hazardous constituents.

Short-term refers to the active project period under each alternative during which implementation (most of the construction, operation, and decommissioning activities) would take place.

Long-term is defined as the timeframe beyond implementation of each alternative.

The analyses for the Phased Decisionmaking Alternative presented in Chapter 4 of the EIS are based on making a Phase 2 decision 30 years after the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. This is consistent with the longest timeframe allowed for making a Phase 2 decision for the Phased Decisionmaking Alternative evaluated in the Revised Draft EIS. Although the Phased Decisionmaking Alternative in the Final EIS specifies that a Phase 2 decision would be made no later than 10 years after issuance of the initial ROD and Findings Statement, the 30-year analytical timeframe has been retained in the Final EIS. The potential effect of making the Phase 2 decision at 10 years rather than 30 years is addressed qualitatively in this section of the *Summary* for the five resource areas identified as being potential discriminators among alternatives. The potential effect on other resource areas that are addressed in Chapter 4 from this change in the timing of the Phase 2 decision for the Phased Decisionmaking Alternative has also been qualitatively addressed. This assessment indicates that the duration of Phase 1 (10 years or 30 years) does not change the overall impact for any of these resource areas because there are no actions that would result in environmental consequences on these resource areas between the completion of Phase 1 decommissioning actions and the initiation of Phase 2 actions.

In addition, the potential impacts of the Phase 2 decision for the SDA of continued active management are also discussed in this section.

Short-term Impacts

Short-term impacts for the resource areas identified as having meaningful differences among the alternatives are presented in *Table 2* on pages 26 and 27 of this *Summary*. The conclusions regarding the short-term impacts of the EIS alternatives are:

Land Use. The Sitewide Removal Alternative would result in the most land available for release for unrestricted use: the entire 1,351 hectares (3,338 acres) encompassing WNYNSC. With the exception of land needed to manage orphan waste that may remain on site until a disposition path is available, the entire site would be cleaned up to the point where it could meet the NRC standard for license termination without restriction, which would allow WNYNSC to be used for other purposes.

The Sitewide Close-In-Place Alternative (after completion of decommissioning activities and decay of the Cesium Prong) would make 1,118 hectares (2,762 acres) available for unrestricted use. However, some land would need to be retained for access control, as a buffer area, and for maintenance and erosion control for the South Plateau burial grounds.

Following completion of Phase 1 of the Phased Decisionmaking Alternative, an estimated 693 hectares (1,712 acres) of land would be available for unrestricted release. The amount of land available for unrestricted release following implementation of Phase 2 would depend on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, the remaining 658 hectares (1,626 acres) would become available, and the total land available for unrestricted release would be the same as that for the Sitewide Removal Alternative, 1,351 hectares (3,338 acres). If the Phase 2 decision is continued active management for the SDA and removal of the remaining waste and contamination for the rest of the site, the amount of land available for release would be reduced by approximately 6.1 hectares (15 acres), plus additional land for a buffer area. If the decision is in-place closure of the remaining waste and contamination, an additional 425 hectares (1,050 acres) would be available for release for unrestricted use, similar to that for the Sitewide Close-In-Place Alternative. There would be no change in the amount of land available for release if the Phase 2 decision for the SDA is continued active management. Making the Phase 2 decision at 10 years rather than 30 years would result in additional land becoming available for unrestricted release approximately 20 years sooner.

For the No Action Alternative, 693 hectares (1,712 acres) would be available for release for unrestricted use. This land would not be needed for continued management and oversight.

Socioeconomics (employment during project implementation). Implementation of the Sitewide Removal Alternative would have the greatest impact on employment because the duration of decommissioning activities would continue longer under this alternative than any of the other alternatives. The average annual employment level for Phase 1 of the Phased Decisionmaking Alternative would be similar to that for the Sitewide Removal Alternative. The average employment level for the Sitewide Close-In-Place Alternative would be about 28 percent higher than that for the Sitewide Removal Alternative. Decommissioning employment for the Sitewide Close-In-Place Alternative and Phase 1 of the Phased Decisionmaking Alternative, however, would not last as long as for the Sitewide Removal Alternative. No post-decommissioning employment for monitoring and maintenance activities would be required for the Sitewide Removal Alternative, unless there is a need for temporary orphan waste storage. The Sitewide Close-In-Place and the No Action Alternatives would require a reduced employment level for an indefinite period of time.

If the Phase 2 decision is removal of all remaining waste and contamination, the employment levels and related socioeconomic impacts for the entire Phased Decisionmaking Alternative would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management for the SDA and removal of the remaining waste and contamination for the rest of the site, the overall labor required for both phases of the alternative would decrease by about 25 percent. If the Phase 2 decision is in-place closure, employment levels and socioeconomic impacts for the entire Phased Decisionmaking Alternative would be similar to the Sitewide Close-In-Place Alternative. If the Phase 2 decision is continued active management for the SDA and in-place closure of the remaining waste and contamination for the rest of the site, employment would be decreased by about 15 percent. In either case, approximately 10 employees would be required for continued active management of the SDA.

Making the Phase 2 decision at 10 years rather than 30 years would eliminate the approximately 20-year period of reduced employment that would occur between completion of Phase 1 decommissioning activities and the beginning of Phase 2 actions. In addition to avoiding a reduction in employment levels, implementation of Phase 2 activities at 10 years would have the advantage of a mobilized and trained workforce available to immediately begin implementing Phase 2.

Based on the expected changes in employment levels for each of the alternatives, there would be no discernable impact on the economies of the local and regional areas surrounding WNYNSC.

Human Health and Safety (radiation doses to the public and site workers during implementation of the alternatives). Decommissioning actions would result in radiological releases to the atmosphere and to local surface waters. These releases would result in radiological exposure and the associated risk of latent cancer fatalities (LCFs) to offsite individuals and populations. Decommissioning actions would also result in occupational exposure to site workers.

Excluding the No Action Alternative, the collective radiological dose to the general population within an 80-kilometer (50-mile) radius of WNYNSC would range from about 40 person-rem for the Sitewide Close-In-Place Alternative to 120 person-rem for the Sitewide Removal Alternative. Less than 1 additional LCF would be expected in the population as a result of decommissioning actions under any of the alternatives. For the Phased Decisionmaking Alternative, the population dose for both phases would range from 82 person-rem for in-place closure to 120 person-rem for removal of remaining waste and contamination. These doses would be reduced if the Phase 2 decision for the SDA is continued active management. Because the dose to the general population is negligible during the monitoring and maintenance period after the Phase 1 decommissioning actions are complete, the general population would not be affected by the timing of the Phase 2 decision. The peak annual dose to the maximally exposed individual at the site boundary would be highest for Phase 1 of the Phased Decisionmaking Alternative because it has the highest annual radionuclide release.

Health Risk

Latent cancer fatality (LCF) is a term used to indicate the estimated number of cancer fatalities that may result from exposure to ionizing radiation. Dose conversion factors are used to convert radiological dose to LCFs.

Collective dose refers to the sum of the individual radiological doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem.

As shown in *Table 2*, the total worker dose for decommissioning actions would range from about 120 person-rem for the Sitewide Close-In-Place Alternative to 990 person-rem for the Sitewide Removal Alternative. For the Phased Decisonmaking Alternative, the total worker dose for both phases would range from 240 person-rem if the Phase 2 decision is in-place closure to 990 person-rem if the Phase 2 decision is removal of remaining waste and contamination. Doses would be reduced if the Phase 2 decision for the SDA is continued active management. The higher dose would still be expected to result in less than 1 additional LCF among the involved worker population. The average worker dose for decommissioning actions would range from about 54 to 83 millirem per year, which is well below the site administrative control limit of 500 millirem per year. The annual worker population dose during the monitoring and maintenance portion of Phase 1 of the Phased Decisionmaking Alternative would be about 1.7 person-rem, so making the Phase 2 decision at 10 years rather than 30 years would reduce the total estimated worker population dose by about 34 person-rem.

Waste Management. Decommissioning activities and construction and operation of decommissioning facilities under different alternatives would generate high-level radioactive waste, nonhazardous waste, hazardous waste, transuranic waste, low-level and mixed low-level radioactive wastes, and Greater-Than-Class C waste (see text box on page 21 of this *Summary* for definitions of these waste types).

General Disposal Options for Low-Level Radioactive Waste

DOE/Commercial Disposal Option - DOE low-level radioactive waste would be disposed of at DOE disposal facilities (e.g. Nevada Test Site). Commercial low-level radioactive waste would be disposed of at commercial disposal facilities.

Commercial Disposal Option - All low-level radioactive waste would be disposed of at commercial disposal facilities.

For both options, all wastes would be disposed of in accordance with applicable waste acceptance criteria and appropriate permits/licenses.

The Sitewide Removal Alternative would generate the largest volume of waste from decommissioning activities, but no waste from long-term stewardship. Wastes that may be generated include nonhazardous waste, hazardous waste, low-level and mixed low-level radioactive wastes (including low-specific-activity waste), transuranic waste, and Greater-Than-Class C waste.

Phase 1 of the Phased Decisionmaking Alternative would generate the second largest volume of waste from decommissioning activities. Wastes that may be generated include nonhazardous waste, hazardous waste, low-level and mixed low-level radioactive wastes (including low specific activity waste), and transuranic waste. Making the Phase 2 decision at 10 years rather than 30 years would result in waste from monitoring and maintenance activities being generated for only about 2 years. The total volume of Phase 1 waste would be reduced by less than 2 percent because the vast majority of the waste generated during Phase 1 would result from decommissioning activities.

If the Phase 2 decision is removal of all remaining waste and contamination, the total decommissioning waste volumes for the Phased Decisionmaking Alternative would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management of the SDA and removal of the remaining waste and contamination for the rest of the site, there would be about 30 percent less low-level radioactive waste generated from decommissioning than for the Sitewide Removal Alternative, and almost no other radioactive waste generated. If the Phase 2 decision is in-place closure of remaining waste and contamination, the total volume of waste generated by the Phased Decisionmaking Alternative would include the Phase 1 waste plus about 30 percent of the waste volume generated under the Sitewide Close-In-Place Alternative. If the Phase 2 decision is continued active management of the SDA and in-place closure for the remainder of WNYNSC, the quantities of wastes from decommissioning would be slightly lower than these estimates.

The Sitewide Close-In-Place Alternative would generate the smallest volume of waste from decommissioning activities. Wastes that may be generated include nonhazardous waste, hazardous waste, low-level and mixed low-level radioactive wastes, and transuranic waste. Low-level radioactive waste would also be generated during long-term stewardship activities.

Waste Types

High-level Waste or High-level Radioactive Waste – The high-level radioactive waste that was produced by the reprocessing of spent nuclear fuel at the Western New York Nuclear Service Center. This waste includes liquid wastes, which are produced directly in reprocessing; dry solid material derived from such liquid wastes; and such other material the U.S. Nuclear Regulatory Commission (NRC) designates as high-level radioactive waste for the purposes of protecting the public health and safety (West Valley Demonstration Project Act, Public Law 96-368, 94 Stat. 1347). Also see the definition of high-level radioactive waste in the Nuclear Waste Policy Act of 1982, as amended (Public Law 97-425, 96 Stat. 2201), and as promulgated in 10 Code of Federal Regulations (CFR) 63.2.

Transuranic Waste – DOE radioactive waste not classified as high-level radioactive waste and containing more than 100 nanocuries per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years (40 CFR Part 191). Transuranic waste may be considered defense or non-defense waste depending on its origin.

Hazardous Waste – A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20-24 and 6 New York Code of Rules and Regulations (NYCRR) 371.1(d)(1) and 371.3—ignitability, corrosivity and reactivity, or toxicity—or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.3-33 or by the State of New York in 6 NYCRR 371.4. Toxicity is determined by the Toxicity Characteristic Leaching Procedure method, as given in 40 CFR 261.24 and 6 NYCRR 371.3(e).

Low-level Radioactive Waste – Waste that contains radioactivity and is not classified as high-level radioactive waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material (DOE Manual 435.1-1, 10 CFR 20.1003). In accordance with NRC regulations in 10 CFR 61.55, low-level radioactive waste is further classified into Class A, Class B, or Class C low-level radioactive waste. [Low-level radioactive waste may also be categorized as low-specific-activity waste for the purposes of transportation analyses. Low-specific-activity wastes have low specific activity, are nonfissile, and meet certain regulatory exceptions and limits. Low-specific-activity wastes may be transported in large bulk containers.]

Mixed Low-level Radioactive Waste – Low-level radioactive waste that also contains hazardous waste regulated under RCRA (42 United States Code [U.S.C.] 6901 et seq.).

Greater-Than-Class C Waste – Low-level radioactive waste that exceeds the concentration limits established for Class C low-level radioactive waste in 10 CFR 61.55. [Note: Greater-Than-Class C waste is generated by activities (e.g., by commercial entities) licensed by NRC or Agreement States. This waste classification does not apply to low-level radioactive waste generated or owned by DOE that is disposed of at a DOE disposal facility.]

Construction and Demolition Debris – Discarded nonhazardous material, including solid, semisolid, or contained gaseous material resulting from construction, demolition, industrial, commercial, mining, and agricultural operations and from community activities. This category does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act (42 U.S.C. 2011 et seq.).

The No Action Alternative would generate no waste from decommissioning activities but the largest annual volume of waste from monitoring and maintenance activities.

Transportation (radiation doses to the public along transportation routes and to transportation workers during transportation). Both radiological and nonradiological impacts could result from shipment of radioactive waste from WNYNSC to offsite disposal facilities. Uncertainty about the locations of facilities for disposal of low-level radioactive waste has been addressed by considering two general disposal options. In the DOE/Commercial Disposal Option, low-level radioactive waste would be transported to a combination of commercial and DOE disposal facilities; and in the Commercial Disposal Option, low-level radioactive waste would be transported only to commercial disposal facilities.

The impacts would be proportional to the distance traveled. DOE and NYSERDA could choose to use a combination of rail and truck shipments during implementation of any of the proposed alternatives. If that were the case, for the DOE/Commercial Disposal Option the dose to the population along the transportation route would be expected to range from the lowest projected dose of about 2.8 person-rem, which is associated with all-rail shipments under the Sitewide Close-In-Place Alternative, to the highest projected dose of about 370 person-rem, which is associated with all-truck shipments under the Sitewide Removal Alternative. Less than 1 additional LCF would be expected from such exposures to the general population.

For the Sitewide Removal Alternative, the highest collective dose to transportation workers would occur under the Commercial Disposal Option using all-truck shipments. For the Sitewide Close-in-Place Alternative, the highest collective dose to transportation workers would occur under the DOE/Commercial Option using all-truck shipments. For both the Sitewide Removal and Sitewide Close-in-Place Alternatives, the highest dose to the population along the transportation route would occur under the DOE/Commercial Disposal Option, also using all-truck shipments. For Phase 1 of the Phased Decisionmaking Alternative, the highest collective dose to transportation workers would be from all-truck shipments under the Commercial Disposal Option; the highest dose to the population along the transportation route would be from all-truck shipments under the DOE/Commercial Disposal Option. Making the Phase 2 decision at 10 years rather than 30 years would result in about a 2 percent reduction in the total number of waste shipments in Phase 1. This would result in about a 4 percent reduction in the collective dose to transportation workers and about a 5 percent reduction in the dose to the population along the transportation route.

If the Phase 2 decision is removal of all remaining waste and contamination, the total transportation worker and population dose and risk for this alternative (both Phase 1 and Phase 2) would be essentially equal to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management for the SDA and removal of the remaining waste and contamination for the rest of the site, the total transportation dose and risk for both phases of the Phased Decisionmaking Alternative would be about 40 percent less than those for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure for all remaining waste and contamination, the total transportation worker and population dose and risk for both phases of this alternative would be about 5 percent higher than those for Phase 1 alone because the Phase 2 closure actions would cause only a small percent increase in the volume of low-level radioactive waste to be shipped. If the Phase 2 decision is continued active management for the SDA and in-place closure of the remaining waste and contamination for the rest of the site, the total transportation dose and risk for both phases of this alternative would be essentially the same as for Phase 1 alone. This is because no closure activities would be undertaken for the SDA, so no radioactive waste would need to be transported offsite for disposal.

The Sitewide Removal Alternative has the highest estimated nonradiological health risk to the public, ranging from about 9.7 to 15 traffic or rail accident fatalities for the various shipping options.[1] The other alternatives would result in less than 1 nonradiological accident fatality, except for Phase 1 of the Phased Decisionmaking Alternative, which would result in about 2 fatalities for the rail shipping options. If the Phase 2 decision is removal of all remaining waste and contamination, the total nonradiological health risk for this alternative (both Phase 1 and Phase 2) would be essentially the same as for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management for the SDA, and removal of the remaining waste and contamination for the rest of the site, nonradiological transportation impacts would be about 30 percent less than for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure for all remaining waste and contamination, the total nonradiological health risk for both phases of this alternative would be about 5 percent higher than the Phase 1 risk. If the Phase 2 decision is continued active management for the SDA and in-place closure for the rest of the site, total nonradiological transportation impacts would be lower because there would be no deliveries of construction and erosion control materials for construction of an engineered cap for the SDA. Considering that the transportation activities would occur over a period of time of about 7 to 60 years and that the average number of annual traffic fatalities in the United States is about 40,000 per year, the traffic fatality risks under all alternatives would be very small.

Long-term Impacts

Long-term impacts would result from any alternative that would leave radioactive materials on site. For analysis purposes, "long-term" extends from the end of the decommissioning action implementation period out to at least 10,000 years, and perhaps longer if the predicted peak annual dose occurs later.

Table 3 on page 28 of this *Summary* provides an overview of the potential long-term human health radiological dose consequences for comparison among the alternatives.

The **Sitewide Removal Alternative** would result in minimal long-term impacts to the public in the vicinity of WNYNSC because this alternative would transfer the long-term waste management risk and the need for long-term institutional controls (stewardship) to other locations where the removed materials would be disposed. Contamination would be removed from WNYNSC such that an individual in direct contact with any residual contamination would receive an annual dose of less than 25 millirem per year, assuming conservative land reuse scenarios that include houses, gardens, and water wells located in areas with the highest residual contamination. Other site reuse scenarios would result in substantially lower doses, and the dose to offsite receptors would be many orders of magnitude lower (i.e., negligible).

The **Sitewide Close-In-Place Alternative** would include additional engineered barriers and also rely on institutional controls to limit offsite and onsite doses. For this alternative, the estimated peak annual dose to offsite individual receptors, if institutional controls are assumed to remain in place, is less than 1 millirem, similar to the dose for the No Action Alternative. The estimated dose to offsite individual receptors in the event of loss of institutional controls is

[1] *The nonradiological accident fatality estimates for rail transport are based on the conservative assumption of one waste railcar per train.*

Alternatives	Impacts from Decommissioning Actions (Short-term Impacts)
Sitewide Removal - All site facilities would be removed - All environmental media would be decontaminated - All radioactive, hazardous, and mixed waste would be shipped off site for disposal	• Entire site would be available for release for unrestricted use. • Requires highest overall level of employment because of long duration. • Incurs highest radiological population dose to the public, but less than 1 LCF. Average worker dose would remain below administrative control limits. • Generates the largest quantity of decommissioning waste for offsite disposal, about 60 times more than Sitewide Close-In-Place and 8 times more than Phase 1 of Phased Decisionmaking. Greatest volume of potential orphan waste. • Has the highest nonradiological health risk to the public from traffic accidents. • This alternative appears to meet NRC's decommissioning ALARA requirement.
Sitewide Close-In-Place - Major facilities would be closed in place - Residual radioactivity and/or contamination in facilities with larger inventories of long-lived radionuclides would be isolated by specially designed closure structures and engineered barriers - Buffer area and long-term stewardship required	• Portions of the site would be available for release for unrestricted use over a period of time. • Requires high level of employment but over a short duration. • Incurs lowest radiological population dose to the public of the decommissioning alternatives, and less than 1 LCF. Average worker dose would remain below administrative control limits. • Smallest volume of waste including potential orphan waste for offsite disposal. • Would result in less than 1 nonradiological traffic fatality from traffic accidents. • This alternative appears to meet NRC's decommissioning ALARA requirement.
Phased Decisionmaking [1](the Preferred Alternative) - Decommissioning would be completed in two phases - Phase 1 activities: removal of Main Plant Process Building, Vitrification Facility and 01-14 Building, source area for the North Plateau Groundwater Plume, lagoons in the Low-Level Waste Treatment Facility Area - The Waste Tank Farm and waste disposal areas would be actively managed in their current configuration during Phase 1 - Additional studies and evaluations would be conducted during Phase 1 to clarify and possibly reduce uncertainties related to the Phase 2 decision - Phase 2 would address Waste Tank Farm, Construction Demolition and Debris Landfill, non-source area of the plume, and waste disposal areas following the approach determined through Phase 1 evaluations, including for the SDA, possible continued active management.	• A portion of the site would be available for release for unrestricted use during Phase 1. Balance of the site would be available for unrestricted release if Phase 2 is removal of the remaining facilities/contamination; a smaller portion if Phase 2 is close-in-place for the remaining facilities/contamination. • Average level of employment for Phase 1 actions comparable to Sitewide Removal but for shorter period of time. Total employment (worker-years) would be similar to Sitewide Removal if Phase 2 is removal of remaining facilities/contamination; similar to Phase 1 plus Sitewide Close-In-Place if Phase 2 is close-in-place for the remaining facilities/contamination. • Phase 1 incurs radiological population dose to the public between the other decommissioning alternatives, and less than 1 latent cancer fatality. Average worker dose would remain below administrative control limits. • Generates more waste for offsite disposal than Sitewide Close-In-Place, but less than Sitewide Removal for Phase 1 actions. Total waste volumes would be similar to Sitewide Removal if Phase 2 is removal of remaining facilities/contamination, similar to Phase 1 plus 30 percent of Sitewide Close-In-Place volume if Phase 2 is close-in-place for the remaining facilities/contamination. • Phase 1 would result in less than 2 nonradiological traffic fatalities. • Impacts for both phases would generally be bounded by those for the Sitewide Removal and Sitewide Close-in-Place Alternatives, but would in some cases be bounded by the No Action Alternative if the Phase 2 decision for the SDA is continued active management. • This alternative appears to meet NRC's decommissioning ALARA requirement regardless of the Phase 2 decommissioning decision.
No Action - No actions taken toward decommissioning - Would require continued management and oversight of all facilities located on the WNYNSC property - Does not meet the purpose and need for agency action	• No decommissioning actions or impacts.

[1] *The short-term impact analyses in the EIS are based on Phase 1 comprising 8 years of decommissioning activities followed by 22 years of monitoring and maintenance.*

Mitigation Measures for Decommissioning Actions	Monitoring and Maintenance Impacts	Mitigation Measures for Long-term Monitoring and Maintenance	Implementation Schedule
• Runoff and sedimentation controls, spill prevention and control measures, waste water treatment systems, scheduling restrictions to protect water quality. • Dust suppression system, equipment exhaust, building off-gas systems to protect air quality. • Environmental enclosures, building off-gas systems, shield walls, remote operations, protective equipment to protect human health and safety.	• No long-term monitoring or maintenance (stewardship) requirement or impacts. • Negligible long-term radiological dose to the offsite public, very small dose to individuals who would reuse the site.	• None necessary.	• 60 years to implement decommissioning actions. • No monitoring or maintenance after removal is complete.
• Runoff and sedimentation controls, spill prevention and control measures, waste water treatment systems, scheduling restrictions to protect water quality. • Dust suppression system, equipment exhaust, building off-gas systems to protect air quality. • Building off-gas systems, shield walls, remote operations, and protective equipment to protect human health and safety.	• Requires a small number of workers in perpetuity. • Small radiological dose to the public and workers (less than No Action). • Small waste volumes (less than No Action). • Results in small to moderate radiological doses in the long-term to the public, assuming institutional controls are in place, moderate dose to an intruder if institutional controls fail.	• Engineered barriers (including erosion control measures), monitoring and maintenance activities to protect the environment and human health and safety.	• 7 years to implement decommissioning actions. • Monitoring and maintenance in perpetuity.
• Runoff and sedimentation controls, spill prevention and control measures, waste water treatment systems, scheduling restrictions to protect water quality. • Dust suppression system, equipment exhaust, building off-gas systems to protect air quality. • Building off-gas systems, shield walls, remote operations, and protective equipment to protect human health and safety.	• If Phase 2 is close-in-place, a small number of workers would be required in perpetuity; no workers would be required if Phase 2 is Sitewide Removal. • Long-term human health impacts are comparable to Sitewide Removal if Phase 2 is removal of remaining facilities/contamination. Long-term human health impacts are slightly less than Sitewide Close-In-Place if Phase 2 is close-in-place for the remaining facilities/contamination. • Long-term human health impacts in some cases are bounded by the No Action Alternative if the Phase 2 decision for the SDA is continued active management.	• Engineered barriers (including erosion control measures), monitoring and maintenance activities to protect the environment and human health and safety if Phase 2 is close-in-place management of portions of the site or if the Phase 2 decision for the SDA is continued active management. • None required if Phase 2 is removal.	• 8 years for Phase 1 removal actions • Up to 10 years (concurrent with Phase 1 removal actions) for additional studies and analyses to support Phase 2 decisionmaking. • Additional time to implement the Phase 2 decision. • Potential for monitoring and maintenance in perpetuity, depending on the Phase 2 decision.
	• Non-impacted portions of the site would be available for unrestricted release. • Requires workers in perpetuity. • Incurs annual radiological dose to the public and workers from monitoring and maintenance activities. • Generates waste from monitoring and maintenance activities in perpetuity. • Results in small to moderate radiological doses in the long-term to the public, potentially very high dose to an inadvertent intruder if institutional controls are lost.	• Existing wastewater treatment systems to protect water quality. • Existing, building off-gas systems to protect air quality. • Existing building off-gas systems, shield walls, and protective equipment to protect human health and safety.	• Monitoring and maintenance in perpetuity.

Table 2. Comparison of Alternatives by Resource Area for Short-term Impacts [a]

Resource Area	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase I only) [b, c]	No Action Alternative
Duration of Decommissioning Action	60 years	7 years	8 years	None
Duration of Post-decommissioning Monitoring and Maintenance or Stewardship	Necessary only while any orphan waste is being stored	In perpetuity	In perpetuity if Phase 2 involves in-place closure	No decommissioning Monitoring and Maintenance in perpetuity
Land Use [d] – land estimated to be available for unrestricted release upon completion of alternative	Entire 1,351 hectares (except for any land used for orphan waste storage)	1,118 hectares	693 hectares	693 hectares
Socioeconomics [e] – average employment	Decommissioning: 250 employees annually Monitoring and Maintenance: 20 employees (assuming orphan waste storage)	Decommissioning: 320 employees annually Monitoring and Maintenance: about 31 employees annually until Interim Storage Facility removed; then about 18, indefinitely	Decommissioning: 230 employees annually Monitoring and Maintenance: About 50 employees annually, up to 30 years	Monitoring and Maintenance: About 75 employees annually, indefinitely
Human Health and Safety (public)[f] – population dose (and risk) to the public	Decommissioning: 120 person-rem (0.027 LCF) Monitoring and Maintenance: negligible dose, even if orphan waste is stored onsite	Decommissioning: 40 person-rem (0.012 LCF) Monitoring and Maintenance: 0.0015 person-rem for periodic permeable treatment wall replacement, if necessary; and one-time Interim Storage Facility removal	Decommissioning: 42 person-rem (0.0056 LCF) Monitoring and Maintenance: 0.038 person-rem for one-time permeable treatment wall replacement, if necessary; one-time Interim Storage Facility removal; and ongoing WMA 3 operations	Monitoring and Maintenance: 0.083 person-rem per year
– peak annual MEI dose	1.3 millirem (2.0×10^{-7} LCF)	0.16 millirem (4.2×10^{-8} LCF)	2.2 millirem (3.5×10^{-7} LCF)	0.61 millirem (2.1×10^{-7} LCF)
Human Health and Safety (site workers) [g] – worker population dose (and risk)	Decommissioning: 990 person-rem (0.60 LCF) Monitoring and Maintenance following decommissioning actions: 0.15 person-rem (8.0×10^{-5} LCF) per year if orphan waste is stored on site	Decommissioning: 120 person-rem (0.0070 LCF) Monitoring and Maintenance following decommissioning actions: 0.80 person-rem (5.0×10^{-4} LCF) per year	Decommissioning: 160 person-rem (0.090 LCF) Monitoring and Maintenance following decommissioning actions: 1.7 person-rem (1.0×10^{-3} LCF) per year	Monitoring and Maintenance: 2.0 person-rem per year (0.0010 LCF)
– average worker dose from decommissioning actions	66 millirem (4.0×10^{-5} LCF) per year	54 millirem (3.0×10^{-5} LCF) per year	83 millirem (5.0×10^{-5} LCF) per year	No decommissioning occurs
Waste Management [h] – packaged decommissioning waste (cubic meters)	140,000 nonhazardous 15 hazardous 1,500,000 LLW [i] 4,200 GTCC [i] 1,000 TRU [i] 570 MLLW **1,600,000 Total**	15,000 nonhazardous 3 hazardous 9,900 LLW [i] 0 GTCC 35 TRU [i] 410 MLLW **26,000 Total**	33,000 nonhazardous 2 hazardous 180,000 LLW [i] 0 GTCC 710 TRU [i] 41 MLLW **210,000 Total**	None
Waste Management [h] – packaged monitoring and maintenance (M&M) or long-term stewardship (LTS) waste (cubic meters per year)	3.2 LLW [i] (assuming orphan waste storage)	0 nonhazardous 0 hazardous 110 LLW 0 GTCC 0 TRU 0 MLLW **110 Total** (LTS)	6 nonhazardous <1 hazardous 140 LLW 0 GTCC 0 TRU 0 MLLW **150 Total** (M&M)	32 nonhazardous 1 hazardous 450 LLW 0 GTCC 0 TRU <1 MLLW **480 Total** (M&M)

Resource Area	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase I only) [b,c]	No Action Alternative
Transportation [j, k] – dose and risk to the public along transportation routes during transportation (person-rem [LCFs])	DOE/Commercial Truck: 370 (0.22) Rail: 94 (0.057) Commercial Truck: 350 (0.21) Rail: 94 (0.57)	DOE/Commercial Truck: 11 (6.6×10^{-3}) Rail: 2.8 (1.7×10^{-3}) Commercial Truck: 9.9 (6.0×10^{-3}) Rail: 2.6 (1.6×10^{-3})	DOE/Commercial Truck: 72 (0.043) Rail: 16 (9.8×10^{-3}) Commercial Truck: 58 (0.035) Rail: 16 (9.7×10^{-3})	DOE/Commercial Truck: 12 (7.1×10^{-3}) Rail: 2.6 (1.6×10^{-3}) Commercial Truck: 9.8 (5.9×10^{-3}) Rail: 2.6 (1.6×10^{-3})
Transportation [j, k] – dose and risk to transportation workers during transportation (person-rem [LCFs]) [l]	DOE/Commercial Truck: 2,100 (1.2) Rail: 65 (0.039) Commercial Truck: 2,200 (1.3) Rail: 65 (0.039)	DOE/Commercial Truck: 49 (0.029) Rail: 1.9 (1.2×10^{-3}) Commercial Truck: 45 (0.027) Rail: 1.4 (8.5×10^{-4})	DOE/Commercial Truck: 270 (0.16) Rail: 11 (6.5×10^{-3}) Commercial Truck: 400 (0.24) Rail: 11 (6.5×10^{-3})	DOE/Commercial Truck: 38 (0.023) Rail: 1.7 (1.0×10^{-3}) Commercial Truck: 31 (0.019) Rail: 1.4 (8.2×10^{-4})
Transportation [j, k] – nonradiological accident risk (number of traffic fatalities)	DOE/Commercial Truck: 9.7 Rail: 15 Commercial Truck: 10 Rail: 15	DOE/Commercial Truck: 0.10 Rail: 0.17 Commercial Truck: 0.12 Rail: 0.17	DOE/Commercial Truck: 1.0 Rail: 1.8 Commercial Truck: 1.3 Rail: 1.8	DOE/Commercial Truck: 0.050 Rail: 0.090 Commercial Truck: 0.060 Rail: 0.090

GTCC = Greater-Than-Class C waste, LCF = latent cancer fatality, LLW = low-level radioactive waste, MEI = maximally exposed individual, MLLW = mixed low-level radioactive waste, TRU = transuranic waste.

[a] Totals may not add due to rounding. All values except for land use are rounded to no more than two significant figures.

[b] Magnitude of impacts for the Phased Decisionmaking Alternative depends on the Phase 2 activities implemented.

[c] The analyses for the Phased Decisionmaking Alternative presented in Chapter 4 of the EIS are based on making a Phase 2 decision 30 years after the initial ROD and Findings Statement, if the Phased Decisionmaking Alternative is selected, and the impacts identified in this table result from those analyses. The Phased Decisionmaking Alternative now specifies that Phase 2 decisions would be made no later than 10 years after issuance of such a ROD and Findings Statement. The potential impact of the change in decision point timing is qualitatively addressed in the text in this section of the Summary.

[d] Source: Chapter 4, Table 4–1, of the EIS, "Summary of Land and Visual Resources Impacts."

[e] Source: Chapter 4, Table 4–11, of the EIS, "Summary of Socioeconomic Impacts."

[f] Source: Chapter 4, Table 4–12, of the EIS, "Summary of Health and Safety Impacts." The peak annual dose to the MEI is the highest of the following locations: receptor at nearest site boundary, on Cattaraugus Creek near the site, or on the lower reaches of Cattaraugus Creek.

[g] Source: Chapter 4, Table 4–18, of the EIS, "Projected Worker Dose and Risk During and After Decommissioning."

[h] Source: Chapter 4, Table 4–46, of the EIS, "Summary of Waste Management Impacts." For all decommissioning alternatives, up to approximately 3.2 cubic meters (110 cubic feet) per year of additional low-level radioactive waste could be generated due to management of orphan waste.

[i] Pre-West Valley Demonstration Project Class B and C low-level radioactive waste, Greater-Than-Class C low-level radioactive waste, and non-defense transuranic waste do not have a clear disposal path and may need to be stored on site until a disposal location is identified. DOE plans to select a location for a disposal facility for Greater-Than-Class C waste and potential non-defense transuranic waste following completion of the Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (GTCC EIS) (DOE/EIS-0375).

[j] Source: Chapter 4, Table 4–53, of this EIS, "Risks of Transporting Radioactive Waste Under Each Alternative."

[k] For the purpose of comparison with other alternatives, transportation impacts for the No Action Alternative are provided for monitoring and maintenance activities over a 20-year period, which would continue to recur in 20-year cycles. Under the DOE/Commercial Disposal Option, low-level radioactive wastes are assumed to go to the Nevada Test Site or a western U.S. commercial disposal site. Under the Commercial Disposal Option, only commercial facilities would be used. However, for purposes of analysis only, it was assumed that transuranic waste and Greater-Than-Class C waste would be transported to the Waste Isolation Pilot Plant and the Nevada Test Site, respectively.

[l] The dose to transportation workers presented in this table does not reflect administrative controls applied to the workers. In practice, workers who are not trained radiation workers would be limited to a dose of 100 millirem per year, and trained radiation workers would be limited to an Administrative Control Limit of 2 rem per year, which would represent an annual risk of 0.0012 LCF for a trained radiation worker. Enforcement of the administrative limit would most likely be necessary under the Sitewide Removal Alternative.

Note: To convert hectares to acres, multiply by 2.471. To convert cubic meters to cubic feet, multiply by 35.314.

Table 3. Comparison of Long-term Human Health Radiological Consequences

Peak Annual Dose	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative	No Action Alternative
Peak Annual Dose to Postulated Offsite Populations	Essentially negligible.	About 95 person-rem with or without institutional controls. About 240 person-rem assuming unmitigated erosion.	If Phase 2 is removal for the remaining Waste Management Areas, long-term impacts would be comparable to the Sitewide Removal Alternative.	Abut 95 person-rem with institutional controls and 340 person-rem without. About 1,500 person-rem assuming unmitigated erosion.
Peak Annual Dose to Postulated Offsite Individual Receptors	Essentially negligible.	Less than 0.2 millirem with or without institutional controls. Up to 4 millirem assuming unmitigated erosion.	If Phase 2 is close-in-place for the remaining Waste Management Areas, long-term impacts would be slightly less than those for the Sitewide Close-In-Place Alternative.	About 0.7 millirem with institutional controls and up to 3 millirem without. Up to 34 millirem assuming unmitigated erosion.
Peak Annual Dose to Postulated Onsite Receptors (Intruders) Assuming Loss of Institutional Controls	Less than 25 millirem for intruders with houses, gardens, and water wells in areas with soil contaminated at unrestricted release levels.	Less than 1 millirem to about 160 millirem to intruders with gardens in contaminated soil or wells in contaminated water.	If the Phase 2 decision for the SDA is continued active management, long-term impacts for some exposure scenarios and receptors would be bounded by the No Action Alternative.	Less than 1 millirem to 400 rem to intruders with gardens in contaminated soil or wells in contaminated water.

less than 1 millirem per year if only groundwater release mechanisms are involved (less than the No Action Alternative) and up to 4 millirem per year if there is extended (many hundreds of years) loss of institutional control such that unmitigated erosion occurs.[2] If institutional controls are lost and there are intruders into the industrialized area, there could be annual doses of less than 1 millirem to 160 millirem to intruders who consume produce from gardens in areas containing contaminated soil from large excavation activities or who use water from contaminated wells. The intruder doses would be less than those for the No Action Alternative because engineered barriers would reduce the likelihood of direct intrusion and slow the migration of contaminants. The highest doses for the Sitewide Close-In-Place Alternative are for an intruder with a well in the North Plateau Groundwater Plume, or near the Main Plant Process Building or the Waste Tank Farm.

Long-term human health impacts for the **Phased Decisionmaking Alternative** would depend on the Phase 2 decision. If the Phase 2 decision is removal of remaining waste and contamination, the long-term impacts at WNYNSC and in the region would be the same as those projected for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure of remaining waste and contamination, long-term impacts would be slightly less than those for the Sitewide Close-In-Place Alternative because the Main Plant Process Building, the Vitrification Facility, the source area of the North Plateau Groundwater Plume, and the Low-

[2] *If institutional controls remain in place, any release to the accessible environment could be monitored and time- and location-specific corrective actions taken.*

Level Waste Treatment Facility Area lagoons would have been removed during Phase 1. If the Phase 2 decision for the SDA is continued active management, the long-term impacts for some exposure scenarios and receptors would be bounded by those for the No Action Alternative. Neither the magnitude nor timing of the peak annual dose from units that would be closed in place is considered to be sensitive to whether the Phase 2 decision is made 10 or 30 years after the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected.

Under the **No Action Alternative**, material would not be removed and engineered barriers would not be added to isolate waste. Existing barriers and institutional controls would be relied on to limit offsite and onsite doses. The estimated peak annual dose to offsite individual receptors, if institutional controls are assumed to remain in place, would be less than 1 millirem. The estimated peak annual dose to offsite individual receptors in the event of loss of institutional controls is up to 3 millirem per year if only groundwater release mechanisms are involved, and up to 34 millirem per year if there is extended (many hundreds of years) loss of institutional controls such that unmitigated erosion occurs. If institutional controls are lost and there are intruders into the industrialized area, there could be annual doses of up to 400 rem to intruders who consume produce from gardens in areas containing contaminated soil from large excavation activities or use water from contaminated wells. The higher doses could occur near any of the industrial facilities on the Project Premises or the SDA. The No Action Alternative is the baseline for evaluating and comparing the long-term impacts under the decommissioning alternatives.

Cost-Benefit Analysis

Insight into the cost-effectiveness of the alternatives is provided by comparing the ratio of the incremental cost for an alternative (the cost for an alternative less the cost of the No Action Alternative) and the net 1,000-year population dose reduction (the avoided population dose due to removal or increased isolation less the worker and public population dose required to achieve the new end state).

As shown in *Table 4*, the Sitewide Close-In-Place Alternative has the lowest range of incremental cost-effectiveness, although portions of the ranges of incremental cost-effectiveness overlap for all action alternatives. The range for the Phased Decisionmaking Alternative is the broadest and is influenced, in order of importance, by the following factors: real discount rate, the nature of the Phase 2 decision (removal or in-place closure), timing of the Phase 2 decision, and the cost of Greater-Than-Class C waste disposal (if the Phase 2 decision is removal). The cost effectiveness range for the Phased Decisionmaking Alternative in *Table 4* includes the cost per avoided person-rem for making the Phase 2 decision at both 10 years and 30 years from the initial ROD and Findings Statement, if the Phased Decisionmaking Alternative is selected. All other factors being equal, the cost per avoided person-rem would be higher if the Phase 2 decision is made at 10 years rather than 30 years. This can be primarily attributed to the effect of the discount rate over time.

Table 4. Cost-Benefit Comparative Assessment [a]

Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative [b]	No Action Alternative
The Sitewide Removal Alternative would transfer essentially the entire site radionuclide inventory to other disposal sites. The incremental cost-effectiveness is estimated to range from about $430,000 to $1,300,000 per avoided person-rem.	The Sitewide Close-In-Place Alternative would keep most of the site radionuclide inventory out of the site's accessible environment. The incremental cost-effectiveness is estimated to range from about $210,000 to $950,000 per avoided person-rem.	The cost-effectiveness of this alternative would depend primarily on the Phase 2 decision. If the Phase 2 decision is timely removal of the remaining waste and contamination, the incremental cost-effectiveness is estimated to range from about $230,000 to $1,300,000 per avoided person-rem. If the Phase 2 decision is timely in-place closure for the remaining waste and contamination, the incremental cost-effectiveness is estimated to range from about $450,000 to $760,000 per avoided person-rem.	The No Action Alternative serves as a baseline for assessing the incremental cost-effectiveness of the decommissioning alternatives.

[a] The analysis was performed for all alternatives assuming real discount rates ranging from 1 to 5 percent, and unit Greater-Than-Class C waste disposal costs ranging from $2,300 to $21,000 per cubic foot. The values in this table are based on calculations that assume continued institutional controls.

[b] The analysis for the Phased Decisionmaking Alternative assumes the Phase 2 decision is either all removal or all in-place closure of the Waste Tank Farm, NRC-Licensed Disposal Area, and State-Licensed Disposal Area.

Conclusions by Alternative

The following conclusions are based on a comparative analysis of impacts of the proposed alternatives. This discussion is focused on impacts considered to be potential discriminators among the alternatives.

- The ***Sitewide Removal Alternative*** would result in the most land available for release for unrestricted use (the entire WNYNSC), and would not require long-term stewardship, although institutional controls could be needed during possible temporary management of orphan waste. This alternative would result in the highest decommissioning impacts at the site, on site workers, and on the public in the vicinity of WNYNSC and along the transportation routes over a period of about 60 years. This alternative would incur the highest short-term collective radiological dose to the public and workers from both onsite and transportation activities. Transporting the waste off site for disposal is estimated to result in as many as 10 to 15 fatalities from truck and rail accidents, respectively. Possible long-term dose to the general population in the vicinity of WNYNSC would be negligible. This alternative appears to meet NRC's decommissioning as low as is reasonably achievable (ALARA) requirement.

- The ***Sitewide Close-in-Place Alternative*** would result in fewer decommissioning impacts at the site, require the least amount of time to accomplish, and generate the least amount of waste (other than the No Action Alternative) that would need to be disposed of elsewhere. This alternative would result in less land available for release for unrestricted use than the Sitewide Removal Alternative. Transporting the waste off site for disposal is estimated to result in 1 fatality from transportation accidents. However, implementing this alternative would require long-term stewardship at WNYNSC, including institutional controls. The reasonably foreseeable long-term peak annual dose to Lake Erie water users assuming unmitigated erosion (worst case) would be about 0.4 millirem, which would be indistinguishable from the dose associated with background radiation. This alternative appears to meet NRC's decommissioning ALARA requirement.

- The ***Phased Decisionmaking Alternative*** (Phase 1) would not result in more land available for release than the No Action Alternative, but would have positive impacts because contaminated facilities would be removed and the source area for the North Plateau Groundwater Plume would be removed during decommissioning activities. Transporting waste off site is estimated to result in 1 to 2 fatalities from transportation accidents.

  If the Phase 2 decision is removal of remaining waste and contamination, total impacts from the Phased Decisionmaking Alternative would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure of the remaining waste and contamination, total waste generation and transportation impacts (including nonradiological fatalities from traffic accidents) would be only slightly more than those for Phase 1, but the total worker exposure would be about 50 percent higher than that for Phase 1. Long-term impacts would be less than those for the Sitewide Closure Alternative: because of removal actions during Phase 1, the time-integrated (cumulative) population dose over 1,000 years would be about 85 percent of the dose projected for the Sitewide Close-in-Place Alternative. However, because of the long-lived radionuclides that would remain in the waste disposal areas, the time-integrated population dose over 10,000 years would be about 97 percent of the dose projected for the Sitewide Close-in-Place Alternative. If the Phase 2 decision for the SDA is continued active management, short-term Phase 2 impacts for some resource areas are expected to be bounded by those for the No Action Alternative. There would be less transportation, so the associated impacts, including nonradiological fatalities from traffic accidents, would be lower. The long-term human health impacts for continued active management of the SDA would be the same as those identified for the SDA under the No Action Alternative. The Phased Decisionmaking Alternative appears to meet NRC's decommissioning ALARA requirement regardless of the Phase 2 decommissioning decision.

  Making the Phase 2 decision at 10 years instead of 30 years would result in a small reduction in the total impact of decommissioning because most of the Phase 1 impacts are the result of the removal actions that occur in the first 8 years of Phase 1. The most important change in impacts associated with the shorter duration of Phase 1 would be the reduced socioeconomic impact. A shorter Phase 1 would eliminate the approximately 20-year period of reduced site employment following completion of the Phase 1 decommissioning actions followed by an increase in site employment when Phase 2 implementation begins.

- The ***No Action Alternative*** would not involve decommissioning. Waste and contamination would remain in their current locations, and there would be no change in site operations. Long-term impacts would be higher than those for the Sitewide Close-in-Place Alternative because there would be fewer engineered barriers to retard the migration of radionuclides from their original locations and to act as intrusion barriers in the event of loss of institutional controls. The long-term peak annual dose to Lake Erie water users assuming unmitigated erosion (worst case) would be about 3 millirem. This alternative and its impacts serve as the baseline for evaluating decommissioning alternatives.

A Low-level Radioactive Waste Shipment Leaving the WNYNSC

4. What are the Uncertainties In the Environmental Impact Estimates?

There are analytical uncertainties in the estimates of environmental impacts. The analytical uncertainties were accommodated either by making conservative assumptions in the environmental impact analyses or by providing multiple analyses with different assumptions in order to provide bounding estimates of the impacts. The following paragraphs provide examples of these uncertainties and how they have been addressed.

Human health impacts. For occupational exposure, information that is incomplete or unavailable includes: (1) more detailed information on the radionuclides in the waste, particularly the gamma emitters, (2) the design details for the facilities that would be used for waste handling and processing, and (3) more detailed information on how workers would be used in decommissioning actions. This uncertainty has been addressed primarily by the use of conservative assumptions related to category-specific exposure rates and by not accounting for radioactive decay of the radionuclides considered to be the major contributors to dose.

For public exposure, information that is incomplete or unavailable includes: (1) more detailed information on the radionuclides in the waste; (2) the location and actions of future nearby critical receptors; and (3) changes in the total population and population distribution during the time period associated with decommissioning actions. The uncertainty related to this lack of information is addressed through the use of conservative assumptions for: the normal and accident scenario release source terms; total population and its distribution; average breathing rate, water, and fish consumption; and the location of critical receptors.

Transportation impacts. Information that is unavailable at this time includes (1) detailed data on the distribution of radionuclides, particularly gamma emitters, in packaged waste; (2) the radiation dose from the waste packages; (3) the specific transportation route (because of uncertainty about where the waste would be disposed); and (4) information on how the waste would be shipped (truck, rail, or a combination of both). Uncertainty about the radionuclide distribution has been addressed by using conservative assumptions related to the waste package inventory and surface dose rate. Uncertainty about the locations of facilities to dispose of low-level and mixed low-level radioactive waste has been addressed by considering two general disposal options. In the *DOE/Commercial Disposal Option*, wastes would be transported to a combination of commercial and DOE disposal facilities; in the *Commercial Disposal Option*, waste would be transported only to commercial disposal facilities. The uncertainty about the transportation mode (truck or rail) has been addressed by evaluating both modes.

Waste management impacts. The waste management analysis has two areas of uncertainty due to the lack of complete information, including (1) the volumes and characteristics of waste that would be generated under each alternative, and (2) the availability of disposal sites for some of the waste, particularly commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, potential non-defense transuranic waste, and any high-level radioactive waste. The uncertainty related to waste volumes and characteristics is limited by the availability of site contamination characterization data. This uncertainty has been addressed by using moderately conservative estimates of waste volume and waste classification. The uncertainty about the availability of disposal sites for commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, and potential non-defense transuranic waste has been addressed by estimating the annual impacts of on-site storage of these potentially orphan wastes.

Long-term human health impacts. The major elements of currently unavailable information include (1) characterization of the nature and distribution of the contaminants, (2) the performance of engineered barriers, (3) site hydrology and groundwater chemistry, (4) contaminant release rates, (5) unmitigated erosion rates, (6) contaminant chemistry at the point of release into surface waters and the resulting adsorption and deposition, (7) bioaccumulation in plants and animals, and (8) knowledge of the timing and nature of future human activity, including the reliability of institutional controls. To address the uncertainty associated with this unavailable information, assumptions considered to be reasonably conservative have been used in the analyses. The major conservative assumptions are discussed in Appendix H, Section H.2.2.1, of the EIS.

The uncertainty about the reliability of institutional controls that would limit access to the site, maintain facilities or engineered barriers, and monitor the performance of waste isolation systems has been addressed by conducting the long-term analyses under two different sets of assumptions. The first set assumes that institutional controls are effective for the foreseeable future and that (1) intruders are kept off the site, and (2) facilities or engineered barriers are maintained. The second set assumes that institutional controls fail after 100 years so that intruders can enter areas containing waste. There is a special case in the second set that analyzes the unmitigated erosion scenario. In this scenario, institutional controls are assumed to remain in a failed mode for many hundreds of years so there is no mitigation of erosion as gullies advance toward areas containing waste.

Franks Creek – A short distance downstream of its confluence with Erdman Brook and just upstream of the WVDP boundary.

5. Potential Mitigation Measures

Mitigation includes avoiding an impact by not taking a certain action; minimizing an impact by limiting the action's magnitude; rectifying an impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating an impact over time by preservation and maintenance operations; or compensating for an impact by replacing or providing substitute resources or environments.

DOE and NYSERDA developed a series of potential mitigation measures to address the anticipated impacts of the proposed alternatives. *Table 5* presents the potential mitigation measures, resource areas, and proposed alternatives and identifies which resource areas and alternatives would benefit from selected measures. The first part of the table identifies potential mitigation measures that could be applied during design, construction, and demolition activities. The second part identifies potential mitigation measures that could be applied during decommissioning activities when facilities would be operating. The third part of *Table 5* identifies mitigation measures (e.g., engineered barriers, access and erosion controls, environmental monitoring) that would reduce potential long-term impacts from implementation of the EIS alternatives.

Soil Characterization Activities

Table 5. Potential Mitigation Measures

Mitigation Measure	Resource Area											EIS Alternative[a]			
	Land Use and Visual Resources	Geology and Soils	Water Resources	Air Quality and Noise	Ecological Resources	Cultural Resources	Socioeconomics	Human Health and Safety	Waste Management	Transportation	Environmental Justice[b]	Sitewide Removal	Sitewide Close-In-Place	Phased Decisionmaking	No Action
Potential Mitigation Measures During Design, Construction, or Demolition[c]															
Visual screens, lower-profile buildings	●											●	●	●	
Erosion and sediment controls		●	●		●	●						●	●	●	
Buffer zones			●		●							●	●	●	
Wetlands and floodplain protection measures			●		●							●	●	●	
Spill control measures			●		●							●	●	●	
Dust suppression measures				●								●	●	●	
Selective location of laydown areas				●								●	●	●	
Use of low sulfur fuels in construction equipment				●								●	●	●	
Scheduling of construction activities			●	●	●		●			●		●	●	●	
Scheduling of transportation				●						●		●	●	●	
Personal protective equipment								●				●	●	●	
Road improvement, traffic controls				●				●		●		●	●	●	
Waste minimization									●	●		●	●	●	
Wastewater treatment systems			●					●	●			●		●	
Preventing contamination spread		●	●									●	●	●	
Potential Mitigation Measures During Facility Operations															
Road improvement, traffic controls				●						●		●		●	
Spill control measures			●		●							●	●	●	●
Personal protective equipment								●				●	●	●	●
Best available control technologies				●								●	●	●	

Mitigation Measure	Resource Area											EIS Alternative [a]			
	Land Use and Visual Resources	Geology and Soils	Water Resources	Air Quality and Noise	Ecological Resources	Cultural Resources	Socioeconomics	Human Health and Safety	Waste Management	Transportation	Environmental Justice [b]	Sitewide Removal	Sitewide Close-In-Place	Phased Decisionmaking	No Action
Confinement systems with ventilation controls and filters				●	●			●				● [d]	●	● [e]	
Wastewater treatment systems			●									● [f]	● [f]	●	●
Scheduling							●			●		●	●	●	●
Job placement and retraining services							●					●	●	●	
Emergency response personnel training								●		●		●	●	●	
Incorporate ALARA measures, including shielding								●				●	●	●	
Selection of transportation routes that limit impacts										●		●	●	●	
Potential Long-Term Mitigation Measures															
Engineered barriers			● [g]		●			●					● [h]	●	●
Access controls								●				● [i]	●	●	●
Erosion controls		● [j]	● [j]									● [j]	● [j]	● [j]	● [j]
Environmental monitoring		●	●		●			●				●	●	●	●
Future site development	●											●	●	●	●

ALARA = as low as is reasonably achievable.

[a] A complete description of the alternatives is found in Chapter 2 of the EIS.

[b] No Environmental Justice mitigation measures have been identified because no disproportionately high and adverse impacts on minority or low-income populations have been identified.

[c] Some of these mitigation measures that are initially implemented for the construction of facilities that aid decommissioning (e.g., the Container Management Facility) would remain during the operating phase of the facility.

[d] e.g., (1) Waste Tank Farm Waste Processing Facility, (2) Container Management Facility, (3) various enclosures to support exhumation efforts.

[e] Enclosures to support exhumation effort.

[f] e.g., Leachate Treatment Facility.

[g] Circumferential hydrologic barriers utilized as a long-term mitigation measure for protection of water resources (i.e., groundwater quality).

[h] e.g., (1) WMA 1 through WMA 3 hydraulic barrier walls and multi-layer cap, (2) WMA 2 lagoons engineered multi-layer cover, (3) NDA engineered multi-layer cover, (4) SDA engineered multi-layer cover, (5) erosion control structures.

[i] Under the Sitewide Removal Alternative, the Container Management Facility would operate indefinitely until final disposition of decommissioning waste is realized. Access controls would be needed.

[j] Erosion controls as a long-term mitigation measure are more permanent measures when compared to "erosion and sediment controls" for design, construction, or demolition that are more temporary in nature (e.g., mitigation measures usually employed during construction).

High-Level Waste Transfer Trench and Vitrification Facility

6. Where Can I Find Out More?

The Foreword to the EIS presents NYSERDA's view regarding analysis and results presented in the document.

Chapter 1 of the EIS provides a historical overview of activities at WNYNSC, including a brief history of the events leading to development of the document. Topics include the purpose and need for agency action; the scope of the EIS and decisions to be made; the relationship of the EIS to other NEPA documentation, the process used to obtain public input for the EIS, including the process for soliciting comments on the Revised Draft EIS and a summary of comments received; and a discussion of important changes from the Revised Draft EIS to the Final EIS.

Chapter 2 describes the actions proposed by DOE and NYSERDA for decommissioning and long-term stewardship of WNYNSC. It includes descriptions of the three decommissioning alternatives, the No Action Alternative, and a discussion of the alternatives considered and subsequently eliminated from detailed evaluation. The chapter concludes with a comparison of impacts of the alternatives, a discussion of uncertainties, and identification of the Preferred Alternative.

Chapter 3 describes the existing conditions at WNYNSC and the surrounding area and the environmental consequences of the historical activities conducted there on the various resource areas.

Chapter 4 describes the environmental consequences of the alternatives. Topics include detailed discussions of the potential impacts of the alternatives, cost-benefit considerations, intentional destructive acts, cumulative impacts, resource commitments, unavoidable adverse environmental impacts, the relationship between short-term use of the environment and long-term productivity, and irreversible and irretrievable commitments of resources.

Chapter 5 identifies the Federal, State, and local laws, regulations, agency orders, and requirements that are relevant to the EIS.

Chapter 6 summarizes the potential mitigation measures that DOE and NYSERDA could use to avoid or reduce the potential environmental impacts that may result from implementation of the alternatives.

Chapters 7 through 10 contain references, a glossary, index, list of EIS preparers; and a list of agencies, organizations, and individuals who were sent copies of the EIS.

Appendix A provides a summary of the comments received on the 1996 *Cleanup and Closure Draft EIS.*

Appendix B includes the *Federal Register* Notices and New York State Environmental Notice Bulletins pertaining to the EIS.

Appendix C describes the facilities and waste disposal areas associated with the 12 WMAs at WNYNSC. Additional topics include proposed decommissioning and construction activities for each decommissioning alternative.

Appendix D provides an overview of the performance assessment approach.

Appendix E discusses geohydrological modeling, including local three-dimensional groundwater modeling, analysis of near-field flow for different EIS alternatives, and independent modeling calibration results.

Appendix F describes the erosion studies conducted as part of the EIS analyses, including erosional processes at WNYNSC and erosion modeling.

Appendix G discusses the long-term performance assessment models used for the EIS analyses.

Appendix H describes the long-term performance assessment results of the EIS analyses.

Appendix I provides a general discussion of radiation and its health effects. It addresses the methodologies and assumptions used to estimate potential impacts on and risks to individuals and the general public from exposure to radioactive and hazardous chemical material releases during normal operations and hypothetical accidents.

Appendix J provides an overview of the approach used to assess the human health risks that could result from transportation of radioactive materials.

Appendix K presents the methodology used to estimate nonradiological air quality concentrations for each alternative evaluated in the EIS.

Appendix L discusses regulatory compliance issues related to implementation of the decommissioning alternatives.

Appendix M is the Floodplain and Wetland Assessment required by 10 CFR Part 1022.

Appendix N is the analysis of Intentional Destructive Acts. Intentional Destructive Acts include intentional malevolent acts, intentional malicious acts, and acts of terrorism.

Appendix O provides letters documenting the consultations with Federal and State agencies and Tribal Governments.

Appendix P provides a Quantitative Risk Assessment for the SDA, authored by NYSERDA, which evaluates the risk to the public from continued management of the SDA for the next 30 years with its current physical and administrative controls.

Appendix Q provides copies of the concurrence letters on the EIS.

Appendix R provides the Contractor Disclosure Statements.

Finding Answers to Your Questions

For More Information About…	See:
Air Quality	Chapter 3, Section 3.7.2 Chapter 4, Section 4.1.5 Appendix K
Affected Environment	Chapter 3
Alternatives Considered But Eliminated from Detailed Analysis	Chapter 2, Section 2.5
Alternatives Evaluated in this Final EIS	Chapter 2, Section 2.4
Applicable Laws and Regulations	Chapter 5
Cesium Prong	Chapter 2, Section 2.3.2.14 Appendix C, Section C.2.14
Comparison of Impacts	Chapter 2, Section 2.6
Construction of New Facilities and Structures	Chapter 2, Sections 2.4.1.3, 2.4.2.3, and 2.4.3.5 Appendix C, Section C.4
Cost of Alternatives	Chapter 4, Section 4.2.1
Cultural Resources	Chapter 3, Section 3.9 Chapter 4, Section 4.1.7
Cumulative Impacts of Alternatives	Chapter 4, Section 4.5
Decisions to be Supported by this EIS	Chapter 1, Section 1.5
Ecological Resources	Chapter 3, Section 3.8 Chapter 4, Section 4.1.6
EIS Starting Point	Chapter 2, Section 2.3.1
Environmental Justice	Chapter 3, Section 3.12 Chapter 4, Section 4.1.13
Erosion	Chapter 3, Section 3.4 Appendix F

For More Information About…	See:
Floodplains	Chapter 4, Section 4.1.4 Appendix M
Geology and Soils	Chapter 3, Section 3.3 Chapter 4, Section 4.1.3
Groundwater	Chapter 3, Section 3.6.2 Chapter 4, Section 4.1.4 Appendix E
Human Health Effects	Chapter 3, Section 3.11 Chapter 4, Sections 4.1.9, 4.1.10, and 4.5.13 Appendix I
Land Use	Chapter 3, Section 3.1.1 Chapter 4, Section 4.1.1
Long-term Impacts of Alternatives	Chapter 2, Section 2.6.2 Chapter 4, Section 4.1.10 Appendix H
Mitigation Measures	Chapter 6
North Plateau Groundwater Plume	Chapter 2, Section 2.3.2.13 Appendix C, Section C.2.13
No Action Alternative	Chapter 2, Section 2.4.4
NRC-licensed Disposal Area	Chapter 2, Section 2.3.2.7 Appendix C, Section C.2.7
Performance Assessment	Appendix D Appendix G Appendix H
Phased Decisionmaking Alternative	Chapter 2, Section 2.4.3 Appendix C, Section 3.3
Preferred Alternative	Chapter 2, Section 2.7
Proposed Action	Chapter 2, Section 2.2
Public Participation and Comment Process	Chapter 1, Section 1.7 CRD Section 1

For More Information About…	See:
Purpose and Need for Agency Action	Chapter 1, Section 1.3
Scope of this EIS	Chapter 1, Section 1.4
Seismology	Chapter 3, Section 3.5
Short-term Impacts	Chapter 2, Section 2.6.1
Site Infrastructure	Chapter 2, Section 2.3 Chapter 3, Section 3.2 Chapter 4, Section 4.1.2 Appendix C, Section C.2
Sitewide Close-In-Place Alternative	Chapter 2, Section 2.4.2 Appendix C, Section C.3.2
Sitewide Removal Alternative	Chapter 2, Section 2.4.1 Appendix C, Section C.3.1
Socioeconomics	Chapter 3, Section 3.10 Chapter 4, Section 4.1.8
State-Licensed Disposal Area	Chapter 2, Section 2.3.2.8 Appendix C, Section C.2.8
Surface Water	Chapter 3, Section 3.6.1 Chapter 4, Section 4.1.4 Appendix E, Section E.2.3
Transportation	Chapter 4, Section 4.1.12 Appendix J
Uncertainties	Chapter 2, Section 2.8 Chapter 4, Section 4.3
Visual Resources	Chapter 3, Section 3.1 Chapter 4, Section 4.1.1
Waste Management	Chapter 3, Section 3.13 Chapter 4, Section 4.1.11
Waste Management Areas	Chapter 2, Section 2.3.2 Appendix C, Section C.2

For More Information About…	See:
Western New York Nuclear Service Center – Overview	Chapter 2, Section 2.3
West Valley Demonstration Project	Chapter 1, Section 1.1
Wetlands	Chapter 3, Section 3.8.2 Chapter 4, Section 4.1.6 and 4.5.10 Appendix M

7. Public Participation

DOE and NYSERDA have been committed to open, two-way, formal and informal communication with the public throughout the development of this EIS. DOE and NYSERDA have involved the public through public hearings and other comment opportunities, website communications, mailings, working groups, and the Citizen Task Force. Figure 4 identifies the steps in developing an EIS under NEPA and SEQR and the formal opportunities for public involvement. When the steps are different or have different names from the NEPA process steps, the SEQR step is indicated parenthetically.

DOE and NYSERDA solicited comments on the Revised Draft EIS during a 9-month public comment period, which began on December 5, 2008, when the Notice of Availability appeared in the *Federal Register* (73 FR 74170). A Notice of Completion of the Revised Draft EIS and Public Hearing Notice was also published on December 10, 2008, in the *New York State Environmental Notice Bulletin* in accordance with SEQR requirements. The Notice of Availability and Notice of Completion announced a 6-month public comment period, through June 8, 2009, and three public hearings to be held to solicit comments. In response to stakeholder requests, another meeting was added in Albany and the Buffalo meeting was moved from the original Blasdell location to a more central downtown Buffalo location. At a later date, again in

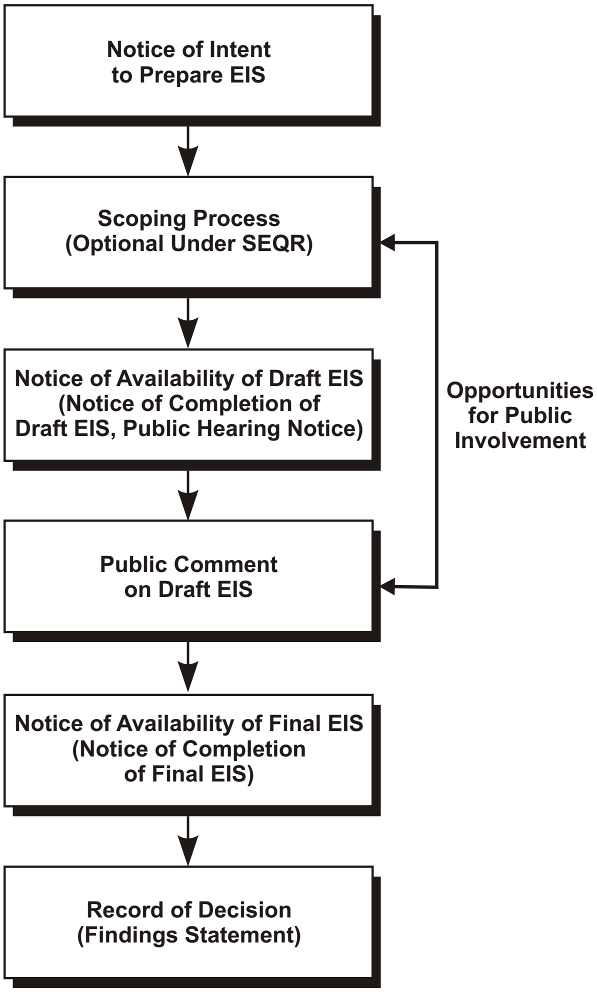


Figure 4. *National Environmental Policy Act and State Environmental Quality Review Act Process*

response to stakeholder requests, the public comment period was extended another 90 days, until September 8, 2009.

Public hearings on the Revised Draft EIS were held in Albany, Irving (on the Seneca Nation of Indians Reservation), Ashford, and Buffalo, New York on March 30 and 31, and April 1 and 2, 2009 respectively. A court reporter recorded the oral comments made at each hearing and prepared a transcript for each that is included in the Comment Response Document (CRD) found in Volume 3, *Comment Response Document*, of the Final EIS.

In response to public concern about some of the alternatives in the Revised Draft EIS, especially after the August 9 and 10, 2009 heavy rainfall events, the DOE Assistant Secretary for Environmental Management and the President of NYSERDA participated in a videoconference with various stakeholders on September 4, 2009 to address those concerns. This meeting was transcribed by a court reporter and the comments and responses were included in the comment response process.

In addition, Federal agencies, state and local government agencies, American Indian Tribal Governments, and the general public were encouraged to submit comments at the public hearings and through U.S. mail, e-mail, a toll-free fax line, and through the DOE EIS website (http://www.westvalleyeis.com). Overall, approximately 420 submittals containing approximately 1,900 comments addressing a wide range of issues were received. DOE and NYSERDA considered all comments, including those received after the comment period ended, in evaluating the accuracy and adequacy of the Revised Draft EIS and to determine whether corrections, clarifications, or other revisions were required.

Individual comments and DOE's and NYSERDA's responses have been compiled in a side-by-side format in Section 3 of the CRD, with each delineated comment receiving a separate response. Topics of broad public interest or concern or that required a more detailed response were characterized as major issues and addressed separately in Section 2 of the CRD.

Summary of Major Issues

The following Major Issues are addressed in Section 2 of the CRD:

> **Modified Phased Decisionmaking Alternative.** A variety of comments revealed a need to clarify the nature of the Phase 2 actions and associated impacts. A specific comment requested clarification that Phase 2 of the Phased Decisionmaking Alternative would involve only removal or in-place closure for those facilities remaining after completion of the Phase 1 decommissioning actions. Several commentors also expressed concerns about the delay in the timing of the Phase 2 decisionmaking. Some expressed a concern that the Phase 2 decision would not be made. Others pointed out the loss in technical expertise and socioeconomic impact that would occur if many years passed between the completion of the Phase 1 decommissioning actions and the initiation of the Phase 2 decommissioning actions.
>
> **Support for Sitewide Removal of All Radioactive and Hazardous Wastes.** Many of the commentors stated their preference for sitewide removal of all radioactive and hazardous wastes from WNYNSC as soon as possible. In many cases, these commentors expressed specific support for the Sitewide Removal Alternative over other alternatives and cited reasons for their preference.

Concerns about Potential Contamination of Water. Commentors expressed concerns that, because streams near WNYNSC eventually discharge into Lake Erie, contaminated liquid effluents from WNYNSC could enter the streams and adversely affect regional water users in Western New York and the Great Lakes region. Concerns were also expressed about the use of water from nearby streams. In addition, some commentors were specifically concerned about the potential effects of erosion at WNYNSC on water quality.

Questions about Long-term Erosion Modeling. Some commentors, referring to statements in the NYSERDA Foreword to the 2008 Revised Draft EIS, expressed their opinion that the long-term erosion analysis presented in the EIS is not scientifically defensible. Others questioned some of the assumptions used to calibrate the erosion model and expressed concerns about gully projections. Several commentors pointed out the erosion that occurred in the region following the heavy rainfall events of August 9 and 10, 2009, as an illustration of the potential for sudden and dramatic topography changes in the region.

Questions about Cost-Benefit Analysis. Several commentors stated that the cost information presented in Chapter 4, Section 4.2, of the Revised Draft EIS does not accurately represent the total costs of the alternatives or that the cost-benefit information (also presented in Section 4.2) is misleading. Some commentors expressed their opinion that there could be large releases of hazardous constituents that would require expensive mitigation actions if wastes were to remain on site. Some commentors were also critical of the assumptions in the cost-benefit methodology, stating that discounting is not appropriate when evaluating long-term costs.

Conclusions of the *Synapse Report*. Several commentors specifically cited or alluded to the conclusions of a report titled, The *Real Costs of Cleaning Up Nuclear Waste: A Full Cost Accounting of Cleanup Options for the West Valley Nuclear Waste Site (Synapse Report)*. These commentors expressed a preference for the Sitewide Removal Alternative, stating that it is the most cost-effective alternative or represents the least risk and lowest cost, based on the *Synapse Report*. In addition, some commentors stated that the *Synapse Report* analysis is supported by NYSERDA. This latter assertion is inaccurate, according to NYSERDA's comments on the report.

Next Steps

A *Summary and Guide for Stakeholders* and the complete Final EIS have been sent to those who requested it in compact disc or print formats. It is also available for downloading on the Internet (www.westvalleyeis.com) and in the following public reading rooms:

Concord Public Library
18 Chapel Street
Springville, NY 14141
716-592-7742

WVDP Public Reading Room
U.S. Department of Energy
Ashford Office Complex
9030 Route 219
West Valley, NY 14171
716-942-4555

U.S. Department of Energy
FOIA Reading Room
Room 1E-190, Forrestal Bldg.
1000 Independence Ave. SW
Washington, DC 20585
202-586-3142

Based on the Final EIS and other considerations, DOE will announce its decision regarding future actions at WNYNSC in a ROD to be published in the *Federal Register* no sooner than 30 days after publication of the EPA Notice of Availability for the Final EIS. The ROD will describe the alternative selected for implementation and explain how environmental impacts will be avoided, minimized, or mitigated, or, if not, why not. NYSERDA will publish its decisions regarding actions at WNYNSC in a Findings Statement in the *New York State Environmental Notice Bulletin* no sooner than 10 days after issuance of the Final EIS.

8. Helpful Information

Glossary

cask – Heavily shielded container used to store or ship radioactive materials.

cesium – A rare, highly reactive, silver-white element of the alkali metals group.

Cesium Prong – The area of surface soil contaminated by cesium-137 from abnormal releases to the atmosphere caused by reprocessing plant ventilation system failures.

collective dose – The sum of individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sievert.

decontamination – Actions taken to reduce or remove chemical or radioactive substances from environmental media (i.e., soil, water, and air), structures (e.g., buildings), equipment, or personnel. Radioactive decontamination may be accomplished by washing, chemical action, mechanical cleaning, or other techniques.

defense waste – Nuclear waste deriving from the manufacture of nuclear weapons and the operation of naval reactors. Associated activities, such as the research carried on in weapons laboratories, also produce defense waste.

dose (radiological) – The radioactive energy that is absorbed by one gram of material that has been irradiated.

ecological resources – Resources such as broadly defined fish and wildlife populations and habitats, as well as their relationships to each other and the environment/ecosystem.

environmental justice – Executive Order 12898 directs Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations.

exposure – The amount of radiation or pollutant present in a given environment that represents a potential health threat to living organisms.

floodplain – The portion of a river valley adjacent to the river channel that is built of sediments during the present regimen of the stream and is covered with water when the river overflows its banks at flood stages.

geology – The science that studies the materials, processes, environments, and history of the Earth, including rocks and their formation and structure.

geomembrane – Any impermeable membrane used with soils, rock, earth, or other geotechnical material to block the migration of fluids.

groundwater – Water below the ground surface in a zone of saturation. *Related definition:* Subsurface water is all water that exists in the voids found in soil, rocks, and sediment below the land surface, including soil moisture, capillary fringe water, and groundwater. The part of subsurface water in voids completely saturated with water is called groundwater. Subsurface water above the groundwater table is called vadose water.

infrastructure – The basic facilities, services, and utilities needed for the functioning of an industrial facility. Transportation and electrical systems are part of the infrastructure.

latent cancer fatality (LCF) – A statistically based estimate of deaths from cancer resulting from, and occurring some time after, exposure to ionizing radiation or other carcinogens (see *radiation*).

legacy waste – Waste resulting from past activities.

long-term stewardship – Activities necessary to ensure protection of human health and the environment following closure of a site. Long-term stewardship includes engineered and institutional controls designed to contain or to prevent exposure to residual contamination and waste such as monitoring and maintenance activities, record-keeping activities, inspections, groundwater monitoring and treatment, access control, posting signs, and periodic performance reviews.

maximally exposed individual (MEI) – A hypothetical individual whose location and habits are deliberately chosen to result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposure routes (e.g., inhalation, ingestion, direct exposure).

media – Materials capable of absorbing or removing contaminants from other materials. Also, the aspects of the environment that may become contaminated (air, water, and soil are environmental media).

millirem – One-thousandth of a rem (see *rem*).

orphan waste – Waste that cannot currently be disposed of in an established or a planned permanent disposal facility because the path forward for treatment and disposal has not yet been defined. Non-defense transuranic waste, Greater-Than-Class C waste, and commercial Class B and C wastes are current examples of Western New York Nuclear Service Center orphan waste.

permeability – The rate at which liquids and gases pass through materials in a specified direction. In hydrology, the term is used to describe the capacity of a rock, sediment, or soil for transmitting groundwater. Permeability depends on the size and shape of the pores between soil particles and how they are interconnected.

person-rem – A unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in a specified population or group.

radiation (ionizing) – Radioactivity resulting from the decay of a radioactive element or produced by radiation-generating equipment.

radioactivity – *As a process:* The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation. *As a property:* The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

radwaste – Radioactive waste.

rem – A unit of radiation dose that reflects the ability of different types of radiation to damage human tissues and the susceptibility of different tissues to the damage.

risk – The probability of a detrimental effect to life, health, property, and/or the environment from exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequences of that event (i.e., the product of these two factors). However, separate presentation of probability and consequence is often more informative.

sediment – Soil, sand, and minerals washed from land into water and deposited on the bottom of a water body.

slurry – A watery mixture of materials that will not dissolve.

source term – The amount of a specific pollutant (e.g., chemical, radionuclide) emitted or discharged to a particular environmental medium (e.g., air, water) from a source or group of sources. It is usually expressed as a rate (i.e., amount per unit time).

upgradient – Upwards against the direction of flow or slope.

uranium – A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. Uranium has 14 known isotopes. Uranium-235 is commonly used as a fuel for nuclear fission.

vadose – The zone between the land surface and the water table (saturated zone).

Waste Incidental to Reprocessing – Waste resulting from reprocessing spent nuclear fuel that is not highly radioactive and does not need to be disposed of in a geologic repository in order to manage the risk that it poses.

wetland – An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in those conditions, including swamps, marshes, bogs, and similar areas.

Acronyms and Abbreviations

ALARA – as low as is reasonably achievable

CFR – *Code of Federal Regulations*

CRD – Comment Response Document

DOE – U.S. Department of Energy

EIS – Environmental Impact Statement

EPA – U.S. Environmental Protection Agency

LCF – latent cancer fatality

NDA – NRC-Licensed Disposal Area

NEPA – National Environmental Policy Act of 1969

NRC – U.S. Nuclear Regulatory Commission

NYCRR – New York Code of Rules and Regulations

NYSDEC – New York State Department of Environmental Conservation

NYSERDA – New York State Energy Research and Development Authority

RCRA – Resource Conservation and Recovery Act

ROD – Record of Decision

SDA – State-Licensed Disposal Area

SEQR – State Environmental Quality Review Act

U.S.C. – United States Code

WMA – Waste Management Area

WNYNSC – Western New York Nuclear Service Center

WVDP – West Valley Demonstration Project

Conversions

To convert hectares to acres, multiply by 2.471.

To convert cubic feet to cubic meters, multiply by 0.02832.

Next Steps:

Record of Decision/ Findings Statement

Next

Final EIS Issued
January 2010

Complete

Consider Comments and Prepare Final EIS

Complete

9-Month Public Comment Period
December 2008 - September 2009

Complete

Draft EIS Issued
December 2008

For more information:

Catherine Bohan, EIS Document Manager
West Valley Demonstration Project
U.S. Department of Energy
Ashford Office Complex
9030 Route 219
West Valley, New York 14171

Telephone: 716-942-4159
Fax: 716-942-4703
email: catherine.m.bohan@wv.doe.gov
www. westvalleyeis.com

DOE/EIS-0226

CHAPTER 1
INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

1.0 INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

Chapter 1 of this environmental impact statement (EIS) gives an overview of the activities at the Western New York Nuclear Service Center and a brief history of events leading to the development of the document. It includes the purpose and need for agency action, the scope of the EIS and decisions to be made, the relationship of this EIS to other National Environmental Policy Act documentation, and discussion of both the scoping process and public comment period for the Draft EIS used to obtain public input on the issues addressed in this EIS. Chapter 1 concludes with a discussion of major changes made between the Draft and Final EISs and a final section describing the organization of this document.

1.1 Overview

The Western New York Nuclear Service Center (WNYNSC) is a 1,351-hectare (3,338-acre) site located 48 kilometers (30 miles) south of Buffalo, New York owned by the New York State Energy Research and Development Authority (NYSERDA). In 1982, under terms of a Cooperative Agreement between the U.S. Department of Energy (DOE) and NYSERDA, DOE assumed control, but not ownership, of the 68-hectare (167-acre) portion of the site known as the Project Premises to conduct the West Valley Demonstration Project (WVDP), as required by the 1980 WVDP Act (Public Law 96-368; October 1, 1980) (DOE and NYSERDA 1981). In 1990, DOE and NYSERDA entered into a supplemental agreement to prepare a joint environmental impact statement (EIS) to address both WVDP completion and closure of WNYNSC. The *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (Cleanup and Closure Draft EIS)* (DOE/EIS-0226-D) (DOE 1996a) was issued for public comment in 1996, but a preferred alternative was not identified, and a final EIS was not prepared.

On March 13 and 19, 2003, DOE and NYSERDA issued Notices in the *Federal Register* and the *New York State Environmental Notice Bulletin*, respectively, of intent to prepare an *Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center (Decommissioning and/or Long-Term Stewardship EIS)*. This EIS revises the 1996 *Cleanup and Closure Draft EIS* and analyzes sitewide alternatives for management or decommissioning of facilities and property at WNYNSC. DOE and NYSERDA are joint lead agencies for the preparation of this EIS, and the U.S. Nuclear Regulatory Commission (NRC), the U.S. Environmental Protection Agency (EPA), and the New York State Department of Environmental Conservation (NYSDEC) are cooperating agencies. The New York State Department of Health (NYSDOH) and NYSDEC are involved agencies as provided for by the State Environmental Quality Review Act (SEQR). The *Revised Draft Decommissioning and/or Long-Term Stewardship EIS* was issued for public comment on December 5, 2008 (73 *Federal Register* 74160). The public comment period was scheduled for 6 months, until June 8, 2009, but was extended for another 90 days, until September 8, 2009. This *Decommissioning and/or Long-Term Stewardship Final EIS* reflects revisions based on agency consideration of public comments.

Established in 1961 as the site of a nuclear center, WNYNSC comprised commercial spent nuclear fuel reprocessing and waste disposal facilities. Nuclear Fuel Services, a private company, built and operated the fuel reprocessing plant and the burial grounds, processing 640 metric tons (705 tons) of spent nuclear fuel at WNYNSC from 1966 to 1972 under an Atomic Energy Commission license. These spent nuclear fuel reprocessing operations resulted in the generation of 2,498,000 liters (660,000 gallons) of high-level radioactive waste which were stored in two underground storage tanks. In 1976, Nuclear Fuel Services withdrew from the reprocessing business and returned control of the facilities to the site owner, NYSERDA.

However, Nuclear Fuel Services remained on site until 1981 to continue plant cleanup activities. The reprocessing operations and subsequent plant cleanup generated approximately 5,380 cubic meters (190,000 cubic feet) of radioactive waste that were buried in a 2.83-hectare (7-acre) burial area termed the "NRC-Licensed Disposal Area" (NDA). An additional 5,663 cubic meters (200,000 cubic feet) of radioactive waste generated by WVDP decontamination and decommissioning activities were disposed of in the NDA between 1982 and 1986. Radioactive waste was accepted at a second burial area adjacent to the NDA, the 6.1-hectare (15-acre) State-Licensed Disposal Area (SDA), from 1963 until 1975. The SDA received waste from offsite locations, as well as waste generated at WNYNSC by nuclear fuel reprocessing operations. The total volume of radioactive waste disposed of in the SDA is estimated to be approximately 68,000 cubic meters (2.4 million cubic feet).

Terminology for the Western New York Nuclear Service Center

Western New York Nuclear Service Center or WNYNSC – The 1,351-hectare (3,338-acre) site located 48 kilometers (30 miles) south of Buffalo, in West Valley, New York. WNYNSC is owned by the New York State Energy Research and Development Authority. WNYNSC was established in 1961 as the site of a nuclear center, with commercial spent nuclear fuel reprocessing and waste disposal facilities. Today, activities at WNYNSC are focused on completion of the West Valley Demonstration Project and remediation of legacy contamination. WNYNSC is divided into the Project Premises and the Retained Premises. In this EIS, *site* refers to the entire WNYNSC, such as in *wastes will be transported off site for disposal*.

Project Premises – An area of approximately 68 hectares (167 acres) within WNYNSC made available to DOE for carrying out the West Valley Demonstration Project. The Project Premises is under DOE control and includes the facilities (e.g., the Main Plant Process Building) made available to DOE to be used to solidify the high-level radioactive waste remaining on site when Nuclear Fuel Services left WNYNSC, and the 3.3-hectare (8-acre) NDA.

Retained Premises – The remainder of WNYNSC, not including the Project Premises, under NYSERDA control. The Retained Premises includes the 6.1-hectare (15-acre) SDA adjacent to the NDA.

West Valley Demonstration Project or WVDP – All activities undertaken by DOE in carrying out the requirements of the West Valley Demonstration Project Act. The West Valley Demonstration Project Act of 1980 authorized DOE to carry out a high-level liquid nuclear waste solidification demonstration project. The Act further directed DOE to develop containers suitable for the permanent disposal of the solidified high-level radioactive waste, to transport the solidified high-level radioactive waste offsite for permanent disposal at a Federal repository as soon as feasible after solidification and in accordance with applicable provisions of law; to decontaminate and decommission the tanks and other facilities, materials and hardware at WNYNSC used in conjunction with waste solidification; and to dispose of low-level radioactive waste and transuranic waste produced in conjunction with these activities in accordance with applicable licensing requirements. DOE solidified 2,498,000 liters (660,000 gallons) of liquid high-level radioactive waste under the WVDP Act, resulting in 275 canisters of solidified high-level radioactive waste currently in storage at WNYNSC.

In 1976, when Nuclear Fuel Services exercised its contractual right to leave the site and transfer ownership and responsibility for the waste and facility to the State of New York, the state-initiated discussions with the U.S. Government concerning management of the waste and facilities.

In 1980, Congress passed the WVDP Act, which directed DOE to take the lead role in solidifying the liquid high-level radioactive waste remaining in underground tanks and decontaminating and decommissioning the facilities at WNYNSC used in solidifying the waste. In particular, the WVDP Act called for DOE to complete the following actions:

1. Solidify, in a form suitable for transportation and disposal, the high-level radioactive waste at WNYNSC.

2. Develop containers suitable for the permanent disposal of the high-level radioactive waste solidified at WNYNSC.

3. Transport as soon as feasible, in accordance with applicable provisions of law, the waste solidified at WNYNSC to an appropriate Federal repository for permanent disposal.

4. Dispose of low-level radioactive waste and transuranic waste produced under the project by the solidification of the high-level radioactive waste in accordance with applicable licensing requirements.

5. Decontaminate and decommission the tanks, facilities, material, and hardware used in the solidification of the high-level radioactive waste and in connection with WVDP in accordance with such requirements as NRC may prescribe.

To take these actions, NYSERDA granted DOE exclusive use and possession of the Project Premises and project facilities solely for the purpose of carrying out the project. The Project Premises consists of the developed areas on WNYNSC, with the exception of the SDA.

DOE has made substantial progress toward completing its WVDP Act requirements. By August 2002, DOE had completed the first two requirements by solidifying the high-level radioactive waste and placing it in 275 canisters suitable for permanent disposal. These 275 canisters are currently stored in a heavily shielded cell in the former reprocessing plant. Completion of WVDP involves completion of requirements 3 through 5. DOE will remain on site until its responsibilities under the WVDP Act are completed.

While DOE has been discharging its responsibilities under the WVDP Act, NYSERDA has continued to monitor and maintain the SDA and the balance of the retained premises (that portion of WNYNSC not provided to DOE for conduct of WVDP activities). NRC has continued to fulfill its WVDP Act responsibilities through informal review and consultation with DOE and by conducting monitoring activities.

While most site activities have focused on the management of radioactive waste and contamination, there are also hazardous chemicals and hazardous wastes on site that are being managed in accordance with EPA and New York State regulations, including those issued to implement the Resource Conservation and Recovery Act (RCRA) Subtitle C Hazardous Waste Management Program. These regulations are referred to hereafter as either "RCRA regulations" when referring to EPA's regulations (40 *Code of Federal Regulations* [CFR] 260–279) or "Part 373/RCRA regulations" when referring to New York State's regulations (6 NYCRR 370–374 and 376).

Resource Conservation and Recovery Act Background

In 1984, DOE notified EPA of hazardous waste activities at WVDP and identified WVDP as a generator of hazardous waste. This preceded the 1987 DOE interpretive rule clarifying that the nonradioactive chemically hazardous component of mixed low-level radioactive waste (waste containing both radiological and RCRA-regulated hazardous components) would be subject to regulation under RCRA. In June 1990, New York State regulations governing mixed low-level radioactive waste became effective and a RCRA Part A Permit Application for WVDP was filed with NYSDEC for the storage and treatment of hazardous waste and mixed low-level radioactive waste generated on site. Similarly, in 1990, NYSERDA submitted a RCRA Part A Permit Application to NYSDEC to store and treat hazardous and mixed low-level radioactive waste at the SDA on its portion of WNYNSC.

In March 1992, DOE and NYSERDA entered into a joint EPA/NYSDEC RCRA 3008(h)/New York State Environmental Conservation Law, Article 27, Titles 9 and 13 Administrative Order on Consent (Consent Order). The Consent Order required DOE and NYSERDA to conduct RCRA facility investigations (RFIs) of solid waste management units (SWMUs) to determine if there had been, or was a potential for, release of RCRA-regulated constituents. The final RFI reports were submitted in 1997, completing the investigation activities required by the Consent Order. Both NYSDEC and EPA approved the RFI reports for SWMUs located within the Project Premises; no corrective actions were required other than continued groundwater monitoring as proposed in the RFI reports. NYSERDA proposed and implemented additional infiltration control measures for the SDA, which were performed as an interim measure under the Consent Order. In the

SDA RFI report, NYSERDA also proposed continued operation and maintenance of installed interim corrective measures. In response to a January 2004 NYSDEC request, the *West Valley Demonstration Project Solid Waste Management Unit Assessment and Current Conditions Report* was submitted to NYSDEC. This report summarized the historic activities at individual SWMUs and provided current environmental monitoring data and information about site activities performed since the completion of the RFI reports. As a result of its review, NYSDEC determined that five Corrective Measures Studies for WVDP SWMUs and a Corrective Measures Study for the SDA would be required pursuant to the Consent Order.

In August 1996, to comply with the Federal Facility Compliance Act, DOE entered into a second Consent Order with NYSDEC to prepare a site treatment plan for treating mixed low-level radioactive waste inventories to meet land disposal restrictions and to update the plan annually to account for development of treatment technologies, capacities, and changes in mixed low-level radioactive waste inventories. The initial plan was submitted in 1997, and updates have been submitted each year.

The RCRA Part A Permit Application for WVDP is revised as changes to the site's interim status waste management operations occur. An update to the WVDP RCRA Part A Permit Application was submitted to NYSDEC in March 2001. In November 2001, NYSDEC responded that the RCRA Part A Permit Application modifications met the requirements for changes to interim status treatment and storage operations at WVDP. Modifications to the WVDP RCRA Part A Permit Application were submitted to NYSDEC in February and December 2008. NYSDEC has completed its review of specific portions of these submittals. Subsequent to additional communication with DOE, including submittal of additional information, NYSDEC granted approval in February 2009 and conditional approval in October 2009 of unit-specific additions to the WVDP Part A Permit Application.

In July 2003, NYSDEC made an official request for the submittal of a Part 373/RCRA Permit Application for WVDP; the application was transmitted to NYSDEC in December 2004. NYSDEC sent a letter to DOE in February 2005 stating that the application was deemed incomplete and that an EIS, as well as other items, was required. At that time, NYSDEC intended to commence its technical review of the permit application. However, NYSDEC's review of the 2005 internal preliminary Draft EIS and 2008 Revised Draft EIS, its participation on the Core Team, and the on-going work at the site has taken precedence. Submission of a revised Part 373/RCRA permit application is planned for 2010 and will be contingent on the outcome of the NEPA process.

Developing a method for completing WVDP and managing the decommissioning and/or long-term stewardship of WNYNSC require consideration of both radioactive and nonradioactive hazardous materials and constituents and the regulations that govern them. Both DOE and NYSERDA are integrating these considerations into their decisionmaking processes as applicable and are coordinating their efforts with the relevant regulatory authorities—NRC, EPA, and NYSDEC.

1.2 History of the Development of This Environmental Impact Statement

In a 1987 Stipulation of Compromise settling a lawsuit filed by local citizens, DOE agreed that by the end of calendar year 1988, it would begin a closure EIS to evaluate disposal of Class A and Class B/C waste generated by DOE activities at WVDP and to evaluate erosion impacts. On December 30, 1988, DOE published a Notice of Intent (NOI) in the *Federal Register* to prepare an EIS for WVDP completion. A similar notice was published by NYSERDA in the *New York State Environmental Notice Bulletin* on January 11, 1989. After publication of these notices, public comments on the scope and content of the EIS were received in letters and during public scoping meetings. Additional characterization information to support preparation of the Draft EIS was collected and a Draft EIS was prepared. The *Cleanup and Closure Draft EIS* (DOE 1996a) was issued in March 1996 without identifying a preferred alternative.

A total of 113 comment letters were received on the 1996 *Cleanup and Closure Draft EIS*. Some commentors expressed a preference for a particular alternative. Other commentors expressed the opinion that selection of an alternative that complied with regulations was not possible because NRC had not prescribed requirements for decontamination and decommissioning as required by the WVDP Act. Other commentors attempted to apply NRC requirements (10 CFR 61) to draw conclusions about the acceptability of various alternatives. Still other commentors called for more characterization of the site (specifically, structural geology and seismic risk) and waste. Commentors also called for erosion analysis methods that would address gully growth. Some commentors questioned aspects of specific closure designs, including the reasonableness of assumptions and the appropriateness of specific design features.

Both DOE and NYSERDA acknowledged the need for additional characterization information and analytical methods to support a final EIS and proceeded to collect additional information on structural geology, local fractures, and seismicity. Updated methods for analyzing erosion were developed and refined. The assumptions and design features for specific alternatives were reviewed and revised. Discussions took place between DOE and NYSERDA on how to select a preferred alternative and what a preferred alternative might involve.

During this time, DOE was also preparing the *Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (WM PEIS)* (DOE 1997a). In 1999 and 2000, DOE issued Records of Decision (RODs) based on the *WM PEIS* that affected WVDP. The ROD for high-level radioactive waste issued in August 1999 called for storage of high-level radioactive waste at the site of generation until a disposal site was available. The February 2000 ROD for low-level radioactive waste and mixed low-level waste established both the Hanford Site (Hanford) and the Nevada Test Site (NTS) as regional DOE disposal sites for low-level radioactive waste and mixed low-level radioactive waste, although the ROD did not preclude the use of commercial disposal facilities, as appropriate.

On March 26, 2001, DOE and NYSERDA issued an NOI in the *Federal Register* announcing their plan to (1) revise the strategy for completing the 1996 *Cleanup and Closure Draft EIS* by preparing a revised draft EIS focusing on DOE's actions to decontaminate WVDP facilities and manage WVDP wastes controlled by DOE under the WVDP Act that would focus solely on DOE actions and would not include NYSERDA as a joint lead agency; and (2) prepare a separate EIS on decommissioning and/or long-term stewardship of WVDP and WNYNSC on which NYSERDA would participate as a joint lead agency. Decisions made after completion of the *West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* would permit DOE to perform additional facility decontamination and ship stored legacy waste and newly generated waste off site for disposal, as WVDP waste could now be disposed at DOE disposal facilities such as NTS. Completing the *Waste Management EIS* also ensured that DOE could continue to make progress toward completing WVDP Act requirements for facility decontamination and waste disposal while the National Environmental Policy Act (NEPA) process for decommissioning and/or long-term stewardship continued. On November 6, 2001, DOE independently issued an Advance NOI to prepare the *EIS for Decommissioning and/or Long-Term Stewardship at WVDP and WNYNSC*.

After issuance of the March 26 and November 6, 2001 *Federal Register* notices and consideration of public scoping comments, DOE decided to focus the *Waste Management EIS* exclusively on waste management actions. DOE also determined that the *Waste Management EIS* would be a new EIS, and that the *Decommissioning and/or Long-Term Stewardship EIS* would instead be considered the revised draft of the 1996 *Cleanup and Closure Draft EIS*. DOE issued the *Waste Management EIS* (DOE 2003e) in draft form for public comment in May 2003 and in final form in January 2004. A ROD was issued on June 16, 2005.

While DOE and NYSERDA were developing additional information and analyses to support preparation of a Revised Draft *Cleanup and Closure EIS*, NRC initiated work that culminated in the 2002 issuance of an NRC policy statement announcing the WVDP decommissioning criteria. On February 1, 2002, NRC published

"Decommissioning Criteria for the WVDP at the West Valley Site; Final Policy Statement" (67 *Federal Register* [FR] 5003). In this notice, NRC announced its decision to apply its License Termination Rule (10 CFR 20, Subpart E) as the decommissioning goal for the entire NRC-licensed site. In addition, the NRC Final Policy Statement also provided specific criteria for classification of waste "incidental" to reprocessing[1] that might be present after decontamination activities.

The License Termination Rule does not apply a single public-dose criterion for meeting license termination requirements. Rather, it provides for a range of criteria. For unrestricted release, the License Termination Rule specifies a dose criterion of 25 millirem per year total effective dose equivalent (TEDE) for the compliance receptor, plus as low as is reasonably achievable (ALARA) considerations. For restricted release, the License Termination Rule specifies an individual dose criterion of 25 millirem per year TEDE plus ALARA considerations using legally enforceable institutional controls established after a public participation process. Even if institutional controls fail, individual doses should not exceed 100 millirem per year TEDE. If it is demonstrated that the 100-millirem-per-year TEDE criterion is technically not achievable or prohibitively expensive in the event of failure of institutional controls, the individual dose criterion in the event of such failure may be as high as 500 millirem per year TEDE. However, in circumstances where restricted release is required, if the 100-millirem-per-year TEDE criterion is exceeded, and/or the use of alternate criteria has been determined, the area would be rechecked by a responsible government entity no less frequently than every 5 years. Finally, the License Termination Rule permits alternative individual-dose criteria of up to 100 millirem per year TEDE plus ALARA considerations for restricted release, with institutional controls established after a public participation process.

In addition to specifying the License Termination Rule as described in the preceding paragraph, the NRC Final Policy Statement also provides certain flexibility to consider other alternatives to the License Termination Rule, if it is demonstrated that the rule cannot be met. The Final Policy Statement indicates that the applicable goal for the entire NRC-licensed site is compliance with the License Termination Rule, but recognizes that health and safety and cost-benefit considerations may justify the use of an alternative that does not fully comply with License Termination Rule criteria. However, to support an exemption to the rule criteria, it must be rigorously demonstrated that protection of the public health and safety for future generations could be reasonably ensured through more-robust engineered barriers and/or increased long-term monitoring and maintenance. The Final Policy Statement indicates that NRC is prepared to provide flexibility to ensure cleanup of the NRC-licensed site to the maximum extent technically and economically feasible. Any exemptions or alternate criteria authorized for DOE to meet the provisions of the WVDP Act will also apply to NYSERDA at the time of site license termination, if license termination is possible.

As discussed in Section 1.1 of this chapter, on March 13 and 19, 2003, DOE and NYSERDA published Notices in the *Federal Register* and the *New York State Environmental Notice Bulletin*, respectively, announcing that they would jointly prepare this *Decommissioning and/or Long-Term Stewardship EIS* to revise the 1996 *Cleanup and Closure Draft EIS*. This *Decommissioning and/or Long-Term Stewardship EIS* builds on a clearer understanding of the major regulatory requirements, including NRC WVDP decommissioning criteria and Part 373/RCRA regulations as they apply to units on site. In this EIS, updated long-term performance assessment models for groundwater and erosion releases are used and closure designs that have waste isolation barriers are analyzed. Short- and long-term impacts, local impacts, and impacts associated with transportation are analyzed in this EIS. The analysis is intended to provide the decisionmakers and public with an updated understanding of the environmental impacts of each alternative.

Following the NOI and scoping meetings of early 2003, DOE, with input from NYSERDA and the cooperating agencies, refined the definitions of five alternatives and prepared an internal preliminary Draft EIS in

[1] Chapter 5, Section 5.2 of this EIS includes a discussion of the NRC Final Policy Statement (67 FR 5003). Waste "incidental" to reprocessing is defined in Chapter 8 (Glossary) of this EIS.

September 2005, in which the environmental impacts of the five alternatives were analyzed. This internal preliminary Draft EIS did not present a preferred alternative and did not address the issue of which agency is responsible for specific portions of the site. The internal preliminary Draft EIS was reviewed by the co-lead and cooperating agencies, and their comments revealed different expectations about the purpose and content of the EIS. To resolve the differences about alternatives to be analyzed and the type of analyses, and to help identify a preferred alternative, DOE established a core team comprising the co-lead and cooperating agencies to discuss and, where practical, resolve the issues raised by the review of the September 2005 internal preliminary Draft EIS. This historical information about the evolution of this *Decommissioning and/or Long-Term Stewardship EIS* is depicted chronologically in **Figure 1–1**. This Final EIS reflects the results of discussions with the core team regarding alternatives to be analyzed, the nature of the analyses, and the nature of the Preferred Alternative that occurred during both the preparation of the Revised Draft EIS and this Final EIS.

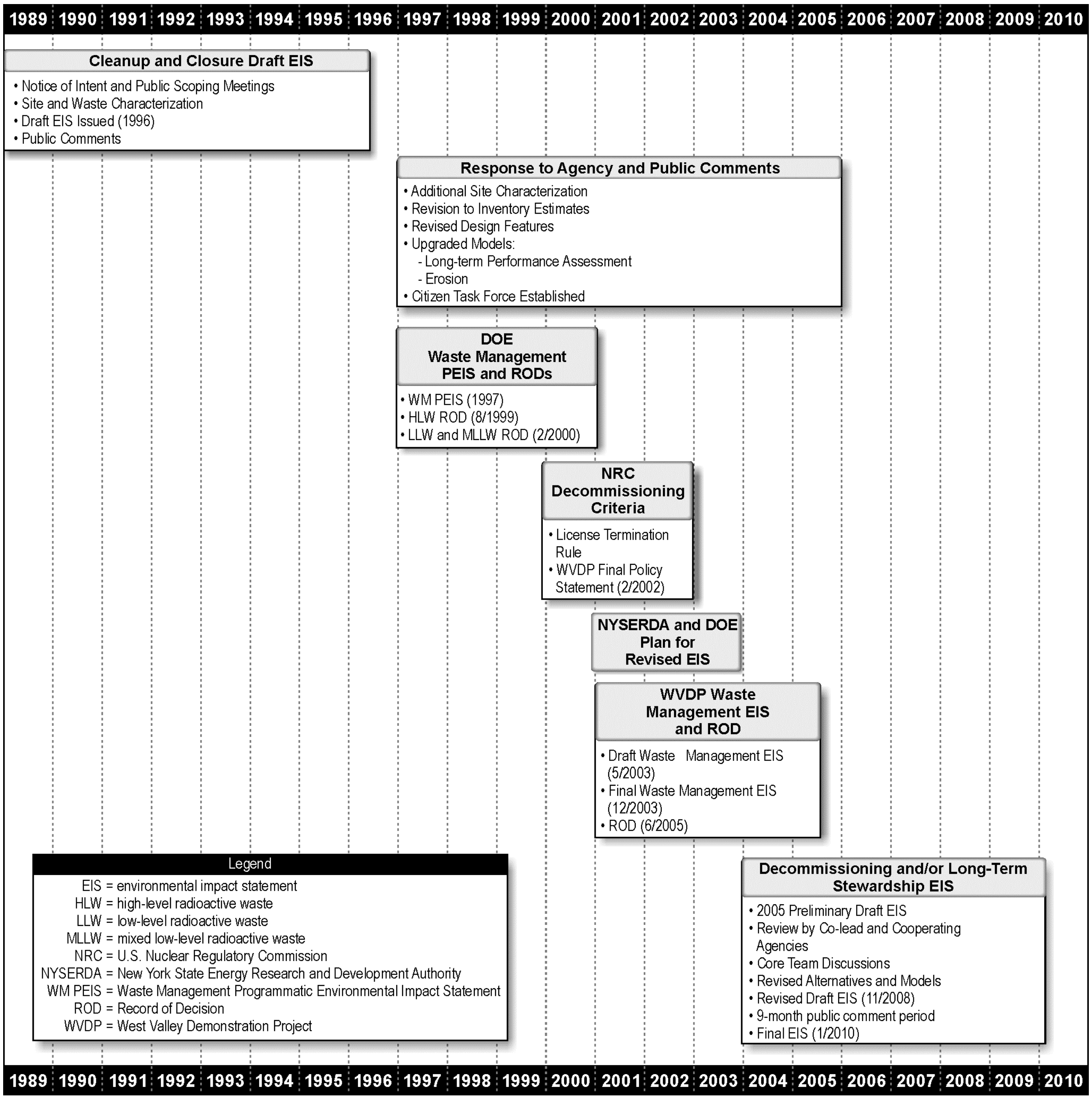


Figure 1–1 *Decommissioning and/or Long-Term Stewardship Environmental Impact Statement* History Timeline

1.3 Purpose and Need for Agency Action

The WVDP Act requires DOE to decontaminate and decommission the waste storage tanks and facilities used in the solidification of high-level radioactive waste, and any material and hardware used in connection with WVDP, in accordance with such requirements as NRC may prescribe. As discussed in Section 1.2, NRC has prescribed its License Termination Rule as the decommissioning criteria for WVDP. DOE needs to ensure that the facilities, materials, and hardware for which it is responsible are managed or decommissioned in accordance with applicable Federal and state requirements, including Part 373/RCRA regulations. To this end, DOE needs to determine which, if any, materials or structures for which it is responsible would remain on site, and what, if any, institutional controls, engineered barriers, or stewardship provisions would be needed. This EIS evaluates alternatives by which DOE would complete its responsibilities under the WVDP Act in accordance with Council on Environmental Quality regulations and DOE implementing procedures (40 CFR 1500–1508 and 10 CFR 1021, respectively).

Likewise, NYSERDA needs to ensure that the manner in which facilities and property for which it is responsible, including the SDA, will be managed or decommissioned in accordance with applicable Federal and state requirements. To this end, NYSERDA also needs to determine which, if any, materials or structures for which it is responsible would remain on site and what, if any, institutional controls, engineered barriers, or stewardship provisions would be needed. In addition to other purposes for this document, this EIS has been prepared to meet NYSERDA's SEQR responsibilities for its decisionmaking process for management of WNYNSC. As the lead New York State agency for preparing SEQR documents for WNYNSC, NYSERDA will submit public notices and issue its Findings Statement under SEQR in parallel with DOE's publication of notices and its ROD under NEPA.

Cooperating and Involved Agencies

Both NEPA and SEQR contain provisions that encourage participation by other Federal and state entities to reduce duplication between NEPA and state and local requirements. Cooperating agencies under NEPA are agencies other than the lead agency that have jurisdiction by law or special expertise with respect to any environmental impact involved in a major Federal action significantly affecting the quality of the human environment. Under SEQR, agencies may be either an involved agency or an interested agency. An involved agency is one that has jurisdiction by law to fund, approve, or directly undertake an action and that will ultimately make a discretionary decision in that regard. An interested agency lacks the jurisdiction to fund, approve, or directly undertake an action but may participate in review of a draft EIS because of its specific expertise or concern about the proposed action. An interested agency has the same ability to participate in the review process as a member of the public. No interested agencies have participated in the review of this EIS. Cooperating agencies are typically invited to participate on an EIS by the lead agency; involved agencies are so by definition.

DOE formally invited NRC, EPA, and NYSDEC to participate on this *Decommissioning and/or Long-Term Stewardship EIS* as cooperating agencies under NEPA. In addition, NYSDEC and NYSDOH are involved agencies under SEQR. The three cooperating agencies were invited by DOE because of both their jurisdictional roles and the special expertise they would provide to the EIS process. These agencies may ultimately choose to adopt or rely on some or all of the analyses in this EIS in fulfillment of their own environmental analysis requirements under NEPA or SEQR regulations, as applicable.

U.S. Nuclear Regulatory Commission—NRC has regulatory responsibility under the Atomic Energy Act for WNYNSC, with the exception of the SDA, and this responsibility is exercised through the NRC license issued to NYSERDA pursuant to "Domestic Licensing of Production and Utilization Facilities" (10 CFR 50). The technical specifications and certain other portions of the NRC license were put into abeyance pending completion of WVDP.

The WVDP Act specifies certain responsibilities for NRC, including (1) prescribing requirements for decontamination and decommissioning and (2) providing review and consultation to DOE and monitoring of WVDP for the purpose of ensuring public health and safety. Because of these mandated responsibilities, NRC was invited to be a cooperating agency under NEPA on this EIS. During NRC's independent environmental review to fulfill its own NEPA responsibilities, NRC may choose to adopt all or part of this EIS to assist in its determination that the Preferred Alternative meets NRC's decommissioning criteria. As a cooperating agency, NRC reviewed agency review draft versions of the 2008 Revised Draft EIS and other documents developed by DOE and NYSERDA to provide early input on the analysis of environmental impacts associated with the proposed alternatives. NRC also reviewed and provided comments on the 2008 Revised Draft EIS during the public comment period.

In addition, DOE has provided a decommissioning plan to NRC in accordance with the September 1981 Memorandum of Understanding between DOE and NRC establishing procedures for review and consultation by NRC of DOE activities conducted under the WVDP Act. The initial *Phase 1 Decommissioning Plan for the West Valley Demonstration Project* (Decommissioning Plan) was submitted to NRC in December 2008 and is based on the Preferred Alternative identified in the Revised Draft EIS. It was updated and resubmitted in December 2009 to reflect the Preferred Alternative in this Final EIS. This Decommissioning Plan will provide information to allow NRC to determine whether the Preferred Alternative, if selected, meets the decommissioning criteria that NRC has identified for WVDP. If DOE selects an alternative other than the Preferred Alternative identified in this Final EIS, the Decommissioning Plan will be revised to reflect the selected alternative. If appropriate, DOE will also provide the waste determination on its classification of incidental wastes to NRC.

NRC retains regulatory responsibility for non-DOE activities in areas outside the Project Premises exclusive of the SDA to the extent that contamination exists both on and off site resulting from activities performed when WNYNSC was operating under its NRC license.

Following completion of activities required by the WVDP Act, the Project Premises will be returned to NYSERDA and NRC will have regulatory responsibility for WNYNSC, exclusive of the SDA.

New York State Department of Environmental Conservation—With respect to DOE Proposed Actions, NYSDEC participates as a cooperating agency on this EIS. As a cooperating agency, NYSDEC reviewed agency review draft versions of the 2008 Revised Draft EIS and other documents developed by DOE and NYSERDA to provide early input on the analysis of environmental impacts associated with the proposed alternatives. NYSDEC also reviewed and provided comments on the 2008 Revised Draft EIS during the public comment period. NYSDEC is also an involved agency under SEQR with respect to permitting actions at the SDA and with respect to any approvals NYSDEC would issue for WVDP or WNYNSC under Part 373/RCRA regulations.

NYSDEC regulates the SDA through issuance of permits under "Rules and Regulations for Prevention and Control of Environmental Pollution by Radioactive Materials" (6 NYCRR 380). NYSDEC regulates hazardous and mixed low-level radioactive waste at WNYNSC (6 NYCRR 370 *et seq*.) and is responsible for permitting activities under interim status for RCRA-regulated units.

In addition, both EPA and NYSDEC are responsible for ensuring that DOE and NYSERDA comply with the Consent Order discussed in Section 1.1 of this chapter. This Consent Order requires investigation of SWMUs, performance of interim corrective measures, and completion of Corrective Measures Studies, if necessary.

New York State Department of Health—NYSDOH is an involved agency as defined by SEQR because it has jurisdiction over the commercial and industrial use of radioactive materials in New York State, including the possession of radioactive materials at the SDA at WNYNSC. It now maintains authority over the radioactive materials license (originally issued by the New York State Department of Labor) that authorizes NYSERDA to possess and manage emplaced radioactive waste at the SDA.

U.S. Environmental Protection Agency—As a cooperating agency under NEPA, EPA reviewed agency review draft versions of the 2008 Revised Draft EIS and other documents developed by DOE and NYSERDA to provide input on the analysis of environmental impacts associated with the proposed alternatives. EPA also reviewed and provided comments on the 2008 Revised Draft EIS during the public comment period. EPA is responsible for assessing compliance with National Emission Standards for Hazardous Air Pollutants (NESHAPs) requirements (40 CFR 61, Subpart H); assessing the ability of the alternatives to meet the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) risk range, if required; and addressing sole-source aquifer concerns.

In addition, both EPA and NYSDEC are responsible for ensuring that DOE and NYSERDA comply with the Consent Order discussed in Section 1.1 of this chapter. This Consent Order requires investigation of SWMUs, performance of interim corrective measures, and completion of Corrective Measures Studies, if necessary.

Regulatory Compliance Processes

This EIS meets the Federal procedural requirements set forth under NEPA of 1969 (as promulgated in 40 CFR 1500 *et seq*.), as well as New York State SEQR requirements (6 NYCRR 617). Both Federal and state regulations require the identification and evaluation of significant environmental impacts resulting from a proposed action and a discussion of mitigative actions. SEQR requires the mitigation of significant environmental impacts to the extent practicable. The requirements of both NEPA and SEQR call for comprehensive assessment of reasonable alternatives and the presentation of comparative information to facilitate agency decisionmaking. Both NEPA and SEQR have public involvement requirements to make the information available to public officials and citizens before decisions are made and actions taken.

Both DOE and NYSERDA recognize that there are regulatory requirements and processes associated with the implementation of each alternative. These regulatory

The NYSERDA View Indicates….

The Connection between the Final EIS Analyses and the Applicable Regulatory Framework Must be Strengthened. NYSERDA discusses its position that the Nuclear Regulatory Commission's low-level radioactive waste disposal regulations (10 CFR Part 61) were used to guide the long-term performance assessment rather than NRC's License Termination Rule and implementing guidance, NRC Consolidated Decommissioning Guidance (NUREG-1757). NYSERDA further states that 10 CFR Part 61 guidance should generally not be used as part of the analytical framework for the EIS.

DOE's Response….

The long-term performance assessment in this Decommissioning and/or Long-Term Stewardship EIS *meets DOE NEPA guidance and precedent. The analysis also uses the requirements of NRC's License Termination Rule (10 CFR Part 20, Subpart E) and Policy Statement for the WVDP (which prescribes the License Termination Rule as the decommissioning criteria for WVDP) and the implementing guidance in NUREG-1757 for the long-term performance analysis for this EIS. A preliminary discussion of compliance with NRC's License Termination Rule for WVDP may be found in Appendix L of this EIS. This discussion includes supporting analyses, but is considered only preliminary because actual compliance scenarios would be determined through the formal NRC process for preparing and reviewing a decommissioning plan specifically focused on license termination as described in NUREG-1757.*

Appendix D, Section D.3 of this EIS provides an overview of the approach used for long-term performance assessment for this EIS. This section provides a detailed discussion of the process DOE used to develop the approach for estimating long-term impacts, including scenario development and model selection. This discussion describes a carefully thought out and executed, scientific approach to evaluating and applying relevant, available scientific and regulatory guidance and precedent to an analysis lacking specific regulatory guidance or requirements. A number of possible sources were considered for development of the scenarios and models. As noted in Section D.3.1.3, information supporting the analyses in the *Environmental Impact Statement on 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste*, "proved useful in identifying receptors and receptor habitats," and as the discussion in Appendix D demonstrates, was by no means the exclusive source.

requirements may consist of RCRA permitting and corrective actions under New York State and/or EPA requirements, decommissioning according to NRC requirements, assessments relative to the CERCLA risk range, and assessment of compliance with NESHAPs regulations. This EIS is not intended to replace any of the regulatory compliance actions that may be undertaken as applicable by DOE and NYSERDA in decommissioning and closing WVDP or WNYNSC.

DOE and NYSERDA are required to comply with applicable RCRA requirements for management of hazardous wastes and the remedial actions/cleanup of their respective portions of WNYNSC. NYSDEC is the primary responsible agency for overseeing the management of hazardous wastes at the site pursuant to NYSDEC Part 373/RCRA requirements, and would issue a permit for the proper management of hazardous waste. EPA and NYSDEC are jointly responsible for the oversight of the site remedial actions/cleanup performed under the 1992 RCRA 3008(h) Consent Order. The aforementioned NYSDEC Part 373/RCRA permit, if and when issued, may also include applicable RCRA corrective action provisions which require remedial actions/cleanup necessary for specific portions of the site.

New York State Part 373/RCRA Permit Applications require a supporting EIS that meets the requirements of SEQR. This *Decommissioning and/or Long-Term Stewardship EIS* analyzes portions of WNYNSC in addition to those portions within the scope of Part 373/ RCRA Permit Application (e.g., the SDA). As such, NYSDEC can use the appropriate sections of this EIS to understand the environmental impacts of actions being considered in the Part 373/RCRA Permit Application.

In its Final Policy Statement (67 FR 5003), NRC prescribed its License Termination Rule as the decommissioning goal for WVDP and all NRC-licensed portions of WNYNSC. NRC will assess compliance during its review of the WVDP Decommissioning Plan.

The NRC Decommissioning Plan review and the RCRA compliance process focus on actions selected by DOE and NYSERDA. If the outcome of the Part 373/RCRA Permit Application review process or decommissioning plan review process results in the need for actions that are substantially different from those analyzed in this EIS, the agencies would prepare a supplement analysis to determine if this *Decommissioning and/or Long-Term Stewardship EIS* needs to be supplemented and the ROD or Findings amended.

EPA has regulatory authority for radioactive air emissions at WNYNSC under NESHAPs regulations.

Preliminary information with respect to compliance with the decommissioning requirements is presented in Appendix L of this EIS.

1.4 Scope of This Environmental Impact Statement

This EIS presents the environmental impacts associated with the full range of reasonable alternatives for decommissioning and/or long-term stewardship of WNYNSC, as well as the No Action Alternative as required by NEPA and SEQR. The environmental impacts along the transportation route(s) for wastes that are proposed to be transported to offsite locations, and the long-term impacts (post-decommissioning phase) at or near WNYNSC for facilities or wastes that are proposed to remain in place, depending on the alternative, are also analyzed.

For further definition of the scope of this EIS, see Chapter 2, Tables 2–1 and 2–2. These tables describe the status of facilities at WNYNSC at the start of decommissioning, which is the starting point for the analyses in this EIS and is referred to as the Interim End State. The *Revised Draft Decommissioning and/or Long-Term Stewardship EIS* indicated that the Interim End State was estimated to be reached by 2011. Based on current information, it is now estimated that most, but not all the activities for achieving the Interim End State will be completed by 2011. In particular, the tanks in the Waste Tank Farm in WMA 3 are not expected to be dry until about 2015. Achievement of the Interim End State is defined by the physical status of each facility or area identified in the referenced tables.

This EIS also addresses topics called for in SEQR implementing regulations (6 NYCRR 617.9), including mitigating measures, adverse environmental impacts that cannot be avoided, any growth-inducing aspects of the proposed action,[2] and the impact of the Proposed Action on solid waste management. These topics were added to this EIS to provide information required by SEQR so this EIS could be used to support NYSERDA decisions about management of non-WVDP portions of WNYNSC.

1.5 Decisions to Be Supported by This Environmental Impact Statement

This EIS will support decisions about actions to complete WVDP and to either close or manage WNYNSC. Major decisions would consist of decommissioning the former spent nuclear fuel reprocessing facility, storage buildings, and the NDA; exhumation, closure in place, or management of the SDA; and remediation and/or management of areas of contaminated soil, sediment, and groundwater.

This EIS may be used by cooperating agencies. In the future, NRC may adopt this EIS if NRC determines that the Preferred Alternative would meet its decommissioning criteria, or NRC could perform its own NEPA evaluation. EPA will review this EIS and other documents to determine if the remediated site would satisfy the requirements of the Consent Order and whether the remediated site would be consistent with the CERCLA risk range and therefore avoid the potential need to list WNYNSC on the National Priorities List. NYSDEC may rely on this EIS for purposes of SEQR to support the Part 373/RCRA Permit Application, RCRA Corrective Measures Study(ies), and decisions regarding the SDA under 6 NYCRR 380, *et seq.*, as appropriate.

The NYSERDA View Indicates….

The Existing Long-term Performance Assessment is not Adequate to Support In-Place Closure of the Waste Tank Farm or any Other Facilities. This issue in the View reflects four other issues related to the long-term performance assessment effort presented in the Final EIS as discussed in the View: erosion, contaminant transport by groundwater, performance of engineered barriers, and the presentation of information about the uncertainty of the long-term performance assessment. NYSERDA believes that the Final EIS long-term performance assessment should not be used to support a decision to close the Waste Tank Farm, or any other facilities, in place.

DOE's Response….

DOE acknowledges that there is uncertainty inherent in long-term (i.e., 10,000 to 100,000 years) performance assessment modeling, but is of the opinion that the analyses and disclosure of uncertainties in the EIS provide a sufficient quality of information to adequately support agency decisionmaking. DOE's analyses account for these uncertainties using state-of-the-art models, generally accepted technical approaches, existing credible scientific methodology, and the best available data in such a way that the predictions of peak radiological and hazardous chemical risks are expected to be conservative (i.e., the results are more likely to overstate rather than understate the actual future consequences). For the Final EIS, DOE updated the hydrologic, groundwater dose, and erosion modeling methodology, and refined the models to reflect new site-specific information. Chapter 4, Section 4.1.10 and Appendices E, F, G, and H have been revised to present the updated results and discuss the changes in methodology, and Section 4.3.5 presents a comprehensive list of uncertainties that affect the results of the long-term performance assessment.

DOE's position is that it has spent much time and effort engaging highly qualified and respected experts in hydrology and hydrological transport, landscape evolution (erosion), human health and environmental risk analysis, and other technical fields, and stands behind the analyses performed for this EIS. These analyses are fully capable of supporting a decision to select any of the alternatives evaluated in this EIS.

[2] SEQR specifies that assessment of environmental impacts should include the growth-inducing aspects of a proposed action. These are generally "secondary" impacts of a proposed action that trigger further development. For example, actions that add substantial new land use, new residents, or new employment could induce additional development of a similar kind or support uses such as stores or other businesses.

1.6 Relationship of this Environmental Impact Statement to Other National Environmental Policy Act Documents

This section explains the relationship between this *Decommissioning and/or Long-Term Stewardship EIS* and other relevant NEPA documents.

1.6.1 *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (Cleanup and Closure Draft EIS)* (DOE/EIS-0226-D)

The *Cleanup and Closure Draft EIS* (DOE 1996a) was issued for public comment in March 1996, and 113 comment letters were received by DOE and considered in preparation of this EIS. The sequence of events described in Section 1.2 of this chapter followed, which led to the decision to revise and reissue the 1996 *Cleanup and Closure Draft EIS* using information gained since 1996, the improved analytical methods developed since that time, and the clearer understanding of regulatory requirements. Responses to summarized comments in the letters received on the *Cleanup and Closure Draft EIS* are provided in Appendix A of this EIS.

1.6.2 *Final Environmental Impact Statement, Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley* (DOE/EIS-0081)

In this EIS (DOE 1982), DOE evaluated alternatives for long-term management of liquid high-level radioactive waste stored in underground tanks. DOE issued a ROD announcing its decision to construct and operate facilities at WNYNSC to solidify the liquid high-level radioactive waste into a form suitable for transportation to and disposal in a Federal geologic repository. In a supplement analysis completed in 1993, DOE evaluated the impacts of modifications in the design, process, and operations since the 1982 EIS ROD. A second supplement analysis, completed in 1998, addressed high-level radioactive waste solidification, management, and interim storage; disposal and transport of wastes; site operations; facility decontamination; and spent nuclear fuel storage. Actions evaluated in the 1982 EIS and its supplement analyses consist of decontamination of the Main Plant Process Building head-end cells; construction of a Load-In/Load-Out Facility to support shipment of vitrified high-level radioactive waste; construction of a Remote-Handled Waste Facility; decontamination of the fuel receiving and storage area; and drainage of water from the fuel storage pool.

The short-term onsite management of the vitrified high-level radioactive waste canisters, currently stored in the Main Plant Process Building, and the disposition of the Remote-Handled Waste Facility and Load-In/Load-Out Facility, are evaluated in this *Decommissioning and/or Long-Term Stewardship EIS*.

1.6.3 *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* (DOE/EIS-0337)

In the *Waste Management EIS* (DOE 2003e) issued in December 2003, DOE considered alternatives for the management of WVDP low-level radioactive waste, mixed (radioactive and hazardous) low-level radioactive waste, transuranic waste, and high-level radioactive waste currently in storage at the site or that will be generated at the site over 10 years from ongoing operations and decontamination activities. In the ROD issued June 16, 2005 (70 FR 35073), DOE announced its decision to ship low-level radioactive waste and mixed low-level radioactive waste off site for disposal at commercial sites, one or both of two DOE sites (NTS near

Mercury, Nevada, or Hanford near Richland, Washington), or a combination of commercial and DOE sites.[3] Also, consistent with the *Final WM PEIS* ROD (64 FR 46661; August 26, 1999) discussed in Section 1.6.6 of this chapter, DOE affirmed that it will temporarily store canisters of vitrified high-level radioactive waste at WNYNSC until transfer to a geologic repository. As discussed in Section 1.6.4 of this chapter, the Administration intends to terminate the Yucca Mountain program. DOE will continue to store canisters of vitrified high-level radioactive waste at WNYNSC in accordance with the Final *WM PEIS* ROD until disposition decisions for high-level radioactive waste are made and implemented. DOE deferred a decision on the disposal of WVDP transuranic waste pending a determination by DOE that the waste meets all statutory and regulatory requirements for disposal (including a determination that the waste is defense waste) at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico.

1.6.4 *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Yucca Mountain EIS)* (DOE/EIS-0250-F)

The *Yucca Mountain EIS* (DOE 2002b) was issued in 2002. In this EIS, DOE analyzed proposed actions to construct, operate, monitor, and eventually close a geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste at Yucca Mountain in Nye County, Nevada. As part of the Proposed Action, DOE analyzed the potential impacts of transporting spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site from 77 sites across the United States, including WNYNSC. Because this 2002 EIS includes consideration of the shipment of the high-level radioactive waste canisters from WNYNSC, that analysis is summarized and incorporated by reference in this *Decommissioning and/or Long-Term Stewardship EIS.* On April 8, 2004, DOE issued a ROD (69 FR 18557) to announce its decision on the mode of waste transport and selection of the rail corridor for transportation of waste to the proposed Yucca Mountain repository.

In June 2008, DOE issued two supplements to the *Yucca Mountain EIS*. The first is the *Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250F-S1), in which DOE evaluates proposed actions to construct, operate, monitor, and eventually close a geologic repository at Yucca Mountain, and the No Action Alternative, which would terminate activities at Yucca Mountain. The second is the *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada – Nevada Rail Transportation Corridor (Final Rail Corridor SEIS)* (DOE/EIS-0250F-S2), in which the potential environmental impacts of constructing and operating a railroad to connect the Yucca Mountain repository to an existing rail line near Wabuska, Nevada (the Mina corridor) are evaluated. This second supplement is linked to and was issued with the *Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0369), discussed in Section 1.6.5 of this chapter.

As indicated in the Administration's fiscal year 2010 budget request, the Administration intends to terminate the Yucca Mountain program while developing nuclear waste disposal alternatives. Notwithstanding this decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of high-level radioactive waste and spent nuclear fuel. The Administration intends to convene a blue ribbon commission to evaluate alternative approaches for meeting these obligations. This commission will provide the opportunity for a meaningful dialogue on how best to address this

[3] In accordance with a Settlement Agreement between DOE and the State of Washington signed on January 6, 2006, in the case State of Washington v. Bodman, DOE will not ship low-level radioactive waste or mixed low-level radioactive waste from WVDP to Hanford until DOE has satisfied the requirements of the Settlement Agreement to complete the Tank Closure and Waste Management EIS for the Hanford Site. Also, under the Preferred Alternative for the Draft EIS, DOE would not ship wastes to Hanford for disposal until after the Hanford Waste Treatment Plant is operational.

challenging issue and will provide recommendations that will form the basis for working with Congress to revise the statutory framework for managing and disposing of high-level radioactive waste and spent nuclear fuel.

1.6.5 *Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada (Final Rail Alignment EIS)* (DOE/EIS-0369)

In the *Final Rail Alignment EIS* (DOE 2008b), DOE analyzes the potential environmental impacts associated with potential rail alignments within the Caliente and Mina corridors as well as the construction and operation of a railroad line in Nevada to transport spent nuclear fuel, high-level radioactive waste, and other Yucca Mountain project materials to a repository at Yucca Mountain. This EIS tiers from the broader corridor analysis in both the *Yucca Mountain EIS* and the *Final Rail Corridor SEIS*, discussed in Section 1.6.4. In the October 2008 ROD (73 FR 60247) for the *Final Rail Alignment EIS*, DOE announced its decision to construct and operate a railroad along a rail alignment within the Caliente corridor. DOE also has decided to allow shipments of general freight on the rail line. As indicated in the previous section, however, the Administration has indicated its intent to terminate the Yucca Mountain program.

1.6.6 *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (WM PEIS)* (DOE/EIS-0200-F)

In May 1997, DOE issued the *WM PEIS* (DOE 1997a), which examined the potential environmental and cost impacts of strategic management alternatives for low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, high-level radioactive waste, and nonwastewater hazardous waste resulting from nuclear defense and research activities at sites around the United States.

DOE published four RODs based on this EIS. In its ROD for the treatment and management of transuranic waste, published on January 23, 1998 (63 FR 3629), DOE announced its decision (with one exception)[4] that each DOE site, including WVDP (if the waste is determined to be defense waste), would prepare its transuranic waste for disposal and store the waste on site until it could be shipped to WIPP in Carlsbad, New Mexico, for disposal.

In the second ROD, published on August 5, 1998 (63 FR 41810), DOE announced its decision to continue using offsite facilities for the treatment of major portions of the nonwastewater hazardous waste generated at DOE sites. This decision did not involve any transfers of nonwastewater hazardous waste between DOE sites.

In the third ROD, published on August 16, 1999 (64 FR 46661), DOE announced its decision to store immobilized high-level radioactive waste in a final form at the site of generation (Hanford, Idaho National Laboratory, the Savannah River Site, and WNYNSC) until transfer to a geologic repository for ultimate disposition.

In a fourth ROD, published in the *Federal Register* on February 25, 2000 (65 FR 10061), DOE addressed the management and disposal of low-level radioactive waste and mixed low-level radioactive waste. In this ROD, DOE announced its decision to perform minimal treatment of low-level radioactive waste at all sites and continue, to the extent practicable, disposal of onsite low-level radioactive waste at Idaho National Laboratory, Los Alamos National Laboratory, the Oak Ridge Reservation, and the Savannah River Site. DOE identified Hanford in Washington and NTS in Nevada as regional disposal sites for low-level and mixed low-level

[4] *Sandia National Laboratories in New Mexico would ship its transuranic waste to the Los Alamos National Laboratory in New Mexico to prepare this waste for shipment to WIPP.*

radioactive waste from other DOE sites that do not have appropriate disposal capability, including WVDP. This decision regarding using DOE sites does not preclude the use of commercial disposal sites.

1.6.7 *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE/EIS-0026-S-2)

In October 1980, DOE issued the *Final Environmental Impact Statement, Waste Isolation Pilot Plant* on the proposed development of WIPP (DOE 1980). In January 1981, in the subsequent ROD, DOE announced a phased development of WIPP, beginning with construction of the WIPP facility. DOE issued the *Final Supplemental Environmental Impact Statement, Waste Isolation Pilot Plant* in January 1990 in which previously unavailable information was considered. Based on the *Supplemental EIS*, DOE decided to continue phased development of WIPP by implementing test-phase activities. On October 30, 1992, the WIPP Land Withdrawal Act transferred the WIPP Site from the U.S. Department of the Interior to DOE. The 1997 Defense Authorization Act (September 23, 1996) amended the WIPP Land Withdrawal Act to make RCRA hazardous waste land disposal prohibitions inapplicable to WIPP. The *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE/EIS-0026-S-2), issued in September 1997, updated information contained in the 1980 and 1990 EISs, and incorporated the analysis of various treatment alternatives for transuranic waste. In a ROD issued in January 1998 (63 FR 3264), DOE announced its decision to open WIPP for the disposal of defense transuranic waste. This *Supplemental EIS* includes WVDP transuranic waste in DOE's Additional Inventory, which is nondefense transuranic waste owned or controlled by DOE. No decisions were made regarding this Additional Inventory.

1.6.8 *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS EIS)* (DOE/EIS-0243)

In this EIS (DOE 1996b), DOE analyzed the potential impacts that could result from mission activities at NTS, including low-level radioactive waste and mixed low-level radioactive waste disposal. In the *NTS EIS*, DOE analyzed waste management and environmental restoration activities and other mission activities for a 10-year period, including receipt of low-level radioactive waste and mixed low-level radioactive waste from other sites such as WVDP.

On July 24, 2009, DOE issued an NOI (74 FR 36691) to prepare a new sitewide EIS for the continued Operation of NTS. This EIS will analyze potential impacts resulting from reasonably foreseeable operations for three action alternatives and a No Action Alternative. The three action alternatives would differ by either their type or level of ongoing operations and may include proposals for new operations or the reduction or elimination of certain operations. The No Action Alternative is to continue current operations through implementation of the 1996 ROD and subsequent decisions.

1.6.9 *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (DOE/EIS-0391)

On October 30, 2009, EPA issued a Notice of Availability (74 FR 56194) for the *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (DOE/EIS-0391). This EIS analyzes and evaluates the potential health and environmental impacts of storing, retrieving, treating, and disposing of the waste inventory generated during defense production years at Hanford in Washington State. This EIS evaluates the potential health and environmental impacts of ongoing solid waste management operations at Hanford, as well as the proposed disposal of Hanford low-level radioactive waste and mixed low-level radioactive waste and a limited volume of low-level radioactive waste and mixed low-level radioactive waste from other DOE sites, such as the WVDP, in an Integrated Disposal Facility located at Hanford.[5] The defense waste inventory of about 205 million liters (54.5 million gallons) of mixed radioactive and chemically hazardous waste, stored in 177 large and 61 smaller underground storage tanks, presents a major source of potential public health and environmental risks. In addition, this EIS evaluates the potential health and environmental impacts of proposed activities to decommission the Fast Flux Test Facility and auxiliary facilities at Hanford, including managing waste generated by the decommissioning process and disposing of Hanford's inventory of radioactively contaminated bulk sodium from the Fast Flux Test Facility and other onsite facilities.

1.6.10 *Environmental Impact Statement for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste* (DOE/EIS-0375)

On July 23, 2007, DOE issued an NOI (72 FR 40135) to prepare an EIS to evaluate alternatives for the disposal of Greater-Than-Class C low-level radioactive waste and similar DOE waste, which may not have an identified path to disposal. The waste volumes being analyzed in this EIS include estimates of the amount of Greater-Than-Class C and potential non-defense transuranic waste that may be generated from decommissioning activities at WNYNSC, as well as transuranic waste currently in storage at WNYNSC. Currently, there is no location for the disposal of Greater-Than-Class C low-level radioactive waste, and the Federal Government is responsible for such disposal under the Low-Level Radioactive Waste Policy Amendments Act (Public Law 99-240). DOE is evaluating several disposal methods in this EIS, including a deep geologic repository, intermediate depth boreholes, and enhanced near-surface facilities at different locations.

1.6.11 *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project* (DOE/EA-1552)

This environmental assessment was issued in September 2006. As part of ongoing WVDP responsibilities and in accordance with the WVDP Act, DOE proposed to demolish and remove 36 facilities. Although some of the facilities are currently in use, DOE would be able to eliminate or significantly reduce the functions that are undertaken in those facilities. Once the functions are replaced or no longer needed by WVDP, DOE would demolish and remove the facilities from the site. All applicable RCRA and NYSDEC regulations for management (storage, shipping, reporting, and offsite disposal) of solid waste, including hazardous waste, would be followed in completing the work.

1.7 Public Participation

1.7.1 Public Participation Process

During the preparation of an EIS, opportunities for public involvement are provided as stipulated by NEPA and SEQR (see **Figure 1–2**). The steps followed under either set of regulations are similar. In Figure 1–2 both the NEPA and SEQR process steps are indicated. When the SEQR process steps are different or have different names from the NEPA process steps, the SEQR step is indicated parenthetically. As a preliminary step in development of an EIS, regulations established by the Council on Environmental Quality (40 CFR 1501.7) and DOE (10 CFR 1021) require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a Proposed Action." As part of the scoping process (40 CFR 1501.7[a]), the Council on Environmental Quality requires the agency preparing an EIS to:

[5] In accordance with a Settlement Agreement between DOE and the State of Washington signed on January 6, 2006, in the case State of Washington v. Bodman, DOE will not ship low-level radioactive waste or mixed low-level radioactive waste from WVDP to Hanford until DOE has satisfied the requirements of the Settlement Agreement to complete the Tank Closure and Waste Management EIS for the Hanford Site. Also, under the Preferred Alternative for the Draft EIS, DOE would not ship wastes to Hanford for disposal until after the Hanford Waste Treatment Plant is operational.

- Invite the participation of affected Federal, state, and local agencies, any affected Indian tribe, the proponent of the action, and other interested persons.
- Determine the scope and significant issues to be analyzed in the EIS.
- Identify and eliminate from detailed study issues that are not significant or have been covered under other environmental reviews.
- Allocate assignments for preparation of the EIS among the lead and cooperating agencies, with the lead agency retaining responsibility for the statement.
- Indicate any other NEPA documents that are being or will be prepared that are related to the EIS but not part of the scope.
- Identify other environmental review and consultation requirements so that other necessary analyses and studies can be prepared concurrently and integrated with the EIS.
- Indicate the relationship between the timing of the preparation of environmental analyses and the agencies' tentative planning and decisionmaking schedule.

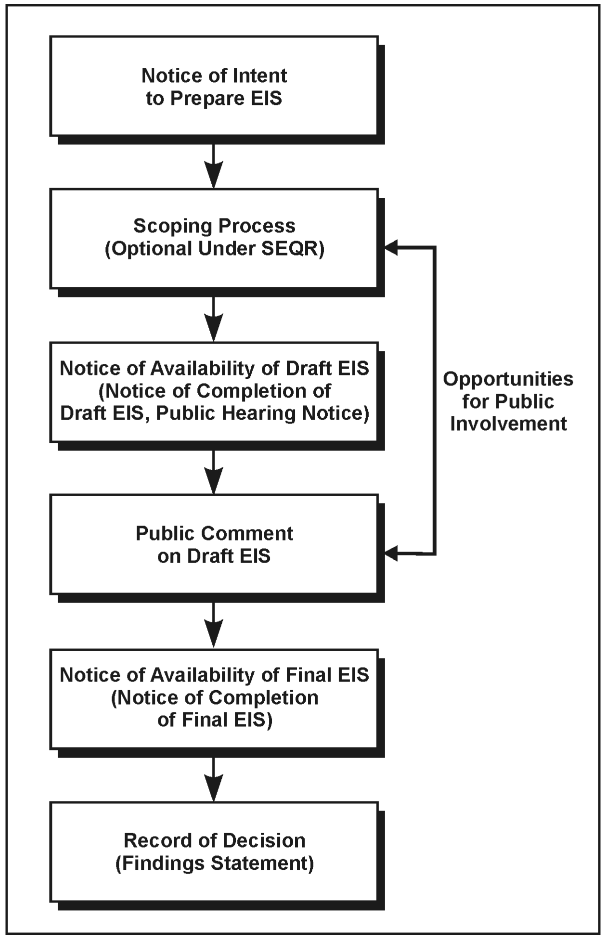


Figure 1–2 National Environmental Policy Act and State Environmental Quality Review Act Process

As indicated in Figure 1–2, scoping is not required under SEQR, but may be initiated by the lead agency (6 NYCRR 617.8). If scoping is conducted, it must include an opportunity for public participation.

In addition to the scoping process, public participation is solicited in the review of a Draft EIS. Both NEPA and SEQR require that comments on a Draft EIS be assessed and considered during the preparation of a Final EIS, and that responses to the comments be provided.

1.7.2 Issues Raised During the Public Comment Period on the 1996 Draft EIS

The 1996 *Cleanup and Closure Draft EIS* was distributed in March 1996 to interested individuals and organizations, including appropriate state clearinghouses, regulatory agencies, and American Indian Tribes. During the 6-month public comment period, four information sessions were held during which DOE and NYSERDA were available to explain and discuss topics and issues that pertained to the Draft EIS. Two of the four sessions were held on reservations of the Seneca Nation of Indians. A formal public hearing was conducted in three meetings on August 6, 1996, in West Valley, New York, to receive oral comments. During the 6-month comment period, DOE received 113 letters from individuals and organizations. A wide spectrum of issues was raised during the public comment period. Many of the comments related to the definition and analysis of the alternatives (the scope of the EIS), but some dealt with issues such as responsibility, determining regulatory compliance, and funding for operation of the West Valley Site, which are outside the scope of an EIS.

All of the documents received during the public comment period on the *Cleanup and Closure Draft EIS,* as well as the transcripts from the formal hearings, were reviewed, and specific comments were delineated and organized into the following 13 major categories:

1. Characterization of the site, waste, and contamination, or presentation of data
2. Reasonableness of alternatives
3. Design or operational details
4. Short-term impact analysis
5. Long-term erosion analysis
6. Long-term hydrologic transport analysis
7. Erosion control strategies
8. Long-term performance assessment
9. Preferences for or against a particular alternative
10. Specific recommendations for the Preferred Alternative
11. Regulatory compliance
12. Understanding the purpose and content of the EIS and its relationship to decisionmaking
13. Out-of-scope comments

Appendix A of this EIS contains a table that cross-references each comment letter or transcript to the applicable category to assist the commentor in understanding how the lead agencies responded to the comment. For each category, examples or summaries of the comments received are provided and then a response is provided to that category of comments. For the out-of-scope comments, an explanation is provided as to why they were placed in that category.

1.7.3 Issues Raised During the 2003 Scoping Process

A 45-day comment period was initiated by the March 13, 2003, DOE Notice in the *Federal Register* (68 FR 12044) and NYSERDA Notice in the *New York State Environmental Notice Bulletin* (NYSERDA 2003) of their intent to prepare a *Decommissioning and/or Long-Term Stewardship EIS*. DOE and NYSERDA held two public scoping meetings (April 9 and 10, 2003) in Ashford, New York, to solicit comments on the scope and content of the EIS. Transcripts of the two scoping meetings captured oral comments and issues raised by four commentors. DOE also received 10 sets of written comments on a variety of EIS-related issues, submitted several ways: by using the “Comment Form” provided by DOE at the public scoping meetings, by letter through the U.S. Postal Service, by electronic mail (email), or handed in during the April 9 and 10 meetings.

Overview of Comments

Several comments were made in the scoping meetings and comment letters that related to recommendations for the scope of the Revised Draft EIS. These were as follows:

- The scope of alternatives should be for the portion of the site controlled by DOE rather than the entire WNYNSC.
- The Final EIS should show the individual comments made on the Revised Draft, as well as comments made on the 1996 *Cleanup and Closure Draft EIS,* and should respond to these comments individually.

- The Revised Draft EIS should evaluate the Exhume and On-site Storage Alternative, which was evaluated in the 1996 *Cleanup and Closure Draft EIS*.
- The impact assessment should use probabilistic risk assessment methods.
- The erosion modeling should account for specific processes, including slumping, stream capture, and gully formation. In addition, the model should be calibrated against measured changes in valley cross section.
- The dose projections should account for populations that are reasonably expected to be exposed.
- The analysis of impacts should consider occupational exposure and the effect of activity timing on occupational exposure.
- The Final EIS should show the relationship of this EIS to other West Valley EISs.
- Requirements of the WVDP Act (Public Law 96-368) and the regulatory standards that would apply to decommissioning should be outlined.

All of these comments were considered in the development of this EIS. The scope of the alternatives considers the entire site consistent with the NOI. The decision was made to address the comments received on the 1996 Draft EIS in a summary manner in this EIS, because of the amount of time that has passed and the numerous changes that have occurred at the site since 1996. As discussed in Section 1.7.2, comments on the 1996 Draft EIS were organized into categories, and the summarized issue(s) and the response(s) appear in Appendix A of this EIS. This EIS considered, but did not analyze, the Exhume and On-site Storage Alternative because it is inconsistent with the purpose and need. This EIS utilizes updated long-term performance assessment models for groundwater and erosion as described in Appendices E, F, and G. The dose projections address the populations that could reasonably be expected to be impacted by site releases. The analysis of impacts does consider occupational exposure, but does not directly investigate the effect of decommissioning timing on occupational exposure. The history of the development of this EIS, including its relationship to other West Valley EISs, is discussed in Section 1.2. The requirements of the WVDP Act and the regulatory standards that apply to decommissioning of WNYNSC are discussed in Section 1.3.

The discussion at the meetings and in the letters also involved issues related to the EIS but not directly related to recommendations for the scope of this EIS. These out-of-scope issues include the following:

- Terms of the stipulation of compromise between DOE and the Coalition on West Valley Nuclear Wastes and Radioactive Waste Campaign
- Process and criteria for agency decisionmaking
- Future NRC actions, some of which might be supported by the DOE/NYSERDA EIS
- Relationship between DOE and NYSERDA
- Objection to the process for classifying waste incidental to reprocessing

1.7.4 Public Participation for the 2008 Revised Draft EIS

DOE and NYSERDA solicited comments on the Revised Draft EIS during a 9-month public comment period, which began on December 5, 2008 when the Notice of Availability appeared in the *Federal Register* (73 FR 74160). A Notice of Acceptance of the Revised Draft EIS and Public Hearings was also published on December 10, 2008 in the *New York State Environmental Notice Bulletin* in accordance with SEQR requirements. The December 5, 2008 Notice of Availability announced a 6-month public comment period, through June 8, 2009. In response to stakeholder requests, the public comment period was extended another 90 days, until September 8, 2009.

During the public comment period, DOE and NYSERDA jointly held four public hearings to provide interested members of the public with opportunities to learn more about the content of the Revised Draft EIS from exhibits, factsheets, and other materials; to hear DOE and NYSERDA representatives present the results of the EIS analyses; to ask clarifying questions; and to provide oral or written comments. A website (http://www.westvalleyeis.com) was established to further inform the public about the Revised Draft EIS, how to submit comments, the public hearings, and other pertinent information. Comment submission mechanisms and public hearing dates, times, and locations were announced in the *Federal Register* and *New York State Environmental Notice Bulletin* notices, in local newspapers, and on the website. Members of the public who expressed interest and are on the DOE and NYSERDA mailing list for the *Decommissioning and/or Long-Term Stewardship EIS* were notified by U.S. mail regarding hearing dates, times, and locations.

Public hearings were held in Albany, Irving (on the Seneca Nation of Indians Reservation), Ashford, and Buffalo, New York on March 30 and 31, and April 1 and 2, 2009, respectively. The December 5, 2008 *Federal Register* notice announced the times and locations for three public hearings. However, in response to stakeholder requests, another meeting was added in Albany, and the Buffalo meeting was moved from the original Blasdell location to a more central downtown Buffalo location. These changes to the hearing schedule were announced in the *Federal Register* on March 17, 2009 (74 FR 11364) and advertised in local newspapers. A court reporter recorded the oral comments made at each hearing and prepared a transcript for each. In addition, Federal, state and local governmental agencies; American Indian Tribal Governments, and the general public were encouraged to submit comments by U.S. mail, e-mail, a toll-free fax line, and the DOE website.

In response to public concerns about some of the alternatives in the Revised Draft EIS, especially after the August 9 and 10, 2009 heavy rainfall events, the DOE Assistant Secretary for Environmental Management and the President of NYSERDA initiated planning for a videoconference to discuss those concerns. The videoconference was held on September 4, 2009, with participation by the Assistant Secretary and the President of NYSERDA and various stakeholders. This 'meeting' was also transcribed by a court reporter and the comments and responses are included in the comment response process.

Overall, approximately 1,900 comments were received during the public comment period on the Revised Draft EIS. DOE and NYSERDA considered all comments, including those received after the comment period ended, in preparing this Final EIS. Volume 3 of this EIS, *Comment Response Document*, provides details of the public meetings and the comment response process.

Copies of each comment document, including the transcripts, with individual comments identified, are presented in a side-by-side format with DOE's and NYSERDA's response to each comment, in Volume 3, *Comment Response Document*, Section 3, "Public Comments and DOE/NYSERDA Responses," of this EIS.[6]

[6] *By a letter dated December 27, 2008, Ms. Barbara Warren, Executive Director of the Citizens' Environmental Coalition, requested that The Real Costs of Cleaning Up Nuclear Waste: A Full Cost Accounting of Cleanup Options for the West Valley Nuclear Waste Site (Synapse Report) be included in the public comment record for this EIS. This report has been addressed in accordance with Council on Environmental Quality NEPA regulations (40 CFR 1503.4[b]) in Issue Summary 5, Conclusions of the Synapse Report, in Section 2 of the Comment Response Document. This issue summary is divided into three major portions: a high-level overview of the information contained in the report and its appendices; a section in which DOE presents perceived shortcomings in the report; and the final section which identifies comments relevant to the 2008 Revised Draft EIS that were inferred by DOE and NYSERDA from the information presented in the report and its appendices, and provides responses to those comments.*

Comments were received on a variety of subjects. However, the following six paragraphs summarize the subjects on which the majority of comments were received:

Modified Phased Decisionmaking Alternative. A variety of comments revealed a need to clarify the nature of the Phase 2 actions and associated impacts. A specific comment requested clarification that Phase 2 of the Phased Decisionmaking Alternative would involve only removal or in-place closure for those facilities remaining after completion of the Phase 1 decommissioning actions. Several commentors also expressed concerns about the delay in the timing of the Phase 2 decisionmaking. Some expressed a concern that the Phase 2 decision would not be made. Others pointed out the loss in technical expertise and socioeconomic impact that would occur if there were many years between the completion of the Phase 1 decommissioning actions and the initiation of the Phase 2 decommissioning actions.

Support for Sitewide Removal of All Radioactive and Hazardous Wastes. Many of the commentors stated their preference for sitewide removal of all radioactive and hazardous wastes from WNYNSC as soon as possible. In many cases, these commentors expressed specific support for the Sitewide Removal Alternative over other alternatives. Reasons for this preference generally centered on concerns about contamination migrating from WNYNSC to groundwater and surface water in the region due to erosion or earthquakes. Some commentors also stated their opinion that the Sitewide Removal Alternative is more cost-effective than the other alternatives.

Concerns about Potential Contamination of Water. Commentors expressed concerns that, because streams near WNYNSC eventually discharge into Lake Erie, contaminated liquid effluents from WNYNSC could enter the streams and adversely affect regional water users in Western New York and the Great Lakes region. Concerns were also expressed about the use of water from nearby streams. In addition, some commentors were specifically concerned about the potential effects of erosion at WNYNSC on water quality.

Questions about Long-term Erosion Modeling. Some commentors, referring to statements in the NYSERDA Foreword to the 2008 Revised Draft EIS, expressed their opinion that the long-term erosion analysis presented in the EIS is not scientifically defensible. Others questioned some of the assumptions used to calibrate the erosion model and expressed concerns about gully projections. Several commentors pointed out the erosion that occurred in the region following the heavy rainfall events of August 9 and 10, 2009, as an illustration of the potential for sudden and dramatic topography changes in the region. Commentors also expressed views regarding the EIS's lack of predictions regarding the timing of the potential Buttermilk Creek capture of Franks Creek. Many commentors asked questions concerning the erosion modeling and analysis conducted for the Revised Draft EIS.

Questions about Cost-Benefit Analysis. Several commentors stated that the cost information presented in Chapter 4, Section 4.2, of the Revised Draft EIS does not accurately represent the total costs of the alternatives or that the cost-benefit information (also presented in Section 4.2) is misleading. Some commentors expressed their opinion that there could be large releases of hazardous constituents that would require expensive mitigation actions if wastes were to remain on site. Some commentors were also critical of the assumptions in the cost-benefit methodology, stating that discounting was not appropriate when evaluating long-term costs.

Conclusions of the *Synapse Report*. Several commentors specifically cited or alluded to the conclusions of a report titled, *The Real Costs of Cleaning Up Nuclear Waste: A Full Cost Accounting of Cleanup Options for the West Valley Nuclear Waste Site* (*Synapse Report*), which was prepared by Synapse Energy Economics, Inc. These commentors expressed a preference for the Sitewide Removal Alternative, stating that it is the most cost-effective alternative or represents the least risk and lowest cost, based on the Synapse Report. In addition, some commentors stated that the *Synapse Report* analysis is supported by NYSERDA. This latter assertion is inaccurate, according to NYSERDA's comments on the report (NYSERDA 2009a).

When the Final EIS is published, its availability will be announced in the *Federal Register*, the *New York State Environmental Notice Bulletin*, local newspapers, and via U.S. mail.

Based on the Final EIS and other considerations, DOE will announce a decision regarding future actions at WNYNSC in a ROD to be published in the *Federal Register* no sooner than 30 days after the EPA Notice of Availability for the Final EIS is published. NYSERDA will publish its decisions regarding actions at WNYNSC in a Findings Statement in the *New York State Environmental Notice Bulletin*.

1.8 Changes from the Revised Draft EIS

In preparing this Final EIS, DOE and NYSERDA made revisions to the Revised Draft EIS in response to comments received during the public comment period from Federal and state legislators, other Federal agencies, state and local government entities, American Indian Tribal governments, and the public. The descriptions of the proposed alternatives, in particular, the Phased Decisionmaking Alternative, have been revised to reflect the current plan for their implementation. In addition, this EIS was revised to provide additional and updated environmental baseline information, to include the results of additional analyses, to correct editorial errors, and to clarify text. This EIS was also updated to reflect events that occurred, notifications that were made for other NEPA documents, and changes in applicable regulatory requirements or guidance since the Revised Draft EIS was issued for public comment in December 2008. The following paragraphs summarize the more important changes made to this EIS.

Incorporation of Updated Environmental and Site-specific Information

This EIS was updated to include another year of environmental monitoring data for WNYNSC, primarily as provided in the *West Valley Demonstration Project Annual Site Environmental Report for Calendar Year 2007* (WVES and URS 2008) and from revisions in the Site Technical Reports (WSMS 2009a, 2009b, 2009c, 2009d, 2009e), including reassessment of the amount of certain wastes that would be exhumed under the Sitewide Removal Alternative and reclassification of other waste from low specific activity radioactive waste to demolition and debris waste. The updated environmental monitoring data was used to update the environmental baseline in Chapter 3. The revised engineering data is reflected in the descriptions of alternatives in Chapter 2 and used in the impact analyses presented in Chapter 4 and the various supporting appendices.

The near-field hydrologic analysis was revised to reflect the current understanding of the structure of the North Plateau slack-water sequence and Lavery till-sand unit and updated to incorporate design parameters for the as-installed NDA slurry wall and geomembrane cover. These changes and the results of the analysis are described in detail in Appendix E of this Final EIS. The results are used in the revised transport and dose analyses in Appendix H, Sections H.2.2.2 and H.2.2.3, and Chapter 4, Sections 4.1.10.3.1 and 4.1.10.3.2.

Changes Made in Response to the NYSERDA View on the Revised Draft EIS

Changes were made in this EIS in response to the initial NYSERDA View, which appeared as the Foreword to the Revised Draft EIS. The View has been revised for this Final EIS, but additional analyses were performed by DOE between the Revised Draft and this Final EIS to address some of the issues raised in the initial View. In addition to revising the text in this EIS to incorporate new analyses and clarify certain discussions, text boxes have been added to applicable sections of this EIS to indicate NYSERDA's revised View and DOE's responses. Specifically, NYSERDA identified eight issues, five of which (issue numbers 1, 2, 3, 4, and 8 in the View) relate to the nature and use of the long-term performance assessment information. These issues present NYSERDA's opinions that:

- ***Issue 1.*** The erosion analysis in the EIS is not scientifically defensible and the predictions do not show gully penetration into the Main Plant Process Building or Waste Tank Farm, nor is gully advancement on the North Plateau at a rate or in a direction acceptable to NYSERDA.

  Change in EIS: The erosion analysis was modified by calibrating the erosion code using Monte Carlo (probabilistic) methods. These updated results were then used for unmitigated erosion scenario predictions. These changes to the erosion analysis are described in detail in Appendix F of this Final EIS. The revised erosion analysis showed a decrease in predicted erosion for the South Plateau and an increase for the North Plateau. The results are used in the revised dose analysis in Appendix H, Section H.2.2.4; and Chapter 4, Section 4.1.10.3.3. The predicted peak dose is less than that predicted in the Revised Draft EIS because of the projected decreasing gully advance rate at times in the future when peak doses are projected to occur. A text box has been added to Section 4.1.10.3.3 to address this issue.

- ***Issue 2.*** The analysis of contaminant transport by groundwater in the EIS, while sound, needs improvement. In particular, NYSERDA questioned why the one-dimensional transport model was used for environmental consequence analysis rather than the three-dimensional model.

  Change in EIS: The one-dimensional model was used for contaminant transport analysis in this EIS because test runs showed that the one-dimension model predictions of strontium-90 concentrations at various locations in the North Plateau Groundwater Plume centerline are comparable to the three-dimensional model (STOMP) prediction, both of which are similar to field observations. In addition, the one-dimensional model has a much shorter run time than the STOMP model when analyzing site-specific transport and is easier to integrate with both the release models and the dose consequence models. The hydrologic parameters used in the one-dimensional transport analysis are drawn from the three dimensional hydrologic analysis discussed in Appendix E, Section E.4 of this EIS. The use of the one-dimensional model also introduces an element of conservatism because it does not allow for lateral dispersion, which would lower the plume centerline concentrations. A more detailed discussion of the rationale for the use of the one-dimensional model for transport analysis is provided in Appendix E, Section E.4.1.1. A text box has been added to Section 4.1.10.3 to address this issue.

- ***Issue 3.*** The assumptions used in the EIS for the performance of engineered barriers such as caps, slurry walls, reducing grout, and other engineered materials intended to keep contamination physically and chemically bound in place have not been substantiated and may be overly optimistic.

  Change in EIS: The discussion of assumptions used for the performance of engineered barriers in Appendix H, Section H.2.2.1 of this Final EIS has been expanded to more fully describe and document the assumptions used in the analysis about engineered barriers. A text box has been added to Section 4.1.10.3.2 to address this issue.

- ***Issue 4.*** The EIS does not address uncertainty in a manner that provides decisionmakers with information about the critical contributors to uncertainty or the importance of uncertainty in site cleanup decisions. In particular, NYSERDA is of the opinion that assertions of conservatism in analyses and assumptions in the EIS are not adequately supported, and that the long-term analysis is not presented in enough detail or with enough clarity to be properly understood or independently replicated.

Change in EIS: Appendix H, Section H.2.2.1 of this Final EIS has been expanded to provide a detailed discussion of assumptions used in the long-term performance analysis and how the assumptions relate to the conservatism of the analysis. Consistent with NEPA requirements, Chapter 4, Section 4.3.5 acknowledges uncertainty in the estimates of environmental consequences for the alternatives and identifies incomplete or unavailable information that contributes to the uncertainty in the environmental consequence analyses. This section has been expanded and revised to clarify how uncertainty is considered in the long-term performance assessment. A text box has been added to Section 4.3 to address this issue.

- ***Issue 8.*** The long-term performance assessment is not adequate to support a decision for in-place closure of the Waste Tank Farm or any other facilities.

  Change in EIS: This last issue in the View is a summation of four other issues related to the long-term performance assessment effort presented in the Revised Draft EIS: erosion, hydrologic contaminant transport, performance of engineered barriers, and the presentation of information about the uncertainly of the long-term performance assessment and the use of this information in decisionmaking.

  DOE acknowledges in this EIS that there is uncertainty inherent in long-term (i.e., 10,000 to 100,000 years) performance assessment modeling, but is of the opinion that the analyses and disclosure of uncertainties in this EIS provide a sufficient quality of information to adequately support agency decisionmaking. For this Final EIS, DOE updated the hydrologic, groundwater dose, and erosion modeling methodology, and refined the models to reflect new site-specific information. Chapter 4, Section 4.1.10 and Appendices E, F, G, and H have been revised to present the updated results and discuss the changes in methodology, and Section 4.3.5 presents a comprehensive list of uncertainties that affect the results of the long-term performance assessment. A text box has also been added to Chapter 1, Section 1.5 of this Final EIS to discuss this issue.

Issues 5, 6, and 7 of the NYSERDA View pertain to other, individual topics:

- ***Issue 5*** indicates that the connection between the EIS analyses and the applicable regulatory framework must be strengthened. In this issue, NYSERDA discusses its position that the Nuclear Regulatory Commission's low-level radioactive waste disposal regulations (10 CFR Part 61) were used to guide the long-term performance assessment rather than NRC's License Termination Rule and implementing guidance (NUREG-1757). NYSERDA further states that 10 CFR Part 61 should generally not be used as part of the analytical framework for the EIS.

  Change in EIS: DOE did not use 10 CFR Part 61 regulatory requirements to structure the long term performance assessment presented in this EIS. The long-term performance assessment follows DOE NEPA guidance and precedent. The analysis presented in Appendix L uses the requirements of NRC's License Termination Rule (10 CFR Part 20, Subpart E) and the implementing guidance in NUREG-1757. A text box has been added to Chapter 1, Section 1.3 of this Final EIS to respond to this issue.

- ***Issue 6*** of the initial View indicates that the approach for exhumation of the SDA, NDA, and Waste Tank Farm described in the Revised Draft EIS may be overly conservative and based on extreme conditions rather than those that are more likely to be encountered during exhumation. This issue is primarily in the context of how this approach affects the estimated cost of the Sitewide Removal Alternative. NYSERDA also suggests that the disposal costs, in particular those for Greater-Than-Class C waste, should be reevaluated.

Change in EIS: The pre-conceptual engineering approach to implementing the Sitewide Removal Alternative was reviewed and revisions were made to reduce the conservatism in some of the assumptions. Costs were recalculated consistent with the revised approach and also using two different cost estimates for disposal of Greater-Than-Class C waste as described in Chapter 4, Section 4.2 of this Final EIS. A text box has been added to Section 4.2.1 to address this issue.

- ***Issue 7*** suggests that current methods for assessing nonradiological risk from transportation have limitations and are likely to overestimate fatalities. This results from use of "railcar-kilometers" to assess the number of expected accident fatalities from rail transport.

  Change in EIS: Chapter 4, Section 4.1.12 and Appendix J of this Final EIS have been revised to reduce conservatism in the transportation analysis. However, the only acceptable reference for railcar accident data reports the data in railcar-kilometers. Therefore, no change in the transportation analysis was made to specifically address this issue. Other changes were made in the transportation analysis to reduce conservatism. Appendix J and Section 4.1.12 have been revised to incorporate the new analysis. A text box was also added to Section 4.1.12 to explain this issue and the changes made to the analysis.

Revised Description of Alternatives

The description in Chapter 2, Section 2.3.1, of the Interim End State, the starting point for analyses in this EIS, has been updated to reflect new information about when activities to achieve the Interim End State are expected to be completed.

The descriptions of the proposed alternatives in Chapter 2, in particular, the Phased Decisionmaking Alternative, have been revised to reflect the current plan for implementing each of the alternatives. For example, the discussion of monitoring and maintenance during decommissioning and for any post-decommissioning activities was expanded for each of the alternatives.

The Phased Decisionmaking Alternative included in the November 2008 Revised Draft EIS allowed for a Phase 2 decision to be made anytime after the Phase 1 decision, but no later than 30 years from issuance of the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. In response to public comments that expressed concern over the length of time that could elapse between the Phase 1 and Phase 2 decisions, DOE and NYSERDA have reconsidered the timeframe for making a Phase 2 decision. As a result, the Phased Decisionmaking Alternative presented in this Final EIS specifies that a Phase 2 decision would be made no later than 10 years after issuance of the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. The overall effect of this change in the timeframe for making a Phase 2 decision is to eliminate the majority of monitoring and maintenance activities and avoid incurring their associated impacts. Specifically, monitoring and maintenance activities originally proposed for years 11 through 30 of Phase 1 would not occur, with the exception of monitoring and maintenance of the Interim Storage Facility for high-level radioactive waste canister storage. Instead, Phase 2 actions would begin. The specific changes in the impacts are discussed qualitatively for each resource area in Chapter 2, Section 2.6 of this EIS, which summarizes and compares the impacts among the evaluated alternatives. The short-term impacts of the modified Phased Decisionmaking Alternative would generally be less than the impacts identified in Chapter 4 of this EIS, which are based on a decision 30 years after the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected.

In addition, NYSERDA has clarified that for the SDA, alternatives that will be considered for Phase 2 actions will include at least: complete exhumation, close-in-place, or continued active management consistent with SDA permit and license requirements. The impact analysis in Chapter 4 includes discussions of the potential impact of continued active management.

1.9 Organization of This Environmental Impact Statement

This EIS includes a separate Summary; Volume 1 consisting of a foreword and 11 chapters; Volume 2, containing 18 appendices; and the *Comment Response Document*, Volume 3. This EIS is organized as follows:

A Summary and Guide for Stakeholders, which provides a summary of the results of the environmental analysis in this EIS and provides a guide to locating specific information in the EIS.

Volume 1 consists of the following chapters:

Foreword (prepared by NYSERDA), which describes NYSERDA's views on the EIS analyses, in terms of their decisionmaking responsibilities.

Chapter 1, Introduction and Purpose and Need for Agency Action: This chapter provides an overview of the activities at WNYNSC, a brief history of events leading to the development of the document, the purpose and need for agency action, the scope and decisions to be supported by the EIS, the relationship of this EIS to other NEPA documentation, and the issues raised during the public participation process.

Chapter 2, Proposed Action, Facility Description, Alternatives, and Comparison of Environmental Impacts: This chapter provides a summary description of the project; a description of WNYNSC facilities and their expected status at the start of the implementation period; descriptions of the alternatives evaluated and alternatives dismissed from detailed evaluation; and a summary comparison of the environmental impacts of the four alternatives.

Chapter 3, Affected Environment: This chapter describes the existing environmental conditions at WNYNSC and surrounding areas.

Chapter 4, Environmental Consequences: This chapter describes the potential environmental impacts on WNYNSC and surrounding areas that could occur as the result of each of the reasonable alternatives during the implementation period, and also includes long-term performance results, cumulative impacts, cost-benefit considerations, incomplete and unavailable information, and resource commitments.

Chapter 5, Applicable Laws, Regulations, and Other Requirements: This chapter describes environmental, and safety and health laws, regulations, and standards applicable to the proposed decommissioning and/or long-term stewardship of WNYNSC.

Chapter 6, Potential Mitigation Measures: This chapter summarizes the mitigation measures that would be used to avoid or reduce potential environmental impacts that may result from implementation of the alternatives analyzed in Chapter 4.

Chapters 7 through 11: Chapters 7 through 11 contain a list of references, glossary, index, list of EIS preparers, and distribution list of agencies, organizations, and persons to whom copies of this *Decommissioning and/or Long-Term Stewardship EIS* were sent.

Volume 2 contains the following 18 appendices that provide technical information in support of information and environmental analyses presented in the main body of the document:

Appendix A – "Summary ofComments Received on the 1996 *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center*"

Appendix B – "*New York State Environmental Notice Bulletins* and *Federal Register* Notices"

Appendix C – "Descriptions of Facilities/Areas, Decommissioning Activities, and New Construction"

Appendix D – "Overview of Performance Assessment Approach"

Appendix E – "Geohydrological Analysis"

Appendix F – "Erosion Studies"

Appendix G – "Models for Long-Term Performance Assessment"

Appendix H – "Long-Term Performance Assessment Results"

Appendix I – "Decommissioning Radiological and Hazardous Chemical Human Health Impacts Evaluation"

Appendix J – "Evaluation of Human Health Effects from Transportation"

Appendix K – "Method for Estimating Nonradiological Air Quality Impacts"

Appendix L – "Regulatory Compliance Discussion"

Appendix M – "Floodplain and Wetlands Assessment"

Appendix N – "Intentional Destructive Acts"

Appendix O – "Consultation Letters"

Appendix P – "The SDA Quantitative Risk Assessment" (prepared by NYSERDA)

Appendix Q – "Concurrence Letters"

Appendix R – "Contractor Disclosure Statements"

Volume 3 is the *Comment Response Document* for this EIS and contains the following 4 sections:

Section 1, *Introduction*, provides an overview of the Revised Draft EIS public comment process.

Section 2, *Issue Summaries*, is a discussion of the major issues from the public comments.

Section 3, *Public Comments and DOE and NYSERDA Responses*, shows the public comment documents with the individual comments delineated and corresponding DOE and NYSERDA responses in a side-by-side format.

Section 4, *References*, presents the references for this volume.

CHAPTER 2
PROPOSED ACTION, FACILITY DESCRIPTION, ALTERNATIVES, AND COMPARISON OF ENVIRONMENTAL IMPACTS

2.0 PROPOSED ACTION, FACILITY DESCRIPTION, ALTERNATIVES, AND COMPARISON OF ENVIRONMENTAL IMPACTS

Chapter 2 describes the actions proposed by the U.S. Department of Energy and the New York State Energy Research and Development Authority for the decommissioning and long-term stewardship of the Western New York Nuclear Service Center (WNYNSC). This chapter includes descriptions of the reasonable decommissioning alternatives, the No Action Alternative, and the alternatives considered and subsequently eliminated from detailed evaluation. It concludes with a summary comparison of environmental impacts, including costs associated with each of the alternatives, identifies the Preferred Alternative, and summarizes uncertainties associated with the analysis. Appendix C includes details on the WNYNSC facilities, the implementation activities associated with each alternative, and the new construction efforts involved.

2.1 Introduction

As required by the National Environmental Policy Act (NEPA) and the New York State Environmental Quality Review Act (SEQR), this environmental impact statement (EIS) presents the environmental impacts associated with the range of reasonable alternatives evaluated to meet the U.S. Department of Energy (DOE) and the New York State Energy Research and Development Authority (NYSERDA) purpose and need for action and a No Action Alternative. The alternatives evaluated include:

- The Sitewide Removal Alternative, which would allow unrestricted release of the entire Western New York Nuclear Service Center (WNYNSC).
- The Sitewide Close-In-Place Alternative, under which existing facilities and contamination would be managed at their current locations. Engineered barriers would be used to control contamination in areas with higher levels of long-lived contamination.
- The Phased Decisionmaking Alternative (the Preferred Alternative), under which activities would be implemented in two phases.

  Phase 1, the initial phase, would involve both decommissioning and ongoing assessment actions. During the first approximately 8 to 10 years of Phase 1 (roughly assumed to begin in mid-2011), decommissioning actions would be undertaken for all facilities except the Waste Tank Farm, U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA), State-Licensed Disposal Area (SDA), and Construction and Demolition Debris Landfill. During the entirety of Phase 1, DOE and NYSERDA would conduct additional scientific studies to possibly reduce uncertainties related to the Phase 2 decisionmaking for those facilities and areas not addressed in Phase 1. DOE and NYSERDA would assess the results of site-specific studies as they become available, along with other relevant information (such as the development of new technologies). The agencies will inform the public on at least a quarterly basis regarding the progress of any such studies. As conditions or new information warrant during that 10-year period, DOE and NYSERDA would determine when a Phase 2 decision is appropriate and involve the public in this process. Additionally, in accordance with their regulatory authority, the regulators would require and conduct regular reviews and renewal of associated permits and licenses.

  As soon as practicable during Phase 1, DOE and NYSERDA would make decisions for the remaining facilities for implementation in Phase 2. It is anticipated that implementation of a Phase 2 decision would begin directly after completion of Phase 1 decommissioning activities in an effort to maintain cleanup momentum and a mobilized work force. Current projections at the site indicate that the transition from Phase 1 into Phase 2 would occur approximately 8 to 10 years after the Phase 1 decision, such that there would be minimal to no work interruptions. However, certain factors such as availability of funding and lack of disposal options for various waste streams may affect Phase 1 completion.

For the West Valley Demonstration Project (WVDP), Phase 2 would complete the decommissioning or long-term management decisionmaking process, implementing the approach determined through review of the currently existing information and any additional studies to be the most appropriate. Decommissioning decisions in Phase 2 would range between full exhumation and in-place closure of remaining facilities. For the SDA, alternatives that will be considered for Phase 2 decisions will range from complete exhumation to close-in-place to continued active management consistent with SDA permit and license requirements. For the balance of WNYNSC, Phase 2 decisions will range from license termination with unrestricted use to continued management under NRC license.

- The No Action Alternative, which involves the continued management and oversight of WNYNSC under the conditions that would exist at the starting point of this EIS. The No Action Alternative does not meet the purpose and need for agency action. It is included for comparison purposes as required by NEPA and SEQR.

2.2 Proposed Action

DOE proposes to decontaminate and decommission the tanks and other WNYNSC facilities in which the high-level radioactive waste solidified under the WVDP was stored, the facilities used in the solidification of the waste, and any material or hardware used in connection with WVDP, in accordance with the requirements of the WVDP Act. DOE would dispose of low-level radioactive waste and defense-related transuranic waste generated from decontamination and decommissioning activities off site and would store the vitrified high-level radioactive waste and non-defense transuranic waste on site until disposition decisions are made and implemented. The types of waste that would be generated are presented in the "Waste Classifications" text box in this section. In carrying out this Proposed Action, DOE would comply with the provisions of NRC's *Decommissioning Criteria for the West Valley Demonstration Project (M-32) at the West Valley Site; Final Policy Statement* (67 *Federal Register* [FR] 5003) and other applicable Federal and state requirements.

A determination needs to be made on how NYSERDA would decommission or manage SDA and any other wastes or facilities at WNYNSC that are not within the scope of the WVDP Act. In carrying out its Proposed Action, NYSERDA will comply with all applicable Federal and state requirements, and will also comply with the NRC License Termination Rule (10 CFR Part 20, Subpart E) for all NRC-regulated facilities not within the scope of the WVDP Act.

DOE and NYSERDA need to use the NRC License Termination Rule and associated guidance provided in NRC's final policy statement as the framework for decommissioning and/or long-term stewardship of WVDP facilities. The NRC License Termination Rule is the framework for decommissioning and/or long-term stewardship of NYSERDA-controlled facilities and areas within the NRC-regulated portion of WNYNSC. There is no site-specific decommissioning guidance (comparable to the NRC's policy statement) for SDA; however, if the site were to be decommissioned for unrestricted use, the New York State Department of Environmental Conservation's (NYSDEC's) Cleanup Guideline for Soils Contaminated with Radioactive Materials, DSHM-RAD-0501 (formerly TAGM 4003), would apply until NYSDEC adopts regulations compatible with the NRC's License Termination Rule. RCRA and corresponding State of New York implementing regulations (6 NYCRR Part 373), along with the RCRA 3008(h) Consent Order issued by NYSDEC and the U.S. Environmental Protection Agency (NYSDEC 1992), provide the regulatory framework for management of hazardous wastes and implementation of remedial actions/cleanup necessary for the sites with respect to any hazardous waste constituents. The RCRA 3008(h) Consent Order is discussed in Chapter 5.

Waste Classifications Used in this EIS

High-level Waste or High-level Radioactive Waste **–** The high-level radioactive waste that was produced by the reprocessing of spent nuclear fuel at the Western New York Nuclear Service Center. This waste includes liquid wastes, which are produced directly in reprocessing; dry solid material derived from such liquid wastes; and such other material as the U.S. Nuclear Regulatory Commission (NRC) designates as high-level radioactive waste for the purposes of protecting the public health and safety (West Valley Demonstration Project Act, Public Law 96-368, 94 Stat. 1347). Also see the definition of high-level radioactive waste in the Nuclear Waste Policy Act of 1982, as amended (Public Law 97-425, 96 Stat. 2201), and as promulgated in 10 *Code of Federal Regulations* (CFR) 63.2.

Transuranic Waste **–** Radioactive waste not classified as high-level radioactive waste and containing more than 100 nanocuries per gram of alpha-emitting transuranic isotopes with half lives greater than 20 years (DOE Order 435.1). Transuranic waste may be considered defense or non-defense waste depending on its origin.

Hazardous Waste **–** A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20-24 and 6 New York Code of Rules and Regulations (NYCRR) 371.1(d)(1) and 371.3—ignitability, corrosivity and reactivity, or toxicity—or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.3-33 or by the State of New York in 6 NYCRR 371.4. Toxicity is determined by the Toxicity Characteristic Leaching Procedure method, as given in 40 CFR 261.24 and 6 NYCRR 371.3(e).

Low-level Radioactive Waste **–** Waste that contains radioactivity and is not classified as high-level radioactive waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material (DOE Manual 435.1-1, 10 CFR 20.1003). In accordance with NRC regulations at 10 CFR 61.55, low-level radioactive waste that is disposed in facilities licensed by NRC or an NRC Agreement State is further classified into Class A, Class B, or Class C low-level radioactive waste. [Low-level radioactive waste may also be categorized as low-specific-activity waste for the purposes of transportation analyses. Low-specific-activity wastes have low specific activity, are nonfissile, and meet certain regulatory exceptions and limits. Low-specific-activity wastes may be transported in large bulk containers.]

Mixed Low-level Radioactive Waste **–** Low-level radioactive waste that also contains hazardous waste regulated under RCRA (42 United States Code [U.S.C.] 6901 *et seq.*).

Greater-Than-Class C Waste **–** Low-level radioactive waste that exceeds the concentration limits established for Class C low-level radioactive waste in 10 CFR 61.55. [Note: Greater-Than-Class C waste is generated by activities (e.g., by commercial entities) licensed by the NRC or Agreement States. This waste classification does not apply to low-level radioactive waste generated or owned by DOE that is disposed of at a DOE disposal facility.]

Construction and Demolition Debris **–** Discarded nonhazardous material, including solid, semisolid, or contained gaseous material resulting from construction, demolition, industrial, commercial, mining, and agricultural operations and from community activities. This category does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act (42 U.S.C. 2011 *et seq.*).

2.3 The Western New York Nuclear Service Center and Facilities

WNYNSC, shown on **Figure 2–1**, is located 48 kilometers (30 miles) south of Buffalo, New York. It occupies 1,351 hectares (3,338 acres) most of which is in northern Cattaraugus County, New York, and less than 1 percent of this area in Erie County, New York. WNYNSC is drained by Buttermilk Creek, which joins Cattaraugus Creek at the northern end of the property. Cattaraugus Creek flows northwest into Lake Erie approximately 50 kilometers (30 miles) southwest of Buffalo, New York.

A 3-strand barbed-wire security fence supported by metal posts runs approximately 38,100 meters (125,000 linear feet) along the perimeter of the WNYNSC property line.

The primary facilities at WNYNSC are a former irradiated nuclear fuel reprocessing plant with four associated underground radioactive waste storage tanks and two radioactive waste disposal areas. One of the disposal areas is licensed by the NRC and the other is licensed by the New York State Department of Health (NYSDOH) and permitted by NYSDEC. Information in this chapter on WNYNSC facilities and areas is from a facility description and methodology technical report (WSMS 2009e), unless otherwise referenced.

WNYNSC has been divided into the 12 Waste Management Areas (WMAs) listed below. The locations of WMAs 1 through 10 are shown on **Figure 2–2**. The locations of WMAs 11 and 12 are shown on **Figure 2–3**.

- WMA 1: Main Plant Process Building and Vitrification Facility Area
- WMA 2: Low-Level Waste Treatment Facility Area
- WMA 3: Waste Tank Farm Area
- WMA 4: CDDL
- WMA 5: Waste Storage Area
- WMA 6: Central Project Premises
- WMA 7: NDA and Associated Facilities
- WMA 8: SDA and Associated Facilities
- WMA 9: Radwaste Treatment System Drum Cell Area
- WMA 10: Support and Services Area
- WMA 11: Bulk Storage Warehouse and Hydrofracture Test Well Area
- WMA 12: Balance of Site

The 68-hectare (167-acre) Project Premises, which is controlled by DOE, is located within WNYNSC and includes WMAs 1 through 10, with the exception of WMA 8 (SDA). WMA 8 is managed by NYSERDA and is not included in the Project Premises.

In addition to the 12 WMAs, two other areas with unique contamination characteristics that extend through more than 1 WMA are identified in this EIS. The North Plateau Groundwater Plume, a zone of groundwater contamination which extends across portions of WMAs 1 through 6, is shown on **Figure 2–4**; the Cesium Prong, an area of surface soil contamination extending northwest from the Main Plant Process Building in WMA 1, is shown on **Figure 2–5**. The nature and extent of the North Plateau Groundwater Plume and the Cesium Prong are described in Chapter 3 and in Appendix C.

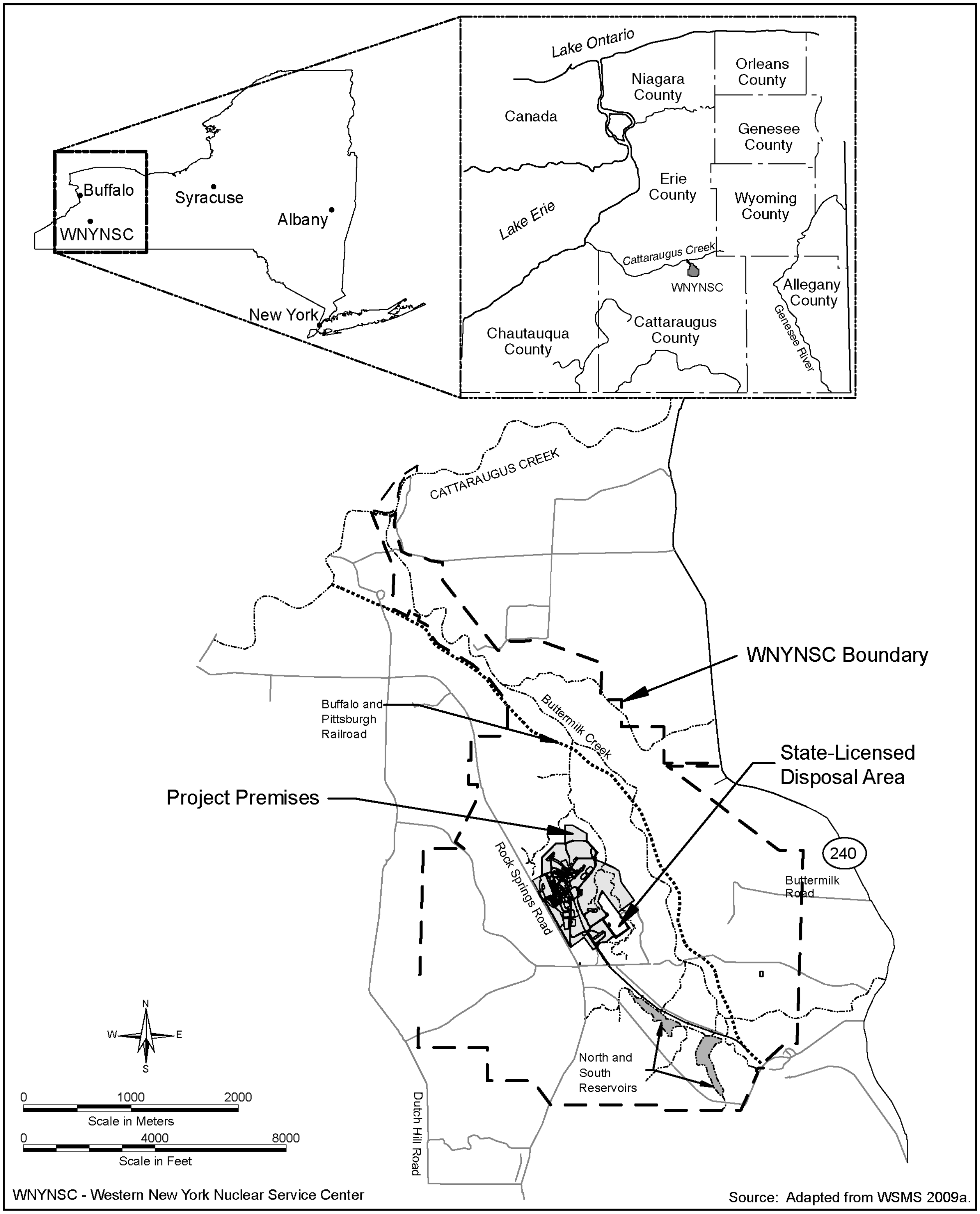


Figure 2–1 The Western New York Nuclear Service Center

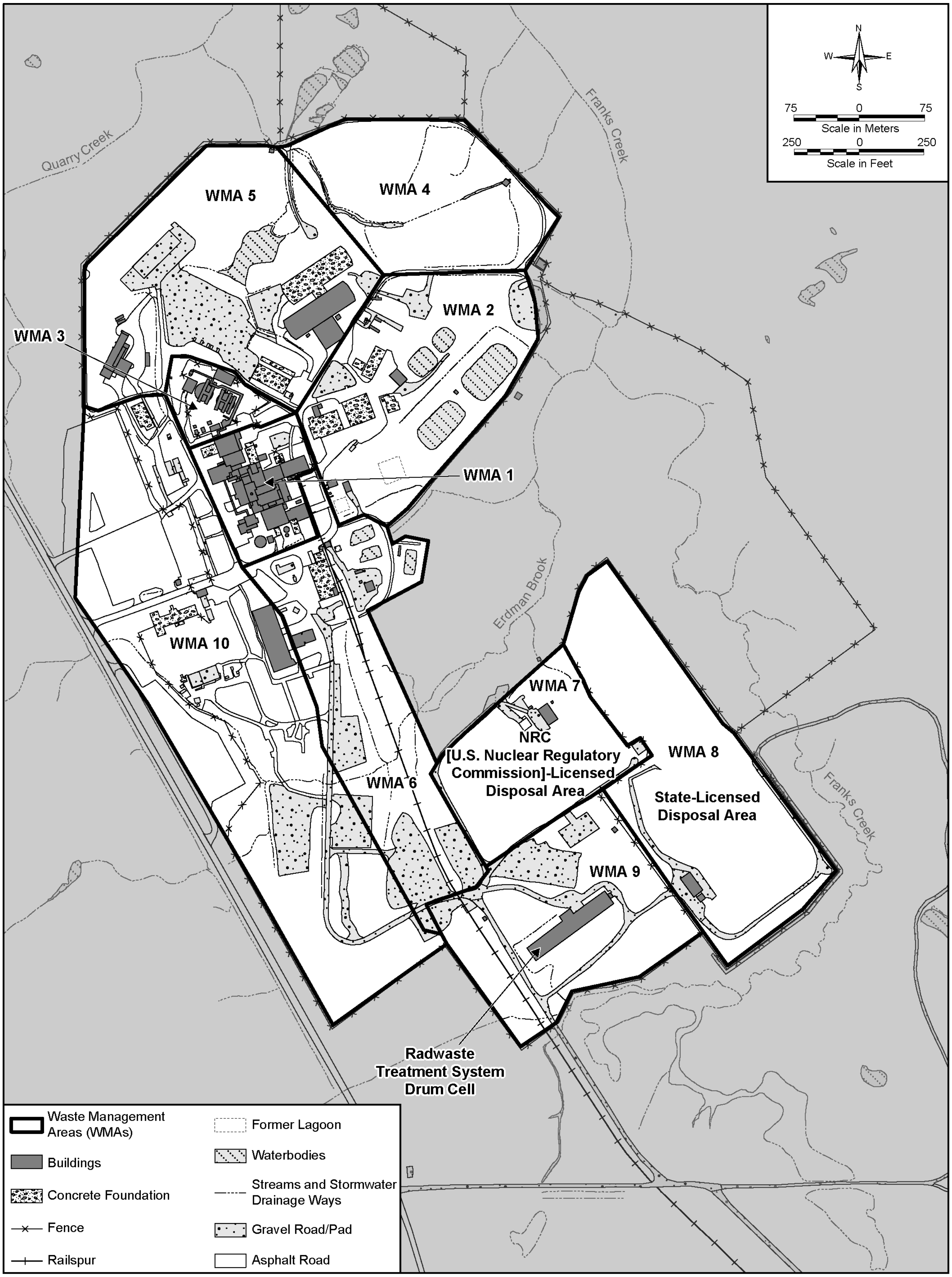


Figure 2–2 Location of Waste Management Areas 1 Through 10

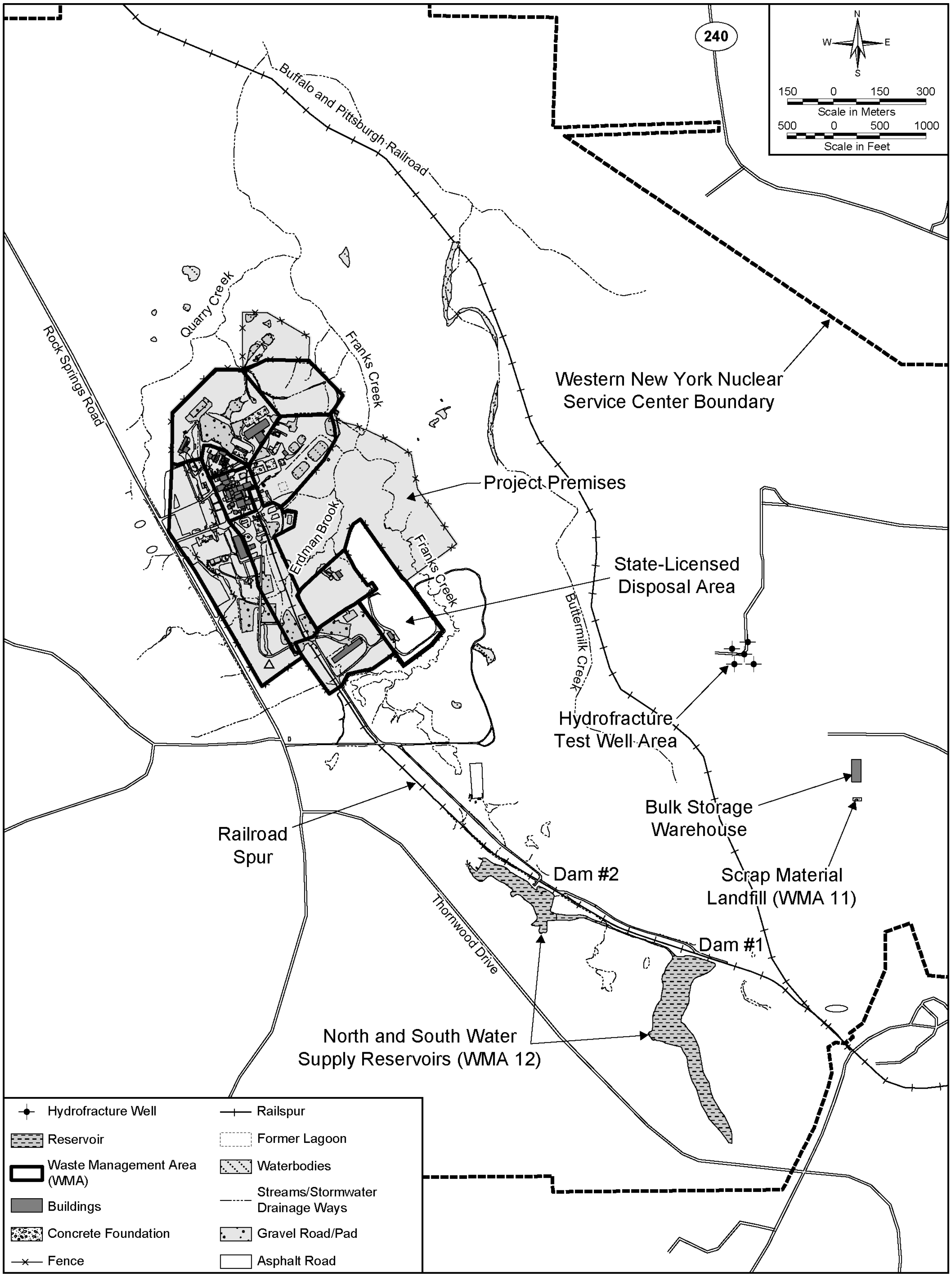


Figure 2–3 Waste Management Areas 11 and 12 – Bulk Storage Warehouse and Hydrofracture Test Area (WMA 11) and Balance of the Western New York Nuclear Service Center (WMA 12)

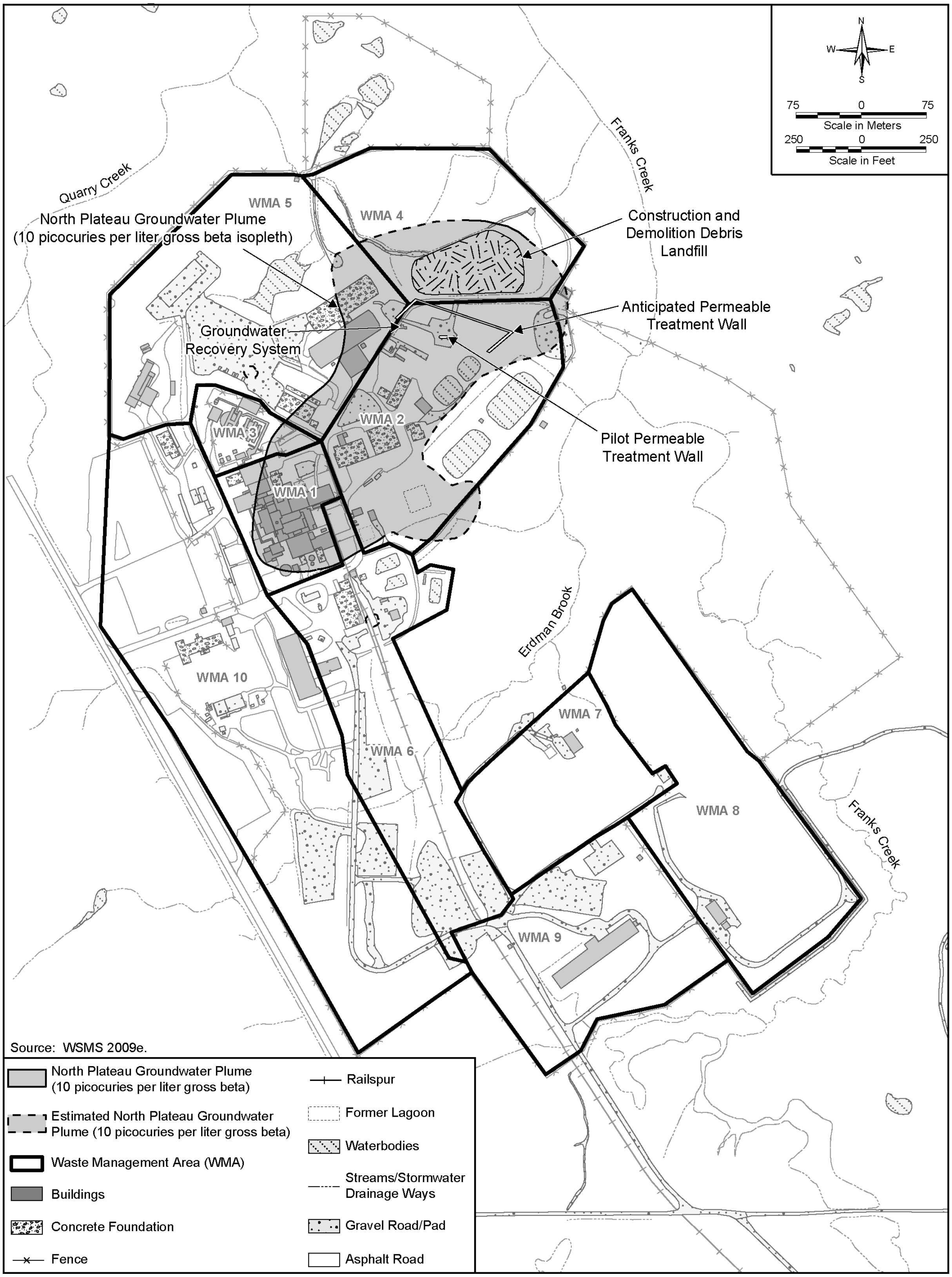


Figure 2–4 The North Plateau Groundwater Plume (a zone of groundwater contamination that extends across Waste Management Areas 1 Through 6)

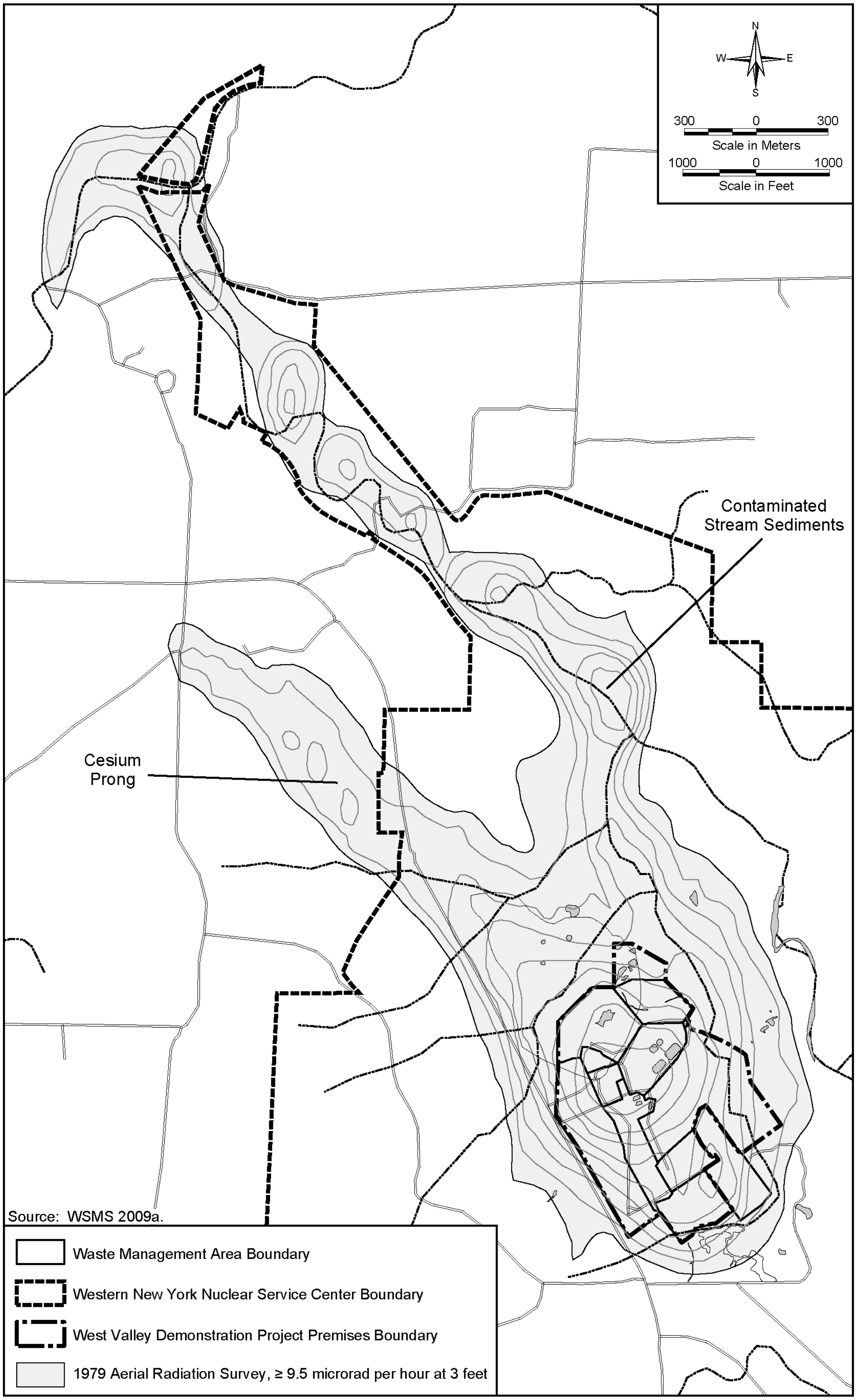


Figure 2–5 1979 Aerial Radiation Survey

2.3.1 Environmental Impact Statement Starting Point

The status of WNYNSC at the starting point of this EIS is called the Interim End State, estimated to be achieved by 2011 for most facilities or areas except as described in this section. Achievement of the Interim End State is defined by the physical status of each facility or area identified in **Tables 2–1** and **2–2**. These various closure, decontamination, removal, disposal, and other activities have been evaluated in prior NEPA reviews (DOE 2003e, 2006c). Table 2–1 provides a list of site facilities assumed to be removed before decommissioning; foundations, slabs, and pads remaining at the starting point of this EIS; the RCRA status of these facilities; and whether there is radiological contamination. Table 2–2 provides a list of facilities/areas assumed to be present at the starting point of this EIS, and their RCRA and radiological status. The table also indicates the specific Appendix C sections where these facilities/areas are discussed in more detail. The additional details in Appendix C provide overall dimensions of key facilities, their operational histories, and, for the larger facilities where information is available, radiological and hazardous chemical inventory estimates. Note that a WMA may contain more than one Solid Waste Management Unit (SWMU). The primary activities that will be completed to achieve the starting point of this EIS are as follows:

- A number of facilities will be closed, emptied of equipment, decontaminated, and demolished down to their concrete foundations, floor slabs, or gravel pads (DOE 2006c). The disposition of the remaining concrete foundations/slabs/gravel pads is addressed in this EIS. The specific facilities to be removed to achieve the starting point of this EIS are identified in Table 2–1, which includes a number of SWMUs identified during the RCRA facility assessments and RCRA interim status units that continue to be managed toward RCRA closure. The anticipated status at the EIS starting point with respect to addressing these units according to RCRA requirements is listed in Table 2–1 under the column titled "RCRA Status."

- The Main Plant Process Building, with the exception of the area used for storing the vitrified waste canisters and areas and systems supporting high-level radioactive waste canister storage, will be decontaminated to a demolition-ready status. Also, the 01-14 Building and the Vitrification Facility in WMA 1, as well as the Remote-Handled Waste Facility in WMA 5, will be decontaminated to a demolition-ready status.

- An upgradient barrier wall was installed and a geomembrane cover placed over NDA as part of NDA infiltration mitigation measures in 2008. The design is similar to that installed over SDA in 1995.

- A Tank and Vault Drying System will be installed at the Waste Tank Farm to dry the remaining liquid heels in the tanks. The liquid in Tank 8D-4 will be processed through adsorbent media to remove most of the cesium-137 inventory. The contaminated adsorbent media will be disposed of off site. The treated liquid will be solidified and shipped off site for disposal. This activity is not expected to be completed until approximately 2015, at which time the Interim End State for the tanks will be achieved.

- A permeable treatment wall will be installed to contain further North Plateau Groundwater Plume migration. The anticipated location for the permeable treatment wall is shown on Figure 2–4. The North Plateau Groundwater Plume and background soils were sampled in 2008 and 2009 for potential RCRA hazardous constituents. The samples were also analyzed for radionuclide content (WVES 2009). These specific activities will be completed by the Interim End State.

- All waste created by activities that are part of achieving the Interim End State will be shipped off site with the possible exception of the transuranic waste. Currently, there is no disposal pathway for non-defense transuranic waste. Transuranic waste generated by Interim End State activities will be stored on site pending either a "defense" determination[1] or availability of a disposal facility for non-defense transuranic waste.

Table 2–1 Site Facilities Assumed to be Removed Before Decommissioning; Foundations/ Slabs/Pads Remaining at the Starting Point of the Environmental Impact Statement

Facilities Demolished to Grade Foundations/Slabs/Pads Remaining	*RCRA Status at EIS Starting Point* [a]	*Radiological Contamination at EIS Starting Point*
WMA 1		
Fuel Receiving and Storage Ventilation Building	N/A	Assumed to have radiological contamination based on past usage
Fuel Receiving and Storage/High Integrity Container Storage Area	Clean-closed under RCRA interim status	Assumed to have radiological contamination based on past usage
Radwaste Process (Hittman) Building	SWMU, NFA	Assumed to have radiological contamination based on past usage
Laundry Room	N/A	Assumed to have radiological contamination based on past usage
Cold Chemical Facility	N/A	No
Emergency Vehicle Shelter	N/A	No
Contact Size-Reduction Facility (including Master Slave Manipulator Repair Shop)	RCRA interim status unit, subject to RCRA closure	Known to have radiological contamination
WMA 2		
02 Building	SWMU, CMS being prepared	Assumed to have radiological contamination based on past usage
Test and Storage Building	N/A	No
Vitrification Test Facility	N/A	No
Vitrification Test Facility Waste Storage Area	SWMU, NFA	No
Maintenance Shop	N/A	No
Maintenance Storage Area	N/A	No
Vehicle Maintenance Shop	N/A	No
Industrial Waste Storage Area	SWMU, NFA	No
WMA 3		
None		
WMA 4		
None		
WMA 5		
Lag Storage Building	Clean-closed under RCRA interim status	Assumed to have radiological contamination based on past usage
Lag Storage Areas 1,2,3	Clean-closed under RCRA interim status	Assumed to have radiological contamination based on past usage
Hazardous Waste Storage Lockers	Clean-closed under RCRA interim status	No
Chemical Process Cell Waste Storage Area	Clean-closed under RCRA interim status	Assumed to have radiological contamination based on past usage
Cold Hardstand near CDDL	SWMU, NFA	Subsurface contamination

[1] *DOE is required to make a determination whether a particular transuranic waste stream is related to defense activities. The Waste Isolation Pilot Plant (WIPP) Land Withdrawal Act of 1992 restricts WIPP disposal activities to transuranic waste generated from defense activities. This "defense waste" is defined as "nuclear waste deriving from the manufacture of nuclear weapons and the operation of naval reactors. Associated activities, such as the research carried on in the weapons laboratories, also produce defense waste" (DOE 1997b).*

Facilities Demolished to Grade Foundations/Slabs/Pads Remaining	*RCRA Status at EIS Starting Point* [a]	*Radiological Contamination at EIS Starting Point*
Vitrification Vault and Empty Container Hardstand	SWMU, NFA	No
Old/New Hardstand Area	SWMU	Assumed to have radiological contamination based on past usage
High-Level Waste Tank Pump Storage Vaults	SWMU, NFA	No
WMA 6		
Old Warehouse	N/A	No
Cooling Tower	N/A	Assumed to have radiological contamination based on past usage
North Waste Tank Farm Test Tower	N/A	No
Road Salt and Sand Storage Shed	N/A	No
Vitrification Test Facility Waste Storage Area	SWMU, NFA	No
Product Storage Area	SWMU, NFA	No
WMA 7 [b]		
NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area (NDA) Hardstand Staging Area	SWMU, NFA	Assumed to have radiological contamination based on past usage
WMA 8		
None		
WMA 9		
Trench Soil Container Area	SWMU, NFA	Assumed to have radiological contamination based on past usage
WMA 10		
Administration Building	N/A	No
Expanded Environmental Laboratory	N/A	No
Construction Fabrication Shop	N/A	No
Vitrification Diesel Fuel Oil Storage Tank and Building	N/A	No
WMA 11		
None		
WMA 12		
None		

CDDL = Construction and Demolition Debris Landfill; CMS = Corrective Measures Study; NFA = no further action required at this time under RCRA, as determined with concurrence of NYSDEC as an outcome of the RCRA facility investigation; N/A = not applicable, not an RCRA-regulated SWMU; RCRA = Resource Conservation and Recovery Act; SWMU = Solid Waste Management Unit; WMA = Waste Management Area.

[a] Interim Status Unit implies that a unit is subject to permitting and closure. SWMU implies that a unit is subject to corrective action. Each Waste Management Unit could contain multiple SWMUs.

[b] The Interim Waste Storage Facility and pad located in WMA 7 has been RCRA clean-closed and the Old Sewage Treatment Plant in WMA 6 has been removed; these are not listed in the table because there are no remaining foundations to be removed.

Table 2–2 Site Facilities/Areas at the Western New York Nuclear Service Center Assumed to be Standing at the Starting Point of the Environmental Impact Statement

Facility	*EIS Starting Point*	*RCRA Status at EIS Starting Point* [a]	*Radiological/Chemical Contamination at EIS Starting Point* [b]	*Description (Appendix C Section)*
WMA 1				
Main Plant Process Building (including HLWISF, LWTS, and A&PC Hot Cells and sealed rooms (demolition ready)	Decontaminated for uncontained demolition except for the HLWISF, which contains HLW canisters	RCRA interim status units, subject to RCRA closure	Yes – significant radiological source term remains	C.2.1.1
Vitrification Facility (demolition ready)	Decontaminated for uncontained demolition	RCRA interim status unit, subject to RCRA closure	Yes – significant radiological source term remains	C.2.1.2
01-14 Building (includes the Cement Solidification System and the Vitrification Off-Gas System) (demolition ready)	Gutted and decontaminated for uncontained demolition	RCRA interim status unit, subject to RCRA closure	Decontaminated with only residual activity remaining	C.2.1.3
Load-In/Load-Out Facility	Operational	N/A	No	C.2.1.4
Utility Room and Utility Room Expansion	Operational	N/A	No	C.2.1.5
Fire Pumphouse and Water Storage Tank	Operational	N/A	No	C.2.1.6
Plant Office Building	Operational	N/A	Subsurface soil may be contaminated	C.2.1.7
Electrical Substation	Operational	N/A	No	C.2.1.8
Underground Tanks 35104, 7D-13, 15D-6	Operational	N/A	Yes – radiological contamination remains	C.2.1.9
Off-Gas Trench	Inactive	N/A	Yes – radiological contamination remains in the duct	C.2.1.10
WMA 2				
Low-Level Waste Treatment Facility	Operational	SWMU, subject to CWA closure and corrective action	Yes – radiological contamination remains	C.2.2.1
Lagoon 1	Inactive	SWMU, CMS being prepared	Yes – radiological contamination remains, PAH concentrations exceed TAGM criteria	C.2.2.2
Lagoons 2 through 5	Operational	SWMUs, subject to CWA closure and corrective action	Yes – radiological contamination remains, Lagoon 2 may contain hazardous chemical constituents	C.2.2.3
Neutralization Pit	Operational	SWMU, CMS being prepared	Yes – radiological contamination remains. May contain hazardous chemical constituents	C.2.2.4
Old Interceptor	Operational	SWMU, CMS being prepared	Yes – radiological contamination remains. May contain hazardous chemical constituents	C.2.2.4

Facility	***EIS Starting Point***	***RCRA Status at EIS Starting Point*** [a]	***Radiological/Chemical Contamination at EIS Starting Point*** [b]	***Description (Appendix C Section)***
New Interceptors (North and South)	Operational	SWMU, CMS being prepared	Yes – radiological contamination remains. May contain hazardous chemical constituents	C.2.2.4
Solvent Dike	Inactive	SWMU, NFA	Yes – radiological contamination remains	C.2.2.5
Maintenance Shop Leach Field	Inactive	SWMU, NFA	Yes – subsurface soil is radiologically contaminated from strontium-90 plume	C.2.2.6
Fire Brigade Training Area	Inactive	SWMU, NFA	Yes – subsurface is radiologically contaminated from strontium-90 plume	C.2.2.7
WMA 3				
Tanks 8D-1, 8D-2, 8D-3, 8D-4	Isolated with remaining contamination in a dry form	RCRA interim status units, subject to RCRA closure	Yes – contains both radiological and hazardous constituents	C.2.3.1
High-Level Waste Transfer Trench	Transfer lines, trench and pump pits remaining	RCRA interim status unit, subject to RCRA closure	Yes – contamination remains in pump pits and transfer lines	C.2.3.2
Permanent Ventilation System Building	Operational	N/A	Yes – radiological contamination primarily in the HEPA filters	C.2.3.3
Supernatant Treatment System	Isolated, liquid drained	RCRA interim status unit, subject to RCRA closure	Yes – radiological contamination remains	C.2.3.4
Supernatant Treatment System Support Building	Operational	RCRA interim status unit, subject to RCRA closure	Yes – radiological contamination in the valve aisle	C.2.3.4
Equipment Shelter and Condensers	Inactive	SWMU, NFA	Yes – most radiological contamination in ventilation system	C.2.3.5
Con-Ed Building	Inactive	SWMU, NFA	Yes – radiological contamination remains	C.2.3.6
WMA 4				
Construction and Demolition Debris Landfill	Inactive (previously closed)	SWMU, CMS being prepared	Yes – radiologically contaminated from strontium-90 plume. May contain hazardous chemical constituents.	C.2.4
WMA 5				
Remote-Handled Waste Facility	Decontaminated and Deactivated	RCRA interim status unit, subject to RCRA closure	Yes – radiological contamination remains	C.2.5.1
Lag Storage Area 4, includes Shipping Depot	Operational	RCRA interim status unit, subject to RCRA closure	Yes – small amount of radiological contamination	C.2.5.2
Construction and Demolition Area	Inactive	SWMU, NFA	No	C.2.5.3

Facility	***EIS Starting Point***	***RCRA Status at EIS Starting Point*** [a]	***Radiological/Chemical Contamination at EIS Starting Point*** [b]	***Description (Appendix C Section)***
WMA 6				
Rail Spur	Operable	N/A	Yes – assumed to have radiological contamination based on past usage	C.2.6.1
Demineralizer Sludge Ponds	Inactive	SWMU, CMS being prepared	Yes – radiological contamination remains with possible PAH concentrations exceeding TAGM criteria	C.2.6.2
Equalization Basin	Operational	SWMU, subject to CWA closure	No	C.2.6.3
Equalization Tank	Operational	SWMU, subject to CWA closure	No	C.2.6.4
Low-Level Waste Rail Packaging and Staging Area	Operable, waste removed	N/A	No	C.2.6.5
Sewage Treatment Plant	Operational	SWMU, subject to CWA closure	No	C.2.6.6
South Waste Tank Farm Test Tower	Operable	N/A	No	C.2.6.7
WMA 7				
NFS Special Holes	Inactive, Geomembrane Cap and Barrier Wall	SWMU, CMS being prepared	Yes – radiological contamination remains, may contain hazardous chemical constituents	C.2.7.1
NFS Deep Holes	Inactive, Geomembrane Cap and Barrier Wall	SWMU, CMS being prepared	Yes – radiological contamination remains, may contain hazardous chemical constituents	C.2.7.1
WVDP Trenches	Inactive, Geomembrane Cap and Barrier Wall	SWMU, CMS being prepared	Yes – radiological contamination remains, may contain hazardous chemical constituents	C.2.7.1
WVDP Caissons	Inactive, Geomembrane Cap and Barrier Wall	SWMU, CMS being prepared	Yes – radiological contamination remains, may contain hazardous chemical constituents	C.2.7.1
NDA Interceptor Trench	Operational	SWMU, CMS being prepared	Yes – subsurface is radiologically contaminated	C.2.7.2
Liquid Pretreatment System	Operable	SWMU, CMS being prepared	No	C.2.7.2
Leachate Transfer Line	Operational	SWMU, CMS being prepared	Yes – radiologically contaminated and may be chemically contaminated	C.2.7.3
Former NDA Lagoon	Inactive, Geomembrane Cap and Barrier Wall	SWMU, CMS being prepared	Yes – radiologically contaminated soil	C.2.7.4
WMA 8				
Disposal Areas	Inactive, Geomembrane Cap	SWMU, CMS being prepared	Yes – radiological and chemical contamination remain	C.2.8.1
Mixed Waste Storage Facility	Operable	RCRA interim status unit, subject to RCRA closure [c]	Yes – assumed to have radiological and chemical contamination	C.2.8.2

Facility	*EIS Starting Point*	*RCRA Status at EIS Starting Point* [a]	*Radiological/Chemical Contamination at EIS Starting Point* [b]	*Description (Appendix C Section)*
Filled Lagoons	Inactive, Geomembrane Cap	SWMU, CMS being prepared	Yes – assumed to have radiological and chemical contamination	C.2.8.3
WMA 9				
Radwaste Treatment System Drum Cell	Operable	SWMU, NFA	Yes – assumed to have radiological contamination	C.2.9
Subcontractor Maintenance Area	In Place	SWMU, NFA	No	C.2.9
WMA 10				
New Warehouse	Operational	N/A	No	C.2.10.1
Meteorological Tower	Operational	N/A	No	C.2.10.2
Security Gatehouse and Fences	Operational	N/A	No	C.2.10.3
WMA 11				
Scrap Material Landfill	Inactive	SWMU, NFA	No	C.2.11
WMA 12				
Dams and Reservoirs	Operable	N/A	No	C.2.12.1
Parking Lots and Roadways	Inactive	N/A	No	C.2.12.2
Railroad Spur	Operable	N/A	No	C.2.12.3
Soils and Stream Sediments	N/A	N/A	Yes – radiological contamination is present	C.2.12.4
North Plateau Groundwater Plume	Inactive	N/A	Yes – radiological contamination is present	C.2.13
Groundwater Recovery System [c]	Operational	N/A	Yes – radiological contamination is present	C.2.13.1
Pilot-Scale Permeable Treatment Wall and Full-Scale Permeable Treatment Wall [d]	Operational	N/A	Yes – radiological contamination is present	C.2.13.2
Cesium Prong	Inactive	N/A	Yes – radiological contamination is present	C.2.14

A&PC = Analytical and Process Chemistry; CMS = Corrective Measures Study; CWA = Clean Water Act; HEPA = high-efficiency particulate air; HLW = high-level radioactive waste; HLWISF = High-Level Waste Interim Storage Facility; LWTS = Liquid Waste Treatment System; NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area; NFA = no further action required at this time under RCRA, as determined with concurrence of NYSDEC as an outcome of the RCRA facility investigation; NFS = Nuclear Fuel Services, Inc.; N/A = not applicable, not an RCRA-regulated SWMU; PAH = polynuclear aromatic hydrocarbon; RCRA = Resource Conservation and Recovery Act; SWMU = Solid Waste Management Unit; TAGM = Technical and Administrative Guidance Memorandum; WMA = Waste Management Area; WVDP = West Valley Demonstration Project.

[a] Interim Status Unit implies that a unit is subject to permitting and closure. SWMU implies that a unit is subject to corrective action.

[b] When chemical contamination is known to exist through sample results or process knowledge, it is reported in the table.

[c] Under the Mixed Waste Conditional Exemption regulation (6 NYCRR 374-1.9), the Mixed Waste Storage Facility is no longer subject to interim status closure. Nevertheless, this unit will be closed under the RCRA interim status requirements.

[d] Physically located in WMA 2.

2.3.2 Description of Waste Management Areas

This section provides more information to support Tables 2–1 and 2–2. This section includes summary descriptions of the facilities and areas that will be standing, operational, or inactive at the starting point of this EIS and that are addressed in this EIS. Any radiological or hazardous chemical contamination that is known or assumed to be present is noted in each description of a WMA. The radiological and hazardous chemical inventories that are used in the impact analyses for this EIS are provided in Appendix C, Section C.2, by WMA. More-detailed descriptions of radiological and hazardous chemical contamination of soils, surface water, and groundwater are provided in Chapter 3, Sections 3.3, 3.6.1, and 3.6.2, respectively.

2.3.2.1 Waste Management Area 1: Main Plant Process Building and Vitrification Facility Area

WMA 1 encompasses approximately 1.7 hectares (4 acres). Key facilities standing in WMA 1 at the starting point of this EIS include the Main Plant Process Building, Vitrification Facility, 01-14 Building, Load-In/Load-Out Facility, Utility Room and Utility Room Expansion, Fire Pumphouse and Water Storage Tank, Plant Office Building, Electrical Substation, and Off-Gas Trench. Included in WMA 1 are underground tanks, underground pipelines (including those that transferred waste to WMA 3), and the source area of the North Plateau Groundwater Plume. The plume extends through portions of WMAs 1 through 6. WMA 1 is shown on Figure 2–2, and in more detail in Appendix C, Figure C–1.

At the starting point of this EIS, WMA 1 facilities, including the Fuel Receiving and Storage Ventilation Building; Fuel Receiving and Storage High Integrity Container Storage Area; Radwaste Process (Hittman) Building; Laundry Room; Cold Chemical Facility; Emergency Vehicle Shelter; and Contact Size-Reduction Facility, including the Master Slave Manipulator Repair Shop, will have been removed to grade. The remaining concrete foundations and slabs are addressed in this EIS.

The Main Plant Process Building was built between 1963 and 1966 and was used from 1966 to 1971 by Nuclear Fuel Services, Inc. (NFS) to recover uranium and plutonium from irradiated nuclear fuel. The building is composed of a series of cells, aisles, and rooms that are constructed of reinforced concrete and concrete block. Most of the facility was constructed above grade; however, a few of the cells extend below the ground surface. One of the cells is currently used to store 275 canisters of vitrified high-level radioactive waste from the solidification of the liquid waste originally in the high-level radioactive waste tanks in WMA 3.

At the starting point of this EIS, the Main Plant Process Building will be standing and will have been emptied of most equipment and decontaminated to the extent that it can be demolished without the use of radiological containment. The major area not decontaminated will be the former Chemical Process Cell (now referred to as the “High-Level Waste Interim Storage Facility”), where the high-level radioactive waste canisters will still be stored, and those areas that support safe storage of the waste canisters. These areas include the Chemical Process Cell Crane Room, Equipment Decontamination Room, Ventilation Supply Room, Ventilation Exhaust Cell, and Head-End Ventilation Building, along with supporting plant utilities. Other equipment that will be remaining in the Main Plant Process Building is located in the Liquid Waste Cell, Off-Gas Cell, Uranium Product Cell, Ventilation Wash Room, and Off-Gas Blower Room. Prior to the starting point of this EIS, a layer of cement grout will be poured on the floors of cells with high radiation and contamination levels, such as the General Purpose Cell and the Process Mechanical Cell, to fix contamination in place and provide radiation shielding. Details on the Main Plant Process Building and the type and quantity of radiological and chemical contamination present are provided in Appendix C, Section C.2.1.1.

The Vitrification Facility is a structural steel–framed, sheet metal building that houses the Vitrification Cell, operating aisles, and a control room. High-level radioactive waste transferred from Tank 8D-2 in WMA 3 was mixed with glass formers and vitrified into borosilicate glass within the Vitrification Cell. The Vitrification

Facility will have been decontaminated for the Interim End State to a point where it will be ready for demolition without containment, but a substantial radiological source term will remain. More-detailed information regarding the status of the Vitrification Facility at the starting point of the EIS can be found in Appendix C, Section C.2.1.2.

The 01-14 Building will be in place and will have been sufficiently decontaminated to allow uncontained demolition. The 01-14 Building is a four-story concrete and steel–framed building located next to the southwest corner of the Main Plant Process Building. This building was built in 1971 to house an NFS off-gas system and acid recovery system, which were to be located in the off-gas treatment cell and acid fractionator cell portions of the building. However, the building was never used to support NFS operations. The 01-14 Building currently houses the Vitrification Off-Gas System and the Cement Solidification System. It is radiologically contaminated. The Vitrification Off-Gas System and the Cement Solidification System will have been removed and the building decontaminated prior to the starting point of the EIS.

The Load-In/Load-Out Facility is located adjacent to the west wall of the Equipment Decontamination Room of the Main Plant Process Building in WMA 1. The facility is a structural steel and steel–sided building. It was used to move empty canisters and equipment into and out of the Vitrification Cell. It has a truck bay and a 13.7-metric ton (15-ton) overhead crane that is used to move canisters and equipment. It is not radioactively contaminated.

The Utility Room is a concrete block and steel–framed building located on the south end of the Main Plant Process Building. It consists of two adjoining buildings that were built at different times: the original Utility Room and the Utility Room Expansion. The original Utility Room, which was built during the construction of the Main Plant Process Building, makes up the western portion of the Utility Room. The Utility Room contains equipment that supplies steam, compressed air, and various types of water to the Main Plant Process Building. Based on process knowledge and the results of routine radiological surveys, the Utility Room is not expected to have substantial radiological contamination. However, the pipe trench in the original Utility Room is reported to be radioactively contaminated as a result of backup of contaminated water from other sources and may have chemical contamination. A water storage tank and an aboveground No. 2 fuel oil tank are located outside the Utility Room. The aboveground fuel oil tank would require closure under petroleum bulk storage regulations (6 NYCRR Part 613). Asbestos-containing material associated with the fuel oil tank will be managed as asbestos-containing waste in accordance with New York State and Toxic Substances Control Act requirements.

The Utility Room Expansion was built in the early 1990s immediately adjacent and connected to the original Utility Room. Because this building is newer, and because radioactive waste processing operations were not performed in it, the Utility Room Expansion is not expected to be contaminated; routine radiological surveys have not detected any radiological contamination in this area.

The Fire Pumphouse was constructed when the Main Plant Process Building was built in 1963. It contains two pumps on concrete foundations. One is driven by an electric motor with a diesel engine backup, and the other is driven by a diesel engine. A 1,098-liter (290-gallon) double-wall, carbon steel diesel fuel day tank with No. 2 fuel oil is also located in the Fire Pumphouse. A light metal storage shed rests on a concrete slab. The shed is used to store fire hoses and fire extinguishers. The Water Storage Tank stores water for firefighting purposes. The Fire Pumphouse and the Water Storage Tank are not expected to be radioactively contaminated based on process knowledge and routine radiological surveys.

The Plant Office Building is a three-story concrete block and steel–framed structure located adjacent to the west side of the Main Plant Process Building. The Plant Office Building is designated as an unrestricted occupancy area. Radiological contamination is present beneath the floor in the men’s shower room. This contamination originated during spent nuclear fuel reprocessing from releases of radioactive acid from the

Acid Recovery System into the adjacent southwest stairwell and into subsurface soils during NFS operations. This contamination is the primary source of the North Plateau Groundwater Plume, described in Section 2.3.2.13 of this chapter.

The Electrical Substation is located adjacent to the southeast corner of the Main Plant Process Building. A 34.5-kilovolt/480-volt transformer rests on a concrete foundation behind a steel-framed structure. The transformer contains 2,220 liters (586 gallons) of oil containing polychlorinated biphenyls at 292 parts per million, which is managed in accordance with New York State and Toxic Substances Control Act requirements. No radiologically contaminated areas have been identified at the Electrical Substation.

Tanks 35104, 7D-13, and 15D-6 are located underground in the vicinity of the Main Plant Process Building. They are stainless steel tanks with capacities of 22,300 liters (5,900 gallons), 7,600 liters (2,000 gallons), and 5,700 liters (1,500 gallons), respectively. They served as collection and holding tanks for liquid from drains in contaminated areas and liquid waste from the Laundry Room and laboratories. They currently contain radioactive liquids and solids and RCRA constituents. See Chapter 3, Section 3.11.5.1, for a description of a leak associated with Tank 7D-13.

The Off-Gas Trench is an underground shielded concrete transfer trench located on the west side of the Main Plant Process Building between the Vitrification Facility and the 01-14 Building. It was used to transfer filtered off-gas generated by the vitrification process to the 01-14 Building for further processing before exhausting through the main stack. The duct is radiologically contaminated, but the trench is not.

More-detailed descriptions of the Main Plant Process Building, Vitrification Facility, 01-14 Building, Load-In/Load-Out Facility, Utility Room and Utility Room Expansion, Fire Pumphouse and Water Storage Tank, Plant Office Building, Electrical Substation, underground tanks, and the Off-Gas Trench are included in Appendix C, Section C.2.1.

2.3.2.2 Waste Management Area 2: Low-Level Waste Treatment Facility Area

WMA 2 encompasses approximately 5.5 hectares (14 acres). It was used by NFS and WVDP to treat low-level radioactive wastewater generated on site. Facilities and areas evaluated in this EIS include the Low-Level Waste Treatment Facility, known as LLW2; inactive filled Lagoon 1; active Lagoons 2, 3, 4, and 5; Neutralization Pit; New and Old Interceptors; Solvent Dike; Maintenance Shop Leach Field; and Fire Brigade Training Area. Included in WMA 2 are underground pipelines; the groundwater recovery wells and the permeable treatment wall described in Section 2.3.2.13 of this chapter; and a portion of the North Plateau Groundwater Plume, which extends under portions of WMAs 1 through 6. The Low-Level Waste Treatment Facility Area is shown on Figure 2–2 and in more detail on Figure C–3 of Appendix C.

At the starting point of this EIS, the 02 Building, Test and Storage Building, Vitrification Test Facility, Vitrification Test Facility Waste Storage Area, Maintenance Shop, Vehicle Maintenance Shop, Maintenance Storage Area, and Industrial Waste Storage Area will have been removed to grade. The remaining concrete foundations and slabs are addressed in this EIS.

The Low-Level Waste Treatment Facility is located southwest of Lagoon 4; is a pre-engineered, single-story, metal-sided building on a concrete foundation. The Packaging Room, which is typically used for resin handling, includes a 3,400-liter (900-gallon) sump and is ventilated through high-efficiency particulate air (HEPA) filters. The Low-Level Waste Treatment Facility is radiologically contaminated.

Lagoon 1 was an unlined pit excavated into the surficial sands and gravels. It was fed directly from the Old and New Interceptors and had a storage capacity of approximately 1,140,000 liters (300,000 gallons). This lagoon was removed from service in 1984 after a determination was made that it was the source of tritium contamination to nearby groundwater. The liquid and sediment were transferred to Lagoon 2. Lagoon 1 was filled with approximately 1,300 cubic meters (1,700 cubic yards) of radiologically contaminated debris from the Old Hardstand (a former pad in WMA 5 that was used to store radioactively contaminated equipment), including asphalt, trees, stumps, roots, and weeds. It was capped with clay, covered with topsoil, and revegetated.

Lagoon 2 is an unlined pit with a storage capacity of 9.1 million liters (2.4 million gallons). This lagoon was excavated into the Lavery till, and water levels are kept below the sand and gravel unit/Lavery till interface. It is used as a storage basin for wastewater discharged from the New Interceptors before its contents are transferred to the Low-Level Waste Treatment Facility for treatment. Prior to installation of the Low-Level Waste Treatment Facility, wastewater was routed through Lagoons 1, 2, and 3 in series before discharge to Erdman Brook. Radioactive contamination is known to be present in Lagoon 2 sediment.

Lagoon 3 is an unlined pit with a storage capacity of 12.5 million liters (3.3 million gallons). This lagoon was excavated into the Lavery till, and water levels are kept below the sand and gravel unit/Lavery till interface. After installation of the 02 Building, which formerly housed the low-level waste treatment equipment, Lagoon 3 was disconnected from Lagoon 2 and emptied, and its sediment removed. Currently, Lagoon 3 only receives treated water from Lagoons 4 and 5. Treated wastewater in Lagoon 3 is periodically discharged to Erdman Brook in batches through a State Pollutant Discharge Elimination System (SPDES)-permitted outfall. Lagoon 3 is radiologically contaminated.

Lagoon 4 was excavated into the sand and gravel unit and was lined with silty till material. Operations relied on a clay liner as the sole barrier until 1974, when the lagoon was identified as a source of tritium in the groundwater. An ethylene membrane liner was then added. The membranes lining the lagoon were removed in the late 1990s by West Valley Nuclear Services Company, Inc. (WVNSCO) and replaced with concrete grout and geomembrane liner. The lagoon has a capacity of 772,000 liters (204,000 gallons). It receives treated water from the Low-Level Waste Treatment Facility and discharges it to Lagoon 3. It is radiologically contaminated.

Lagoon 5 was also excavated into the sand and gravel unit and lined with silty till material. Operations relied on a clay liner as the sole barrier until 1974, when the lagoon was identified as a source of tritium in the groundwater. A propylene diamine membrane liner was then added. The membranes lining the lagoon were removed in the late 1990s by WVNSCO and replaced with concrete grout and geomembrane liner. The lagoon has a capacity of 628,000 liters (166,000 gallons). It receives treated water from the Low-Level Waste Treatment Facility and discharges it to Lagoon 3. It is radiologically contaminated.

The Neutralization Pit is a below-grade tank constructed with concrete walls and floor. The tank initially had an acid-resistant coating, which failed and was replaced with a stainless steel liner. The pit is radiologically contaminated and may contain chemical constituents derived from the management of low-level radioactive wastewater.

The Old Interceptor is a liquid waste storage tank located below grade that received low-level liquid waste generated at the Main Plant Process Building from the time of initial operation until the New Interceptors were constructed. High levels of radioactive contamination introduced into the Old Interceptor required the addition of a 0.3-meter-thick (1-foot-thick) layer of concrete to the floor for shielding. The Old Interceptor is currently used for storing radiologically contaminated liquids that exceed the effluent standard.

The New Interceptors are twin (north and south) stainless steel–lined open-top concrete storage tanks located below grade. The New Interceptors replaced the Old Interceptor and are used as liquid sampling points before transfer of the liquid to Lagoon 2.

The Solvent Dike is located about 90 meters (300 feet) east of the Main Plant Process Building. It was an unlined basin excavated in the surficial sands and gravels. It received rainwater runoff from the Main Plant Process Building Solvent Storage Terrace, which formerly housed an acid storage tank and three storage tanks containing a mixture of used n-dodecane and tributyl phosphate. The sediment has been removed and the area backfilled. The Solvent Dike still contains radiologically contaminated soil.

The Maintenance Shop Leach Field occupies an area of 140 square meters (1,500 square feet) and consists of three septic tanks, a distribution box, a tile drain field, and associated piping. The leach field served the Maintenance Shop and the Test and Storage Building before these buildings were connected to the sanitary sewer system in 1988. It may be radiologically contaminated by the North Plateau Groundwater Plume. RCRA hazardous constituents were detected in the sediment of one septic tank, but none of the concentrations exceeded RCRA hazardous waste criteria or action levels prescribed by NYSDEC. All three tanks are out of service and have been filled with sand.

The Fire Brigade Training Area is located north of Lagoons 4 and 5 and was used two to four times a year between 1982 and 1993 for several types of firefighting training exercises. Piles of wood coated with kerosene or diesel fuel were ignited and then extinguished with water and/or foam. Other exercises involved diesel fuel and water mixtures placed in a shallow metal pan that were ignited and extinguished using a steady stream of water and/or foam. These training exercises were conducted pursuant to the Restricted Burning Permits issued for the training area.

More-detailed descriptions of the Low-Level Waste Treatment Facility, Lagoons 1 through 5, Neutralization Pit and Interceptors, Solvent Dike, Maintenance Shop Leach Field, and Fire Brigade Training Area are included in Appendix C, Section C.2.2.

2.3.2.3 Waste Management Area 3: Waste Tank Farm Area

WMA 3 encompasses approximately 0.8 hectare (2 acres). Waste Tank Farm Area facilities evaluated in this EIS include Waste Storage Tanks 8D-1, 8D-2, 8D-3, and 8D-4, their associated vaults, High-Level Waste Transfer Trench, Permanent Ventilation System Building, Supernatant Treatment System (STS) and STS Support Building, Equipment Shelter and Condensers, and Con-Ed Building. Also included in WMA 3 is the North Plateau Groundwater Plume, which extends through WMAs 1 through 6, and underground pipelines, which transferred waste from WMA 1. At the starting point of this EIS, a Tank and Vault Drying System will have been added to Tanks 8D-1 and 8D-2, which would have dried the residuals left in the tanks as part of achieving the Interim End State. The Waste Tank Farm Area is shown on Figure 2–2 and in more detail on Figure C–4 of Appendix C.

Waste Storage Tanks 8D-1, 8D-2, 8D-3, and 8D-4 were built to store liquid high-level radioactive waste generated during spent nuclear fuel reprocessing operations. Tanks 8D-2 and 8D-4 were used to store plutonium-uranium extraction (PUREX) and thorium extraction (THOREX) wastes respectively from reprocessing operations. Tanks 8D-1 and 8D-3 were used to store condensate from the THOREX waste. These tanks were subsequently modified to support treatment of high-level radioactive waste during implementation of WVDP. Modifications included constructing a fabricated steel truss system over Tanks 8D-1 and 8D-2 to carry the weight of sludge mobilization and transfer pumps and installing STS equipment in Tank 8D-1. The tanks will contain residual radiological as well as hazardous chemical constituents, but all the tank contents will be dry. Piping and utilities to the tanks will be isolated to prevent transfers to and from the tanks. Details on the waste storage tanks and associated vaults and the type and quantities of the waste contents at the starting point of this EIS are provided in Appendix C, Section C.2.3.

Tank 8D-1 contains five high-level radioactive waste mobilization pumps, and Tank 8D-2 contains four of these centrifugal pumps. Each pump is approximately 2.4 meters (8 feet) long and is supported by a

25.4-centimeter (10-inch) stainless steel pipe column that is 15 meters (50 feet) long. Tanks 8D-1, 8D-2, 8D-3, and 8D-4 also each contain a transfer pump. These centrifugal multistage turbine type pumps are each supported by a 35.6-centimeter (14-inch) pipe column, with an overall length of more than 15.2 meters (50 feet) for Tanks 8D-1 and 8D-2 and approximately 6 to 8 meters (20 to 25 feet) in length for Tanks 8D-3 and 8D-4. Like the mobilization pumps, the transfer pumps were driven by 150-horsepower electric motors. The mobilization and transfer pumps are radiologically contaminated. The transfer pumps will likely have more contamination since high-level radioactive waste passed through the entire length of the pump rather than only the lower portion, as with the mobilization pumps.

The High-Level Waste Transfer Trench is a long concrete vault containing double-walled piping that was designed to convey waste between the Waste Tank Farm and the Vitrification Facility in WMA 1. It is approximately 152 meters (500 feet) long, extending from the Tank 8D-3/8D-4 vault along the north side of Tanks 8D-1 and 8D-2, before turning to the southwest and entering the north side of the Vitrification Facility. The pump pits and piping used to convey high-level radioactive waste are radiologically contaminated.

The Permanent Ventilation System Building is located approximately 15.3 meters (50 feet) north of Tank 8D-2. This steel-framed building contains four rooms: the Permanent Ventilation System Room, Electrical Room, Mechanical Room, and Control Room. It is designed to provide ventilation to the STS Support Building; STS Valve Aisle; STS Pipeway; and Tanks 8D-1, 8D-2, 8D-3, and 8D-4. Most of the residual contamination in this building is in the two HEPA filters, which could contain as much as 7.5 curies of cesium-137 and much smaller amounts of other radionuclides. No hazardous contamination is expected. The building contains an aboveground and an underground petroleum storage tank, both of which would require closure under 6 NYCRR Part 613 regulations.

STS was installed in and adjacent to Tank 8D-1. STS equipment installed in Tank 8D-1 (and the only STS equipment coming in contact with high-level radioactive waste) includes the STS prefilter, supernatant feed tank, supernatant cooler, four zeolite columns, STS sand post filter, sluice lift tank, and associated transfer piping.

The STS Support Building is located adjacent to and above Tank 8D-1. It is a two-story structure that contains equipment and auxiliary support systems needed to operate STS. The upper level of the STS Support Building is a steel-framed structure covered with steel siding. The lower level was constructed with reinforced concrete walls, floor, and ceiling. The building, with the exception of the Valve Aisle, is radiologically clean. The shielded Valve Aisle is located on the first floor of the STS Building adjacent to Tank 8D-1. The Valve Aisle is radiologically contaminated.

The Equipment Shelter is a one-story concrete block building located immediately north of the Vitrification Facility. It is radiologically contaminated.

The Waste Tank Farm condensers are located west of the Equipment Shelter and were originally designed to condense the overheads from Tanks 8D-1 and 8D-2, which were designed to be in a self-boiling condition during operations. The condensed overheads were directed to the Waste Tank Farm Condensate Tank to an ion-exchange unit, and then to the Low-Level Waste Treatment Facility for additional treatment before discharge to Erdman Brook. The condensers are still contaminated with small amounts of radioactivity.

The Con-Ed Building is a concrete block building located on top of the concrete vault containing Tanks 8D-3 and 8D-4. This building houses the instrumentation and valves used to monitor and control the operation of Tanks 8D-3 and 8D-4. The Con-Ed Building is radiologically contaminated. The majority of the radiological inventory is believed to be contained in the piping and equipment inside the building.

More-detailed descriptions of the High-Level Waste Transfer Trench, Permanent Ventilation System Building, STS, STS Support Building, Waste Tank Farm Equipment Shelter and condensers, and Con-Ed Building are provided in Appendix C, Section C.2.3.

2.3.2.4 Waste Management Area 4: Construction and Demolition Debris Landfill

WMA 4, which includes CDDL, is a 4-hectare (10-acre) area in the northeast portion on the North Plateau of WNYNSC. CDDL is the only waste management unit in WMA 4. WMA 4 is shown on Figure 2–2 and in more detail on Figure C–5 of Appendix C.

CDDL covers a 0.6-hectare (1.5-acre) area approximately 305 meters (1,000 feet) northeast of the Main Plant Process Building. CDDL was initially used by Bechtel Engineering from 1963 to 1965 to dispose of nonradioactive waste generated during Bechtel's construction of the Main Plant Process Building. CDDL was used by NFS from 1965 to 1981 to dispose of nonradioactive construction- office- and facility-generated debris, including ash from the NFS incinerator. CDDL was used by DOE from 1982 to 1984 to dispose of nonradioactive waste. Disposal operations at CDDL were terminated in December 1984, and the landfill closed in accordance with the New York State regulations that were applicable at that time (6 NYCRR 360-7.6).

Some volatile organic compounds have been detected in groundwater downgradient of CDDL. In addition, CDDL is located in the flow path of the North Plateau Groundwater Plume. The radioactively contaminated groundwater in the plume is assumed to have come into contact with the waste buried in CDDL; therefore, the buried wastes in CDDL are assumed to require handling as radioactive wastes. A more-detailed description of CDDL is included in Appendix C, Section C.2.4.

2.3.2.5 Waste Management Area 5: Waste Storage Area

WMA 5 encompasses approximately 7.6 hectares (19 acres). Facilities in WMA 5 that will be operational or standing at the starting point of this EIS include the Remote-Handled Waste Facility, LSA 4 (Lag Storage Area 4) with associated Shipping Depot, and the Construction and Demolition Area. Also included in WMA 5 is the North Plateau Groundwater Plume, which extends through WMAs 1 through 6. WMA 5 is shown on Figure 2–2 and in more detail on Figure C–6 of Appendix C.

At the starting point of this EIS, WMA 5 facilities, including the Lag Storage Building; LSAs 1, 2, and 3; Hazardous Waste Storage Lockers; and Chemical Process Cell Waste Storage Area will have been removed to grade. The remaining concrete foundations, slabs, and gravel pads are addressed in this EIS. In addition, the Cold Hardstand near CDDL, Vitrification Vault and Empty Container Hardstand, Old/New Hardstand Area, Waste Packaging Area, Lag Hardstand, High-Level Waste Tank Pump Storage Vaults, and Container Sorting and Packaging Facility will have been completely removed. However, the ground underneath these facilities could be radioactively contaminated from operations or the Cesium Prong, or both, and would be subject to decommissioning activities.

At the starting point of this EIS, the Remote-Handled Waste Facility will have been decontaminated to a point where it could be demolished without containment. It is used to remotely section and package high-activity equipment and waste under the operational requirements specified in 6 NYCRR Subpart 373-3.30.

Included in LSA 4 are a Shipping Depot, a Container Sorting and Packaging Facility, and a covered passageway between LSA 3 and 4. The Shipping Depot, a metal-framed structure, is connected to LSA 4. If contamination is encountered in LSA 4, it is expected to be minimal due to packaging requirements and storage practices. LSA 4 and the Container Sorting and Packaging Facility are used for storage, sorting, and repackaging low-level radioactive waste and mixed low-level radioactive waste.

The Construction and Demolition Area, also known as the Concrete Washdown Area, is a shallow ground depression located southwest of the Remote-Handled Waste Facility, approximately 91 meters (300 feet) west of the STS Building. From 1990 to June 1994, waste concrete was deposited in this area during the cleanout of concrete mixing trucks that transported concrete from offsite sources to support construction projects such as the Vitrification Facility. The waste concrete generated during truck washing was staged in this area until it hardened, after which it was placed in a dumpster for offsite disposal. Residual concrete is the only waste that was managed in this area.

More-detailed descriptions of the Remote-Handled Waste Facility, LSA 4, and Construction and Demolition Area are included in Appendix C, Section C.2.5.

2.3.2.6 Waste Management Area 6: Central Project Premises

WMA 6 encompasses approximately 5.7 hectares (14 acres). Facilities that will be standing, operable, or operational at the starting point of this EIS in WMA 6 include two Demineralizer Sludge Ponds and the Rail Spur, Equalization Basin, Equalization Tank, Low-Level Radioactive Waste Rail Packaging and Staging Area, Sewage Treatment Plant, and South Waste Tank Farm Test Tower. Also included in a small portion of WMA 6 is the North Plateau Groundwater Plume, which extends through portions of WMAs 1 through 6. WMA 6 is shown on Figure 2–2 and in more detail on Figure C–7 of Appendix C.

At the starting point of this EIS, a number of facilities, including the Old Warehouse, Cooling Tower, North Waste Tank Farm Test Tower, Road Salt and Sand Storage Shed, Vitrification Test Facility Waste Storage Area, and Product Storage Area will have been removed to grade. The remaining concrete foundations, slabs, and gravel pads associated with these facilities are addressed in this EIS. The ground that was underneath the previously removed Old Sewage Treatment Facility may be radioactively contaminated and would be subject to decommissioning.

The Rail Spur runs about 2,440 meters (8,000 feet) from the south side of the Main Plant Process Building to where it connects to the main line of the railroad. The rails are hot-rolled steel and the ties are creosote pressure-treated wood. Low-level radiological soil contamination has been detected in an area along a section of dual track east of the Old Warehouse.

The Demineralizer Sludge Ponds were built between 1964 and 1965 during construction of the Main Plant Process Building on the North Plateau. The sludge ponds are two unlined rectangular basins located southeast of the Main Plant Process Building. The ponds were designed to receive liquids and sludge from the site utility water treatment system and discharge this waste through a weir box and underground piping to an SPDES-permitted outfall. Both ponds are radiologically contaminated. Characterization activities have also identified the presence of semivolatile chemicals in sediment that are at concentrations that slightly exceed Technical and Administrative Guidance Memorandum criteria.

The Equalization Basin is a lined basin that is excavated into the sand and gravel layer and underlain with a sand drain. Originally, the basin was called the Effluent Mixing Basin; it received effluents from the Sanitary Sewage Treatment Plant, some discharge from the Utility Room, and cooling water blowdown. Later it received effluents from the Demineralizer Sludge Ponds. The basin currently is used as an excess capacity settling pond for discharges from the Utility Room. No known hazardous or radiological contamination is present in the Equalization Basin.

The Equalization Tank was installed in 1997 to work in parallel with the existing Equalization Basin, not as a replacement. The Equalization Tank is an inground concrete tank that was designed with a total capacity of 75,700 liters (20,000 gallons) and a maximum working capacity of 56,800 liters (15,000 gallons). The Equalization Tank is not expected to be radiologically or chemically contaminated.

The Low-Level Radioactive Waste Rail Packaging and Staging Area covers approximately 2,510 square meters (27,000 square feet) east of and adjacent to the railroad tracks at the south end of WMA 6. It was used to package and ship contaminated soil stored in roll-off containers. This area is not expected to be radiologically contaminated.

The Sewage Treatment Plant is a wood-framed structure with metal siding and roofing. The base of the facility is concrete and crushed stone. Eight tanks are associated with the plant: six inground concrete tanks, one aboveground polyethylene tank, and one aboveground stainless steel tank. The Sewage Treatment Plant is used to treat sanitary waste. Water treatment chemicals, such as sulfuric acid, sodium hypochlorite, sodium bisulfite, and sodium bicarbonate, have been used at the plant. The Sewage Treatment Plant also previously contained a satellite accumulation area that stored mercury-bearing RCRA hazardous waste from the Main Plant Process Building. No hazardous or radiological contamination is known to exist there. Treated wastewater from the Sewage Treatment Plant is discharged to Erdman Brook through an SPDES-permitted outfall.

The Waste Tank Farm Test Towers, also known as training platforms, consist of two towers. The North Test Tower will have been removed at the starting point of this EIS. The South Test Tower is a pre-engineered structure erected as a stack of six modules, including ladders, handrails, and grating.

More-detailed descriptions of the Rail Spur, Demineralizer Sludge Ponds, Equalization Basin, Equalization Tank, Low-Level Radioactive Waste Rail Packaging and Staging Area, Sewage Treatment Plant, and Waste Tank Farm Tower are included in Appendix C, Section C.2.6.

2.3.2.7 Waste Management Area 7: NRC-Licensed Disposal Area and Associated Facilities

WMA 7 encompasses approximately 3.3 hectares (8 acres). NDA includes a radioactive waste disposal area and ancillary structures. NDA is about 120 meters (400 feet) wide and 180 meters (600 feet) long within WMA 7. It is divisible into three distinct areas: NFS shallow disposal area (known as special holes) and deep burial holes; WVDP disposal trenches and caissons; and the area occupied by the Interceptor Trench and associated Liquid Pretreatment System structures. Other ancillary structures in NDA include the Leachate Transfer Line and a former lagoon, and NDA Hardstand Staging Area. NDA is shown on Figure 2–2 and in more detail on Figure C–8 of Appendix C.

The NDA Hardstand/Staging Area will have been removed to grade at the starting point of this EIS. The removal of the remaining concrete foundation is addressed in this EIS.

NDA was operated by NFS, under license from NRC (formerly the U.S. Atomic Energy Commission), for disposal of solid radioactive waste generated from fuel reprocessing operations. Beginning in 1966, solid radioactive waste materials from the nearby Main Plant Process Building exceeding 200 millirad per hour and other materials not allowable in SDA were buried in holes and trenches and backfilled with earth. Between 1966 and 1981, NFS disposed of a variety of wastes in approximately 100 deep holes and 230 special holes in a U-shaped area along the eastern, western, and northern boundaries of NDA. Between 1982 and 1986, after establishment of WVDP, waste generated from decontamination and decommissioning activities was disposed of in NDA in 12 trenches and 4 caissons. Most of these wastes were placed in trenches located in the unused parcel of land interior to the U-shaped disposal area used by NFS. No waste has been buried at NDA since 1986. Leachate is known to exist in some NDA disposal holes and trenches, with estimates in the range of approximately 3.8 million liters (1 million gallons). The leachate consists of water contaminated with radiological and chemical constituents leached from the buried wastes.

The Interceptor Trench and associated Liquid Pretreatment System were installed after groundwater chemical and radioactive contamination was detected in a well downgradient of NDA. The purpose of the installation was to intercept potentially contaminated groundwater migrating from NDA. The trench subsurface is radiologically contaminated and several organic constituents have been detected slightly above Technical and Administrative Guidance Memorandum criteria.

In late 2008, infiltration mitigation measures consisting of an upgradient barrier wall and a geomembrane cover over NDA were installed, as an interim measure under the RCRA 3008(h) Consent Order.

The Leachate Transfer Line is a black polyvinyl chloride pipeline that runs along the northeast and northwest sides of NDA, continues northward across WMA 6, and terminates at Lagoon 2 in WMA 2. The transfer line was originally used to transfer liquids from the SDA lagoons via a pumphouse next to the NDA Hardstand to Lagoon 1. It is radiologically contaminated and may be chemically contaminated.

The former lagoon was used for collecting surface-water runoff. It was located in the northeastern portion of NDA. Around 1972, it was filled with radiologically contaminated soil from cleanup after a HEPA filter was dropped at NDA during disposal operations.

Detailed descriptions of the disposal areas, Interceptor Trench and Liquid Pretreatment System, Leachate Transfer Line, and former lagoon are included in Appendix C, Section C.2.7.

2.3.2.8 Waste Management Area 8: State-Licensed Disposal Area and Associated Facilities

Facilities in WMA 8 that are addressed in this EIS include the North Disposal Area, South Disposal Area, Mixed Waste Storage Facility, and three filled lagoons. SDA is approximately 6.1 hectares (15 acres) in size and is covered with an impermeable geomembrane to prevent infiltration of precipitation. WMA 8 is shown on Figure 2–2 and in more detail on Figure C–9 of Appendix C.

From 1963 to 1975, approximately 68,000 cubic meters (2.4 million cubic feet) of wastes were received at SDA for burial. The wastes were disposed of in their shipping containers, including 19-liter (5-gallon) steel drums, 114-liter (30-gallon) steel drums, 208-liter (55-gallon) steel drums, wooden crates, cardboard boxes, fiber drums, and plastic bags. A subsurface concrete wall was installed in 1987 immediately west of Trench 14. The concrete wall supported NYSERDA's efforts to remove the sand and gravel unit adjacent to Trench 14 and replace it with compacted till. A barrier wall located along the west side of Trench 14 was installed in 1992 to control groundwater infiltration into SDA. It was made from a mixture of native clay and at least 1 percent bentonite clay. No radioactive or hazardous chemical contamination of the barrier wall is expected.

Leachate is known to exist in the SDA trenches. The leachate consists of infiltration water contaminated with radiological and hazardous chemical materials leached from the buried waste. Geomembrane covers were installed in the 1990s to reduce the amount of water infiltrating into the trenches as part of a series of interim measures under the RCRA 3008(h) Consent Order. The disposal areas and details on the types and quantities of waste buried in SDA are discussed in Appendix C, Section C.2.8.

The Mixed Waste Storage Facility consists of two aboveground buildings near the southern end of SDA. The T-1 Tank Building, which is the smaller of the buildings, is a heated, weatherproof building that houses Tank T-1, a 34,800-liter (9,200-gallon) leachate collection tank made of fiberglass-reinforced plastic. The lower portion of the building is built of concrete to provide secondary containment for the tank. Tank T-1 contains approximately 28,400 liters (7,500 gallons) of untreated leachate that was pumped from Trench 14 in 1991. The Frac Tank Building, the larger of the two buildings, is a nonheated, weatherproof building that houses two stainless steel tanks that have never been used. These tanks provide contingency storage capacity for SDA leachate. Residual radioactive and possibly chemical contamination is expected to be found in the Mixed Waste Storage Facility.

Three lagoons were built in SDA, and all three have been filled. The Northern Lagoon and Southern Lagoon were associated with the North Disposal Area. The third lagoon, called the Inactive Lagoon, was associated with the South Disposal Area. Based on samples collected and analyzed as part of the RCRA facility investigation, these lagoons contain RCRA hazardous constituents and are assumed to contain radiological contamination.

Detailed descriptions of the disposal areas, the Mixed Waste Storage Facility, and the filled lagoons are included in Appendix C, Section C.2.8.

2.3.2.9 Waste Management Area 9: Radwaste Treatment System Drum Cell

WMA 9 includes 5 hectares (12.4 acres) on the South Plateau adjacent to NDA and SDA. The Radwaste Treatment System Drum Cell (Drum Cell) is the only facility in WMA 9. WMA 9 is shown on Figure 2–2 and in more detail on Figure C–10 of Appendix C.

At the starting point of this EIS, the pad of the Trench Soil Container Area, which is expected to be slightly contaminated, will be in place. Removal of the pad is addressed in this EIS.

The Drum Cell was used to store square 270-liter (71-gallon) drums of cement-solidified supernatant and sludge wash liquids generated from high-level radioactive waste pretreatment; it has a capacity of 21,000 drums. These drums have been shipped off site. The Drum Cell is enclosed by a temporary weather structure, which is a pre-engineered metal building. The facility consists of a base pad, shield walls, remote waste handling equipment, container storage areas, and a Control Room within the weather structure. Data and operational history suggest the Drum Cell is not contaminated or can be easily decontaminated. It is assumed that waste generated from its decommissioning would be nonradioactive construction and demolition debris. A more-detailed description of the Drum Cell is included in Appendix C, Section C.2.9.

The Subcontractor Maintenance Area, located on the South Plateau portion of WNYNSC, is approximately 6 meters (20 feet) wide by 9 meters (30 feet) long. The area is flat, covered with compacted stone, and is adjacent to a paved highway. Prior to 1991, a construction contractor had used this area to clean asphalt paving equipment by spraying the equipment with diesel fuel. During the operation, some of the diesel fuel and asphalt material dripped off the equipment and fell onto the ground surface. Since remediation of the area in 1991, it has been used as a staging area for heavy equipment and inert construction materials, including stone and gravel.

2.3.2.10 Waste Management Area 10: Support and Services Area

WMA 10 encompasses approximately 12.3 hectares (30 acres) on the North Plateau and South Plateau. Facilities in WMA 10 addressed in this EIS include the New Warehouse, Meteorological Tower, and Security Gatehouse and fences. WMA 10 is shown on Figure 2–2 and in more detail on Figure C–11 of Appendix C.

At the starting point of this EIS, a number of facilities in WMA 10, including the Administration Building, Expanded Environmental Laboratory, Construction Fabrication Shop, and Vitrification Diesel Fuel Oil Storage Tank and Building will have been removed to grade. The remaining concrete foundations and slabs are addressed in this EIS.

The New Warehouse was built during the 1980s and is located east of the Administration Building. It is a pre-engineered steel building, resting on about 40 concrete piers and a poured-concrete foundation wall.

The Meteorological Tower is located south of the Administration Building. It is constructed from steel and is supported by a concrete foundation.

The Security Gatehouse is located adjacent to the Administration Building. This gatehouse was constructed when the Main Plant Process Building was built in 1963. During the early 1980s, the Main Gatehouse was renovated, and a large addition was added. A steel security fence with galvanized steel pipe posts set in concrete footings surrounds the Project Premises, SDA, and miscellaneous other locations. Its total length is approximately 7,620 meters (25,000 feet).

Detailed descriptions of the New Warehouse, Meteorological Tower, and Security Gatehouse and fences are included in Appendix C, Section C.2.10.

2.3.2.11 Waste Management Area 11: Bulk Storage Warehouse and Hydrofracture Test Well Area

WMA 11 is located in the southeast corner of WNYNSC outside of the Project Premises and SDA. The only facility in the WMA addressed in this EIS is the Scrap Material Landfill. The disposition of the Bulk Storage Warehouse and the Hydrofracture Test Well Area were analyzed in an environmental assessment completed in 2006 (DOE 2006c); therefore, these facilities are not addressed in this EIS. The Hydrofracture Test Wells will be decommissioned per New York State regulations applicable to such wells. While the Bulk Storage Warehouse and Hydrofracture Test Well Area are not addressed in this EIS, they are shown on Figure 2–3 and Figure C–12 of Appendix C for reference.

The Scrap Material Landfill is located approximately 30 meters (100 feet) south of the Bulk Storage Warehouse. The surface expression of the Scrap Material Landfill is a noticeable low mound that rises above the surrounding natural grade. During 1982, NYSERDA removed scrap equipment, consisting of an aluminum transfer hood and 326 empty steel and concrete containers, from the Bulk Storage Warehouse and buried them in a trench in the Scrap Material Landfill. This waste material was radiologically surveyed; decontaminated, as necessary; and released for unrestricted use before it was buried in the trench. No radioactive or hazardous waste was buried in the Scrap Material Landfill. The trench was backfilled with soil and capped with a soil cover. Two concrete markers identify the ends of the burial trench. The Scrap Material Landfill is also discussed in Appendix C, Section C.2.11.

2.3.2.12 Waste Management Area 12: Balance of Site

WMA 12 facilities addressed in this EIS consists of two earthen dams and reservoirs, parking lots, and miscellaneous (roped-off) areas of surface contamination. WMA 12 also includes a railroad spur, parts of roadways, and Erdman Brook and Franks Creek. The brook and creek contain radiologically contaminated sediments resulting from permitted releases of treated process wastewater from the Low-Level Waste Treatment Facility by way of Lagoon 3. WMA 12 is shown on Figure 2–3 and on Figure C–12 of Appendix C.

The two water supply reservoirs, the South Reservoir and the North Reservoir, were constructed during 1963 about 2.4 kilometers (1.5 miles) southeast of the Main Plant Process Building. The South Reservoir has an earthen dam that is 23 meters (75 feet) high with pilings to prevent seepage. The South Reservoir drains through a short canal to the North Reservoir. The North Reservoir has an earthen dam that is 15 meters (50 feet) high. It also has a control structure and pumphouse to regulate the water level. This reservoir drains into Buttermilk Creek.

Two parking lots are located off Rock Springs Road. They are designated as the Main Parking Lot and the South Parking Lot. The original Main Parking Lot was constructed during the mid-1960s. Two extensions were added during the 1980s. It has a total paved surface area of 16,700 square meters (180,000 square feet). The South Parking Lot is an irregularly shaped area constructed during 1991. It has approximately 7,430 square meters (80,000 square feet) of parking area and approximately 595 square meters (6,400 square feet) of driveways; both are covered with 20 centimeters (8 inches) of asphalt.

A Railroad Spur runs from the Fuel Receiving and Storage Building to a rail line junction, northeast of Riceville Station.

Roadways are constructed of a stone sub-base covered with asphalt. The total area of pavement is approximately 120,000 square meters (1,300,000 square feet). Although the paved roadways are located in most of the designated WMAs, they are addressed here collectively for convenience.

Contaminated stream sediments in WMA 12 include sediments in Erdman Brook and in Franks Creek between the Lagoon 3 (WMA 2) outfall and the confluence of Franks Creek and Quarry Creek inside the Project Premises fence. Additional stream sediment contamination can be found along Buttermilk Creek. Stream sediment and water contamination are discussed in Chapter 3, Section 3.6.1.

Descriptions of the Dams and Water Supply Reservoirs, parking lots, roadways, Railroad Spur, and miscellaneous contaminated areas are included in Appendix C, Section C.2.12.

2.3.2.13 North Plateau Groundwater Plume

For the purpose of analysis in this EIS, the North Plateau Groundwater Plume is divided into two areas: a source area, which is directly underneath the Main Plant Process Building, and the nonsource area, which encompasses the rest of the plume. More-detailed information on the North Plateau Groundwater Plume is provided in Appendix C, Section C.2.13.

Groundwater in portions of the sand and gravel unit in the North Plateau of WNYNSC is radiologically contaminated as a result of past NFS operations. The most significant area of groundwater contamination is associated with the North Plateau Groundwater Plume, which extends from WMA 1 into WMAs 2, 3, 4, 5, and 6, as shown on Figure 2–4. The plume discharges from groundwater to surface water in WMA 4. This contaminated surface water then flows from WMA 4 to Franks Creek and then to Cattaraugus Creek, where it leaves WNYNSC. Chapter 3, Section 3.6.2.1, describes the groundwater contamination and associated remediation efforts that have been undertaken.

A pump and treat system, the Groundwater Recovery System, was established in 1995 in WMA 2 to control the western lobe of the plume. Groundwater is pumped from two wells and treated by ion-exchange in the Low-Level Waste Treatment Facility in WMA 2. The treated groundwater is pumped to Lagoons 4 or 5 and then to Lagoon 3, from which it is eventually discharged through an SPDES-regulated discharge point to Erdman Brook.

During 1999, a pilot-scale permeable treatment wall was installed within the leading edge of the eastern lobe of the plume to evaluate the effectiveness of this type of system in treating groundwater contaminated with strontium-90. The bottom of the pilot-scale permeable treatment wall is keyed into the Lavery till, and the wall extends above the water table level. An evaluation of monitoring data indicates that the permeable treatment wall is effective in removing strontium-90 from groundwater inside the permeable treatment wall through ion-exchange, although the pilot system is not long enough to mitigate the advance of strontium-90 in the east lobe. Evaluations also indicate some operational and construction improvements can be made to increase the effectiveness of the technology application if applied at full scale. Because the pilot program successfully showed that strontium-90 can be removed in situ using a permeable treatment wall and also provided information on construction and design issues that can be overcome (Geomatrix 2007), this technology is seen as a potential full-scale remedy for managing groundwater affected by strontium-90 at the site; a full-scale system, approximately 150 meters (500 feet) long, is assumed to be implemented before the EIS starting point.

In addition to these activities, note that the State of New York may require RCRA-related actions following future characterization activities. If NEPA or SEQR documentation is necessary for these actions, they would be addressed in a future document.

2.3.2.14 Cesium Prong

The Cesium Prong is the result of uncontrolled releases from the Main Plant Process Building in 1968 that contaminated portions of land inside and outside of WNYNSC. Soil contamination resulted from airborne contaminant dispersion and deposition. The primary contaminant is cesium-137. Based on historical data, the Cesium Prong extends into WMAs 1, 3, 5, 10, and 12, and outside WNYNSC (offsite impacts are addressed as part of the long-term impact analysis in Chapter 4). Studies have shown that contamination concentrations may decrease with depth, with the majority of the activity present in the upper 5 centimeters (2 inches) of soil. The extent of the Cesium Prong is shown on Figure 2–5. Additional information is provided in Appendix C, Section C.2.14.

2.4 Alternatives Evaluated in this Environmental Impact Statement

As required by NEPA and SEQR, this EIS presents the environmental impacts associated with the full range of reasonable alternatives evaluated to meet the Proposed Action of DOE and NYSERDA, along with a No Action Alternative. The alternatives are based on the recognition that options for management of contaminated facilities and buried waste at WNYNSC range from removal and offsite disposal, to in-place management with isolation barriers, to no action.

Assumptions Used for Analyzing Disposal Locations (by Waste Type) in this Environmental Impact Statement

High-level Radioactive Waste – In accordance with the Nuclear Waste Policy Act, vitrified high-level radioactive waste must be disposed of in a Federal repository. Transportation and onsite disposal impacts for high-level radioactive waste were analyzed in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Yucca Mountain EIS)* and related documents (DOE 2002b, 2008a, 2008b).

As indicated in the Administration's fiscal year 2010 budget request, the Administration intends to terminate the Yucca Mountain program while developing nuclear waste disposal alternatives. Notwithstanding this decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of high-level radioactive waste and spent nuclear fuel. The Administration intends to convene a blue ribbon commission to evaluate alternative approaches for meeting these obligations. The commission will provide the opportunity for a meaningful dialogue on how best to address this challenging issue and will provide recommendations that will form the basis for working with the Congress to revise the statutory framework for managing and disposing of high-level radioactive waste and spent nuclear fuel.

Until disposition decisions are made and implemented, the high-level radioactive waste canisters will be safely stored on site. Impacts of onsite storage for approximately 30 years are presented in this EIS.

Transuranic Waste – Under the Waste Isolation Pilot Plant Land Withdrawal Act, DOE may dispose of only that transuranic waste associated with defense activities in the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. Disposal of West Valley Demonstration Project transuranic waste at WIPP would require a defense waste determination or a modification to the Act. For the purposes of transportation impact analysis only, DOE assumed the route characteristics of transporting transuranic waste to WIPP. Onsite impacts of transuranic waste disposal at WIPP were analyzed in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997b). All transuranic waste would be safely stored until offsite disposal capacity is available.

General Disposal Options for Low-level Radioactive Waste

Two disposal options are considered:

DOE/Commercial Disposal Option – DOE low-level radioactive waste would be disposed of at DOE disposal facilities, while commercial low-level radioactive waste would be disposed of at commercial disposal facilities. Commercial Class A low-level radioactive waste would be disposed of at a commercial facility such as EnergySolutions in Utah, while commercial Class B and C low-level radioactive waste would be disposed of at a commercial facility, which would need the appropriate permits and/or changes in state law to accept these wastes for disposal. For purposes of analysis, DOE assumed that commercial Class B and C wastes would be shipped to the Hanford Site in Washington State or to a disposal facility in Barnwell, South Carolina. DOE low-level radioactive wastes containing radionuclides in equivalent concentrations to Class A, B, or C wastes would be disposed of at the Nevada Test Site which may include low-specific-activity waste.

Commercial Disposal Option – All low-level radioactive waste would be disposed of at commercial disposal facilities. All commercial Class A low-level radioactive waste would be disposed of at a commercial disposal facility such as EnergySolutions in Utah, as would all DOE low-level radioactive waste containing radionuclides in equivalent concentrations to Class A waste and all low-specific-activity waste. All commercial Class B and C low-level radioactive wastes would be disposed of at a commercial disposal facility, as would all DOE wastes having radionuclides in equivalent concentrations to Class B and C wastes. Such a disposal facility would need the appropriate permits and/or changes in state law. For purposes of analysis, DOE assumed the route characteristics for shipment to the Hanford Site in Washington State or to a disposal facility in Barnwell, South Carolina.

There is currently no location for the disposal of Greater-Than-Class C low-level radioactive waste, and the Federal Government is responsible for such disposal under the Low-Level Radioactive Waste Policy Amendments Act (Public Law 99-240). DOE is currently evaluating disposal options for Greater-Than-Class C low-level radioactive waste through the preparation of an EIS (DOE/EIS-0375) that considers seven DOE site locations, including the Nevada Test Site, along with generic commercial locations. For the purposes of evaluating transportation impacts in this Final EIS, DOE assumed the route characteristics of transporting Greater-Than-Class C low-level radioactive waste from the Western New York Nuclear Service Center to the Nevada Test Site.

Unless otherwise referenced, the description of the alternatives is based on information provided in a series of technical reports (WSMS 2009a, 2009b, 2009c, 2009d) prepared to support the EIS effort. They describe the proposed engineered approaches for implementation of each alternative. The engineered approaches presented in the technical reports are conceptual in nature and provide information for estimating the environmental impacts of the alternatives analyzed in this EIS. The conceptual approaches evaluated provide a spectrum of detailed data useful for understanding and evaluating the impacts of implementing the alternatives, including resource commitments, energy/utility usage, labor requirements, durations, waste volumes generated, radiological and nonradiological emissions, and costs. The technical reports also present information on activities that would be necessary after completion of decommissioning actions, including monitoring and maintenance in support of any remaining facilities.

The following alternatives are analyzed in this EIS:

- ***The Sitewide Removal Alternative*** – Under this alternative, all site facilities (see Table 2–2) would be removed. Contaminated soil, sediment, and water would be removed. All radioactive, hazardous, and mixed low-level radioactive waste would be characterized; packaged, as necessary; and shipped off site for disposal. This alternative includes temporary onsite storage for the vitrified high-level radioactive waste canisters in the Interim Storage Facility until disposition decisions are made and implemented. Under this alternative, waste for which there is currently no offsite disposal facility (e.g., non-defense transuranic waste, commercial B/C low-level radioactive waste, Greater-Than-Class C waste) would be generated. This "orphan" waste would be stored on site until appropriate offsite facilities are available. Because the estimated duration of this alternative is approximately 60 years, it is conceivable that the waste and canisters could be shipped off site during this period. The entire WNYNSC would be available for release for unrestricted use. Under the Sitewide Removal Alternative, facilities and contamination would be removed so that the site could be reused with no restrictions. This alternative represents one end of the spectrum among the range of alternatives evaluated.

  The NRC-Licensed portion of WNYNSC would meet the criteria of the NRC License Termination Rule (10 CFR 20.1402). The SDA would meet applicable state criteria. Residual hazardous contaminants would meet applicable Federal and state standards. A final status survey performed in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NRC 2002) and RCRA guidance would demonstrate that the remediated site meets the standards for unrestricted release, which would be confirmed by independent verification surveys.

- ***The Sitewide Close-In-Place Alternative*** – Under this alternative, most site facilities would be closed in place. The residual radioactivity in facilities having larger inventories of long-lived radionuclides would be isolated by specially designed closure structures and engineered barriers. Closure structures would be designed to meet RCRA requirements and NRC criteria to protect cover systems from damage due to long-term erosion. Engineered barriers in general would be designed to resist degradation due to erosive and geochemical processes; limit infiltration of precipitation; withstand intrusion by plants, animals and humans; and exhibit slope stability under static, seismic, and seepage conditions. Long-term monitoring and maintenance activities would be performed to maintain the closure structures. Under this alternative, the major facilities and sources of contamination would be managed at their current locations; this alternative represents the other end of the spectrum among the range of alternatives evaluated. This alternative includes temporary onsite storage for the vitrified high-level radioactive waste canisters in the Interim Storage Facility until disposition decisions are made and implemented.

This decommissioning approach would allow large portions of WNYNSC to be released for unrestricted use. The remaining portions of WNYNSC could remain under long-term license or permit, or the NRC-regulated portion of WNYNSC could have its license terminated under restricted conditions.

- ***The Phased Decisionmaking Alternative*** (the Preferred Alternative) – Under this alternative, decommissioning would be completed in two phases:

  – Phase 1 would include decommissioning of facilities identified in Section 2.4.3.1 of this chapter, and any foundations, slabs or pads, the source area of the North Plateau Groundwater Plume, and the lagoons in WMA 2. Except for the permeable treatment wall, all facilities and the lagoons in WMA 2 would be removed. Phase 1 would also include decommissioning of a number of facilities in WMAs 5, 6, 9, and 10. The Waste Tank Farm and its support facilities, the CDDL, the nonsource area of the North Plateau Groundwater Plume, NDA and SDA would continue under active management (i.e., no decommissioning or long-term management activities would be conducted). Phase 1 activities would also include additional characterization of site contamination or studies that may reduce uncertainties to facilitate Phase 2 decisionmaking.

  – Phase 2 would complete the decommissioning or long-term management decisionmaking process, implementing the approach determined through review of the currently existing information and any additional studies to be the most appropriate. NYSERDA has clarified that for the SDA, alternatives that will be considered for Phase 2 actions will include at least: complete exhumation, close-in-place, or continued active management consistent with SDA permit and license requirements.

Phase 1 activities would make use of proven technologies and available waste disposal sites to reduce potential short-term health and safety risks from residual radioactivity and hazardous contaminants at the site. In order to facilitate interagency consensus, additional studies would be conducted to possibly reduce technical uncertainties related to the decision on final decommissioning and long-term management of the site, particularly the uncertainty associated with long-term performance models, viability and cost of exhuming buried waste and tanks, and availability of waste disposal sites. During Phase 1, DOE and NYSERDA would seek and evaluate information about improved technologies for in-place containment and for exhuming the tanks and burial areas as may become available for use in decisionmaking for Phase 2. See Section 2.4.3.1 of this chapter for more information regarding the process and types of studies that could be used to facilitate consensus on the Phase 2 approach.

During Phase 1, DOE and NYSERDA would assess the results of site-specific studies as they become available, along with other emerging information such as applicable technology development. In consultation with NYSERDA and cooperating and involved agencies on this EIS, DOE would determine whether new information would warrant preparation of a Supplemental EIS. Council on Environmental Quality and DOE NEPA implementing regulations at 40 CFR 1502.9(c) and 10 CFR 1021.314(a), respectively, require a Supplemental EIS if:

– The agency makes substantial changes in the Proposed Action that are relevant to environmental concerns; or

– There are significant new circumstances or information relevant to environmental concerns and bearing on the Proposed Action or its impacts.

If it is unclear whether a Supplemental EIS is needed, DOE would prepare a Supplement Analysis in accordance with 10 CFR 1021.314(c) and make this analysis and resulting determination available to the public. A Supplement Analysis would discuss the circumstances that are pertinent to deciding whether to prepare a Supplemental EIS. Subject to appropriate NEPA review, DOE would determine whether a Phase 2 decision is appropriate at that time. DOE would issue a Record of Decision (ROD) for Phase 2 no later than 10 years after the initial ROD that documents selection of the Phased Decisionmaking Alternative.

In addition to DOE, NYSERDA would assess results of site-specific studies and other information during Phase 1. NYSERDA expects to prepare an EIS, or to supplement the existing EIS, to evaluate Phase 2 decisions for the SDA and balance of WNYNSC. NYSERDA would issue a Findings Statement for Phase 2 no later than 10 years after the Phase 1 Findings Statement, if the Phased Decisionmaking Alternative is selected.

- ***The No Action Alternative*** – Under the No Action Alternative, no actions toward decommissioning would be taken. The No Action Alternative would involve the continued management and oversight of the remaining portion of WNYNSC and all facilities located on WNYNSC property as of the starting point of this EIS.

Sections 2.4.1 through 2.4.4 of this chapter discuss the salient features of each alternative that pertain to the environmental impact analysis in this EIS. Because radioactive and hazardous waste would be generated with each alternative, waste management is analyzed as an integral component of each alternative. The previous text box in this section describes the disposal assumptions used for each waste type.

2.4.1 Sitewide Removal Alternative

The following sections provide summaries of the implementation activities, new construction required, time sequencing of implementation activities, and waste generation under the Sitewide Removal Alternative, as well as any long-term monitoring and institutional controls required after its completion. Information in this section is from the Sitewide Removal Alternative Technical Report (WSMS 2009a). Detailed discussions of implementation activities, waste generation, and new construction are provided in Appendix C, Sections C.3.1 and C.4.

2.4.1.1 Decommissioning Activities

The following provisions would apply to the decommissioning activities for all WMAs:[2]

- Decommissioning of the NRC-licensed portion of WNYNSC would be accomplished in accordance with the NRC-reviewed *Phase 1 Decommissioning Plan for the West Valley Demonstration Project (Decommissioning Plan)* and applicable RCRA requirements. Removal of SDA would be accomplished in accordance with a NYSDEC-approved plan. A licensing action by NYSDOH would be necessary to allow the property to be made available for release.

- All radioactive, hazardous, and mixed low-level radioactive waste generated during the work would be disposed of off site.

- Characterization surveys would be performed early in the process to quantify the nature and extent of contamination at WNYNSC. The design of these surveys would take into account available data on environmental contaminants. These surveys would address surface soil, subsurface soil, surface water, groundwater, and stream sediment, as applicable, on all impacted portions of WNYNSC. Data quality objectives would be such that data collected could also support the final status survey for those areas where no removal actions are taken.

[2] *Decommissioning actions would be performed in accordance with applicable Part 373/RCRA requirements.*

- Before excavated areas are backfilled, final radiological status surveys and RCRA confirmatory sampling of these areas would be completed, including associated independent verification surveys.
- Areas inside and outside the Project Premises having surface soil and sediment with radioactivity concentrations in excess of DCGLs would be removed for offsite disposal.
- Contaminated soil, rubble, and debris would be disposed of appropriately in accordance with all applicable regulatory criteria.

Implementing this alternative (particularly for the Waste Tank Farm, NDA, and SDA) would generate some wastes for which offsite disposal capability is currently lacking (e.g., non-defense transuranic waste, commercial Class B/C low-level radioactive waste, Greater-Than-Class C waste). These wastes are referred to as orphan wastes, and would be stored on site until appropriate offsite facilities are available.

The decommissioning activities in each WMA are summarized as follows:

WMA 1 – The Equipment Decontamination Room and the Load-In/Load-Out Facility would be modified to support removal of the canisters of vitrified high-level radioactive waste. High-level radioactive waste canisters would then be removed from the Main Plant Process Building and stored in a new Interim Storage Facility (Dry Cask Storage Area) constructed on the South Plateau until they could be shipped off site. The Main Plant Process Building areas that had supported high-level radioactive waste canister storage would be decontaminated to the point where the building could be demolished without containment.

All facilities, including underground structures and remaining concrete floor slabs and foundations, would be completely removed, including the Main Plant Process Building; Utility Room; Utility Room Expansion; Plant Office Building; Vitrification Facility; 01-14 Building; Fire Pumphouse and Water Storage Tank; Electrical Substation; underground tanks (35104, 7D-13, and 15D-6); underground process, wastewater, and utility lines; and Off-Gas Trench; and Load In/Load Out Facility.

The source area of the North Plateau Groundwater Plume, located beneath the Main Plant Process Building, would be removed, with subsurface soil removed as necessary to meet DCGLs consistent with unrestricted release. Foundation piles exposed during soil removal would be cut at the bottom of the excavation or deeper, if necessary, to support unrestricted release. All other contaminated soil and groundwater within WMA 1 would be removed until DCGLs supporting unrestricted release have been met.

WMA 2 – All facilities would be completely removed, including all five lagoons, Low-Level Waste Treatment Facility, Fire Brigade Training Area, Neutralization Pit, Old Interceptor, New Interceptors, Solvent Dike, Maintenance Shop Leach Field, underground lines, and all remaining concrete slabs and foundations.

Soil, sediment, and groundwater within WMA 2 would be removed to DCGLs consistent with unrestricted release, including the area impacted by the North Plateau Groundwater Plume.

WMA 3 – All facilities would be removed, including Tanks 8D-1, 8D-2, 8D-3, and 8D-4 and their associated vaults; STS and ion-exchange media; high-level radioactive waste mobilization and transfer pumps; High-Level Waste Transfer Trench; Permanent Ventilation System Building; STS Support Building; Equipment Shelter and Condensers; Con-Ed Building; underground process, wastewater, and utility lines; and all remaining concrete slabs and foundations. All contaminated soil and groundwater within WMA 3 would be removed until DCGLs supporting unrestricted release have been met.

WMA 4 – The waste in CDDL would be exhumed and disposed of off site. All contaminated soil, stream sediment, and groundwater would be removed until DCGLs supporting unrestricted release have been met.

WMA 5 – LSA 4 and the associated Shipping Depot, the Remote-Handled Waste Facility, and Construction and Demolition Area would be completely removed, along with remaining concrete floor slabs and foundations in the area. The underground pipe running from the Remote-Handled Waste Facility to the Waste Tank Farm would also be removed. All contaminated soil, sediment, and groundwater in the area would be removed until DCGLs supporting unrestricted release have been met.

WMA 6 – The Sewage Treatment Plant and the South Waste Tank Farm Test Tower would be removed, along with remaining concrete floor slabs and foundations, asphalt pads, and gravel pads. The Rail Spur, Low-Level Radioactive Waste Rail Packaging and Staging Area, Equalization Basin and Tank, and Demineralizer Sludge Ponds would be removed. Any contaminated soil, sediment, and groundwater in the area would be removed until DCGLs supporting unrestricted release have been met.

WMA 7 – The geomembrane cover, the Interceptor Trench, and the Liquid Pretreatment System would be removed, along with the buried Leachate Transfer Line and the remaining concrete slabs and gravel pads associated with the NDA Hardstand Staging Area. The waste in NDA would be exhumed, repackaged, and transported to suitable offsite disposal facilities. All contaminated soil, sediment, and groundwater in the area would be removed until DCGLs supporting unrestricted release have been met. The NDA Lagoon would be removed after the NDA wastes have been removed.

WMA 8 – A similar approach to that for NDA (WMA 7) would be followed for SDA. In addition, the Mixed Waste Storage Facility and geomembrane cover would be removed and all of the waste exhumed. All contaminated soil, sediment, and groundwater in the area would be removed until DCGLs consistent with unrestricted release have been met.

WMA 9 – The Drum Cell would be removed, along with its associated instrumentation monitoring shed. The NDA Trench Soil Container Area gravel pad and the Subcontractor Maintenance Area would also be removed. Any contaminated soil, sediment, and groundwater in the area would be removed until DCGLs supporting unrestricted release have been met.

WMA 10 – The Meteorological Tower, New Warehouse, Main Security Gatehouse, and security fence would be removed, along with the remaining concrete floor slabs and foundations. Any contaminated soil, sediment, and groundwater in the area would be removed until DCGLs supporting unrestricted release have been met.

WMA 11 – The waste in the Scrap Material Landfill would be exhumed. Any contaminated soil, sediment, and groundwater would be removed until DCGLs supporting unrestricted release have been met.

WMA 12 – The dams and reservoirs, parking lots, roadways, and rail spurs would be removed. Contaminated soil across the Project Premises and stream sediments would be removed, as necessary, until DCGLs supporting unrestricted release have been met.

North Plateau Groundwater Plume – The source area of the North Plateau Groundwater Plume would be removed, with subsurface soil removed, as necessary, to meet DCGLs consistent with unrestricted release. Soils and water within the nonsource area would be removed until DCGLs allowing unrestricted use have been met. In addition, the Groundwater Recovery System, pilot-scale permeable treatment wall and full-scale permeable treatment wall would be removed.

Cesium Prong – Areas exceeding DCGLs for unrestricted release would be excavated, including areas within the Project Premises and WNYNSC. Areas outside of WNYNSC are assumed to be within DCGLs based on existing data (Dames and Moore 1995) and would be confirmed through final status surveys.

2.4.1.2 Monitoring and Maintenance

During decommissioning activities, environmental monitoring is expected to continue as currently conducted and described in Chapter 3, Sections 3.6.1, 3.6.1.1, 3.6.2.3, 3.7.2, and 3.11.1. Monitoring locations, contaminants measured, sampling schedules, and reporting requirements would be periodically evaluated and adjusted as decommissioning activities progress to account for elimination of environmental release pathways. Such changes would be made through consultation with the appropriate regulatory agencies.

2.4.1.3 New Construction

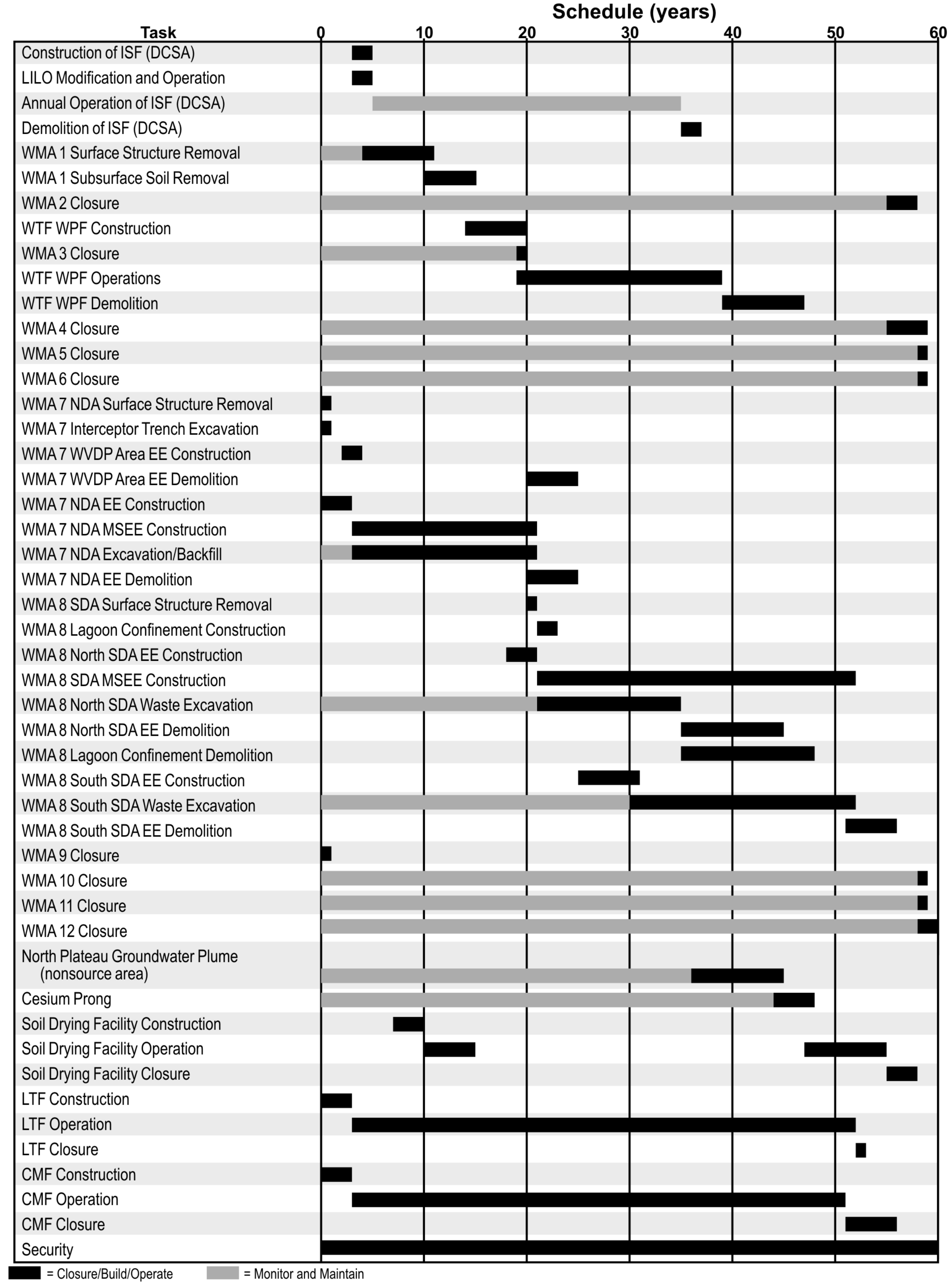
The following new construction would be required to support decommissioning activities at WNYNSC under the Sitewide Removal Alternative:

- An Interim Storage Facility (Dry Cask Storage Area) located in the southern portion of WMA 6 on the west side of the Rail Spur to temporarily store the vitrified high-level radioactive waste canisters from WMA 1 until disposition decisions are made and implemented.
- A Waste Tank Farm Waste Processing Facility to support exhumation of the high-level radioactive waste storage tanks in WMA 3.
- A Soil Drying Facility to process soils contaminated by the North Plateau Groundwater Plume, waste exhumed from CDDL, and contaminated sediment from Erdman Brook and Franks Creek.
- A Leachate Treatment Facility to process contaminated leachate from NDA and SDA.
- A Container Management Facility to process wastes exhumed from NDA and SDA. The Container Management Facility would also have a storage area to provide for long-term storage of any orphan waste (waste for which there is no immediate approved disposal location) generated by the alternative.
- A Main Plant Process Building barrier wall (whose upgradient and crossgradient portions would consist of sheet pile and downgradient portion would consist of a soil-cement-bentonite backfill mixture) to facilitate removal of underground structures and contaminated soil beneath the Main Plant Process Building.
- Environmental Enclosures to support exhumation of wastes and contaminated soil from NDA, SDA, Lagoon 1 in WMA 2, and the North Plateau Groundwater Plume source area.

These facilities and structures would be constructed, operated, and then demolished when their mission is complete. Descriptions of the proposed new facilities and structures are presented in Appendix C, Section C.4.

2.4.1.4 Time Sequencing of Decommissioning Activities

The time sequencing of the decommissioning activities and the overall time required to complete them under the Sitewide Removal Alternative are shown on **Figure 2–6**. The activities depicted on the figure are described in detail in Appendix C, Sections C.3.1 and C.4. The schedule is based on assumed funding levels and task sequencing that could change in the future. The task sequences are intended to provide an approximation of how long each task would take and when each task would be performed relative to one



Key: CMF = Container Management Facility; DCSA = Dry Cask Storage Area; EE = Environmental Enclosure; ISF = Interim Storage Facility; LILO = Load-In/Load-Out Facility; LTF = Leachate Treatment Facility; MSEE = Modular Shielded Environmental Enclosure; NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area; SDA = State-Licensed Disposal Area; WMA = Waste Management Area; WPF = Waste Processing Facility; WTF = Waste Treatment Facility; WVDP = West Valley Demonstration Project.

Figure 2–6 Sitewide Removal Alternative – Sequencing of Implementation Activities

another within the assumed planning constraints. Chapter 4 of this EIS presents estimates of impacts from storage of vitrified high-level radioactive waste in the Interim Storage Facility for 31 years, followed by waste removal for shipment to offsite disposal facilities and then demolition. Chapter 2, Section 2.6.1 includes a discussion of the annual major incremental impacts of storing the high-level radioactive waste canisters on site for a longer period of time. If the storage period is extended, the impacts of Interim Storage Facility demolition would also be delayed. The schedule supports the environmental impact analysis but does not represent a final approach. While not reflected in the schedule, annual environmental monitoring would take place for the duration of the alternative.

2.4.1.5 Waste Generation

The waste volumes projected to be generated under the Sitewide Removal Alternative would be approximately as follows:

- Construction and demolition debris: 140,000 cubic meters (4.9 million cubic feet)
- Hazardous waste: 15 cubic meters (530 cubic feet)
- Low-level radioactive waste: 1.5 million cubic meters (53 million cubic feet)
- Greater-Than-Class C waste: 4,200 cubic meters (150,000 cubic feet)
- Transuranic waste: 1,000 cubic meters (36,000 cubic feet)
- Mixed low-level radioactive waste: 570 cubic meters (20,000 cubic feet)

Slight variations in packaged waste volumes reflect differences in packaging requirements between the disposal options. These estimated waste volumes reflect the Commercial Disposal Option discussed in the text box at the beginning of Section 2.4.

Under the Sitewide Removal Alternative, two cases were analyzed in this EIS for managing potential orphan wastes: (1) prompt offsite shipment of such wastes and (2) interim onsite storage of the waste in temporary storage areas until offsite disposal capacity becomes available, with estimates for the annual costs and impacts of the onsite storage, including monitoring and maintenance. Orphan wastes are those generated during the decommissioning that do not have immediate approved disposal capacity. They would be stored in the new Container Management Facility. Management of orphan waste is projected to result in annual generation of up to 3.2 cubic meters (110 cubic feet) of low-level radioactive waste.

Details on the waste volumes that would be generated under this alternative are presented in Appendix C, Section C.3.1.

2.4.1.6 Long-term Monitoring and Institutional Controls (Long-term Stewardship)

Because WNYNSC would meet all required criteria for unrestricted release, no long-term monitoring or institutional controls would be required.

2.4.2 Sitewide Close-In-Place Alternative

The following sections summarize decommissioning activities, new construction required, time sequencing of decommissioning activities, and waste generation under the Sitewide Close-In-Place Alternative, as well as the long-term stewardship program that would be required after its completion. Information in this section is from the Sitewide Close-In-Place Alternative Technical Report (WSMS 2009b). Detailed discussions of decommissioning activities; waste generation; and new construction, including any closure caps; are provided in Appendix C, Sections C.3.2 and C.4.

2.4.2.1 Decommissioning Activities

The following provisions would apply to the activities for all WMAs:[3]

- Decommissioning of the NRC-licensed portion of WNYNSC, including NDA, would also be accomplished in accordance with NRC requirements. Long-term management activities for SDA would be accomplished in accordance with NYSDEC requirements.

- Characterization surveys would be performed to quantify the nature and extent of contamination in soil and streambed sediment. The surveys would focus primarily on the known impacted areas. Much of the data collected would be intended to serve final status survey purposes as well, because remediation of any areas exceeding DCGLs would not be undertaken under this alternative.

- No efforts would be made to remediate impacted surface soil in the Cesium Prong area; other surface or subsurface soil contamination; or contaminated groundwater, including that associated with the North Plateau Groundwater Plume; however, engineered barriers (i.e., new treatment walls to be installed as part of the Interim End State) would be maintained to contain the plume while it decays. Radioactivity would be allowed to decay in place.

- In cases in which below-grade portions of facilities are to be backfilled with demolition rubble or with soil, characterization or final status surveys including RCRA confirmatory sampling, would be performed to document the radiological and hazardous chemical status of the underground area and arrangements made for appropriate independent verification surveys to be performed before backfilling.

- Several facilities such as LSA 4 and the Remote-Handled Waste Facility would be demolished to grade; the resulting wastes would be shipped off site for disposal. LSA 4 may be retained temporarily if needed for storage of orphan waste.

Decommissioning activities in each WMA are summarized as follows:

WMA 1 – The Equipment Decontamination Room and the Load-In/Load-Out Facility would be modified to support removal of the canisters of vitrified high-level radioactive waste. The high-level radioactive waste canisters would be removed from the Main Plant Process Building and stored in a new Interim Storage Facility (Dry Cask Storage Area) to be constructed on the South Plateau in WMA 6 until they could be shipped off site. This new facility is discussed in Appendix C, Section C.4.1. The Main Plant Process Building areas that had supported high-level radioactive waste canister storage would be decontaminated to the point where the building could be demolished without containment. All structures within WMA 1 would be demolished to grade level, including the Main Plant Process Building, Utility Room, Utility Room Expansion, Plant Office Building, Vitrification Facility, 01-14 Building, Fire Pumphouse and Water Storage Tank, Load In/Load Out Facility, and Electrical Substation. The demolition rubble from the above-grade portions of these structures would be used as backfill for the below-grade portions of the Main Plant Process Building and Vitrification Facility. The remaining debris would be used to form a rubble pile that would form the foundation of a cap. The underground tanks (35104, 7D-13, and 15D-6) would be filled with grout, and all underground process, wastewater, and utility lines and the Off-Gas Trench would remain in place.

[3] *Decommissioning actions would be performed in accordance with applicable Part 373/RCRA requirements.*

The backfilled, below-grade portions of the Main Plant Process Building and the Vitrification Facility and the North Plateau Groundwater Plume source area would all be closed in an integrated manner with WMA 3, within a common circumferential hydraulic barrier (such as a barrier wall) and an upgradient barrier wall and beneath a common multi-layer cap. The source area for the North Plateau Groundwater Plume would not be removed. The top and the sides of the cap would be covered with riprap and the edge would be bordered by a wall of large boulders to provide erosion protection and act as an intruder barrier.

WMA 2 – Decommissioning activities involve enclosing Lagoon 1 within a vertical hydraulic barrier wall, filling Lagoons 2 and 3 with compacted clean soil, removing the liners and underlying berms from Lagoons 4 and 5, regrading and covering the area of all five lagoons with a multi-layer cover. Other activities in WMA 2 include backfilling the Neutralization Pit and the interceptors after breaking up their bottoms and removing the Low-Level Waste Treatment Facility to grade. No actions would be taken on the North Plateau Groundwater Plume, which would be managed by the control measures installed as part of the Interim End State; the Solvent Dike; the Maintenance Shop Leach Field; Fire Brigade Training Area; or the remaining floor slabs and foundations.

WMA 3 – The four underground waste tanks and associated vaults, with the STS equipment still in place, would be backfilled with controlled low-strength material (a self-compacted, cementious material used primarily as a backfill in lieu of compacted material). Strong grout would be placed between the tank tops and the roof vaults and in the tank risers to serve as an intrusion barrier. The underground piping in the area would remain in place and be filled with grout.

The Permanent Ventilation System Building, STS Support Building, Con-Ed Building, and Equipment Shelter and related condensers would be removed. The high-level radioactive waste mobilization and transfer pumps would be removed, along with the pump pits. The High-Level Waste Transfer Trench piping would be grouted and left in place with the transfer trench.

The Waste Tank Farm would be closed in an integrated manner with the area of the Main Plant Process Building, Vitrification Facility, and North Plateau Groundwater Plume source area within a common circumferential hydraulic barrier and an upgradient barrier wall and beneath a common multi-layer cap that incorporates large boulders to provide erosion protection and serve as an intrusion barrier.

WMA 4 – CDDL would remain in place and continue to be monitored and maintained.

WMA 5 – LSA 4 and the associated Shipping Depot and the Remote-Handled Waste Facility would be removed to grade; the resulting debris would be disposed of off site as appropriate. The below-grade portion of the Remote-Handled Waste Facility would be filled with clean soil. The remaining concrete floor slabs and foundations would remain in place.

WMA 6 – The Sewage Treatment Plant and the South Waste Tank Farm Test Tower would be removed to grade and the demolition debris disposed of off site. The Rail Spur and Low-level Waste Rail Packaging and Staging Area would remain in place. The Demineralizer Sludge Ponds, the Equalization Basin, and the Equalization Tank would be backfilled with clean soil.

WMA 7 – The Liquid Pretreatment System would be removed and the demolition debris disposed of off site. The Interceptor Trench would be emptied of leachate and filled with material such as cement grout to provide a stable base for a multi-layer cap and to impede potential transport of groundwater contamination. Leachate would also be removed from some of the NFS disposal holes and the WVDP trenches where it accumulates, and grout would be injected in these holes and trenches to stabilize them. The buried Leachate Transfer Line, which has been determined to contain a small amount of residual radioactivity, would remain in place. The existing NDA geomembrane cover would be replaced with a robust multi-layer cap.

WMA 8 – Leachate would be removed from the disposal trenches and stabilizing grout injected in the disposal trenches. The Mixed Waste Storage Facility would be removed to grade and the resulting debris disposed of off site, as appropriate. The existing SDA geomembrane cover would be replaced with a robust multi-layer cap, and a hydraulic barrier wall would be installed.

WMA 9 – The Radwaste Treatment System Drum Cell would be removed, along with its associated instrumentation monitoring shed, and the rubble disposed of off site.

WMA 10 – No decommissioning actions would be taken in WMA 10. The Meteorological Tower, Main Security Gatehouse, and security fence would remain in place and operational.

WMA 11 – No decommissioning actions would be implemented.

WMA 12 – The dams and reservoirs would be taken out of service in accordance with applicable Federal and state regulations; only the middle third of the dams would be removed. As part of the sitewide erosion controls construction, all of the streams would be regraded and covered with erosion protection rip-rap, an activity which involves significant excavation in the streambeds. All of this excavated material, including the material that has been potentially impacted by site operations, would be utilized on site for grading fill beneath the engineered caps.

North Plateau Groundwater Plume – The source area of the North Plateau Groundwater Plume would be closed in an integrated manner with the area of the Main Plant Process Building, Vitrification Facility, and Waste Tank Farm within a common circumferential hydraulic barrier. The nonsource area of the North Plateau Groundwater Plume would be allowed to decay in place. The permeable treatment wall installed prior to the starting point of this EIS would remain in place and would be replaced approximately every 20 years.

Cesium Prong – The Cesium Prong would be managed by implementing restrictions on use for a nominal period of 100 years until in-place decay results in levels allowing for unrestricted use. Monitoring data would be routinely evaluated and access to the area reassessed as part of performance evaluations (see Section 2.4.2.5 of this chapter).

2.4.2.2 Monitoring and Maintenance

During decommissioning activities, environmental monitoring is expected to continue as currently conducted and described in Chapter 3, Sections 3.6.1, 3.6.1.1, 3.6.2.3, 3.7.2, and 3.11.1. Monitoring locations, contaminants measured, sampling schedules, and reporting requirements would be periodically evaluated and adjusted as decommissioning activities progress. Such changes would be made through consultation with the appropriate regulatory agencies.

2.4.2.3 New Construction

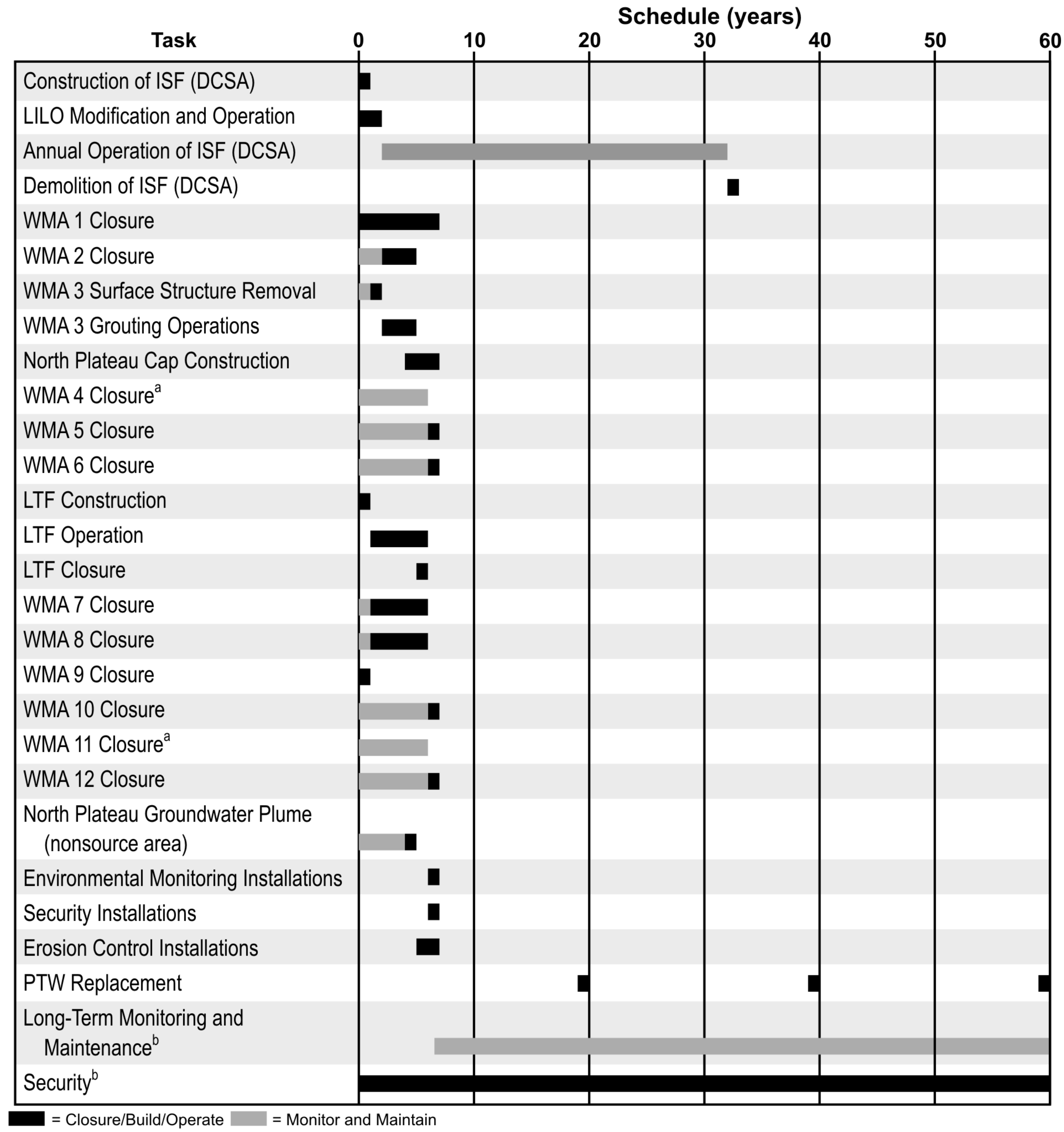
The following new construction would be required to support decommissioning activities at WNYNSC under the Sitewide Close-In-Place Alternative.

- An Interim Storage Facility (Dry Cask Storage Area) would be located in the southern portion of WMA 6 on the west side of the Rail Spur to temporarily store the vitrified high-level radioactive waste canisters from WMA 1 until disposition decisions are made and implemented.
- A Leachate Treatment Facility would be built to treat leachate from NDA and SDA before grouting.
- An upgradient chevron-shaped and a circumferential hydraulic barrier wall would be installed around WMAs 1 and 3 to control groundwater.
- An integrated engineered multi-layer cover would be installed over WMAs 1 and 3, and erosion control structures would be installed on the North Plateau.
- A hydraulic barrier wall would be installed around Lagoon 1 in WMA 2.
- A multi-layer cover would be installed over the lagoons in WMA 2.
- Engineered multi-layer covers and erosion control structures would be installed for NDA and SDA.
- Erosion control structures on the North and South Plateaus would be constructed around closed-in-place facilities and along creeks.

Descriptions of the proposed facilities and structures are presented in Appendix C, Section C.4.

2.4.2.4 Time Sequencing of Decommissioning Activities

The time sequencing of decommissioning activities and the overall time required to complete these activities under the Sitewide Close-In-Place Alternative are shown on **Figure 2–7**. The decommissioning activities depicted on the figure are described in detail in Appendix C, Sections C.3.2 and C.4. The schedule is based on assumed funding levels and task sequencing that may change in the future. The task sequences are intended to provide an approximation of how long each task would take and when each task would be performed relative to one another within the assumed planning constraints. Chapter 4 of this EIS presents estimates of impacts from storage of vitrified high-level radioactive waste in the Interim Storage Facility for 32 years, followed by waste removal for shipment to offsite disposal facilities and then demolition. Chapter 2, Section 2.6.1 includes a discussion of the annual major incremental impacts of storing the high-level radioactive waste canisters on site for a longer period of time. If the storage period is extended, the impacts of Interim Storage Facility demolition would also be delayed. The schedule supports the environmental impact analysis but does not represent a final approach. While not reflected in the schedule, annual environmental monitoring would take place for the duration of the alternative.



Key: DCSA = Dry Cask Storage Area; ISF = Interim Storage Facility; LILO = Load-In/Load-Out Facility; LTF = Leachate Treatment Facility; PTW = Permeable Treatment Wall; WMA = Waste Management Area.

[a] WMAs 4 and 11 would be included in Long-Term Monitoring and Maintenance after completion of closure activities at the other WMAs.
[b] Continued Indefinitely.

Figure 2–7 Sitewide Close-In-Place Alternative – Sequencing of Implementation Activities

2.4.2.5 Waste Generation

The decommissioning waste volumes expected to be generated under the Sitewide Close-In-Place Alternative would be approximately as follows:

- Construction and demolition debris: 15,000 cubic meters (550,000 cubic feet)
- Hazardous waste: 3 cubic meters (120 cubic feet)
- Low-level radioactive waste: 9,900 cubic meters (350,000 cubic feet)
- Greater-Than-Class C waste: 0
- Transuranic waste: 35 cubic meters (1,200 cubic feet)
- Mixed low-level radioactive waste: 410 cubic meters (14,000 cubic feet)

Slight variations in packaged waste volumes reflect differences in packaging requirements between the disposal options. These estimated waste volumes reflect the Commercial Disposal Option discussed in the text box at the beginning of Section 2.4. Monitoring and maintenance activities and periodic replacement of the North Plateau Groundwater Plume permeable treatment wall would generate an average of 110 cubic meters (3,900 cubic feet) per year of low-level radioactive waste.

Details on the waste volumes that would be generated and subject to offsite disposal under the alternative are presented in Appendix C, Section C.3. If any orphan waste were to be generated under the Sitewide Close-In-Place Alternative, it would be stored in an existing storage facility. Management of orphan waste is projected to result in annual generation of some low-level radioactive waste, but less than that estimated for the Sitewide Removal Alternative.

2.4.2.6 Long-term Monitoring and Institutional Controls (Long-term Stewardship)

Once close-in-place activities are completed, the environmental monitoring program would be revised to effectively monitor the performance of structures that have been closed-in-place. The long-term monitoring program would include:

- Surface-water monitoring devices on Franks Creek, Erdman Brook, and Quarry Creek that would be routinely sampled. Other sampling locations would be located upstream and downstream of WNYNSC along Buttermilk Creek and Cattaraugus Creek near the perimeter of WNYNSC.

- Groundwater wells to monitor groundwater elevations and groundwater quality in the North and South Plateaus and offsite residential water supply wells to monitor offsite groundwater. Monitoring tasks would include measurement of water levels, well purging, sampling for appropriate site radiological and chemical parameters, and inspection of each well; any maintenance or repairs required to maintain proper working conditions would be performed as needed.

- Piezometers along the upgradient and downgradient sides of subsurface hydraulic barrier walls installed on the North and South Plateaus to evaluate the performance of these features.

- Inspections and an instrumentation network to monitor the effectiveness and integrity of the multi-layered cover systems. The monitoring and inspection process would be followed by routine maintenance and repair, as necessary, to maintain the integrity of the engineered cover systems.

- Erosion control structures, including diversion berms, diversion ditches, water control structures, and streambed armoring. These structures would be regularly inspected to ensure that they are functioning as designed and to identify signs of blockage and/or physical damage. Corrective maintenance would be performed in response to the inspections and would include clearing debris, repairing erosion control structures, and regrading surfaces, where necessary.

Institutional controls would also be put in place for portions of the site not released from the NRC license or the NYSDEC permit, and for portions where the NRC license is terminated under restrictions. The institutional controls would be approved by regulatory authorities and are expected to include the following:

- An 8-foot-high chain-link fence around the closed facilities in the North Plateau and South Plateau that would have one or more access points with locked gates and motion sensors and video cameras wired to activate alarms at local law enforcement facilities.

- Signs around the perimeter, as well as near the main WNYNSC access point, providing appropriate information identifying the nature of the site and the presence of residual radioactive inventories in the North Plateau and of buried radioactive wastes in WMAs 7 and 8 and contact information. These signs would be maintained for the duration of the postclosure stewardship.

The performance of the monitoring program, institutional controls, and in-place closure designs would be reviewed and evaluated on a regular basis, and changes to specific aspects would be made, as appropriate.

2.4.3 Phased Decisionmaking Alternative

The Preferred Alternative is the Phased Decisionmaking Alternative. Section 2.7 of this chapter provides the rationale for identifying this alternative as preferred. The following sections summarize decommissioning activities, new construction required, time sequencing of decommissioning activities, and waste generation under the Phased Decisionmaking Alternative, as well as any long-term monitoring and institutional controls required after its completion. Detailed discussions of decommissioning activities, waste generation, and new construction are provided in Appendix C, Sections C.3.3 and C.4. Information in this section is from the Phased Decisionmaking Alternative Technical Report (WSMS 2009c).

2.4.3.1 Decommissioning Activities

The following provisions apply to Phase 1 decommissioning activities for all WMAs:[4]

- Decommissioning activities would be accomplished in accordance with the NRC-reviewed *Phase 1 Decommissioning Plan for the West Valley Demonstration Project (Decommissioning Plan)*, which specifies the appropriate DCGLs. The *Decommissioning Plan* also provides information on analyses performed to estimate the impacts of residual radioactivity that would remain at WNYNSC after completion of Phase 1 decommissioning activities.

- All radioactive, hazardous, and mixed low-level radioactive wastes generated during the work that have an immediate path to disposal would be disposed of off site, with the possible exception of transuranic waste, which could require temporary onsite storage pending a “defense” determination or availability of a disposal facility for non-defense transuranic waste.

- Characterization surveys and analyses would be performed during Phase 1 to determine the nature and extent of surface soil and sediment contamination.

[4] *Decommissioning actions would be performed in accordance with applicable Part 373/RCRA requirements.*

- Before excavated areas are backfilled, final radiological status surveys and RCRA confirmatory sampling of these areas would be completed, including associated independent verification surveys.
- Any excavation performed to remove slabs and foundations would be limited. If additional contamination were found at a depth greater than approximately 0.5 meters (2 feet), that contamination would be addressed as part of Phase 2.

Phase 1 activities in each WMA are summarized as follows:

WMA 1 – The canisters of vitrified high-level radioactive waste would be removed from the Main Plant Process Building and placed in a new Interim Storage Facility (Dry Cask Storage Area) constructed early in Phase 1 on the South Plateau. The Main Plant Process Building areas that support high-level radioactive waste canister storage would be decontaminated to the point where the building could be demolished without containment. All facilities in WMA 1 would be completely removed, including the Main Plant Process Building; Utility Room; Utility Room Expansion; Plant Office Building; Vitrification Facility; 01-14 Building; Load-In/Load-Out Facility; Electrical Substation; Fire Pumphouse; Water Storage Tank; underground tanks (35104, 7D-13, 15D-6); all underground process, wastewater, and utility lines; Off-Gas Trench; and all remaining concrete slabs and foundations.

The source area of the North Plateau Groundwater Plume, located beneath the Main Plant Process Building, would be removed, with subsurface soil removed as necessary to meet DCGLs consistent with unrestricted release. A hydraulic barrier would be installed around the Main Plant Process Building area to control groundwater during excavation. The downgradient portion of this barrier would remain in place after the excavated area is backfilled.

To remove the plume source area and the below-grade structures of the Main Plant Process Building and Vitrification Facility, an area larger than the footprints of these two buildings would be excavated. This excavation would extend into the Lavery till, where necessary, to accommodate removal of extended below-grade structures such as the Cask Unloading Pool. Foundation piles exposed during soil removal would be cut at the bottom of the excavation or deeper, if necessary, to support unrestricted release. Underground lines within the excavated area would be removed. Pipeline sections remaining at the face of the excavation would be characterized and the portion of the piping within WMA 1 removed, as necessary, depending on the characterization results.

WMA 2 – All facilities in WMA 2 would be removed. A hydraulic barrier wall would be installed northwest of Lagoons 1, 2, and 3. The liners and underlying berms for Lagoons 4 and 5 would be removed.

Underground lines within the excavated areas would be removed. Pipeline sections remaining at the face of the excavations would be characterized and the portion of the piping within WMA 2 removed, as necessary, depending on the characterization results.

WMA 3 – The high-level radioactive waste mobilization and transfer pumps would be removed from the underground waste tanks. The waste tanks themselves would remain in place, as would the Permanent Ventilation System Building, STS Support Building, and underground piping in the area. The STS vessels and contents in Tanks 8D-1 and 8D-2 would remain in place. The Equipment Shelter and Condensers and Con-Ed Building would be removed. The waste tanks would continue to be monitored and maintained, and the Tank and Vault Drying System would operate as necessary. The piping used to convey high-level radioactive waste in the High-Level Waste Transfer Trench would be removed, and the trench would remain in place. Pipe removal would be conducted in conjunction with soil removal; cutoffs of the piping would occur somewhere between the excavation and the tanks. The barrier wall would also extend westward across the piping runs.

WMA 4 – CDDL would remain in place and continue to be monitored and maintained.

WMA 5 – LSA 4 and the associated Shipping Depot and the Remote-Handled Waste Facility would be removed. The remaining concrete floor slabs and foundations in the area would also be removed. LSA 4 may be retained temporarily if needed for storage of orphan waste.

WMA 6 – The Sewage Treatment Plant and the South Waste Tank Farm Test Tower would be removed, along with the remaining concrete floor slabs and foundations, asphalt pads, and gravel pads. The Equalization Basin and Tank, Demineralizer Sludge Ponds, and Low-Level Waste Rail Packaging and Staging Area would be removed. The Rail Spur would remain operational, potentially with a new terminus due to the excavation of the Main Plant Process Building.

WMA 7 – NDA would continue to be monitored and maintained. The Interceptor Trench and the Liquid Pretreatment System would remain operational. The buried Leachate Transfer Line would remain in place. The remaining concrete slabs and gravel pads associated with the NDA Hardstand would be removed. NDA is subject to RCRA corrective actions requested by EPA and/or NYSDEC. However, the pad associated with the NDA Hardstand and the Trench Soil Container Area would be removed under the WMA 9 scope of work.

WMA 8 – SDA would continue to be actively managed, and any additional actions requested by the regulator would be taken. The associated Mixed Waste Storage Facility would remain operational. SDA is subject to actions requested by NYSDEC.

WMA 9 – The Drum Cell and the Subcontractor Maintenance Area would be removed, along with the associated instrumentation monitoring shed. The NDA Trench Container Area pad would also be removed.

WMA 10 – The New Warehouse and the remaining concrete floor slabs and foundations would be removed. The Meteorological Tower, Security Gatehouse, and security fence would remain in place and operational.

WMA 11 – No decommissioning actions would be implemented.

WMA 12 – The dams and reservoirs would continue to be monitored and maintained. Parking lots and roadways would remain in place. Sediment and surface soils would be characterized to evaluate any potential contamination.

North Plateau Groundwater Plume – The source area of the North Plateau Groundwater Plume would be removed as under the Sitewide Removal Alternative.

The nonsource area of the North Plateau Groundwater Plume would be contained by the permeable treatment wall installed for the Interim End State. The permeable treatment wall would be replaced if necessary.

Cesium Prong – The Cesium Prong would be managed by continuing restrictions on use and access.

2.4.3.2 Monitoring and Maintenance

During Phase 1, environmental monitoring is expected to continue as currently conducted and described in Chapter 3, Sections 3.6.1, 3.6.1.1, 3.6.2.3, 3.7.2, and 3.11.1. Monitoring and associated sampling activities would be initially conducted on a semiannual basis, with subsequent plans to revert to an annual basis, depending on monitoring results and progress towards implementation of Phase 2. Several specific aspects of environmental monitoring activities during Phase 1 are expected to include the following:

- Monitoring of surface waters draining the North and South Plateaus at locations on Franks Creek, Erdman Brook, and Quarry Creek. Other sampling locations would be located upstream and downstream of WNYNSC along Buttermilk Creek and Cattaraugus Creek near the perimeter of WNYNSC. Additionally, groundwater seeps would be included in the groundwater monitoring program.

- Groundwater wells to monitor groundwater elevations and groundwater quality in the North and South Plateaus. Monitoring tasks would consist of measurement of water levels, well purging, sampling for appropriate site radiological and chemical parameters, and inspection of each well; any maintenance or repairs required to maintain proper working conditions would be performed as needed.

- Piezometers to monitor the performance of the NDA and SDA subsurface barrier walls.

- An air emission discharge point at the stack discharge from the Permanent Ventilation System Building in the Waste Tank Farm in WMA 3. Air discharges from this location would be analyzed for radiological indicator parameters (gross alpha, gross beta, and tritium) and specific radionuclides (cesium-137, strontium-90, iodine-129, americium-241, and uranium and plutonium isotopes). DOE is working with EPA to gain approval to use an alternate method of demonstrating compliance with 40 CFR Part 61 during Phase 1 activities by measuring environmental concentrations of airborne radionuclides at critical receptor locations rather than by using the current "measure and model" approach.

The geomembrane caps installed at NDA and SDA would be routinely inspected for signs of deterioration or damage resulting from subsidence, erosion, or the growth of deep-rooted vegetation. Routine repairs to the covers would be performed as needed. Additional maintenance activities would consist of periodic mowing of the vegetated portions of the site, trimming of vegetation, and removal of vegetation with root depths in excess of one foot to prevent deep root growth into the ballast material on the covers.

During Phase 1, regular inspections would be conducted for signs of erosion in WNYNSC. Maintenance would be performed in response to the inspections and could include clearing debris, repairing or upgrading erosion control structures, and regrading surfaces, where necessary.

Annual environmental monitoring and inspection reports and multiyear review reports would be prepared as part of the environmental monitoring program. The reports would provide data summaries and trends, highlight data points above regulatory or site-specific action levels, and include conclusions and recommendations for interim action, if appropriate. Annual reporting would be conducted up to each scheduled multiyear review cycle (anticipated at 5-year intervals). The multiyear review would contain summarized data and evaluations from the annual reports, as well as additional analysis and recommendations for modification to the monitoring program or further remedial action, if necessary. The annual reports and multiyear review reports would be publicly available.

2.4.3.3 Phase 1 Data Collection and Studies

The following types of studies would be performed during Phase 1:

- Characterization studies, which would include sampling of surface soil and stream sediments and characterization of selected underground piping that would be exposed during other removal activities
- Data collection and studies to improve understanding of the removal option or improve its viability, such as monitoring and evaluating technology developments regarding disposal facilities for orphan waste, cleaning and exhumation of underground waste tanks, and exhumation of buried radioactive waste
- Data collection and studies to improve understanding of the in-place closure option or improve its viability, such as research related to long-term performance of engineered barriers and work to enhance site erosion and hydrology models
- Updated long-term performance assessment modeling that may enhance, for example, (probabilistic) risk assessment methods or parameterization

2.4.3.4 Process for Studies to Facilitate Decisionmaking on the Phase 2 Approach

DOE and NYSERDA have both identified the Phased Decisionmaking Alternative as their Preferred Alternative. The agencies agree that under Phase 1 of this alternative, important work would be conducted that the agencies believe is critical to keep WVDP moving toward completion.

In addition, DOE and NYSERDA, with the participation of WNYNSC regulators, who serve as cooperating agencies for the EIS, would on a regular basis review relevant data and information, whether developed by the site, or by industry in the general areas of nuclear decommissioning and environmental remediation.

Phase 2 decisions could be made at any time, or in conjunction with periodic regulatory reviews. Factors that would be taken into account in these reviews could include:

- Site characterization and project implementation information learned during performance of Phase 1 decommissioning activities (e.g., sample data obtained during excavation of the Main Plant Process Building, exhumation technology innovations and best management practices, performance of excavation containment structures and their effect on groundwater mechanics);
- Any information developed in the additional studies to be carried out in Phase 1 (e.g., site-specific erosion and groundwater measurements, radionuclide fate data, and bioaccumulation and dose factors; improved inventory estimates; or tests of exhumation technologies and engineered barriers);
- The availability of new technologies (for use in exhumation or in-place closure) or appropriate disposal options that might be applied in Phase 2;
- Significant advancements of long-term performance modeling capabilities beyond the current state-of-the art.

During Phase 1, DOE and NYSERDA would annually review and evaluate progress and performance of ongoing decommissioning activities, for example the effectiveness of the techniques used and any lessons learned in the process, as well as additional site characterization data collected that may be useful in Phase 2 decisions. Evaluations would take into account the status of the underground waste tanks and the two waste disposal areas, along with the various decommissioning or long-term management approaches (as defined in the NRC Policy Statement on West Valley and any other applicable regulations), changes to regulatory requirements, and the availability of disposal sites for any wastes that would be generated by Phase 2 actions.

Public involvement would continue until final decisions are made and implemented. DOE and NYSERDA would inform the public on at least a quarterly basis regarding the progress of any additional studies. The agencies would schedule additional meetings as necessary to assure timely communication with the public. It is anticipated that the West Valley Citizen Task Force[5] would remain in place during this time. As discussed in Section 2.4, DOE and NYSERDA would conduct appropriate reviews under NEPA and SEQR.

2.4.3.5 New Construction

The following new construction would be required to support decommissioning activities at WNYNSC during Phase 1 of the Phased Decisionmaking Alternative.

- An Interim Storage Facility (Dry Cask Storage Area) would be located in the southern portion of WMA 6 on the west side of the Rail Spur to temporarily store the high-level radioactive waste canisters from WMA 1 until disposition decisions are made and implemented.
- A Main Plant Process Building barrier wall (whose upgradient and crossgradient portions would consist of sheet pile and downgradient portion would consist of a soil-cement-bentonite backfill mixture) to facilitate removal of below-grade structures and contaminated soil associated with the source area of the North Plateau Groundwater Plume.
- A low-permeability subsurface barrier wall would be installed in WMA 2 northwest of Lagoons 1, 2, and 3 to control groundwater.

Descriptions of the proposed facilities and structures are presented in Appendix C, Section C.4.

2.4.3.6 Waste Generation

The decommissioning waste volumes expected to be generated during Phase 1 would be approximately as follows:

- Construction and demolition debris: 33,000 cubic meters (1.2 million cubic feet)
- Hazardous waste: 2 cubic meters (83 cubic feet)
- Low-level radioactive waste: 180,000 cubic meters (6.2 million cubic feet)
- Greater-Than-Class C waste: 0
- Transuranic waste: 710 cubic meters (25,000 cubic feet)
- Mixed low-level radioactive waste: 41 cubic meters (1,400 cubic feet)

[5] *Sponsored by DOE and NYSERDA since 1997, the West Valley Citizen Task Force is an 18-member advisory group that initially reviewed and advised on policies, priorities, and guidelines for the clean up, closure, or long-term management of WNYNSC. The Citizen Task Force has met regularly since 1998 to discuss issues regarding facility closure; regulatory issues; and long-term management, including future site use, long term stewardship, and regulatory issues. Most of the Citizen Task Force meetings are open to the general public.*

Slight variations in packaged waste volumes reflect differences in packaging requirements between the disposal options. These estimated waste volumes reflect the Commercial Disposal Option discussed in the text box at the beginning of Section 2.4. Monitoring and maintenance and periodic replacement of the North Plateau Groundwater Plume permeable treatment wall, if necessary, and the SDA geomembrane would generate an average of 190 cubic meters (4,900 cubic feet) per year of low-level radioactive waste, 6 cubic meters (210 cubic feet) of nonhazardous waste, and less than 1 cubic meter (35 cubic feet) of hazardous waste.

Details on the waste volumes that would be generated and would be subject to offsite disposal under the Phased Decisionmaking Alternative are presented in Appendix C, Section C.3. If any orphan waste were to be generated, it would be stored on site in an existing facility. The amount of waste stored and annual waste volumes generated as part of storage operations would depend on decisions to be made for both phases of the alternative. Annual waste generation rates for orphan waste storage are expected to be no more than those for the Sitewide Removal Alternative (3.2 cubic meters (110 cubic feet) of low-level radioactive waste per year).

2.4.3.7 Time Sequencing of Decommissioning Activities

The time sequencing of decommissioning activities and the overall time required to complete the activities of Phase 1 of the Phased Decisionmaking Alternative are shown on **Figure 2–8**. The decommissioning activities depicted on the figure are discussed in detail in Appendix C, Sections C.3.3 and C.4. The figure shows a hatched area with monitoring, maintenance, and replacement activities that are proposed for years 10 through 30 after the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. If the Phase 2 decision is made as late as 30 years after the ROD and Findings Statement, these activities would occur as part of Phase 1. If the Phase 2 decision is made 10 years after the initial ROD and Findings Statement, these activities would not occur. The schedule is based on assumed funding levels and task sequencing that may change in the future. The task sequences are intended to provide an approximation of how long each task would take and when each task would be performed relative to one another within the assumed planning constraints.

The impact analysis presented in Chapter 4 of this EIS assumes that Phase 2 actions are initiated 30 years after the initial DOE ROD and NYSERDA Findings Statement, and is considered to be a bounding Phase 1 impact analysis. The impacts associated with initiation of Phase 2 actions both at both 10 and 30 years after issuance of the initial ROD and Findings Statement are discussed in Section 2.6. Chapter 4 presents estimates of impacts from storage of vitrified high-level radioactive waste in the Interim Storage Facility for 29 years, followed by waste removal for shipment to offsite disposal facilities and then demolition. Chapter 2, Section 2.6.1 includes a discussion of the annual major incremental impacts of storing the high-level radioactive waste canisters on site for a longer period of time. If the storage period is extended, the impacts of Interim Storage Facility demolition would also be delayed. The schedule supports the environmental impact analysis but does not represent a final approach. Not shown on the figure are Phase 1 characterization and monitoring studies, discussed in Section 2.4.3.2 of this chapter, or annual environmental monitoring, which would be conducted during decommissioning activities.

2.4.3.8 Long-term Monitoring and Institutional Controls (Long-term Stewardship)

Long-term monitoring and institutional controls would be dependent on Phase 2 activities. Depending on the nature of Phase 2, long-term monitoring and institutional controls (stewardship) could resemble those of the Sitewide Close-In-Place Alternative, or no monitoring or institutional controls would be required as under the Sitewide Removal Alternative.

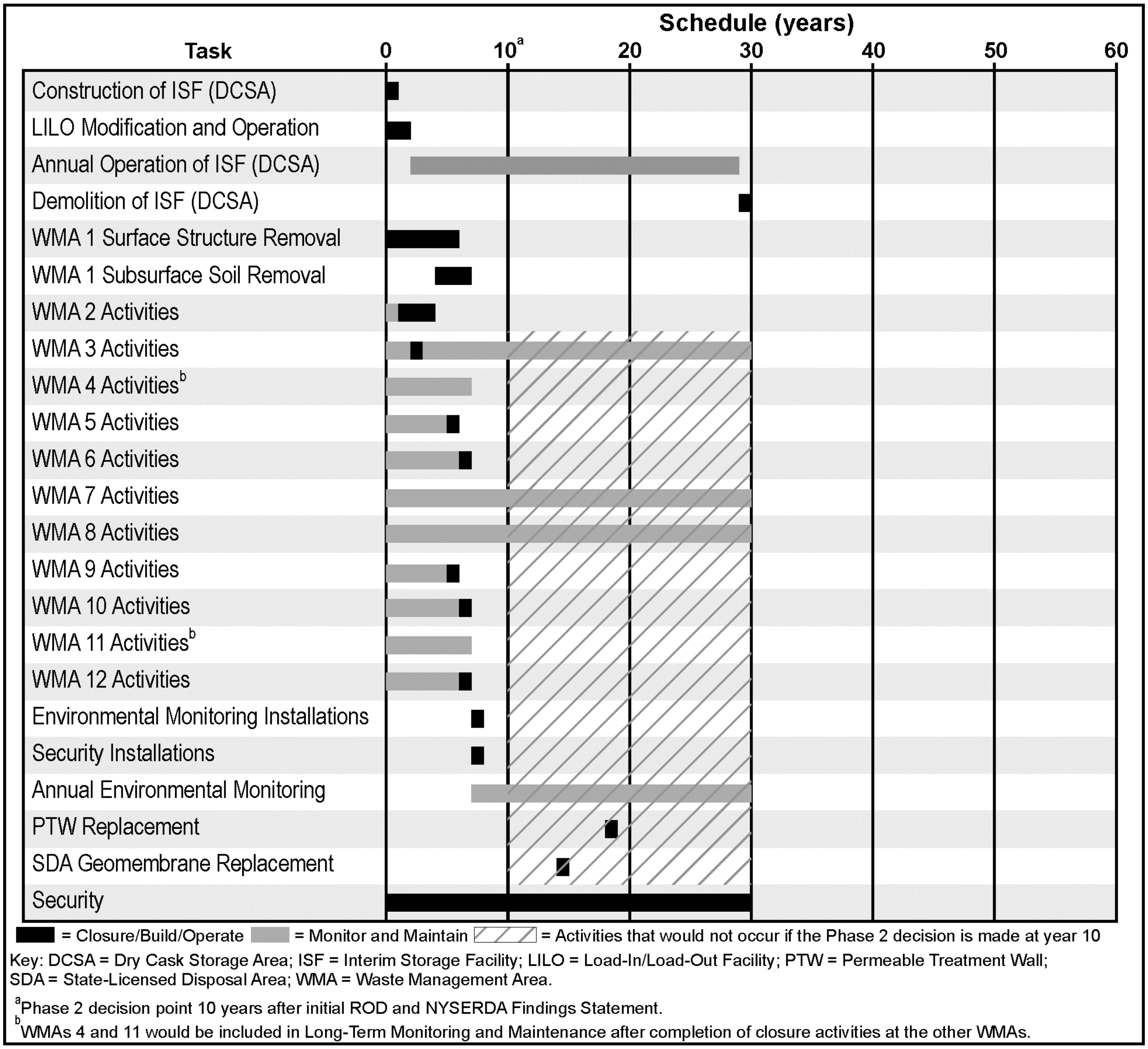


Figure 2–8 Phased Decisionmaking Alternative – Sequencing of Implementation Activities

NYSERDA owns the WNYNSC property and would remain owner following Phase 1 activities. As stipulated in the Cooperative Agreement with NYSERDA, DOE would remain in exclusive use and possession of the Project Premises and related project facilities throughout the remainder of the project term, which includes Phase 1 and Phase 2 (DOE and NYSERDA 1981). DOE would therefore continue to be in control of the Project Premises during implementation of Phase 1. In this capacity, DOE would carry the full authority of the Federal Government in enforcing institutional controls over the Project Premises and other areas under DOE control.

DOE would be responsible for operating and maintaining facilities within the Project Premises such as the Waste Tank Farm, NDA, and nonsource area of the North Plateau Groundwater Plume in a safe manner. DOE would continue to implement the environmental radiation protection program for the Project Premises as required by DOE Order 450.1A, *Environmental Protection Program*. NRC would also be involved in a regulatory oversight capacity over the Project Premises and balance of WNYNSC, which would remain under NRC license.

Existing institutional controls would remain in place during Phase 1. Additional institutional controls would be provided for the new Interim Storage Facility on the South Plateau, such as security fencing around the area and appropriate security lighting. Changes to the environmental monitoring program and institutional controls for Phase 2 would be dependent on future decisions related to the scope of Phase 2, but would be similar to those described in Section 2.4.1.6 if sitewide removal is selected or similar to those described in Section 2.4.2.6 if remaining facilities are closed-in-place.

2.4.4 No Action Alternative

Under the No Action Alternative, no decommissioning or long-term stewardship would take place. Consistent with the Interim End State, the site would continue to be monitored and maintained for the foreseeable future, as required by Federal and state regulations, to protect the health and safety of workers, the public, and the environment. Information in this section is from the No Action Alternative Technical Report (WSMS 2009d).

2.4.4.1 Maintenance and Replacement Activities

The site maintenance program would be modified, as appropriate, for facility and system conditions of the Interim End State. These conditions would include continued interim storage of the high-level radioactive waste canisters in the Main Plant Process Building. The Waste Tank Farm and all waste burial grounds would remain under Interim End State conditions.

Facilities would be repaired, as necessary, to maintain safe conditions. Portions of facilities would be replaced periodically to this end, e.g., the roof of the Main Plant Process Building, the geomembrane covers over the waste disposal areas, and the permeable treatment wall for the North Plateau Groundwater Plume.

Capabilities would remain in place to deal with unexpected failures of structures, systems, and components, as well as with other site contingencies that might occur. Appropriate site management and oversight would remain in place.

2.4.4.2 Waste Generation

The annual waste volumes expected to be generated under the No Action Alternative would be approximately:

- Construction and Demolition debris: 32 cubic meters (1,100 cubic feet)
- Hazardous waste: 0.73 cubic meters (26 cubic feet)
- Low-level radioactive waste: 450 cubic meters (16,000 cubic feet)
- Greater-Than-Class C waste: 0 cubic meters (0 cubic feet)
- Transuranic waste: 0 cubic meters (0 cubic feet)
- Mixed low-level radioactive waste: 0.14 cubic meters (5 cubic feet)

Slight variations in packaged waste volumes reflect differences in packaging requirements between the disposal options. These estimated waste volumes are based on the Commercial Disposal Option discussed in the text box in Section 2.4.

2.4.4.3 Time Sequencing of Maintenance and Replacement Activities

A typical schedule of the stewardship activities of the No Action Alternative is shown on **Figure 2–9**. The activities necessary to monitor, maintain, and/or operate facilities would be ongoing, while those activities necessary to ensure protection of the public and the environment would be performed periodically (e.g., about once every 20 to 25 years) and would be completed within 1 year. Maintenance and replacement activities would continue indefinitely.

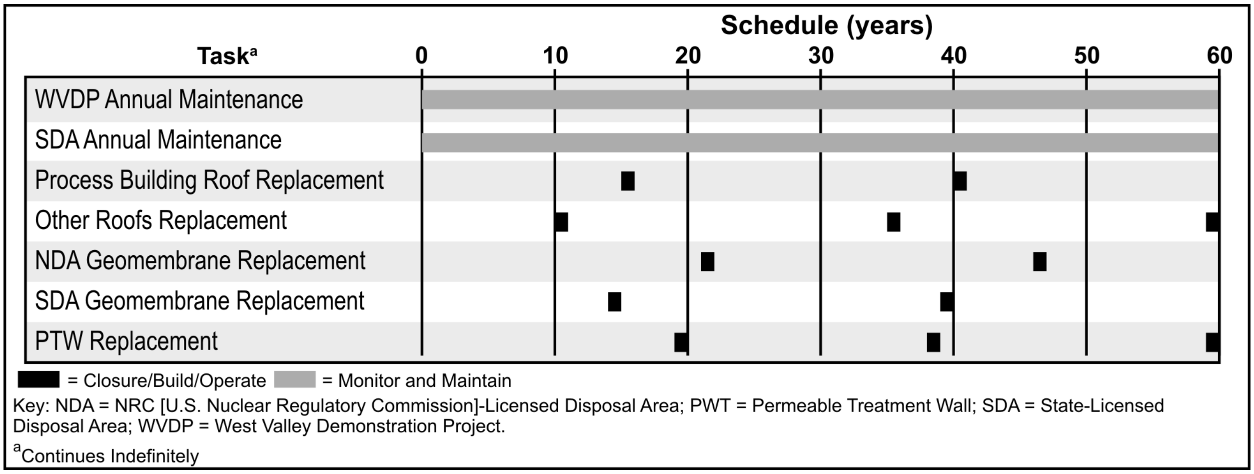


Figure 2–9 No Action Alternative – Sequencing of Implementation Activities

2.4.4.4 Monitoring and Institutional Controls

Environmental monitoring is expected to continue as currently conducted and described in Chapter 3, Sections 3.6.1, 3.6.1.1, 3.6.2.3, 3.7.2, and 3.11.1. There are two general components of the WVDP environmental monitoring program: effluent monitoring and environmental surveillance. In addition, there is a separate monitoring program for SDA.

Institutional controls currently in place would remain. These controls would include maintaining a security workforce; security hardware, such as fencing and monitoring devices; and operating procedures designed to ensure a safe and secure site.

2.5 Alternatives Considered but Eliminated from Detailed Analysis

2.5.1 Indefinite Storage of Decommissioning or Long-term Management Waste in Existing or New Aboveground Structures

DOE and NYSERDA do not consider the use of existing structures or construction of new aboveground facilities at WNYNSC for indefinite storage of decommissioning or long-term management waste to be a reasonable alternative for further consideration. The indefinite storage of waste in this manner is inconsistent with the NRC License Termination Rule and Final Policy Statement on WVDP Decommissioning. In the ROD for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997a), DOE announced its decision that sites such as the Project Premises would ship their low-level radioactive waste and mixed low-level radioactive waste to other DOE sites that have disposal capabilities for these wastes (65 FR 10061). This decision did not preclude the use of commercial disposal facilities. The construction, subsequent maintenance, and periodic replacement over time of new facilities for indefinite onsite waste storage at WNYNSC would be impractical from a cost, programmatic, health, and environmental standpoint. Thus, DOE would not consider indefinite onsite waste storage in new or existing facilities to be a viable waste management alternative for its decommissioning actions at the Project Premises. In addition, the WVDP Act calls for DOE to decontaminate and decommission facilities. NYSERDA would use available commercial facilities for disposal of any non-WVDP low-level radioactive waste and mixed low-level radioactive waste that it may generate in lieu of incurring the costs of new construction.

2.5.2 Walk Away

The 1996 *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (Cleanup and Closure Draft EIS)* included analysis of an alternative that involved discontinuing all operations and essentially "walking away" from WNYNSC, its facilities, and its wastes (DOE 1996a). This "Walk Away" Alternative was intended to help DOE and the public understand the inherent risks of site facilities, buried waste, environmental contamination, and site erosion. (This alternative was also identified in the March 13, 2003, Notice of Intent for this EIS, but it was called the No Action Alternative). In the 1996 *Cleanup and Closure Draft EIS* and in this EIS, this option was not considered a reasonable alternative.

After additional consideration, the lead agencies, in consultation with the cooperating agencies, decided to eliminate the Walk Away Alternative and redefine the No Action Alternative. The Walk Away Alternative, as defined in the 1996 *Cleanup and Closure Draft EIS*, was not a reasonable alternative because it would not satisfy the requirements of the WVDP Act, it would not satisfy requirements for DOE and NYSERDA under 6 NYCRR Part 373 and RCRA, and it would pose major public health and safety issues. Further, neither of the lead agencies would or could select this alternative because it would represent a violation of their duties and statutory responsibilities.

2.6 Comparison of Alternatives

This section summarizes the environmental impacts of the alternatives in a concise comparative form, thus sharply defining the issues and providing a clear basis for selection among the alternatives, as required by 40 CFR 1502.14. This section also summarizes the environmental impacts for those resource areas with impacts that have meaningful differences among the alternatives.

Chapter 4 of this EIS presents an analysis of the environmental impacts, by resource area, of implementing each alternative. These analyses form the analytical basis for the concise comparison of alternatives in this section. See Chapter 4 for more information on impacts by resource area for each alternative, including the impacts of those resource areas not presented in this section. The analyses for the Phased Decisionmaking Alternative presented in Chapter 4 are based on making a Phase 2 decision 30 years after the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. This is consistent with the longest timeframe allowed for making a Phase 2 decision for the Phased Decisionmaking Alternative evaluated in the Revised Draft EIS. The Phased Decisionmaking Alternative, the Preferred Alternative for this EIS, now specifies that the Phase 2 decision would be made no later than 10 years after issuance of the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. The potential effect of making the Phase 2 decision in 10 years rather than 30 years is addressed qualitatively in this section.

The comparison of alternatives is organized into three sections that present impacts for specific resource areas that have meaningful differences in impacts among the alternatives. These include:

- Short-term impacts, the potential impacts that could result from implementing the decommissioning actions (e.g., removal or in-place closure)
  - Land use: land available for release
  - Socioeconomics: employment levels

  - Human health and safety: population dose and worker dose
  - Waste management: waste generation
  - Transportation: population dose and worker dose
- Long-term impacts, the potential impacts that could result from wastes and contamination remaining on site
  - Human health and safety: population dose to downgradient water users and potential intruders
- Cost-benefit considerations

Other resource areas that are addressed in Chapter 4 are not discussed in this comparison of alternatives because, although there may be differences in impacts among the alternatives, the differences are not considered meaningful enough to discriminate among the alternatives. The potential effect on these resource areas from this change in the timing of the Phase 2 decision for the Phased Decisionmaking Alternative has also been qualitatively addressed. This assessment indicates that the duration of Phase 1 (10 years or 30 years) does not change the overall impact for any of these resource areas because there are no actions that would result in environmental consequences on these resource areas between the completion of Phase 1 decommissioning actions and the initiation of Phase 2 actions.

The Sitewide Removal and Sitewide Close-In-Place Alternatives are decommissioning alternatives, with defined end states. Decommissioning actions for Phase 1 of the Phased Decisionmaking Alternative have been defined and the impacts have been analyzed. Phase 2 impacts are expected to be generally bounded by those identified for the Sitewide Removal and Sitewide Close-In-Place Alternatives. If the Phase 2 decision for the SDA is continued active management, Phase 2 impacts for some resource areas are expected to be bounded by those for the No Action Alternative. Therefore, a qualitative statement can be made about the range of impacts for the Phased Decisionmaking Alternative. The No Action Alternative is not a decommissioning alternative because no actions would be taken to reconfigure the site.

2.6.1 Short-term Impacts

Short-term impacts for the five resource areas identified as having meaningful differences among the alternatives are presented in **Table 2–3**. Additionally, the duration of the decommissioning and monitoring and maintenance periods for each of the alternatives is shown in Table 2–3 for comparison.

To construct the analytical basis for evaluation of project impacts, appropriate analytical tools and methods were used to estimate potential environmental impacts. The best available information on waste inventory and characteristics, site characteristics and processes, and engineering approaches was used in the analysis. Uncertainty has been addressed by performing multiple analyses (e.g., alternate disposal configurations, alternate transportation modes, institutional control continuance and loss) and using conservative assumptions that were consistently applied to all alternatives. This approach was performed in a manner intended to avoid bias in the comparison of alternatives.

The impacts evaluated for each of the decommissioning alternatives include those from approximately 30 years of storage of vitrified high-level radioactive waste in the Interim Storage Facility followed by waste removal for shipment to offsite disposal facilities and then demolition of the Interim Storage Facility. If the waste is stored on site for a longer period of time, the major annual incremental impacts are additional site employment (about 3 additional workers per year) and additional occupational exposure (0.2 person-rem per year). If the storage period is extended, the impacts of Interim Storage Facility demolition would be delayed.

Table 2–3 Comparison of Alternatives by Resource Areas for Short-term Impacts [a]

Resource Area	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1 only)* [b,c]	*No Action Alternative*
Duration of Decommissioning Action	60 years	7 years	8 years	None
Duration of Post-Decommissioning Monitoring and Maintenance or Stewardship	Necessary only while any orphan waste is being stored.	In perpetuity	In perpetuity if Phase 2 involves in-place closure.	No decommissioning. Monitoring and Maintenance in perpetuity.
Land Use [d] – land estimated to be available for unrestricted release upon completion of alternative	Entire 1,351 hectares (except for any land used for orphan waste storage)	1,118 hectares	693 hectares	693 hectares
Socioeconomics [e] – average employment	Decommissioning: 250 employees annually Monitoring and Maintenance: 20 employees (assuming orphan waste storage)	Decommissioning: 320 employees annually Monitoring and Maintenance: About 31 employees annually until Interim Storage Facility removed; then about 18, indefinitely	Decommissioning: 230 employees annually Monitoring and Maintenance: About 50 employees annually, up to 30 years	Monitoring and Maintenance: About 75 employees annually, indefinitely
Human Health and Safety (public) [f] – population dose (and risk) to the public	Decommissioning: 120 person-rem (0.027 LCF) Monitoring and Maintenance: negligible dose, even if orphan and legacy waste are stored on site	Decommissioning: 40 person-rem (0.012 LCF) Monitoring and Maintenance: 0.0015 person-rem for periodic permeable treatment wall replacement, if necessary; and one-time Interim Storage Facility removal.	Decommissioning: 42 person-rem (0.0056 LCF) Monitoring and Maintenance: 0.038 person-rem for one-time permeable treatment wall replacement, if necessary; one-time Interim Storage Facility removal; and ongoing WMA 3 operations	Monitoring and Maintenance: 0.083 person-rem per year
– peak annual MEI dose	1.3 millirem (2.0×10^{-7} LCF)	0.16 millirem (4.2×10^{-8} LCF)	2.2 millirem (3.5×10^{-7} LCF)	0.61 millirem (2.1×10^{-7} LCF)
Human Health and Safety (site workers) [g] – worker population dose (and risk)	Decommissioning: 990 person-rem (0.60 LCF) Monitoring and Maintenance following decommissioning actions: 0.15 person-rem (8.0×10^{-5} LCF) per year if orphan waste is stored on site.	Decommissioning: 120 person-rem (0.0070 LCF) Monitoring and Maintenance following decommissioning actions: 0.80 person-rem (5.0×10^{-4} LCF) per year	Decommissioning: 160 person-rem (0.090 LCF) Monitoring and Maintenance following decommissioning actions: 1.7 person-rem (1.0×10^{-3} LCF) per year	Monitoring and Maintenance: 2.0 person-rem per year (0.0010 LCF)
– average worker dose from decommissioning actions	66 millirem (4.0×10^{-5} LCF) per year	54 millirem (3.0×10^{-5} LCF) per year	83 millirem (5.0×10^{-5} LCF) per year	No decommissioning occurs
Waste Management [h] – packaged decommissioning waste (cubic meters)	140,000 nonhazardous 15 hazardous 1,500,000 LLW [h] 4,200 GTCC [h] 1,000 TRU [h] 570 MLLW 1,600,000 Total	15,000 nonhazardous 3 hazardous 9,900 LLW [h] 0 GTCC 35 TRU [h] 410 MLLW 26,000 Total	33,000 nonhazardous 2 hazardous 180,000 LLW [h] 0 GTCC 710 TRU [h] 41 MLLW 210,000 Total	None
Waste Management [h] – packaged monitoring and maintenance (M&M) or long-term stewardship (LTS) waste (cubic meters per year)	3.2 LLW [i] (assuming orphan waste storage)	0 nonhazardous, 0 hazardous 110 LLW 0 GTCC 0 TRU 0 MLLW 110 Total (LTS)	6 nonhazardous, <1 hazardous 140 LLW 0 GTCC 0 TRU 0 MLLW 150 Total (M&M)	32 nonhazardous, 1 hazardous 450 LLW 0 GTCC 0 TRU <1 MLLW 480 Total (M&M)

Resource Area	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1 only)* [b,c]	*No Action Alternative*
Transportation [j, k] – dose and risk to the public along transportation routes during transportation (person-rem [LCFs])	<u>DOE/Commercial</u> Truck: 370 (0.22) Rail: 94 (0.057) <u>Commercial</u> Truck: 350 (0.21) Rail: 94 (0.057)	<u>DOE/Commercial</u> Truck: 11 (6.6×10^{-3}) Rail: 2.8 (1.7×10^{-3}) <u>Commercial</u> Truck: 9.9 (6.0×10^{-3}) Rail: 2.6 (1.6×10^{-3})	<u>DOE/Commercial</u> Truck: 72 (0.043) Rail: 16 (9.8×10^{-3}) <u>Commercial</u> Truck: 58 (0.035) Rail: 16 (9.7×10^{-3})	<u>DOE/Commercial</u> Truck: 12 (7.1×10^{-3}) Rail: 2.6 (1.6×10^{-3}) <u>Commercial</u> Truck: 9.8 (5.9×10^{-3}) Rail: 2.6 (1.6×10^{-3})
Transportation [j, k] – dose and risk to transportation workers during transportation (person-rem [LCFs]) [l]	<u>DOE/Commercial</u> Truck: 2,100 (1.2) Rail: 65 (0.039) <u>Commercial</u> Truck: 2,200 (1.3) Rail: 65 (0.039)	<u>DOE/Commercial</u> Truck: 49 (0.029) Rail: 1.9 (1.2×10^{-3}) <u>Commercial</u> Truck: 45 (0.027) Rail: 1.4 (8.5×10^{-4})	<u>DOE/Commercial</u> Truck: 270 (0.16) Rail: 11 (6.5×10^{-3}) <u>Commercial</u> Truck: 400 (0.24) Rail: 11 (6.5×10^{-3})	<u>DOE/Commercial</u> Truck: 38 (0.023) Rail: 1.7 (1.0×10^{-3}) <u>Commercial</u> Truck: 31 (0.019) Rail: 1.4 (8.2×10^{-4})
Transportation [j, k] – nonradiological accident risk (number of traffic fatalities)	<u>DOE/Commercial</u> Truck: 9.7 / Rail: 15 <u>Commercial</u> Truck: 10 / Rail: 15	<u>DOE/Commercial</u> Truck: 0.10 / Rail: 0.17 <u>Commercial</u> Truck: 0.12 / Rail: 0.17	<u>DOE/Commercial</u> Truck: 1.0 / Rail: 1.8 <u>Commercial</u> Truck: 1.3 / Rail: 1.8	<u>DOE/Commercial</u> Truck: 0.050 / Rail: 0.090 <u>Commercial</u> Truck: 0.060 / Rail: 0.090

GTCC = Greater-Than-Class C waste, LCF = latent cancer fatality, LLW = low-level radioactive waste, MEI = maximally exposed individual, MLLW = mixed low-level radioactive waste, TRU = transuranic waste.

[a] Totals may not add due to rounding. All values except for land use are rounded to no more than two significant figures.

[b] Magnitude of impacts for the Phased Decisionmaking Alternative depends on the Phase 2 activities implemented.

[c] The analyses for the Phased Decisionmaking Alternative presented in Chapter 4 of this EIS are based on making a Phase 2 decision 30 years after the initial ROD and Findings Statement, if the Phased Decisionmaking alternative is selected, and the impacts identified in this table result from those analyses. The Phased Decisionmaking Alternative now specifies that Phase 2 decisions would be made no later than 10 years after issuance of such a ROD and Findings Statement. The potential impact of the change in decision point timing is qualitatively addressed in the text in this section of the EIS.

[d] Source: Chapter 4, Table 4–1, of this EIS, "Summary of Land and Visual Resources Impacts."

[e] Source: Chapter 4, Table 4–11, of this EIS, "Summary of Socioeconomic Impacts."

[f] Source: Chapter 4, Table 4–12, of this EIS, "Summary of Health and Safety Impacts." The peak annual dose to the MEI is the highest of the following locations: receptor at nearest site boundary, on Cattaraugus Creek near the site, or on the lower reaches of Cattaraugus Creek.

[g] Source: Chapter 4, Table 4–18, of this EIS, "Projected Worker Dose and Risk During and After Decommissioning."

[h] Source: Chapter 4, Table 4–46, of this EIS, "Summary of Waste Management Impacts." For all decommissioning alternatives, up to approximately 3.2 cubic meters (110 cubic feet) per year of additional low-level radioactive waste could be generated due to management of orphan waste.

[i] Pre-West Valley Demonstration Project Class B and C low-level radioactive waste, Greater-Than-Class C low-level radioactive waste, and non-defense transuranic waste do not have a clear disposal path and may need to be stored on site until a disposal location is identified. DOE plans to select a location for a disposal facility for Greater-Than-Class C waste and potential non-defense transuranic waste following completion of the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (GTCC EIS)* (DOE/EIS-0375).

[j] Source: Chapter 4, Table 4–53, of this EIS, "Risks of Transporting Radioactive Waste Under Each Alternative."

[k] For the purpose of comparison with other alternatives, transportation impacts for the No Action Alternative are provided for monitoring and maintenance activities over a 20-year period, which would continue to recur in 20-year cycles. Under the DOE/Commercial Disposal Option, DOE low-level radioactive wastes are assumed to go to the Nevada Test Site and commercial low-level radioactive wastes would go to a western U.S. commercial disposal site. Under the Commercial Disposal Option, only commercial facilities would be used for DOE and commercial low-level radioactive waste. However, for purposes of analysis only, it was assumed that transuranic waste and Greater-Than-Class C waste would be transported to the Waste Isolation Pilot Plant and the Nevada Test Site, respectively. There would be no disposition for transuranic waste, Class B and C low-level radioactive wastes, or Greater-Than-Class C wastes.

[l] The dose to transportation workers presented in this table does not reflect administrative controls applied to the workers. In practice, workers who are not trained radiation workers would be limited to a dose of 100 millirem per year, and trained radiation workers would be limited to an Administrative Control Limit of 2 rem per year, which would represent an annual risk of 0.0012 LCF for a trained radiation worker. Enforcement of the administrative limit would most likely be necessary under the Sitewide Removal Alternative.

Note: To convert hectares to acres, multiply by 2.471; cubic meters to cubic feet, multiply by 35.314.

2.6.1.1 Land Use

The Sitewide Removal Alternative would result in the most land area available for release for unrestricted use, which would be the entire 1,351 hectares (3,338 acres) of WNYNSC. With the exception of land needed to manage any orphan waste that would remain on site until a disposition path is available, the entire site would be remediated to meet NRC's standards for license termination without restriction, potentially allowing it to be used for other purposes.

The Sitewide Close-In-Place Alternative would ultimately result in an estimated 1,118 hectares (2,762 acres) being available for release for unrestricted use. After completion of decommissioning activities and decay of the Cesium Prong, much of the site would be available for release for unrestricted use. Land would need to be retained for access control, as buffer areas, and for maintenance and erosion control. The exact amount and timing of land release from WNYNSC would be the result of interactions among NYSERDA, NRC, DOE (until completion of WVDP), and other Federal and state agencies having jurisdiction.

Following completion of Phase 1 of the Phased Decisionmaking Alternative, an estimated 693 hectares (1,712 acres) of land would be available for release for unrestricted use. The amount of land available for release following implementation of Phase 2 would depend on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, the remaining 658 hectares (1,626 acres) would become available, and the total land available for release for unrestricted use would be the same as that for the Sitewide Removal Alternative. If the Phase 2 decision for the SDA is continued active management, the amount of land available for release would be reduced by approximately 6.1 hectares (15 acres), plus land needed for a buffer area. If the decision is in-place closure of all remaining waste and contamination, an additional 425 hectares (1,050 acres) would be available for release for unrestricted use, similar to that for the Sitewide Close-In-Place Alternative. There would be no change in the amount of land available for release if the Phase 2 decision for the SDA is continued active management.

Making the Phase 2 decision at 10 years rather than 30 years would result in additional land becoming available for unrestricted release about 20 years sooner.

For the No Action Alternative, an estimated 693 hectares (1,712 acres) would be available for release for unrestricted use. This land would not be needed for continued management and oversight.

Release of land under all alternatives would be subject to meeting all regulatory requirements, including those promulgated by NRC, the U.S. Environmental Protection Agency (EPA), NYSDEC, and NYSDOH.

2.6.1.2 Socioeconomics

For decommissioning activities, the Sitewide Removal Alternative would have the greatest impact on employment because the duration of decommissioning activities would continue longer under this alternative than any of the other alternatives. Phase 1 of the Phased Decisionmaking Alternative would result in average annual employment levels similar to those for the Sitewide Removal Alternative, while the average employment level for the Sitewide Close-In-Place Alternative would be about 28 percent higher than that for the Sitewide Removal Alternative. Decommissioning employment for the Sitewide Close-In-Place Alternative and Phase 1 of the Phased Decisionmaking Alternative, however, would not last as long as for the Sitewide Removal Alternative. The short-term socioeconomic impact of all alternatives is positive because local employment would be maintained. The negative impact associated with the completion of decommissioning actions would cause only limited disruption because WNYNSC is not a major employer on a local or regional scale.

There would be no post-decommissioning employment required for monitoring and maintenance activities for the Sitewide Removal Alternative, assuming there is no need for orphan waste storage. The Sitewide Close-In-Place and No Action Alternatives would require a reduced employment level for an indefinite period of time.

If the Phase 2 decision is removal of all remaining waste and contamination, the employment levels and related socioeconomic impacts for the entire Phased Decisionmaking Alternative would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision for the SDA is continued active management, the overall labor required for both phases of the alternative would decrease by about 25 percent because the reduction in personnel needed for removal activities would outweigh the additional maintenance personnel. If the Phase 2 decision is in-place closure, employment levels and socioeconomic impacts for the Phased Decisionmaking Alternative would be equal to or slightly less than those for the Sitewide Close-In-Place Alternative. If the Phase 2 decision for the SDA is continued active management, the overall labor requirement for both Phases of the Alternative would decrease by about 15 percent. In either case, approximately 10 employees would be required for continued active management of the SDA.

Making the Phase 2 decision at 10 years rather than 30 years would eliminate the approximately 20-year period of reduced employment that would occur between completion of Phase 1 decommissioning activities and the beginning of Phase 2 actions. In addition to avoiding a reduction in employment levels, implementation of Phase 2 activities at 10 years would have the advantage of a mobilized and trained workforce available to immediately begin implementing Phase 2.

Based on the expected changes in employment levels for each of the alternatives, there would be no discernable impact on the economies of the local and regional areas surrounding WNYNSC.

2.6.1.3 Human Health and Safety

Decommissioning actions would result in radiological releases to the atmosphere and to local surface waters. These releases would result in radiation doses and associated risk of latent cancer fatalities (LCFs)[6] to offsite individuals and populations. The number of LCFs can be used to compare the risks among the various alternatives. The decommissioning actions would also result in occupational exposure to site workers. Collective radiological doses to the public and to site workers from decommissioning actions would be highest under the Sitewide Removal Alternative. Actions to implement Phase 1 of the Phased Decisionmaking Alternative would generate doses to workers that are higher than those for the Sitewide Close-In-Place Alternative.

Excluding the No Action Alternative, the projected total radiological dose to the general population within an 80-kilometer (50-mile) radius of WNYNSC from decommissioning would range from about 40 person-rem for the Sitewide Close-In-Place Alternative to about 120 person-rem for the Sitewide Removal Alternative. These doses would result in less than 1 (0.0056 to 0.027) additional LCF within the affected population as a result of decommissioning actions under any of the alternatives. The decommissioning dose to this population for Phase 1 of the Phased Decisionmaking Alternative is 42 person-rem, which is slightly higher than the dose for the Sitewide Close-In-Place Alternative. Because the dose to the general population would be negligible during monitoring and maintenance after the Phase 1 decommissioning actions are complete, the general population would not be affected by the timing of the Phase 2 decision.

If the Phase 2 decision is removal of all remaining waste and contamination, the total dose to this population for this alternative (both Phase 1 and Phase 2) would be essentially equal to that for the Sitewide Removal Alternative (i.e., about 120 person-rem). If the Phase 2 decision is in-place closure, the total dose to this

[6] *LCF is a term to indicate the estimated number of cancer fatalities that may result from exposure to ionizing radiation. Dose conversion factors are used to convert radiation dose to LCFs.*

population from both phases of this alternative would be less than 82 person-rem, which is sum of the population dose for Phase 1 and the Sitewide Close-In-Place Alternative. If the Phase 2 decision for the SDA is continued active management, the total dose to this population would be bounded by this 82 to 120 person-rem range.

The peak annual dose to a maximally exposed individual located at the site boundary would be highest for Phase 1 of the Phased Decisionmaking Alternative (about 2.2 millirem) because it has the highest annual radionuclide release rate. For perspective, the average individual dose in the United States from ubiquitous background and other sources of radiation is about 620 millirem per year (NCRP 2009).

The total estimated worker dose from decommissioning actions would range from about 120 person-rem for the Sitewide Close-In-Place Alternative to about 990 person-rem for the Sitewide Removal Alternative. The decommissioning worker population dose for Phase 1 of the Phased Decisionmaking Alternative is about 160 person-rem, which is slightly higher than that for the Sitewide Close-In-Place Alternative. The annual worker population dose during the monitoring and maintenance portion of Phase 1 is about 1.7 person-rem, so making the Phase 2 decision within 10 years rather than 30 years would reduce the total estimated worker population dose by about 34 person-rem.

If the Phase 2 decision is removal of the remaining waste and contamination, the total worker dose for this alternative (both Phase 1 and Phase 2) would be the same as that for the Sitewide Removal Alternative (about 990 person-rem). If the Phase 2 decision is in-place closure, the total worker dose from both phases of this alternative is estimated to be about 240 person-rem, which is less than the sum of the worker dose for Phase 1 and the Sitewide Close-In-Place Alternative. The higher worker dose (Sitewide Removal) would still be expected to result in less than 1 (0.60) additional LCF among the involved worker population. Reduced total decommissioning worker doses would result if the Phase 2 decision for the SDA is continued active management.

The average individual worker dose from decommissioning actions would range from about 54 millirem per year for the Sitewide Close-In-Place Alternative to 83 millirem per year for Phase 1 of the Phased Decisionmaking Alternative, which are well below the 500-millirem-per-year administrative limit established for activities on the Project Premises (WVNSCO 2006). All workers in radiation areas would be monitored to ensure that their exposures remain within these annual limits.

2.6.1.4 Waste Management

Depending on the alternative, construction, operations, and decommissioning actions would generate several types of waste, as discussed in this section.

The Sitewide Removal Alternative would generate the largest volume of waste from decommissioning, including nonhazardous, hazardous, low-level radioactive, mixed low-level radioactive, Greater-Than-Class C, and transuranic waste, but no waste from long-term stewardship. Nonhazardous waste is common demolition debris that would be expected to have no adverse impact on the capacities of commercial disposal facilities. Much of the Class A low-level radioactive waste is lightly contaminated low-specific-activity waste that would be expected to have no adverse impact on the capacities of DOE or commercial disposal facilities. Until the issues related to disposal of commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, and non-defense transuranic waste are resolved, these potentially orphan wastes would be stored in the new Container Management Facility. A decision regarding a disposal facility for Greater-Than-Class C waste and potential non-defense transuranic waste would be expected to be announced in a ROD for the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (GTCC EIS)* (DOE/EIS-0375), currently under preparation.

Phase 1 of the Phased Decisionmaking Alternative would generate the second largest volume of waste from decommissioning activities, including nonhazardous, hazardous, low-level radioactive, mixed low-level radioactive, and transuranic waste. Nonhazardous waste is common demolition debris that would be expected to have no adverse impact on the capacities of commercial disposal facilities. Much of Class A low-level radioactive waste is lightly contaminated low-specific-activity waste that would be expected to have no adverse impact on the capacities of DOE or commercial disposal facilities. Until the issues related to disposal of non-defense transuranic waste are resolved, this potentially orphan waste would be stored in LSA 4. Making the Phase 2 decision in 10 years would reduce the total volume of Phase 1 waste by less than 2 percent because waste from monitoring and maintenance activities would not be generated for more than 2 years.

If the Phase 2 decision is removal of all remaining waste and contamination, the total decommissioning waste volumes for the Phased Decisionmaking Alternative would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management of the SDA and removal of the remaining waste and contamination, there would be about 30 percent less Class A low-level radioactive waste, including low-specific-activity waste, generated from decommissioning than that for the Sitewide Removal Alternative, and almost no mixed low-level radioactive, Class B and C, and Greater-Than-Class C waste. If the Phase 2 decision is in-place closure of all remaining waste and contamination, the total decommissioning waste volumes generated for the Phased Decisionmaking Alternative would be the sum of the Phase 1 waste volume plus about 30 percent of the waste volume generated under the Sitewide Close-In-Place Alternative. If the Phase 2 decision is continued active management of the SDA and in-place closure of the remaining waste and contamination, the total volume of waste from decommissioning would be slightly lower than these estimates.

The Sitewide Close-In-Place Alternative would generate the least amount of waste from decommissioning, including nonhazardous, hazardous, low-level radioactive, mixed low-level radioactive, and transuranic waste. Some low-level radioactive waste would also be generated during long-term stewardship activities. Until the issues related to disposal of commercial Class B and C low-level radioactive waste and non-defense transuranic waste are resolved, these potentially orphan wastes would be stored in LSA 4.

The No Action Alternative would generate no waste from decommissioning activities but the largest annual volume of waste, primarily low-level radioactive waste, from monitoring and maintenance activities.

2.6.1.5 Transportation

Both radiological and nonradiological impacts would result from shipment of radioactive waste from WNYNSC to offsite disposal sites. DOE and NYSERDA could choose to use a combination of rail and truck shipments during the implementation of any of the alternatives. The dose to the population along the transport route would range from about 2.8 person-rem, which is associated with transporting all waste by rail under the DOE/Commercial Disposal Option (discussed in the text box at the beginning of Section 2.4) for the Sitewide Close-In-Place Alternative, to about 370 person-rem which is associated with transporting all waste by truck under the DOE/Commercial Disposal Option for the Sitewide Removal Alternative. Less than 1 (0.0017 to 0.22) additional LCF would be expected from such exposures to the general population. The impacts are dependent on the distance traveled and the number of people residing along the transportation routes.

The dose and risk information in Table 2–3 for transportation workers assumes that no administrative controls would be placed on the workers; however, DOE limits dose to a worker to 5 rem per year (10 CFR 835.202) and sets an administrative control limit of 2 rem per year (DOE 1999b). A 2-rem dose corresponds to a risk of about 0.0012 LCF.

For the Sitewide Removal Alternative, the highest collective radiation dose to transportation workers would occur under the Commercial Disposal Option (discussed in the text box at the beginning of Section 2.4) using all truck shipments; the highest dose to the population along the transport route would occur under the

DOE/Commercial Disposal Option, also using all truck shipments. For the Sitewide Close-In-Place Alternative, the highest collective dose to transportation workers would occur under the DOE/Commercial Disposal Option using all truck shipments, while the highest dose to the population along the transportation route would occur under the DOE/Commercial Disposal Option, also using all truck shipments. For Phase 1 of the Phased Decisionmaking Alternative, the highest collective dose to transportation workers would be from the all-truck Commercial Disposal Option; the highest dose to the population along the transportation route would be from the all-truck DOE/Commercial Disposal Option. Making the Phase 2 decision in 10 years would result in about a 2 percent reduction in the total number of waste shipments during Phase 1. This would result in about a 4 percent reduction in the collective dose to transportation workers and about a 5 percent reduction in the dose to the population along the transportation route.

If the Phase 2 decision is removal of all remaining waste and contamination, the total transportation worker and population radiological dose and risk for this alternative (both Phase 1 and Phase 2) would be essentially equal to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management for the SDA and removal of remaining waste and contamination in the remainder of the site, the total transportation dose and risk for both phases of the alternative would be about 40 percent less than those for the Sitewide Removal Alternative. This reduction in dose and risk would result because the wastes that were projected to be removed from the SDA would not be removed nor transported to offsite disposal facilities. If the Phase 2 decision is in-place closure for all remaining waste and contamination, the total transportation worker and population dose and risk for both phases of this alternative would be about 5 percent higher than those for Phase 1 alone because the Phase 2 closure actions would cause only a small increase in the volume of low-level radioactive waste to be shipped. If the Phase 2 decision is continued active management for the SDA and in-place closure for the remainder of the site, the total transportation dose and risk for both phases of the alternative would be essentially equivalent to those for Phase 1 alone, because no radioactive waste would be generated from removal of the existing geomembrane cover and construction of an engineered SDA cap.

For the No Action Alternative, assuming 20 years of waste shipments, the highest dose to transportation workers and population along the transport route would occur under the all-truck DOE/Commercial Disposal Option.

The Sitewide Removal Alternative has the highest nonradiological health risk to the public, ranging from about 9.7 to 15 traffic or rail accident fatalities for the various shipping options.[7] The other alternatives would result in less than 1 nonradiological accident fatality, except for Phase 1 of the Phased Decisionmaking Alternative, which would have a risk of 1.8 fatalities for the rail shipping options. If the Phase 2 decision is removal of all remaining waste and contamination, total nonradiological health risks for this alternative (Phases 1 and 2) would be essentially equivalent to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management for the SDA and removal of waste and contamination in the remainder of the site, total nonradiological impacts would be about 30 percent less than those for the Sitewide Removal Alternative, principally because there would be fewer offsite shipments of waste. If the Phase 2 decision is in-place closure for all remaining waste and contamination, the total nonradiological health risk for both phases of this alternative would be higher than the Phase 1 risk, principally because of deliveries of construction and erosion control materials. If the Phase 2 decision is continued active management for the SDA and in-place closure of the remainder of the site, total nonradiological impacts would be less because there would be no deliveries of the construction and erosion control materials required to build the engineered SDA cap.

Considering that the transportation activities would occur over a period of time ranging from about 7 to 60 years and that the average number of annual traffic fatalities in the United States is about 40,000 per year (NHTSA 2006), the traffic fatality risks under all alternatives would be very small.

[7] *The nonradiological accident fatality estimates for rail transport are based on the conservative assumption of one waste railcar per train.*

2.6.2 Long-term Impacts

This section summarizes the estimated long-term impacts associated with the alternatives (see Chapter 4, Section 4.1.10, of this EIS for additional information). For analysis purposes, "long-term" extends from the end of the decommissioning action implementation period to at least 10,000 years into the future, and perhaps longer if the projected peak annual impacts occur later. The impacts were estimated using models that account for site features and processes that facilitate contaminant transport, as well as natural and engineered barriers that mitigate contaminant transport. The models projected the dose and risk consequences as a function of time to a spectrum of offsite and onsite receptors engaged in a variety of potential exposure scenarios. For alternatives where the amount and configuration of remaining contamination could be quantitatively estimated (the Sitewide Close-In-Place and No Action Alternatives), the analysis includes scenarios where long-term institutional controls were assumed to be permanently retained, as well as scenarios where long-term institutional controls were assumed to be lost after 100 years. The latter case includes a separate, unmitigated erosion scenario that assumes institutional controls are lost for hundreds of years and not reinstated before impacts would be evident.

Table 2–4 provides an overview comparison of the estimated long-term radiological dose impacts among the alternatives (the analysis showed that the risks from long-term release of hazardous chemicals are very small relative to those from radionuclides). The top two sections of Table 2–4 compare doses to populations and individual receptors, respectively, assumed to use untreated water obtained from Lake Erie or the Niagara River; the third section compares doses to postulated receptors assumed to farm alongside and use untreated water from Cattaraugus Creek downstream of WNYNSC; and the fourth section compares doses to a spectrum of postulated receptors assumed to access WNYNSC after institutional controls are lost. The Lake Erie and Niagara River water user populations and individual receptors were assumed to consume and garden with untreated river or lake water and to consume fish from the lake. The Cattaraugus Creek receptors were assumed to consume water and fish and irrigate farms with untreated water obtained either directly downstream of WNYNSC or on the lower reaches of the creek. The receptor at the latter location was assumed to consume larger quantities of fish than other receptors, and could be a member of the Seneca Nation of Indians. The onsite receptors were assumed to undertake activities such as hiking and recreation, housing or well construction, or onsite farming or well water use in contaminated areas.

The Sitewide Removal Alternative would have minimal long-term impacts to the public in the vicinity of WNYNSC because this alternative transfers the long-term waste management risk and the need for long-term institutional controls to other locations where the removed materials would be disposed. Contamination would be removed from WNYNSC such that an individual in direct contact with any residual contamination would receive an annual dose of less than 25 millirem, assuming conservative land reuse scenarios that include houses, gardens, and water wells located in the highest areas of residual contamination. Other site reuse scenarios would result in substantially lower doses, and the dose to offsite receptors would be many orders of magnitude lower (i.e., negligible).

The Sitewide Close-In-Place Alternative would include additional engineering barriers and also rely on institutional controls to limit offsite and onsite doses. The peak annual dose to any offsite receptor, if institutional controls were assumed to remain in place, would be less than 1 millirem, and would be similar to that for the No Action Alternative. The peak annual dose to any offsite receptor in the event of loss of institutional controls would be less than 1 millirem if only groundwater release mechanisms were involved and could be up to 4 millirem to the Cattaraugus Creek receptors if there were extended (many hundreds of years) loss of institutional control such that unmitigated erosion would occur. Assuming unmitigated erosion, the peak annual dose to the Lake Erie and Niagara River water user receptors would be on the order of 0.4 millirem.

Table 2–4 Comparison of Long-term Human Health Radiological Consequences

Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Postulated Offsite Populations – Lake Erie and Niagara River Water Users			
Negligible dose with no need for institutional controls.	A peak annual population dose of about 95 person-rem with or without institutional controls. A peak annual population dose of about 240 person-rem assuming unmitigated erosion.[a]	If Phase 2 is removal of remaining WMAs, impacts would be comparable to those for the Sitewide Removal Alternative; if Phase 2 is close-in-place, impacts would be slightly less than those for the Sitewide Close-In-Place Alternative.[b]	A peak annual population dose of about 95 person-rem with institutional controls, and about 340 person-rem without institutional controls. A peak annual population dose of about 1,500 person-rem assuming unmitigated erosion.[a]
Postulated Individual Offsite Receptors – Lake Erie and Niagara River Water Users			
Negligible dose with no need for institutional controls.	A small peak annual dose of up to 0.2 millirem with or without institutional controls. A peak annual dose (0.4 millirem) assuming unmitigated erosion.[a]	If Phase 2 is removal of remaining WMAs, impacts would be comparable to those for the Sitewide Removal Alternative; if Phase 2 is close-in-place, impacts would be slightly less than those for the Sitewide Close-In-Place Alternative.[b]	A peak annual dose of up to 0.2 millirem with institutional controls, and up to 0.6 millirem without institutional controls. A peak annual dose of 2.7 millirem assuming unmitigated erosion.[a]
Postulated Individual Offsite Receptors – Cattaraugus Creek and Seneca Nation of Indians Receptors			
Negligible dose with no need for institutional controls.	A peak annual dose of less than 0.7 millirem to a resident farmer with or without institutional controls. A peak annual dose of up to about 4 millirem assuming unmitigated erosion.	If Phase 2 is removal of remaining WMAs, impacts would be comparable to those for the Sitewide Removal Alternative; if Phase 2 is close-in-place, impacts would be slightly less than those for the Sitewide Close-In-Place Alternative.[b]	A peak annual dose of less than 0.7 millirem with institutional controls; 2 to 3 millirem without institutional controls. A peak annual dose of 15 to 34 millirem assuming unmitigated erosion.
Postulated Individual Onsite Receptors (Intruders) Assuming Loss of Institutional Controls			
Peak annual dose to onsite receptors after unrestricted release of WNYNSC would be less than 25 millirem for onsite intruders who have gardens in contaminated soil or wells in contaminated groundwater.	Not applicable if institutional controls continue. Otherwise, a peak annual dose of less than 1 to 160 millirem for onsite intruders who have gardens in contaminated soil or wells in contaminated groundwater. A peak annual dose of 70 millirem to onsite residents and hikers assuming unmitigated erosion.	If Phase 2 is removal of remaining WMAs, impacts would be comparable to those for the Sitewide Removal Alternative; if Phase 2 is close-in-place, impacts would be slightly less than those for the Sitewide Close-In-Place Alternative.[b]	Not applicable if institutional controls remain in place. Otherwise, a peak annual dose of less than 1 millirem to 400 rem to onsite intruders who have gardens in contaminated soil or wells in contaminated water. A peak annual dose of 130 millirem to onsite residents and hikers assuming unmitigated erosion.

WMA = Waste Management Area; WNYNSC = Western New York Nuclear Service Center.

[a] Population and individual receptor doses for the Lake Erie and Niagara River water users were determined by conservatively assuming that all persons drink and garden using untreated water and consume fish from the lake, and assuming no monitoring of community drinking water treatment and distribution systems pursuant to Title 40 of the *Code of Federal Regulations* Part 141. Individual receptor doses are averages for receptors assumed to use water from the Sturgeon Point water distribution system.

[b] This is because the Main Plant Process Building, Vitrification Facility, source area for the North Plateau Groundwater Plume, and Low-Level Waste Treatment Facility Area lagoons would have been removed. Note that if the Phase 2 decision for the State-Licensed Disposal Area (SDA) is continued active management, the impacts for some exposure scenarios and receptors would be bounded by those for the No Action Alternative.

If institutional controls were lost after 100 years and there were intruders into closed WMAs containing contamination, there could be a peak annual dose (less than 1 to 160 millirem) to intruders assumed to exhume contamination from construction activities, consume food from gardens containing contaminated soil, or use untreated water from contaminated wells. Assuming unmitigated erosion, onsite residents and hikers could receive a peak annual dose of about 70 millirem). These intruder doses would be less than those for the No Action Alternative; because engineered barriers would reduce the likelihood of direct intrusion into contamination or slow the migration of contaminants. The highest intruder doses for the Sitewide Close-In-Place Alternative would be related to the North Plateau Groundwater Plume, the Main Plant Process Building, and the Waste Tank Farm.

Long-term human health impacts for the Phased Decisionmaking Alternative would depend on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, long-term impacts at the site and in the region would be the same as those for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure of all remaining waste and contamination, long-term impacts would be slightly less than those for the Sitewide Close-In-Place Alternative because the Main Plant Process Building, Vitrification Facility, source area for the North Plateau Groundwater Plume, and Low-Level Waste Treatment Facility Area lagoons would have all been removed. Neither the magnitude nor timing of the peak annual dose from units that would be closed in place is considered to be sensitive to whether the Phase 2 decision is made 10 or 30 years after the initial ROD and Findings Statement, if the Phased Decisionmaking Alternative is selected. If the Phase 2 decision for the SDA is continued active management, long-term impacts for some exposure scenarios and receptors would be bounded by those for the No Action Alternative.

The No Action Alternative is considered the baseline when evaluating the long-term performance of the various decommissioning actions. No contaminated material or radioactive waste would be removed or engineering barriers added to isolate this material or waste, but existing barriers and institutional controls would be relied on to limit offsite and onsite doses. The peak annual dose to any offsite receptor, if institutional controls were assumed to remain in place, would be less than 1 millirem, similar to that for the Sitewide Close-In-Place Alternative. The peak annual dose to any offsite receptor in the event of loss of institutional controls could be up to 3 millirem if only groundwater release mechanisms were involved and could range from about 15 to 34 millirem to the Cattaraugus Creek receptors if there were extended (many hundreds of years) loss of institutional control such that unmitigated erosion occurs. Assuming unmitigated erosion, the peak annual dose to the Lake Erie and Niagara River water user receptors would be on the order of 2.7 millirem.

If institutional controls were lost and there were intruders into the industrialized area, there could be an annual dose of less than 1 millirem to 400 rem to intruders assumed to exhume contamination from construction activities, consume food from gardens containing contaminated soil, or use untreated water from contaminated wells. The peak dose varies depending on the intruder activities and the onsite locations where the activities might occur. Assuming unmitigated erosion, onsite residents and hikers could receive a peak annual dose of about 130 millirem.

2.6.3 Cost-benefit Analysis

The incremental cost-effectiveness of the dose reduction for the alternatives is presented in **Table 2–5**. This is based on the dose reduction and the present value estimates identified in Chapter 4, Section 4.2, of this EIS.

The various decommissioning alternatives use different strategies to reducing long-term risk, which is predominantly from radiological releases. Insight into the cost-effectiveness of the alternatives is provided by comparing the ratio of the incremental cost for an alternative (the cost for an alternative less the cost of the No Action Alternative) and the net 1,000-year population dose reduction (the population dose due to removal or increased isolation less the worker and public population dose required to achieve the new end state). A cost-effectiveness analysis can be useful when comparing the alternatives and when evaluating compliance with decommissioning requirements. Additional information on the cost-benefit analysis is presented in Chapter 4, Section 4.2.

Table 2–5 Cost-Benefit Comparative Assessment [a]

Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative [b]*	*No Action Alternative*
The Sitewide Removal Alternative would transfer essentially the entire site radionuclide inventory to other disposal sites. The incremental cost-effectiveness is estimated to range from about $430,000 to $1,300,000 per avoided person-rem.	The Sitewide Close-In-Place Alternative would keep most of the site radionuclide inventory out of the site's accessible environment. The incremental cost-effectiveness is estimated to range from about $210,000 to $950,000 per avoided person-rem.	The cost-effectiveness of this alternative would depend primarily on the Phase 2 decision. If the Phase 2 decision is timely removal of the remaining waste and contamination, the incremental cost-effectiveness is estimated to range from about $230,000 to $1,300,000 per avoided person-rem. If the Phase 2 decision is timely in-place closure for the remaining waste and contamination, the incremental cost-effectiveness is estimated to range from about $450,000 to $760,000 per avoided person-rem.	The No Action Alternative serves as a baseline for assessing the incremental cost-effectiveness of the decommissioning alternatives.

WMA = Waste Management Area.

[a] The analysis was performed for all alternatives assuming real discount rates ranging from 1 to 5 percent, and unit Greater-Than-Class C waste disposal costs ranging from $2,300 to $21,000 per cubic foot (WSMS 2009e). The values in this table are based on calculations that assume continued institutional controls.

[b] The analysis for the Phased Decisionmaking Alternative assumes the Phase 2 decision is either all removal or all in-place closure of the Waste Tank Farm, NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, and State-Licensed Disposal Area.

As shown in Table 2–5, the Sitewide Close-In-Place Alternative has the lowest range of incremental cost-effectiveness, although portions of the ranges of incremental cost-effectiveness overlap for all action alternatives. The range for the Phased Decisionmaking Alternative is the broadest and is influenced, in order of importance, by the following factors: real discount rate, the nature of the Phase 2 decision (removal or in-place closure), timing of the Phase 2 decision, and if the Phase 2 decision is removal, the cost of Greater-Than-Class C waste disposal. The cost-effectiveness range for the Phased Decisionmaking Alternative in Table 2–5 includes the cost per avoided person-rem for making the Phase 2 decision at both 10 years and 30 years from the initial ROD and Findings Statement, if the Phased Decisionmaking Alternative is selected. All other factors being equal, the cost per avoided person-rem would be higher if the Phase 2 decision is made at 10 years rather than 30 years. This can be primarily attributed to the effect of the real discount rate over time.

All decommissioning alternatives appear to meet NRC's decommissioning as low as is reasonably achievable (ALARA) requirement.

2.6.4 Conclusions from Comparative Analysis of Alternatives

This section summarizes the comparison of the alternatives and illustrates the nature of the environmental tradeoffs between decommissioning and post-decommissioning impacts. This discussion also points out how the differences among the alternatives influence the magnitude and location of the decommissioning impacts (which would occur within a few to several tens of years) as well as the location of the post-decommissioning impacts (which would occur over thousands of years).

Sitewide Removal Alternative. This alternative would result in the greatest decommissioning impacts at the site, on site workers, and on the public in the vicinity of WNYNSC and along the transportation routes as waste is removed from WNYNSC over a period of about 60 years. Implementing the Sitewide Removal Alternative is estimated to result in a combined worker and population dose of about 1,300 to 3,700 person-rem. The higher estimated dose is associated with transporting 1.6 million cubic meters (56 million cubic feet) of waste by truck while the lower estimated dose is associated with transporting this waste by rail. Most of this exposure would be to site and transportation workers. Transporting this waste is estimated to result in as many as 10 to 15 fatalities from truck and rail transportation accidents, respectively. If this alternative were selected and initiated in the near future, there could be a need to store orphan waste onsite until disposal or offsite interim storage locations were available. This would require continued site presence, and monitoring and maintenance of waste storage, which would also result in an annual occupational worker exposure consequence. Lack of offsite waste disposition options would also delay completion of decommissioning.

Post-decommissioning impacts from residual contamination would be very small because this alternative transfers the long-term waste management risk and the need for institutional controls to other locations where the removed materials would be disposed.[8] However, at some point, the entire WNYNSC would be available for release for unrestricted use.

The Sitewide Removal Alternative appears to meet NRC's decommissioning ALARA requirement. This alternative is estimated to have the highest incremental cost-effectiveness range (incremental cost per avoided person-rem) using the No Action Alternative as the baseline for the calculation.

Sitewide Close-In-Place Alternative. This alternative would result in fewer decommissioning impacts at the site, on site workers, and on the public in the region of WNYNSC relative to the Sitewide Removal Alternative. This alternative would require about 7 years to complete, and would involve fewer construction-like activities and minimal waste handling activities, which would result in less worker exposure to radioactive and hazardous materials. Implementing the Sitewide Close-In-Place Alternative is estimated to result in about 164 to 215 person-rem of exposure to workers and the general population during decommissioning. The higher estimated dose is associated with transporting 26,000 cubic meters (920,000 cubic feet) of waste by truck, and the lower estimated dose is associated with transporting this waste by rail. Most of this exposure would be to site and transportation workers. Transporting this waste is estimated to result in 1 fatality from transportation accidents. Orphan waste would not be expected to be generated under this alternative. Upon completion of decommissioning activities, about 80 percent of the site would be available for unrestricted release.

After decommissioning is complete and the site is reconfigured for a long-term stewardship program, there could be post-decommissioning impacts on the public in the vicinity of WNYNSC as the radionuclides migrate from their original location and decay. The human health consequences are highly dependent on future human actions including the durability of institutional controls intended to maintain engineered barriers and to keep intruders out of waste disposal locations. The estimated peak annual dose to postulated human receptors would range from less than 1 millirem if institutional controls remain in place to approximately 160 millirem (still below background levels) for the scenario in which it is assumed that an intruder enters the site and consumes and uses water from a well installed downgradient of an area containing waste. The highest estimated peak annual dose for an unmitigated erosion scenario in which institutional controls are assumed to be lost for many hundreds of years is less than 100 millirem to a postulated onsite intruder. The natural processes that would move contamination from the site to the accessible environment would occur over a time period that would allow the migration to be monitored and time and location-specific corrective actions taken. Assuming the population in the region remains similar to the current situation and institutional controls remain in place, the estimated time-integrated population dose over 1,000 years is about 4,000 person-rem. For perspective, the total background dose that would be accumulated in 1 year solely by Lake Erie water uses would be about

[8] *The near-term and long-term consequences at offsite disposal locations would be a function of the type and amount of waste disposed at the offsite locations, the site characteristics, and the durability of institutional controls.*

350,000 person-rem. If institutional controls are assumed to fail, the population dose over 1,000 years could range from 4,000 person-rem to 170,000 person-rem. The higher value is associated with the postulated unmitigated erosion scenario.

The Sitewide Close-In-Place Alternative appears to meet NRC's decommissioning ALARA requirement. This alternative is estimated to generally have the lowest incremental cost-effectiveness range (incremental cost per avoided person-rem) using the No Action Alternative as the baseline for the calculation.

Phased Decisionmaking Alternative. Implementing Phase 1 of the Phased Decisionmaking Alternative is estimated to result in about 230 to 670 person-rem of exposure to workers and the general population during decommissioning. The higher estimated dose is associated with transporting 210,000 cubic meters (7.4 million cubic feet) of waste by truck while the lower estimated dose is associated with transporting this waste by rail. Most of this exposure would be to site and transportation workers. Transporting the waste is estimated to result in 1 to 2 fatalities from truck and rail transportation accidents, respectively.

The overall environmental consequences of decommissioning under this alternative would depend on the Phase 2 decision, which would identify the decommissioning actions for NDA, SDA, and Waste Tank Farm. If the Phase 2 decision is removal of all remaining waste and contamination, the overall decommissioning impacts would be bounded by those for the Sitewide Removal Alternative. There would also be the potential for generation of orphan waste as discussed for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure of all remaining waste and contamination, the overall decommissioning impacts would be greater than those estimated for the Sitewide Close-In-Place Alternative because of the combination of the Phase 1 removal actions followed by in-place closure of the remaining waste and contamination. If the Phase 2 decision for the SDA is continued active management, overall decommissioning impacts would be generally bounded by those for the Sitewide Removal and Sitewide Close-In-Place Alternatives, but would be bounded for some resource areas, exposure scenarios, or receptors by those for the No Action Alternative.

If the Phase 2 decision is removal of all remaining waste and contamination, the entire WNYNSC would ultimately be available for release for unrestricted use. Less land would be available for release if the Phase 2 decision for the SDA is continued active management. If the Phase 2 decision is in-place closure of all remaining waste and contamination, about 80 percent of the site ultimately would be available for release for unrestricted use. The same amount of land would be available for release if the Phase 2 decision for the SDA is continued active management.

Long-term (post-decommissioning) impacts would also depend on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, long-term impacts to the public in the vicinity of WNYNSC would be very small (similar to those for the Sitewide Removal Alternative) because the long-term waste management risk and the need for institutional controls would be transferred to other locations where removed materials would be disposed. If the Phase 2 decision is in-place closure of all remaining waste and contamination, corresponding long-term impacts would be somewhat less than those for the Sitewide Close-In-Place Alternative because the source area of the North Plateau Groundwater Plume, the Main Plant Process Building, and the Low-Level Waste Treatment Facility Area lagoons would have been removed during Phase 1. If the Phase 2 decision for the SDA is continued active management, long-term impacts for some exposure scenarios and receptors would be bounded by those for the No Action Alternative.

Reducing the duration of Phase 1 from 30 years to 10 years would result in only a small reduction in total decommissioning impacts because most Phase 1 impacts result from removal actions that occur in the first 8 years of Phase 1. The most important change in impacts associated with the shorter duration of Phase 1 would be the reduced socioeconomic impact. A shorter Phase 1 would eliminate the approximately 20-year period of reduced site employment following completion of Phase 1 decommissioning before site employment would increase again for Phase 2.

The Phased Decisionmaking Alternative appears to meet NRC's decommissioning ALARA regardless of the Phase 2 decision. The ranges of incremental cost-effectiveness are generally comparable to those for the Sitewide Removal and Sitewide Close-In-Place Alternatives, depending on the Phase 2 decision.

No Action Alternative. There would be no decommissioning impacts for the No Action Alternative because there are no decommissioning actions associated with this alternative.

Long-term impacts of the No Action Alternative would be greater than those for the Sitewide Close-In-Place Alternative because there would be fewer engineered barriers to retard the migration of radionuclides from their original locations and to act as intrusion barriers in the event of loss of institutional controls. The estimated peak annual doses to postulated human receptors would range from less than 1 millirem if institutional controls remain in place to hundreds of rems if an intruder were to consume and use water from a well installed downgradient of an area containing waste. The highest estimated peak annual dose for an unmitigated erosion scenario where institutional controls are assumed to be lost after 100 years is over 100 millirem to a postulated onsite intruder. Assuming the population in the region remains similar to the current situation and institutional controls remain in place, the estimated time-integrated population dose over 1,000 years is about 4,000 person-rem. For perspective, the total background dose that would be accumulated in 1 year solely by Lake Erie water users would be about 350,000 person-rem. If institutional controls are assumed to fail, the population dose over 1,000 years could range from 40,000 person-rem to 450,000 person-rem. The higher value is associated with the postulated unmitigated erosion scenario.

2.7 Preferred Alternative Identification and Rationale

DOE and NYSERDA have selected the Phased Decisionmaking Alternative as their Preferred Alternative. The rationale for selecting the Phased Decisionmaking Alternative is as follows:

Under this alternative, decommissioning would be completed in two phases. Phase 1 of this alternative would involve substantial removal actions. In addition, during Phase 1, additional site characterization and scientific studies would be undertaken to facilitate consensus decisionmaking for the remaining facilities or areas. Phase 1 activities are expected to take 8 to 10 years to complete. During this time, the agencies would conduct a number of activities to help determine the best technical approach to complete decommissioning of the remaining facilities.

Phase 2 actions would complete decommissioning or long-term management decisionmaking according to the approach determined most appropriate during the additional Phase 1 evaluations for each remaining facility. Comprehensive Phase 2 decisions would be made within 10 years of the initial DOE ROD and NYSERDA Findings Statement, if the Phased Decisionmaking Alternative is selected. Making decisions at this time would allow DOE and NYSERDA to maintain clean-up momentum and retain the highly skilled workforce at WNYNSC.

Phase 1 would include removal of the Main Plant Process Building and the source of the North Plateau Groundwater Plume. In addition, the lagoons and all facilities in WMA 2 (except the permeable treatment wall) would be removed. The Vitrification Facility, the Remote Handled Waste Facility and a number of facilities in WMAs 5, 6, 9, and 10 would also be removed. Foundations, slabs, or pads from these facilities, as well as previously demolished facilities, would also be removed. Proven technologies and available waste disposal sites would be used to reduce the potential short-term health and safety risks from residual radioactivity and hazardous contaminants at the site while introducing minimal potential for generation of new orphan waste.

While the Phase 1 activities are being conducted, DOE and NYSERDA would assess the results of site-specific studies as they become available, along with other emerging information such as applicable technology development. In consultation with NYSERDA and cooperating and involved agencies on this EIS, DOE would determine whether new information would warrant preparation of a Supplemental EIS. NYSERDA expects to prepare an EIS, or to supplement the existing EIS, to evaluate Phase 2 decisions for the SDA and the balance of WNYNSC, for which NYSERDA has responsibility.

2.8 Uncertainties Associated with Implementation of the Various Alternatives

Implementing any of the project alternatives involves some amount of uncertainty. For example, there is uncertainty related to the availability of waste disposal capacity for some classes of waste expected to be generated under the different alternatives. Also, there is some uncertainty involved with the availability of technologies needed to implement the alternatives. These uncertainties are discussed in greater detail in the following sections. Uncertainty associated with analytical methods and the use of new technologies has been accommodated in this EIS by making conservative assumptions in the environmental impact analysis.

2.8.1 Consequence Uncertainties

Chapter 4, Section 4.3, of this EIS presents a discussion of incomplete and unavailable information that introduces uncertainty into the analyses. The areas affected include human health (occupational exposure), transportation, waste management (waste quantities and disposal options), and long-term human health. The uncertainties associated with incomplete and unavailable information related to these areas are summarized in this section.

2.8.1.1 Human Health

For occupational exposure, information that is incomplete or unavailable includes the following: (1) more-detailed information on the radionuclides in the waste, particularly the gamma emitters; (2) the design details for the facilities that would be used for waste handling and processing; and (3) more-detailed information on how workers would be used in decommissioning actions. However, the uncertainty related to the lack of this information is addressed through the use of conservative assumptions related to the development of labor-category-specific exposure rates and the fact that no credit is taken for the decay of the gamma emitters that are expected to control the dose.

For public exposure, information that is incomplete or unavailable includes the following: (1) more detailed information on the radionuclides in the waste; (2) the location and actions of future nearby critical receptors; (3) changes in the total population and population distribution during the time period associated with decommissioning actions. However, the uncertainty related to the lack of this information is addressed through the use of conservative assumptions related to normal and accident scenario release source terms, total population and its distribution, population breathing rate, water and fish consumption, and the location of critical receptors. Appendix I further addresses uncertainties associated with short-term human health impacts.

2.8.1.2 Transportation

Information that is incomplete or unavailable includes the following: (1) more-detailed information on the distribution of radionuclides in the packaged waste, particularly the gamma emitters; (2) the radiation dose from the waste package shipment arrays; (3) the specific transportation route; and (4) more-precise information on how the waste would be shipped (by truck, rail, or some combination of truck and rail). The uncertainty related to the lack of this information is addressed through the use of conservative assumptions related to waste package inventory and surface dose rate and the fact that no credit is taken for the decay of the gamma emitters that are expected to control the dose. Uncertainty about disposal locations was addressed by considering two different waste disposal options (DOE/Commercial and Commercial) and different disposal sites for low-level radioactive waste.

2.8.1.3 Waste Volumes

The waste management analysis has two areas of uncertainty due to incomplete or unavailable information: (1) the volumes and characteristics of waste that would be generated by each alternative and (2) the availability of disposal capacity for all waste, particularly commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, non-defense transuranic waste, and high-level radioactive waste. The uncertainty related to the volumes and characteristics of the waste is principally related to the amount of site characterization data available. While some soil characterization data do exist, the volumes of soil projected to be exhumed for the Sitewide Removal and Phased Decisionmaking Alternatives incorporate contamination assumptions that are based on process knowledge and operational history. The actual volumes to be exhumed could be smaller or greater than the assumptions in this EIS. Based on the above and the challenge of estimating exact volumes of water that would require treatment during excavation of soils and buried wastes, there would also be uncertainty associated with the volume and characteristics of wastes resulting from water management/treatment during excavation activities. The Phased Decisionmaking Alternative allows for some uncertainty in that additional actions could be analyzed and implemented as part of Phase 2 activities.

2.8.1.4 Waste Disposal Options

The lack of availability of disposal capacity for commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, non-defense transuranic waste, and high-level radioactive waste creates uncertainty in how these wastes would be disposed of. Management options are presented in Chapter 4, Section 4.1.11.2, of this EIS. Until recently, the only commercial facility available and licensed for disposal of Class B or C waste from WNYNSC activities was in Barnwell, South Carolina; however, this facility no longer accepts waste for disposal other than that generated in the states comprising the Atlantic Interstate Low-Level Radioactive Waste Management Compact (Connecticut, New Jersey, and South Carolina). Alternatives that generate commercial Class B or C wastes, therefore, could require an onsite storage facility to store these wastes until a disposal location is available.

Under the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240), DOE is responsible for ensuring the safe disposal of Greater-Than-Class C waste in a facility licensed by NRC; however, no such Greater-Than-Class C waste disposal facility exists at this time. The *GTCC EIS*, which evaluates alternatives for developing a Greater-Than-Class C waste disposal facility, is being prepared (72 FR 40135). Future options for Greater-Than-Class C waste disposal may significantly change the Greater-Than-Class C disposal cost included in the Sitewide Removal Alternative cost estimate. Under the Sitewide Removal Alternative, onsite storage would be needed for these wastes until a disposal location is available.

As discussed in Chapter 4, Section 4.1.11.2, the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (*WIPP SEIS*) included analysis of the receipt and disposal of transuranic waste from WVDP (DOE 1997b). At this time, DOE has not approved shipment of WVDP transuranic waste to the Waste Isolation Pilot Plant (WIPP) because of unresolved questions regarding whether the waste could be considered defense or non-defense in origin. WIPP is currently authorized to accept only DOE defense waste, as discussed in footnote 1 in Section 2.3.1. In addition, disposal of non-defense transuranic wastes (including WVDP transuranic waste) is currently being examined in the *GTCC EIS*. Until a determination is made with regard to WVDP transuranic waste, it would be stored on site.

No high-level radioactive waste would be generated by decommissioning and/or long-term stewardship of WNYNSC unless the waste incidental to reprocessing process determines that the residual materials in the high-level radioactive waste tanks (and any applicable associated equipment) are not incidental to reprocessing. If it is determined that the waste incidental to reprocessing process cannot be applied (i.e., the wastes cannot be managed as low-level radioactive waste and transuranic waste), these wastes would need to be managed as high-level radioactive waste under all of the alternatives. Under the Sitewide Removal and Phased Decisionmaking Alternatives, this waste would need to be stored on site until a disposal location is available.

For any alternative, NRC may require a long-term license for an appropriate portion of the site until an acceptable alternative is found for the disposition of these wastes.

2.8.1.5 Long-term Human Health

The estimates of long-term doses and risk to individuals are the result of a complex series of calculations. The major elements of incomplete or unavailable pieces of information that are used in these calculations include (1) characterization of the nature and extent of the contaminants, (2) the performance of engineered barriers and caps (presented in Section 2.8.2.6 of this EIS), (3) site hydrology and groundwater chemistry, (4) contaminant release rates, (5) long-term erosion-driven releases rates of contaminants, (6) contaminant chemistry at the point of release into surface waters and the resulting adsorption and deposition, (7) bioaccumulation in plants and animals, and (8) knowledge of future human activity. To accommodate the uncertainty associated with this incomplete or unavailable information, conservative assumptions are used in the analysis, as presented in Chapter 4, Section 4.3.5, of this EIS. Appendix H further addresses uncertainties associated with the long-term impact analyses.

2.8.2 Technology Uncertainties

There are several activities involved in the implementation of the alternatives wherein there exists uncertainty related to the technology, productivity, or safety of the workers involved in the work. This uncertainty could impact the cost and schedule of activities to mitigate these factors. The following provides a brief description of the application of technologies that may introduce greater uncertainties as compared with other technologies being implemented.

2.8.2.1 NRC-Licensed Disposal Area/State-Licensed Disposal Area and Container Management Facility

As presented in Appendix C, Sections C.4.4 and C.4.6.8, of this EIS, the conceptual Container Management Facility and the modular shielded environmental enclosures proposed for NDA and SDA remediation are considered first of their kind. There are no full-scale field examples of waste retrieval and processing operations of this magnitude involving the waste classes that would be dealt with under the Sitewide Removal Alternative. The expected wastes have been listed based on historic documentation. However, there exists a significant potential to discover wastes that are unexpected or unplanned. The cost of construction of the facilities would be fairly reliable (within the contingency specified in the estimates), as the structural and equipment components are readily available and have been used in some capacity in the past. However, project productivity and safety are items of uncertainty and will need to be managed during operations.

One component of the waste retrieval process that involves a high level of uncertainty is the retrieval of wastes from the NFS deep holes using primarily a telescoping boom with various tools. Conceptually, this equipment would be able to work vertically at depth, using different end attachments to scan, excavate, cut, and vacuum the waste materials and bring the wastes to the surface; however, this process would need to be demonstrated in a full-scale field application.

2.8.2.2 Leachate Treatment Facility

Similar to the Container Management Facility, the conceptual Leachate Treatment Facility (presented in Appendix C, Section C.4.5) is designed to process leachate generated during NDA and SDA waste removal. Management of the leachate in the excavations is assumed to occur in concert with the removal of wastes. However, difficulties in leachate management and treatment might eventually cause disruption of work progress in NDA and SDA. Handling and treatment processes are based on currently available technologies that have been tested, but management of the wastes generated during the leachate treatment process may be problematic. Waste types, leachate volumes, and waste products are assumed based on the current leachate characterization data. Significant changes to the leachate quality or quantity might trigger significant reduction in NDA and SDA productivity. Verification tests would be performed to optimize technology performance and reduce uncertainties associated with processing leachate.

2.8.2.3 Main Plant Process Building Foundation

During removal of the Main Plant Process Building and the North Plateau Groundwater Plume source area soils, nearly 500 foundation piles would be encountered (see Appendix C, Section C.3.1.1.8, of this EIS). Assumptions have been made regarding pile removal that involve potentially numerous work crews working together in a small space (excavation and concrete demolition would be proceeding at the same time as pile removal). This working arrangement might cause reductions in work productivity to occur, increasing cost and decreasing the level of safety against worker injury. The work involved in this task is relatively common; however, coordination among the work crews would need to be managed closely.

2.8.2.4 Waste Tank Farm Mobilization Pump Removal

Several pumps have been removed from high-level waste tanks and stored on site, as presented in Appendix C, Section C.3.1.3.2, of this EIS. Under the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking Alternatives, all of the remaining pumps would be removed and segmented. The methods and controls needed for safe removal of the pumps have been demonstrated with the previous pump removals; however, the segmenting methods and controls have not been demonstrated. The pumps would have to be segmented to fit inside of waste containers for eventual offsite disposal. Trial runs could be performed to demonstrate the effectiveness of segmenting methods and controls.

2.8.2.5 Dry Cask Storage Waste Transfers

For purposes of these evaluations, it is assumed that one canister could be removed from the Load-In/Load-Out Facility, transferred to the Interim Storage Facility (Dry Cask Storage Area), and unloaded into a storage unit in an 8-hour shift (see Appendix C, Section C.4.1, of this EIS). This estimate is based on experience gained during the removal and placement of material with high and very high dose rates (greater than 100 milliroentgen per hour) contained in lead-shielded containers at Brookhaven National Laboratory and Oak Ridge National Laboratory, and compares favorably with the *Diablo Canyon Independent Spent Fuel Storage Installation Safety Analysis Report* (PG&E 2002) estimate of time required for similar activities (17 hours for transferring a loaded cask to the Independent Spent Fuel Storage Installation). While these events are similar to those proposed for the high-level radioactive waste canister transfer, there are differences in loading configuration and waste disposition that could affect duration and cost estimates, which could be addressed through detailed project planning and trial runs.

2.8.2.6 Performance of Engineered Hydraulic Barriers and Covers

Engineered hydraulic barriers and covers are described in Appendix C, Sections C.2.13 and C.4.7, of this EIS. Performance of the permeable treatment wall would be predicated on the effectiveness of the zeolite material on contaminant removal and its duration. To reduce uncertainties associated with the performance of the permeable treatment wall, a study was conducted that evaluated the performance of the pilot-scale permeable treatment wall (Geomatrix 2007). While the study showed where construction and operational improvements could be made in a full-scale system, other factors could influence the performance of the technology. These include hydraulic factors, such as groundwater bypass around the system and dispersal of "treated" groundwater, and operational factors, such as the logistics and practicality of replacing the zeolite approximately every 20 years.

There is uncertainty about the long-term performance of other engineered barriers, including multi-layered covers, waste grout, and hydraulic barrier walls. Hydraulic factors, such as mounding and groundwater bypass, and other aspects, such as long-term durability could potentially impact the long-term performance of hydraulic barrier walls designed to keep subsurface contaminants from migrating off the site. Long-term performance of closure caps can be affected by erosion and differential settlement that increases the permeability of the engineered covers. These hydraulic factors are mitigated in the analysis by use of assumptions that are generally expected to be conservative. The performance of the hydraulic barriers, as incorporated into the sensitivity analysis, is addressed in Appendix H.

CHAPTER 3
AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

This chapter contains a description of the existing conditions at the Western New York Nuclear Service Center (WNYNSC) and surrounding area. This information provides the context for understanding the environmental consequences and also serves as a baseline to evaluate the alternatives in this environmental impact statement as of completion of the Interim End State. The affected environment at WNYNSC is described for the following resource areas: land use and visual resources; site infrastructure; geology, geomorphology, seismology, and soils; water resources; meteorology, air quality, and noise; ecological resources; cultural resources; socioeconomics; human health and safety; environmental justice; and waste management and pollution prevention.

In accordance with the Council on Environmental Quality's National Environmental Policy Act (NEPA) regulations (40 *Code of Federal Regulations* [CFR] Parts 1500 through 1508), the affected environment is "interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment." In addition, the State Environmental Quality Review Act (6 New York Code of Rules and Regulations [NYCRR] 617.9) states that the affected environment is to be a "concise description of the environmental setting of the areas to be affected, sufficient to understand the impacts of the proposed action and alternatives." The affected environment descriptions provide the context for understanding the environmental consequences described in Chapter 4 of this environmental impact statement (EIS). For the purposes of this analysis, this chapter serves as a baseline from which any environmental changes brought about by implementing the alternatives can be evaluated.

For this *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center (Decommissioning and/or Long-Term Stewardship EIS)*, each resource area is described that may be particularly affected by the Proposed Action and alternatives. The level of detail varies depending on the potential for impacts resulting from each alternative. A number of site-specific and recent project-specific documents are important sources of information in describing the existing environment at the Western New York Nuclear Service Center (WNYNSC) and were summarized and/or incorporated by reference in this chapter. Numerous other sources of site- and resource-related data were also used in the preparation of this chapter and are cited as appropriate.

The U.S. Department of Energy (DOE) evaluated the environmental impacts of the alternatives within defined regions of influence (ROIs) and along potential transportation routes. The ROIs are specific to the type of effect evaluated, and encompass geographic areas within which impacts may occur. For example, human health risks to the general public from exposure to hazardous and radionuclide airborne contaminant emissions were assessed for an area within an 80-kilometer (50-mile) radius of WNYNSC. The human health risks from shipping materials were evaluated for populations living along certain transportation routes. Economic effects such as job and income changes were evaluated within a socioeconomic ROI that includes the county in which WNYNSC is located and nearby counties in which substantial portions of the site's workforce reside. The affected environment resource areas and associated ROIs are summarized in **Table 3–1**.

Site Facilities

Chapter 1 contains a general description of the Project Premises. The Project Premises and State-Licensed Disposal Area (SDA) are shown on **Figure 3–1**. The Project Premises within the greater WNYNSC site are shown on **Figure 3–2**.

Table 3–1 General Regions of Influence by Resource Area

–	*Affected Environment* [a]	*Region(s) of Influence* [b]
Land use and visual resources	Land ownership information, land use practices, policies, and controls, and viewsheds of the site and surrounding region	WNYNSC and nearby offsite areas in Cattaraugus and Erie Counties
Site infrastructure	Utilities that service the site, including electricity, fuel, water, sewage treatment, and roadways	WNYNSC and nearby offsite areas in Cattaraugus and Erie Counties
Geology, geomorphology, seismology, and soils	Geologic and soil characteristics; mineral and energy resources; soil contamination; site erosion processes; and geologic hazards, including seismic activity and history	WNYNSC and nearby offsite areas to include regional seismic sources
Water resources	Surface water features and watersheds; groundwater hydrology; water supply sources; and surface and groundwater quality, including contaminant sources	Surface waterbodies and groundwater at WNYNSC and downstream from the site
Meteorology, air quality, and noise	Meteorological conditions (i.e., temperature, precipitation, severe weather), air pollutant concentrations and emissions, site and surrounding noise sources	Meteorology: WNYNSC and the western New York region. Air Quality: WNYNSC and nearby offsite areas within local air quality control regions (nonradiological emissions) Noise: Nearby offsite areas, and access routes to the site
Ecological resources	Plants and animals; habitat types and assemblages, including terrestrial resources; wetlands; aquatic resources; and threatened and endangered species or special status species	WNYNSC and nearby offsite areas
Cultural resources	Historical and archaeological resources and Traditional Cultural Resources	WNYNSC and nearby offsite areas within a 146-hectare (360-acre) area, Seneca Nation of Indians
Socioeconomics	The regional population, housing, public services (i.e., safety, health, education), and local transportation facilities and services	Income and housing/public services in Cattaraugus and Erie Counties, population distribution within an 80-kilometer (50-mile) and 480-kilometer (300-mile) radius of WNYNSC
Human health and safety	The health of site workers and the public	WNYNSC and offsite areas and waterbodies within 80 kilometers (50 miles) of the site (radiological air emissions); and the transportation corridors and waterbodies where worker and general population radiation, radionuclide, and hazardous chemical exposures could occur
Environmental justice	The presence of minority and low-income populations	The minority and low-income populations within 80 kilometers (50 miles) of WNYNSC
Waste management and pollution prevention	Hazardous and nonhazardous solid waste and wastewater generation and management infrastructure practices	WNYNSC

WNYNSC = Western New York Nuclear Service Center.
[a] The baseline conditions of the environment.
[b] The geographic region evaluated by the Proposed Action or alternatives.

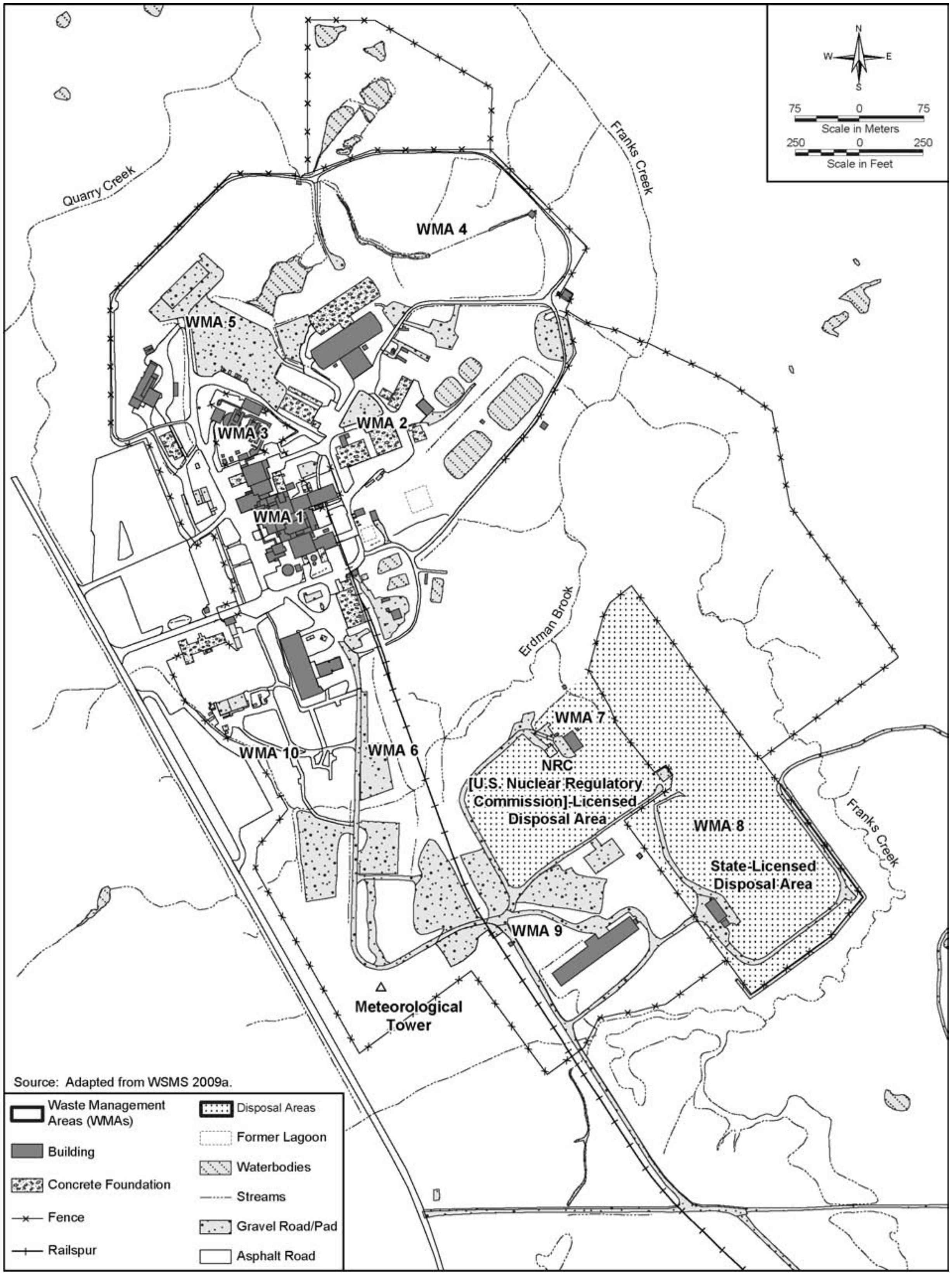


Figure 3–1 The West Valley Demonstration Project Premises (including the NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area) and the State-Licensed Disposal Area

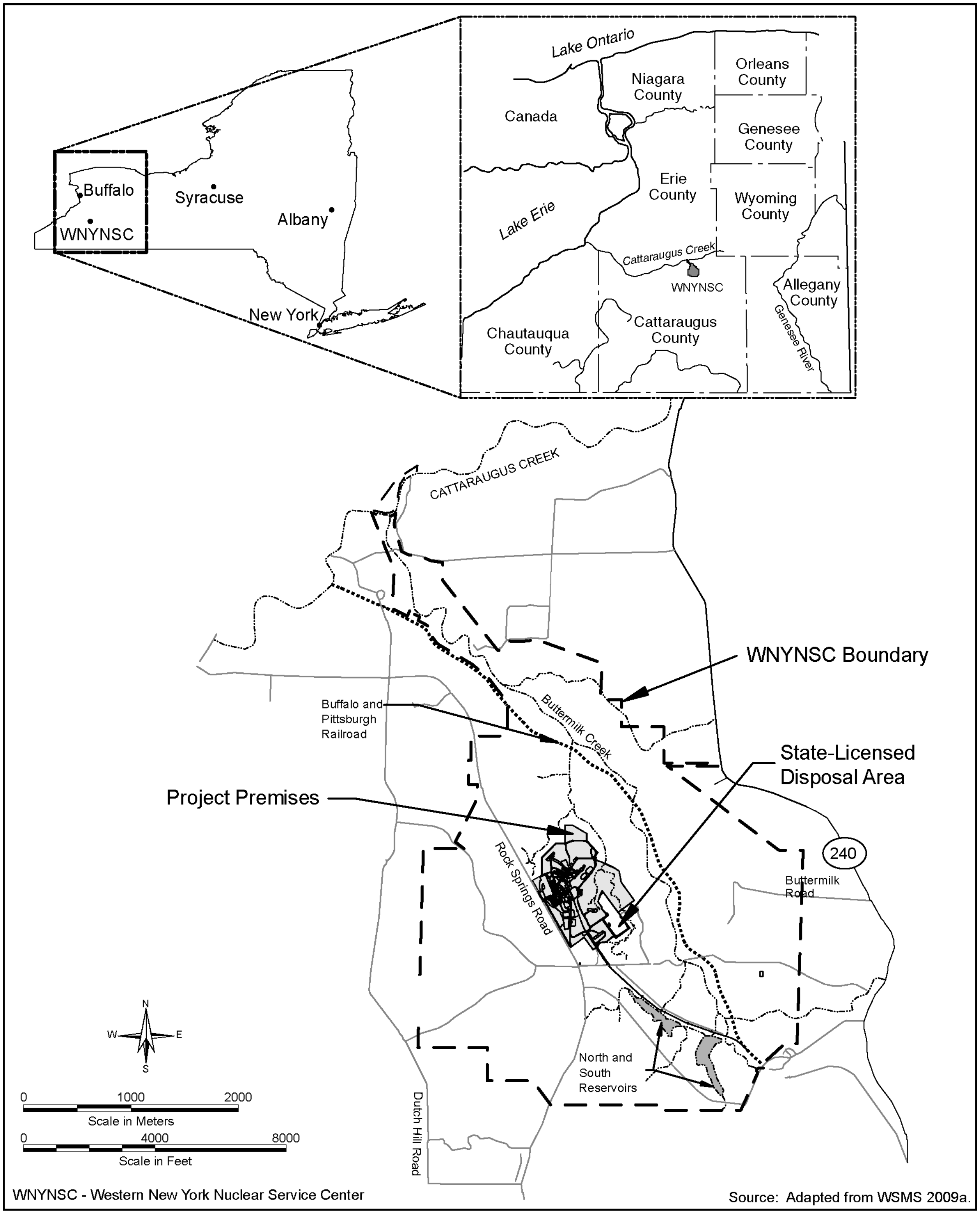


Figure 3–2 The Western New York Nuclear Service Center

Baseline conditions for each environmental resource area were determined for ongoing operations from information provided in previous environmental studies, relevant laws and regulations, and other Government reports and databases. More-detailed information on the affected environment at WNYNSC can be found in annual site environmental reports.

3.1 Land Use and Visual Resources

3.1.1 Land Use

WNYNSC is on a 1,351-hectare (3,338-acre) site located near the Hamlet of West Valley in the Town of Ashford, New York, and was acquired by the State of New York in 1961. The property was leased to Nuclear Fuel Services, Inc. (NFS), who developed 68 hectares (167 acres) of the land and operated a nuclear fuel reprocessing center there from 1966 to 1972. NFS processed 640 metric tons (705 tons) of spent fuel at its West Valley reprocessing facility from 1966 to 1972 under an Atomic Energy Commission license. Fuel reprocessing ended in 1972 when the plant was shut down for modifications to increase its capacity, and reduce occupational radiation exposure and radioactive effluents. By 1976, NFS judged that over $600 million would be required to modify the facility. Later that year, NFS withdrew from the reprocessing business and requested to return control of the facilities to the site owner, New York State Energy Research and Development Authority (NYSERDA) (DOE 1978). In 1982, DOE assumed control, but not ownership, of the 68-hectare (167-acre) Project Premises portion of the site, as required by the 1980 West Valley Demonstration Project (WVDP) Act. DOE provides general surveillance and security services for all of WNYNSC site (DOE 1996a, 2003e).

Major land uses in Cattaraugus County include: residential (29.3 percent); wild, forested, conservation lands, and public parks (22.8 percent); vacant land (22.4 percent); and agriculture (19.2 percent). The remaining 6.3 percent of the land within the county is classified as community services, recreation and entertainment, public services, industrial, commercial, or unknown (Crawford 2008). Land use within 8 kilometers (5 miles) of WNYNSC is predominantly agricultural and the setting includes cropland, pasture, woodlands, natural areas, ponds, and house lots. The major exception is the Village of Springville, which comprises residential/commercial and industrial land use (DOE 2003e). The Hamlet of West Valley is primarily characterized by residential and commercial land uses. The residential land use is generally rural in nature (WVNS 2006).

Agricultural land use is concentrated in the northern region of Cattaraugus County because the landscape is more favorable for agricultural practices (Paoletta 2003). Urban land use increases north of WNYNSC toward Buffalo and west along the Lake Erie shoreline. Recreational land use increases to the south toward Allegany State Park and west toward Lake Erie. The section of Cattaraugus Creek that is downstream from WNYNSC is primarily used for recreational purposes; however, some water is used for irrigation purposes (WVES and URS 2008).

Light industrial and commercial (either retail or service-oriented) land use occurs near WNYNSC. A field review of an 8-kilometer (5-mile) radius did not indicate the presence of any industrial facilities that would present a hazard in terms of safe operation of the site (DOE 2003e, WVNS 2006). A small military research installation is located approximately 5 kilometers (3 miles) northeast of the Project Premises. The facility, operated by Calspan Corporation, is used to conduct research operations for the U.S. Department of Defense. Although the facility uses small amounts of hazardous materials, it does not produce any products of a hazardous nature (DOE 2003e).

A similar land use field review of the Village of Springville and the Town of Concord did not indicate the presence of any significant industrial facilities. Industrial facilities near WNYNSC include Winsmith-Peerless

Winsmith, Inc., a gear reducer manufacturing facility; Wayne Concrete Co., Inc., a readi-mix concrete supplier and concrete equipment manufacturing facility; and Springville Manufacturing, a fabricating facility for air cylinders. The industries within the Village of Springville and the Town of Concord, Erie County, are located in a valley approximately 6.4 kilometers (4 miles) to the north and 11.3 kilometers (7 miles) to the northwest, respectively, of WNYNSC (DOE 2003e).

The Southern Tier West Regional Planning and Development Board, a regional planning board that includes Cattaraugus County, has issued its *2004 Regional Development Strategy* (Southern Tier West 2004). The objectives of the document include identifying an economic development strategy for the region, recommending implementation strategies, ensuring coordinated development, identifying the need to improve public facilities and utilities, facilitating economic development, and supporting Cattaraugus County corridor economic development and land use planning along U.S. Route 219 and NY Route 16 in the vicinity of WNYNSC.

Most of the land use data for the region date back to the late 1960s and 1970s, when many of the region's land use plans were developed. Since that time, minor changes include a decrease in active agricultural land acreage, an increase in maturing forest acreage, and an increase in the number of recreational, commercial, and residential lots (Southern Tier West 2004). In Cattaraugus County, future use of agricultural land is expected to remain relatively unchanged. Residential growth near WNYNSC is expected to continue in the towns of Yorkshire, Machias, and Ashford. Other towns near WNYNSC are expected to remain rural for the foreseeable future. Commercial land use is expected to remain in the commercial centers of the county's villages, towns, and cities. Industrial land use is expected to increase in Yorkshire Township (northeast Cattaraugus County). Recreation on the Allegheny River, approximately 32 kilometers (20 miles) south of WNYNSC, is also expected to increase.

Construction improvements to U.S. Route 219 will promote development and expansion by increasing the area's accessibility to major markets and transportation networks (Cattaraugus 2006a, ACDS 2007). Increased development is expected to occur in the village of Ellicottville and in Erie County (ACDS 2007). A proposed Business Park will be located on an estimated 30 to 40 hectares (75 to 100 acres) of land within the Village of Ellicottville (Cattaraugus 2006b). The proposed Ashford Education and Business Park would be located next to the Ashford Office Complex and would require approximately 8 hectares (20 acres) of land (Cattaraugus 2006a). A Railyard Industrial Park is planned at a site that previously served as a railyard in the Town of Great Valley. This park will support warehouse, industrial, distribution, intermodal, office, and research uses and facilities (Cattaraugus 2006c).

Growth in areas surrounding Ellicottville is partially due to the increased demand for tourism and recreation-related infrastructure (Southern Tier West 2006). Ski areas, including Holiday Valley and HoliMont, contribute to Ellicottville's development as a tourist destination (Cattaraugus 2006b). Proposed projects to develop tourism in Ellicottville include a tourist information center, an interpretive center, a performing arts center, and studio and shopping spaces that are estimated to total 32 to 40 hectares (80 to 100 acres). Tourism development will be concentrated in the central business district to limit sprawl in outlying areas (Cattaraugus 2006d). In the surrounding area, the Seneca Allegany Casino and Hotel in Salamanca was completed in March 2007 and includes a casino and a 212-room hotel (Seneca Gaming Corporation 2008).

The Zoar Valley Multiple Use Area located in the Towns of Collins, Persia, and Otto, includes three areas that total 1,183 hectares (2,923 acres). The *2006 Draft Unit Management Plan* contains a proposal to designate a "protection area" that would encompass the Cattaraugus Creek Gorge and nearby trails along the gorge and the banks of the Cattaraugus Creek's South Branch (NYSDEC 2006d).

3.1.2 Visual Environment

WNYNSC is located in the northwest-southeast trending valley of Buttermilk Creek and consists mainly of fields, forests, and the ravines of several tributaries to Buttermilk Creek. WNYNSC is in a rural setting surrounded by farms, vacant land, and single homes. From distant northern hilltops, the site appears to be primarily hardwood forest and would be indistinguishable from the surrounding countryside if the Main Plant Process Building and main stack were not visible. From that distance, the Main Plant Process Building resembles a factory building or power plant. Several public roads pass through WNYNSC, including Rock Springs Road, Buttermilk Road, and Thomas Corners Road. The site boundary is marked along the roadsides by a barbed wire fence with regularly spaced "POSTED" signs. Passers-by mainly see hardwood and hemlock forests, overgrown former farm fields, the southern end of the south reservoir bordered by pine trees, and wet, low-lying areas.

The WNYNSC facilities are predominantly located on plateaus between Dutch Hill and Buttermilk Creek. The surrounding topography and forested areas obstruct views of the site areas from roadways; however, most of the facilities can be seen from hilltops along Route 240 (east of WNYNSC). WNYNSC is generally shielded from Rock Springs Road by pine trees, but can be seen from Rock Springs Road and Thornwood Drive when approaching from the south. Facilities, including the Main Plant Process Building and main stack; a warehouse; a large, white, tent-like lag storage area; the Remote-Handled Waste Facility; and other smaller structures, resemble an industrial complex. Two large paved parking lots are located outside the barbed wire–topped chain link security fence. Disposal areas include the SDA and the NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area (NDA). The NDA and SDA each have a geomembrane cover that is sloped to provide drainage. Security lights illuminate the entire Project Premises at night. The developed portion is consistent with the Bureau of Land Management's Visual Resource Management Class IV rating, where major modifications to the natural landscape have occurred. The balance of the site's viewshed generally ranges from Visual Resource Management Class II to Class III, where visible changes to the natural landscape are low to moderate but may attract the attention of the casual observer (DOI 1986).

3.2 Site Infrastructure

Site infrastructure includes those utilities required to support the operations of WNYNSC and local transportation infrastructure, as summarized in **Table 3–2**.

Table 3–2 Western New York Nuclear Service Center Sitewide Infrastructure Characteristics

Resource	*Site Usage*	*Site Capacity*
Electricity		
Energy consumption (megawatt-hours per year)	15,860	105,120
Peak load (megawatts)	2.2 [a]	12
Fuel		
Natural gas (cubic meters per year)	2,170,000	27,300,000 [b]
Fuel oil (liters per year)	26,500	38,000 [c]
Water (liters per year)	153,000,000	788,000,000
Sanitary Sewage Treatment (liters per day)	–	151,000
U.S. Route 219 near WNYNSC	–	Level of Service D

[a] Peak load estimated from average sitewide electrical energy usage, assuming peak load is 120 percent of average demand.
[b] Calculated from installed capacity and may not reflect sustainable supply.
[c] Reflects onsite bulk storage only. Capacity is only limited by the ability to ship resources to the site.
Note: To convert liters to gallons, multiply by 0.264; cubic meters to cubic feet, multiply by 35.314.
Sources: Steiner 2006, WVNS 2004a.

As a participant in the now discontinued U.S. Environmental Protection Agency (EPA) National Environmental Performance Track Program, DOE committed to reduce total non-transportation energy use by 5 percent by the end of 2009, using 2006 as the baseline. In 2007, DOE reduced total energy use by 15.6 percent (WVES and URS 2008).

3.2.1 Electricity

Electrical power is transmitted to WNYNSC via the National Grid USA (formerly Niagara Mohawk) distribution system (WVNS 2006). For the Project Premises, electricity is purchased through the Defense Energy Support Center (Steiner 2006). Power for the Project Premises is supplied via a 34.5-kilovolt loop system. A feeder line from a 34.5-kilovolt switching station transmits power to the site substations where it is stepped down to 480 volts. Electricity from the 34.5-kilovolt line is routed to two 2,500-kilowatt-ampere transformers at the Main Plant Process Building and Utility Room Expansion in Waste Management Area (WMA) 1. The substation switchgears are interconnected through cables to provide backfeed capabilities in the event that any 34.5-kilovolt-to-480-volt substation transformer fails (WVNS 2006).

The reservoir pumps that supply water to the Radwaste Treatment System Drum Cell (WMA 9), the Remote-Handled Waste Facility in WMA 5, the NDA facilities, and the site perimeter monitoring stations obtain power from a separate 4,800-volt-to-480-volt rural distribution system (WVNS 2006).

Backup electrical power is supplied by three standby (backup) diesel-fired generators with diesel fuel provided from onsite storage tanks. The generators include a 625-kilovolt-ampere unit located in the Utility Room (WMA 1), a 1,560-kilovolt-ampere unit located in the Utility Room Expansion (WMA 1), and a 750-kilovolt-ampere generator located in the Permanent Ventilation System Building mechanical room (WMA 3). In the event of failure of the main power supply, all of the diesel generators will initiate automatically and then the associated switchgears will disconnect the utility line and noncritical loads and supply power to essential systems. Day tank storage capacity is sufficient for each generator to operate continuously for 8 hours (WVNS 2006).

Between April 2005 and March 2006, electrical energy consumption was 15,860 megawatt-hours (Steiner 2006). This consumption reflects an average load demand of about 1.8 megawatts. WNYNSC substations have a combined installed capacity of 12 megawatts, which is equivalent to a site electrical energy availability of about 105,000 megawatt-hours annually. Electricity consumption is expected to decrease as buildings continue to be decommissioned (Steiner 2008a).

3.2.2 Fuel

The National Fuel Company provides natural gas, the primary fuel used by WNYNSC facilities, to WNYNSC through a 15-centimeter (6-inch) supply line. The supply is pressure regulated and metered at the Utility Room. Natural gas is distributed from the Utility Room to onsite areas for heating purposes and is regulated at the points of use. Natural gas is not routed through areas that contain, or historically contained, radioactive materials. Two major users of natural gas are two natural gas steam boilers housed in the Utility Room Expansion. The boilers can also use No. 2 diesel fuel oil. However, cessation of nuclear fuel reprocessing operations resulted in a major reduction in steam usage and associated natural gas demand (WVNS 2006).

Natural gas consumption totaled approximately 2.17 million cubic meters (76.8 million cubic feet) in 2005. Natural gas consumption has historically averaged about 2.8 million cubic meters (100 million cubic feet) annually (Steiner 2006). The natural gas distribution system serving site facilities has an installed capacity of about 3,110 cubic meters (110,000 cubic feet) per hour or approximately 27.3 million cubic meters (964 million cubic feet) annually (WVNS 2006).

No. 2 diesel fuel oil is also used to operate the backup generators and to run forklifts (Steiner 2006). In addition to day tanks at each generator, the bulk of the fuel is stored in a 38,000-liter (10,000-gallon) aboveground storage tank (Steiner 2008a, WVNS 2006). In 2005, approximately 26,500 liters (7,000 gallons) of fuel oil were consumed at the site (Steiner 2006). Fuel use is expected to be smaller in the future (Steiner 2008a).

3.2.3 Water

WNYNSC has its own reservoir and water treatment system to service the site. The system provides potable and facility service water for operating systems and fire protection. The reservoir system was created by constructing dams on Buttermilk Creek tributaries south of the Project Premises. The reservoirs provide the raw water source for the noncommunity, nontransient water supply operated on site (DOE 2003e). Specifically, the two interconnected reservoirs (north and south reservoirs) cover about 10 hectares (25 acres) of land and contain approximately 2.1 billion liters (560 million gallons) of water (see Figure 3–2). A pump house located adjacent to the north reservoir with dual 1,500-liters-per-minute- (400-gallons-per-minute-) rated pumps supplies water to the Project Premises through a 20-centimeter (8-inch) pipeline. A clarifier/filter system in WMA 1 provides treatment for incoming raw water, prior to transfer into a 1.8-million-liter (475,000-gallon) storage tank. An electric pump with a diesel backup is used to pump water from the storage tank through underground mains to the plant or utility system. Water pressure is furnished by two 950-liter-per-minute (250-gallon-per-minute) pumps that supply water at a minimum pressure of 520 kilopascals (75 pounds per square inch). The utility provides makeup water for the cooling operations and other subsystems and directly feeds the fire protection system (WVNS 2006).

Water for the domestic (potable) system is drawn on demand from the utility water and is further chlorinated using sodium hypochlorite, with the treated water stored in a 3,800-liter (1,000-gallon) accumulator tank for distribution. Demineralized water can be produced in the Utility Room (WMA 1) via a cation-anion demineralizer. The demineralized water system will normally produce 60 liters per minute (16 gallons per minute) of demineralized water that is stored in a 68,000-liter (18,000-gallon) storage tank. Three pumps are available to distribute demineralized water to chemical process areas within Project Premises (WVNS 2006).

The raw water supply system has an installed capacity of approximately 1,500 liters per minute (400 gallons per minute) or approximately 795 million liters (210 million gallons) annually (WVNS 2004a). Water use across WNYNSC has averaged roughly 153 million liters (40.3 million gallons) annually (Steiner 2006). This estimate is based on the average demands for the site's workforce and industrial demands for systems still in operation. Annual water use may be reduced in the future due to ongoing decommissioning activities (Steiner 2008a).

3.2.4 Sanitary Sewage Treatment

The Sewage Treatment Plant (WMA 6) treats sanitary sewage and nonradioactive industrial wastewater from the Utility Room. The treatment system consists of a 151,000-liter-per-day (40,000-gallon-per-day) extended aeration system with sludge handling (WVNS 2004a).

There are no entry points into the sanitary sewage system other than toilet facilities, washroom, kitchen sinks, and shower facilities. No process area or office building floor drains are connected to the sanitary sewer system other than the floor drains in the facility shower rooms and lavatory facilities (WVNS 2004a).

Industrial wastewater from the Utility Room is collected using dedicated pipes, tanks, and pumps. The collected wastewater is pumped into the Sewage Treatment Plant, where it is mixed with sanitary sewage and treated. Entries to the system are through dedicated lines from the Utility Room water treatment equipment, boilers, and floor drains in the Utility Room Expansion. Liquid is discharged to one of four outfalls where liquid effluents are released to Erdman Brook. These four outfalls are identified in the State Pollutant Discharge Elimination System (SPDES) permit, which specifies the sampling and analytical requirements for each outfall (WVNS 2004a).

3.2.5 Local Transportation

Transportation facilities near WNYNSC include highways, rural roads, a rail line, and aviation facilities. The primary method of transportation in the site vicinity is by motor vehicle on the local roads (see **Figure 3–3**).

The majority of roads in Cattaraugus County, with the exception of those within the cities of Olean and Salamanca, are considered rural roads. Rural principal arterial highways are connectors of population and industrial centers. This category includes U.S. Route 219, located about 4.2 kilometers (2.6 miles) west of the site; Interstate 86, the Southern Tier Expressway located about 35 kilometers (22 miles) south of the site; and the New York State Thruway (I-90), about 56 kilometers (35 miles) north of the site. U.S. Route 219 exists as a freeway from its intersection with Interstate 90 near Buffalo, New York, to its intersection with Route 39 at Springville, New York, but exists as a 2-lane road from Springville to Salamanca, New York. Average annual daily traffic volume along U.S. Route 219 between Springville and the intersection with Cattaraugus County Route 12 (East Otto Road) ranges from approximately 8,900 vehicles near Ashford Hollow to approximately 9,700 vehicles at Route 39 near Springville (NYSDOT 2006). This route, as it passes the site, operates at a level of service D, reflecting high density and unstable flow, an operating speed of 80 kilometers (50 miles) per hour, and limited maneuverability for short periods during temporary backups (USDOT and NYSDOT 2003b).

Rock Springs Road, adjacent to the site's western boundary, serves as the principal site access road. The portion of this road between Edies Road and U.S. Route 219 is known as Schwartz Road. Along this road, between the site and the intersection of U.S. Route 219, are fewer than 21 residences. State Route 240, also identified as County Route 32, is 2 kilometers (1.2 miles) northeast of the site. Average annual daily traffic on the portion of NY Route 240 that is near the site (between County Route 16, Roszyk Hill Road, and NY Route 39) ranges from 880 vehicles to 1,550 vehicles (NYSDOT 2006).

One major road improvement project could impact access to WNYNSC. In January 2007, the New York State Department of Transportation started construction to extend the U.S. Route 219 freeway at NY Route 39 in Springville to Interstate 86 in Salamanca. Near West Valley, the new freeway will be located only 0.2 to 0.4 kilometers (0.1 to 0.25 miles) from the existing U.S. Route 219, which will be retained. Completion of a 6.8-kilometer (4.2-mile) extension from Route 39 to Peters Road in Ashford (west-northwest of WNYNSC) is expected in Winter 2009/2010 (NYSDOT 2009). An interchange at Peters Road in Ashford will accommodate employees living north of the site (NYSDOT 2003). Continued expansion to Interstate 86 in Salamanca will not proceed until an agreement is reached with the Seneca Nation of Indians (Seneca Nation) or additional environmental studies have been completed (NYSDOT 2005). In addition, a supplemental EIS is being prepared for the freeway project EIS issued in 2003 (NYSDOT 2003). The supplemental EIS will evaluate a new route or upgrades to U.S. Route 219 between the town of Ashford and Interstate 86 due to (1) a significant increase in identified wetlands in the project corridor, and (2) observed changes in traffic growth rates for some segments of existing U.S. Route 219 that could influence the safety and operational characteristics of previously identified EIS alternatives (74 FR 41781).

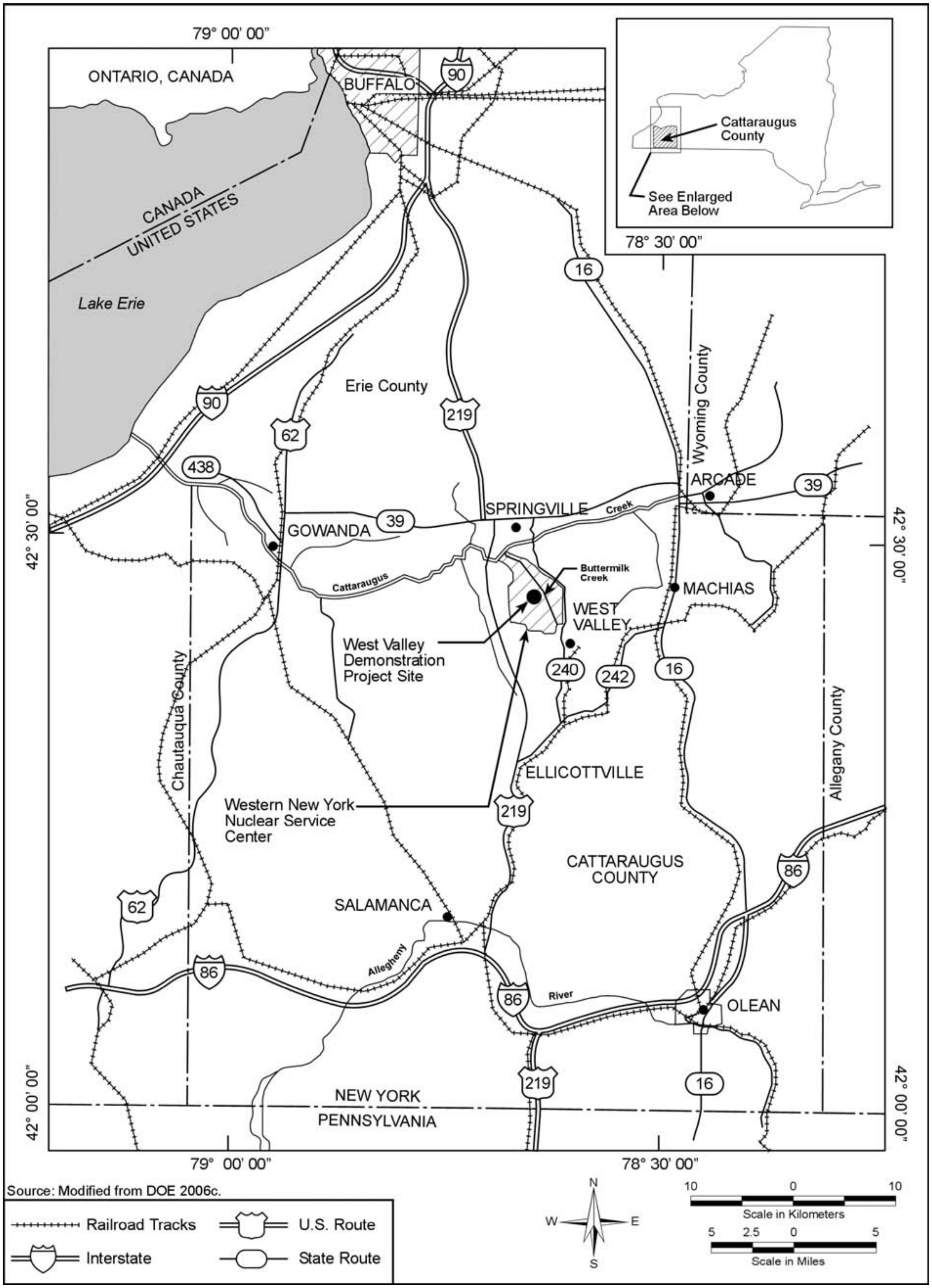


Figure 3–3 Transportation Routes Near the Western New York Nuclear Service Center

The Buffalo and Pittsburgh Railroad line is located within 800 meters (2,600 feet) of the site. Owned and operated by Genesee and Wyoming, Inc., the Buffalo and Pittsburgh Railroad is part of an integrated regional rail operation that includes Rochester and Southern Railroad and the South Buffalo Railway. Together they have direct connections to the two major U.S. railroads that service the east (CSX Transportation and Norfolk Southern) as well as both of Canada's transcontinental railroads (Canadian National and Canadian Pacific). Major types of freight include coal, petroleum, metals, and forest products (G&W 2008). In 1999, the Buffalo and Pittsburgh Railroad completed the connection of a track between Ashford Junction and Machias, New York. Service by the Buffalo and Pittsburgh Railroad on the rail line from the Project Premises to Ashford Junction and then to Machias provides WNYNSC with rail access (DOE 2003e). This access is expected to continue despite the plan to abandon a 44.4-kilometer (27.6-mile) portion of the Buffalo and Pittsburgh rail system between Orchard Park, New York, and Ashford, New York (north of Ashford Junction). The railroad right of way may be converted to a bicycle trail (73 FR 58297).

There are no commercial airports in the site vicinity. The only major aviation facility in Cattaraugus County is the Olean Municipal Airport, located in the Town of Ischua, 34 kilometers (21 miles) southeast of WNYNSC. Regularly scheduled commercial air service was terminated at this airport in early 1972. The nearest major airport is Buffalo Niagara International Airport, 55 kilometers (34 miles) north of the site (DOE 2003e).

3.3 Geology and Soils

The geologic conditions, including physiographic location, surface topography, glacial lithology and stratigraphy, and bedrock conditions underlying and surrounding WNYNSC and the Project Premises are described in the following sections.

3.3.1 Geology

Geologic unit descriptions and origins obtained in 1986 (Prudic 1986) were modified by the West Valley Nuclear Services Company (WVNS 1993d, 1993f). The thickness of stratigraphic units was obtained from lithologic logs of borings drilled in 1989, 1990, and 1993 (WVNS 1994b); Well 905 (WVNS 1993d); and Well 834E (WVNS 1993f).

3.3.1.1 Glacial Geology and Stratigraphy

WNYNSC is located within the glaciated northern portion of the Appalachian Plateau physiographic province (**Figure 3–4**). The surface topography is dominated by Buttermilk Creek and its tributaries, which are incised into bedrock and the surrounding glaciated upland topography. The maximum elevation on the WNYNSC site occurs at the southwest corner of the property at an elevation of 568 meters (1,862 feet) above mean sea level. The minimum elevation of 338 meters (1,109 feet) above mean sea level occurs near the confluence of Buttermilk Creek and Cattaraugus Creek on the floodplain at the northern extent of the WNYNSC. The average elevation across WNYNSC is 435 meters (1,426 feet) with a modal elevation of 423 meters (1,387 feet) above mean sea level (URS 2008a). The facility is approximately midway between the boundary line delineating the southernmost extension of Wisconsin Glaciation and a stream-dissected escarpment to the north that marks the boundary between the Appalachian Plateau and the Interior Low Plateau Province. The Appalachian Plateau is characterized by hills and valleys of low-to-moderate relief between the Erie-Ontario Lowlands to the north and the Appalachian Mountains to the south (WVNS 1993f).

The Project Premises are located on a stream-dissected till plain that occurs west of Buttermilk Creek and east of the glaciated upland. Surface topography on the Project Premises declines from a maximum elevation of 441 meters (1,447 feet) in the main parking lot to 398 meters (1,305 feet) near the confluence of Franks Creek and Erdman Brook with an average elevation of 423 meters (1,389 feet) above mean sea level. Erdman Brook separates the Project Premises into the North and South Plateau areas (WVNS 1993f). The confluence of Franks Creek and Erdman Brook delineates an eastern plateau area that is contiguous with the South Plateau. The surface topography east of the Project Premises declines to approximately 366 meters (1,200 feet) within the Buttermilk Creek Valley (**Figure 3–5**).

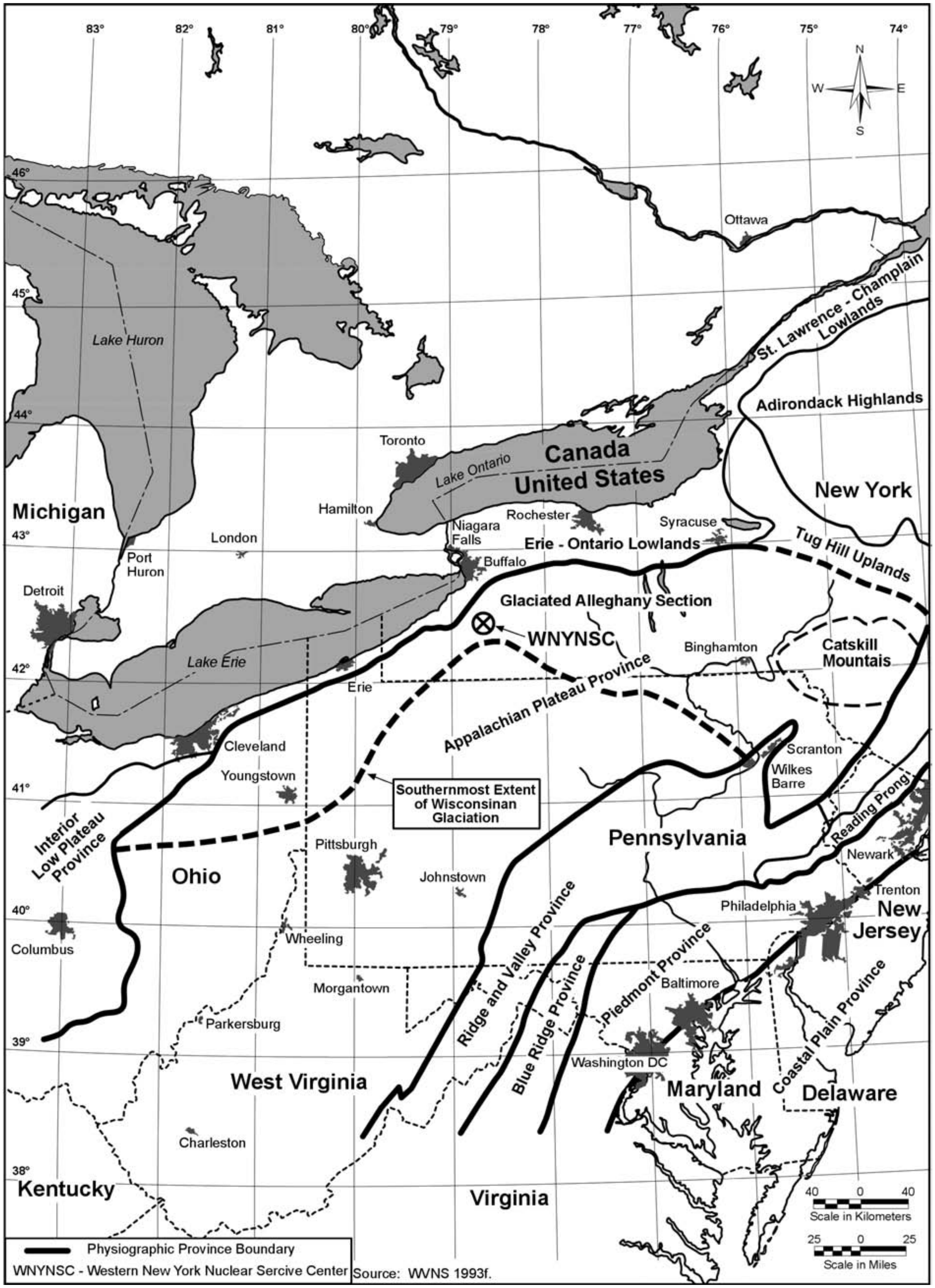


Figure 3–4 Regional Physiographic Map

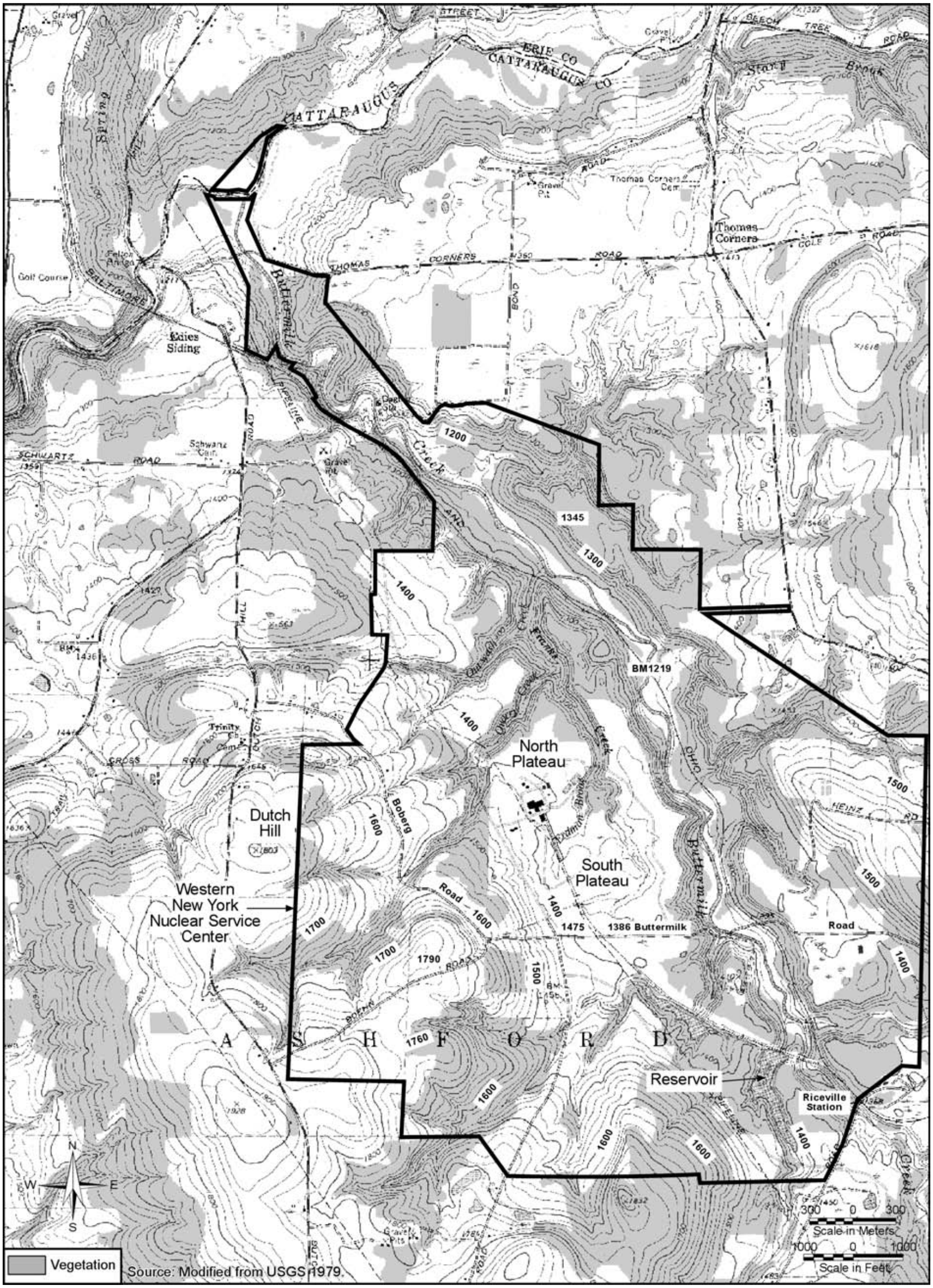


Figure 3–5 Topography of the Western New York Nuclear Service Center

WNYNSC is located on the west flank of the Buttermilk Creek Valley, which is part of a longer steep-sided, northwest-trending U-shaped valley that has been incised into the underlying Devonian bedrock. A 150-meter- (500-foot-) thick sequence of Pleistocene-age deposits and overlying Holocene (recent age) sediments occupies the valley. Repeated glaciation of the ancestral bedrock valley occurred between 14,500 and 38,000 years ago, resulting in the deposition of three glacial tills (Lavery, Kent, and Olean) that comprise the majority of the valley fill deposits (WVNS 1993f, WVNS and URS 2005). The uppermost Lavery till and younger surficial deposits form a till plain with elevation ranging from 490 meters to 400 meters (1,600 to 1,300 feet) from south to north that covers 25 percent of the Buttermilk Creek basin. The Project Premises and the SDA are located on the stream-dissected till plain west of Buttermilk Creek. The Holocene sediments were primarily deposited as alluvial fans and aprons that were derived from the glacial sediments that covered the uplands surrounding WNYNSC and from floodplain deposits derived from the Pleistocene tills (WVNS 1993f, 2006).

The stratigraphy underlying WNYNSC exhibits key differences between the North and South Plateaus as summarized in **Table 3–3** and shown in the generalized cross-sections on **Figures 3–6** and **3–7**, respectively. The surficial geology on the Project Premises and the SDA is shown on **Figure 3–8**. Additional information on the hydrogeologic characteristics of the site stratigraphy is provided in Section 3.6.2 and Appendix E of this EIS.

Table 3–3 Stratigraphy of the West Valley Demonstration Project Premises and the State-Licensed Disposal Area

Geologic Unit	Description	Origin	Thickness: North Plateau (meters)	Thickness: South Plateau (meters)
Colluvium	Soft plastic pebbly silt only on slopes, includes slump blocks several meters thick	Reworked Lavery or Kent till	0.3 to 0.9	0.3 to 0.9
Thick-bedded unit	Sand and gravel, moderately silty	Alluvial fan and terrace deposits	0 to 12.5	0 to 1.5 at Well 905 [a]; not found at other locations
Slack-water sequence	Thin-bedded sequence of clays; silts, sands, and fine-grained gravel at base of sand and gravel layer	Lake deposits	0 to 4.6	Not present
Weathered Lavery till	Fractured and moderately porous till, primarily composed of clay and silt	Weathered glacial ice deposits	0 to 2.7 (commonly absent)	0.9 to 4.9, average = 3
Unweathered Lavery till	Dense, compact, and slightly porous clayey and silty till with some discontinuous sand lenses	Glacial ice deposits	1 to 31.1 Lavery till thins west of the Project Premises	4.3 to 27.4 Lavery till thins west of the Project Premises
Lavery till-sand	Fine-to-coarse sand within Lavery till in the southeastern portion of the North Plateau	Possible meltwater or lake deposits	0.3 to 2.1	Not present
Kent recessional sequence	Gravel composed of pebbles, small cobbles, and sand, and clay and clay-silt rhythmic layers overlying the Kent till	Proglacial lake, deltaic, and alluvial stream deposits	0 to 21.3	0 to 13.4
Kent till, Olean Recessional Sequence, Olean till	Kent and Olean tills are clayey and silty till similar to Lavery till. Olean Recessional Sequence predominantly clay, clayey silt, and silt in rhythmic layers similar to the Kent recessional sequence	Mostly glacial ice deposits	0 to 91.4	0 to 101
Upper Devonian bedrock	Shale and siltstone, weathered at top	Marine sediments	> 402	> 402

[a] Coarse sandy material was encountered in this well. It is unknown whether this deposit is equivalent to the sand and gravel layer on the North Plateau.

Note: To convert meters to feet, multiply by 3.2808.

Source: Geologic unit descriptions and origins (Prudic 1986) as modified by the West Valley Nuclear Services Company (WVNS 1993d, 1993f). Thickness from lithologic logs of borings drilled in 1989, 1990, and 1993 (WVNS 1994b); from Well 905 (WVNS 1993d); and from Well 834E (WVNS 1993f). Kent and Olean till thickness from difference between bedrock elevation (based on seismic data) and projected base of Kent recessional sequence (WVNS 1993f); upper Devonian bedrock thickness from Well 69 U.S. Geological Survey 1-5 located in the southwest section of WNYNSC (WVNS 1993f).

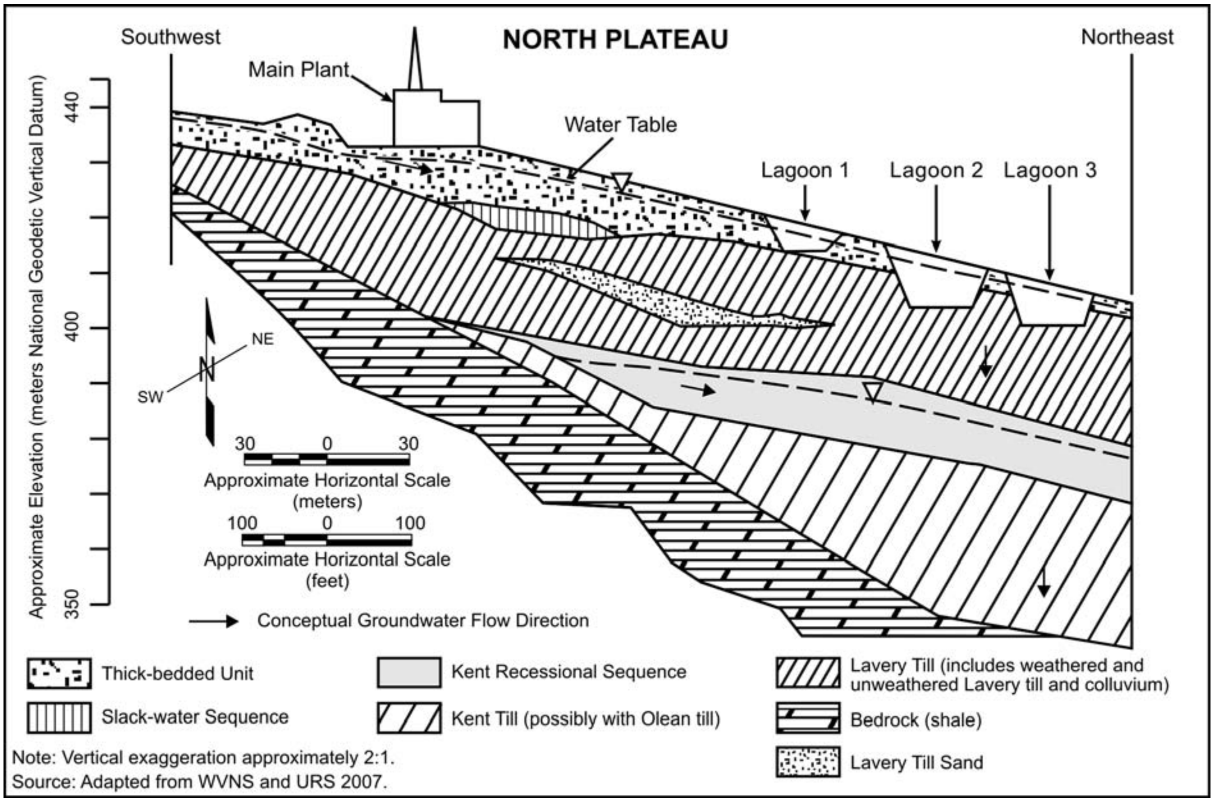


Figure 3–6 Generalized Geologic Cross-section through the North Plateau and Colluvium

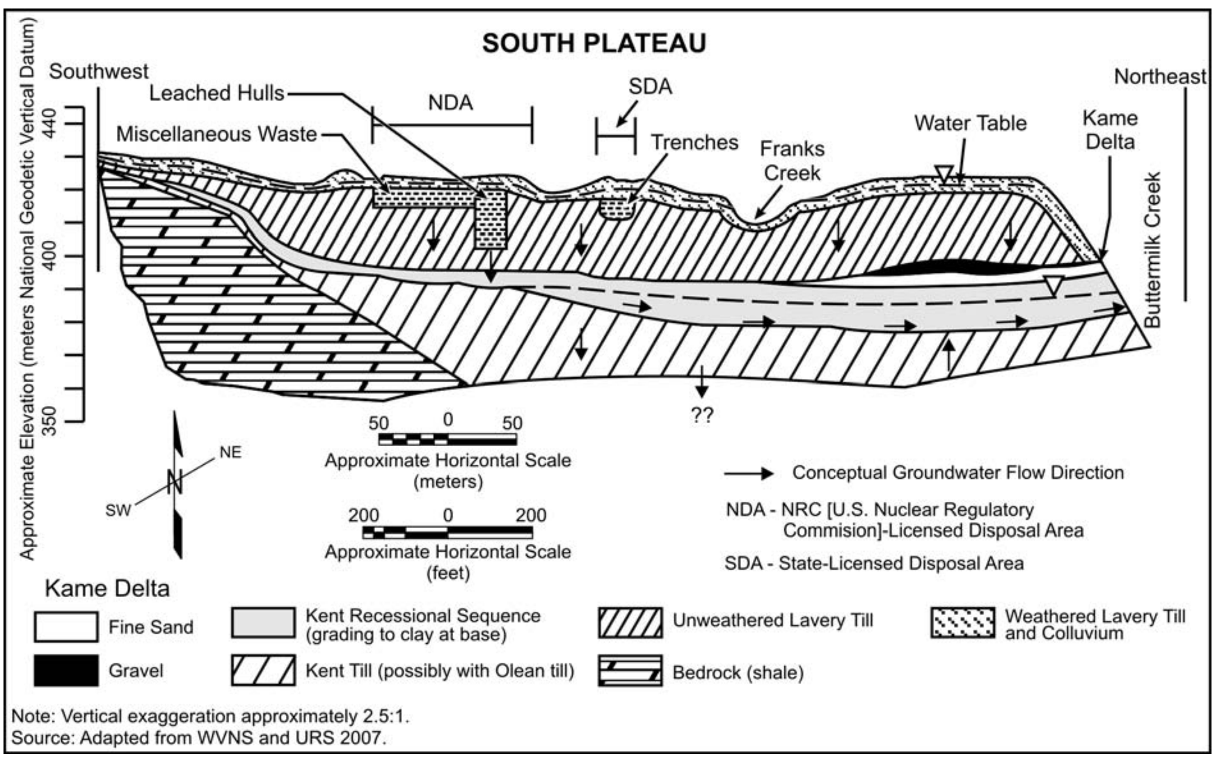
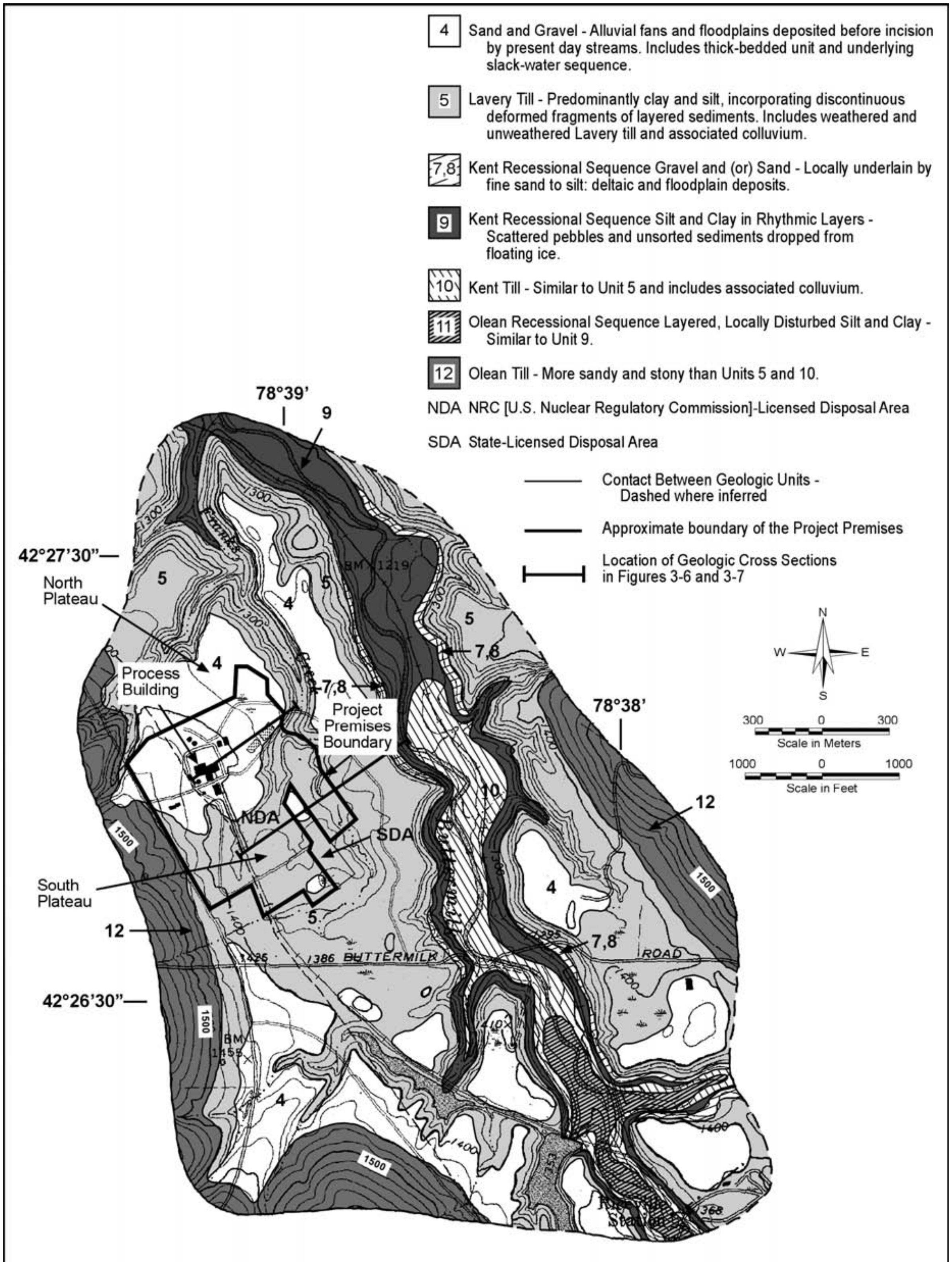


Figure 3–7 Generalized Geologic Cross-section through the South Plateau



Source: Modified from Prudic 1986.
Note: Topographic contours are in feet. Multiply by 0.3048 to convert to meters.

Figure 3–8 Topography and Surface Geology at the West Valley Demonstration Project Site and Vicinity

North Plateau

Surficial Units (Colluvium, Thick-bedded Unit, and Slack-water Sequence)—The surficial sand and gravel consists of an upper alluvial deposit, the thick-bedded unit, and a lower glaciofluvial deposit, the slack-water sequence (**Figures 3–9** and **3–10**). The thick-bedded unit, the thicker and more extensive of the coarse deposits, is an alluvial fan that was deposited by Holocene streams entering the Buttermilk Creek Valley. The alluvial fan overlies the Lavery till over the majority of the North Plateau and directly overlaps the Pleistocene-age glaciofluvial slack-water sequence that occurs in a narrow northeast-trending trough in the Lavery till (Figures 3–9 and 3–10). The Main Plant Process Building and the adjacent facilities partially or fully penetrate the thick-bedded unit (WVNS 1993d, 1993f, 2004a). Holocene landslide deposits (colluvium) also overlie or are interspersed with the sand and gravel on steeper slopes (WVNS 1993f). Fill material occurs in the developed portions of the North Plateau, and mainly consists of recompacted surficial sediment that is mapped with the sand and gravel (WVNS 1993d).

The slack-water sequence consists of Pleistocene glaciofluvial deposits that overlie the Lavery till in a narrow northeast-trending trough across the North Plateau (WVNS 1993d, 1993f, 2004a). The slack-water sequence consists of undifferentiated thin-bedded layers of clay, silt, sand, and small gravel deposited in a glacial lake environment (WVNS 2004a).

The average textural composition of the surficial sand and gravel is 41 percent gravel, 40 percent sand, 11 percent silt, and 8 percent clay, classifying it as a muddy gravel or muddy sandy gravel (WVNS 1993d). The sand and gravel is thickest along a southwest-to-northeast trend across WMA 1, based on borehole observations. The total thickness ranges from approximately 9 meters (30 feet) along this trend to 12.5 meters (41 feet) near the northeastern corner of WMA 1. Locally thick sand and gravel deposits are inferred to correspond to channels in the underlying Lavery till. The sand and gravel thins to the north, east, and south where it is bounded by Quarry Creek, Franks Creek, and Erdman Brook, respectively, and to the west against the slope of the bedrock valley (WVNS 1993d, 1993f; WVNS and URS 2006). Reinterpretation introduced in 2007 of sandy intervals underlying the North Plateau has revised the extent of the Lavery till-sand and the slack-water sequence. The primary justification for the stratigraphic revision is based on the elevation of the encountered units as delineated from borings. As a result of the reinterpretation, the horizontal extent of the slack-water sequence has been expanded from previous delineations to encompass areas upgradient of the Main Plant Process Building and extended to conform to the surface of the underlying unweathered Lavery till. Because fewer borings are now considered to have encountered Lavery till-sand, the horizontal extent of the Lavery till-sand has been reduced (WVES 2007b). The hydrogeologic characteristics of the surficial sand units on the North Plateau are described in Section 3.6.2.1.

Lavery Till—The entire Project Premises are underlain by Lavery till. The till was deposited from an ice lobe that advanced into the ancestral Buttermilk Creek Valley through impounded lake waters (WVNS 1993d). The unweathered Lavery till consists of dense olive-gray, pebbly, silty clay and clayey silt that is typically calcareous. The till contains discontinuous and randomly oriented pods or masses of stratified sand, gravel, and rhythmically laminated clayey silt. The till underlying the North Plateau is predominantly unweathered and unfractured, owing to the emplacement of the overlying sand and gravel (WVNS 1993f). Weathered zones in the till underlying the North Plateau are generally less than 0.3 meters (1 foot) thick (WVNS and Dames and Moore 1997). The average textural composition of the unweathered Lavery till is 50 percent clay, 30 percent silt, 18 percent sand, and 2 percent gravel (WVNS 1993d). The till ranges in thickness from 9 to 12 meters (30 to 40 feet) beneath the process area (WMAs 1 and 3) (WVNS 1993f, WVNS and Dames and Moore 1997). The hydrogeologic characteristics of the unweathered Lavery till are described in Section 3.6.2.1.

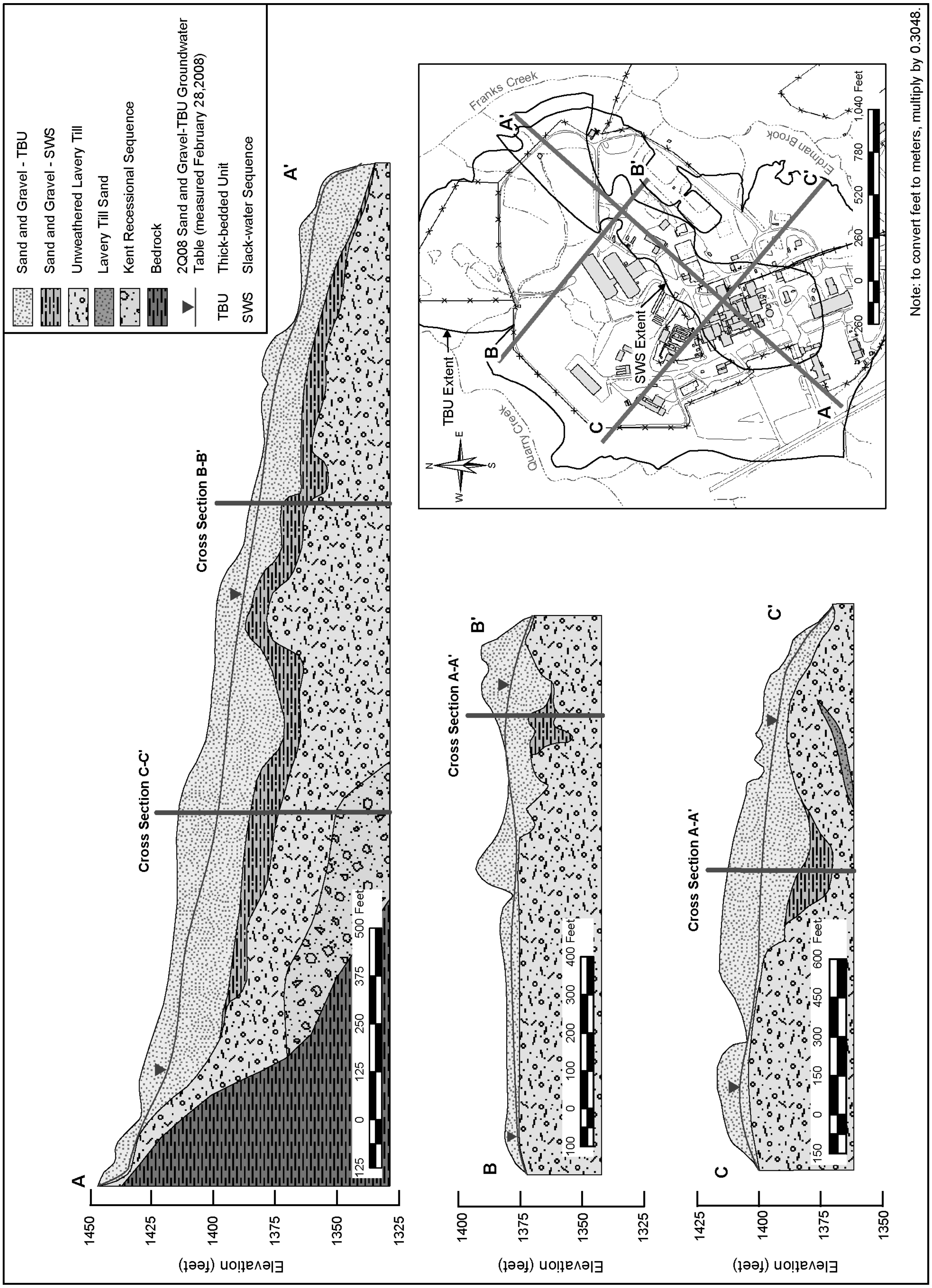


Figure 3–9 Slack-water Sequence in Profile

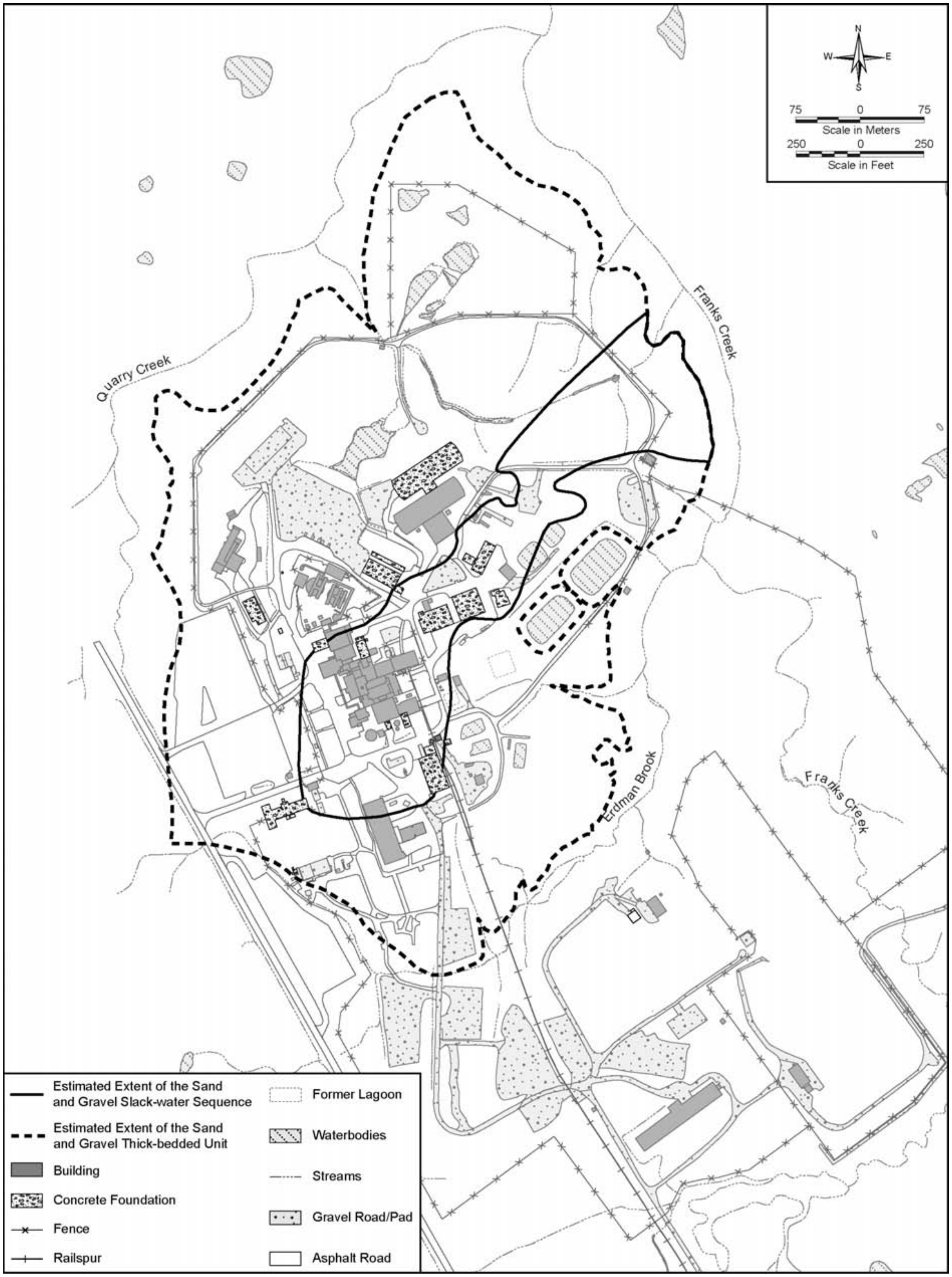


Figure 3–10 Horizontal Extent of the Thick-bedded Unit and the Underlying Slack-water Sequence on the North Plateau

Lavery Till-Sand—The Lavery till-sand is contained within the Lavery till on the North Plateau. The till-sand represents a localized, ice contact deposit resulting from the accumulation of stratified sediments entrained in debris-laden glacial meltwater. Because of dynamics in the glacial environment, transport of the coarser-grained sediment was terminated, leaving the sand deposits to be incorporated into the finer-grained till during subsequent melting of the glacier. The till-sand is distinguished from isolated pods of stratified sediment in the Lavery till because borehole observations indicate that the sand is laterally continuous beneath the southeastern portion of the North Plateau (Figure 3–6) (WVNS 1993d, WVNS and Dames and Moore 1997). Recent reinterpretation of sandy intervals underlying the North Plateau has revised the extent of the Lavery till-sand and the slack-water sequence. Because fewer borings are now considered to have encountered Lavery till-sand, the horizontal extent of the Lavery till-sand has been reduced (WVES 2007b). The till-sand consists of 19 percent gravel, 46 percent sand, 18 percent silt, and 17 percent clay. Within the Lavery till, the till-sand occurs within the upper 6 meters (20 feet) of the till, and it ranges in thickness from about 0.3 to 2.1 meters (1 to 7 feet). The unit has been mapped as being up to 0.6 meters (2 feet) thick in the southeast corner of WMA 1 (WVNS 1993d). The hydrogeologic characteristics of the Lavery till-sand are described in Section 3.6.2.1.

Kent recessional sequence—The Lavery till is underlain by a complex association of gravel, sand, silt, and clay comprising the Kent recessional sequence (see Table 3–3). The Kent recessional sequence is composed of alluvial, deltaic, and lacustrine deposits with interbedded till (WVNS 1993d, 1993f). The Project Premises are underlain by the Kent recessional sequence, except to the west where the walls of the bedrock valley truncate the sequence and the overlying Lavery till (see Figures 3–6 and 3–7). The Kent recessional sequence is not exposed on the Project Premises but occurs along Buttermilk Creek to the east of the site (WVNS 1993f, WVNS and URS 2005). The upper Kent recessional sequence consists of coarse-grained sand and gravel that overlie lacustrine silt and clay (WVNS 1993d, WVNS and Dames and Moore 1997, WVNS and URS 2005). The basal lacustrine sediments were deposited in glacial lakes that formed as glaciers blocked the northward drainage of streams. Some of the fine-grained deposits were eroded and re-deposited by subsequent glacial movement. Sand and gravel were deposited locally, chiefly in deltas where streams entered glacial lakes and on the floodplains of streams that formed during ice-free interstadial episodes. Beneath the North Plateau, the Kent recessional sequence consists of coarse sediments that overlie either lacustrine deposits or glacial till. The average textural composition of the coarse-grained Kent recessional sequence deposits is 44 percent sand, 23 percent silt, 21 percent gravel, and 12 percent clay. The composition of the lacustrine deposits is 57 percent silt, 37 percent clay, 5.9 percent sand, and 0.1 percent gravel. The Kent recessional sequence attains a maximum thickness of approximately 21 meters (69 feet) beneath the northeastern portion of the Project Premises (WVNS 1993d). The hydrogeologic characteristics of the Kent recessional sequence are described in Section 3.6.2.1.

Kent Till, Olean Recessional Sequence, and Olean Till—Older glacial till and periglacial deposits of lacustrine and glaciofluvial origin underlie the Kent recessional sequence beneath the North and South Plateaus, extending to the top of the Upper Devonian bedrock (see Table 3–3) (WVNS 1993f, 2004a). The Kent till has characteristics similar to the Lavery till and was deposited during a glacial advance that occurred between 15,500 and 24,000 years ago. The Olean Recessional Sequence underlies the Kent till and has characteristics similar to the Kent recessional sequence. The Kent till and Olean Recessional Sequence are exposed along Buttermilk Creek southeast of the project (Figure 3–8). The Olean till contains more sand- and gravel-sized material than the Lavery and Kent tills. The Olean till was deposited between 32,000 and 38,000 years ago (WVNS 1993f) and is exposed near the sides of the valley overlying bedrock (Prudic 1986). The sequence of older glacial till and recessional deposits ranges up to approximately 91 meters (299 feet) in thickness beneath the North Plateau.

South Plateau

Substantive stratigraphic differences exist between the geologic conditions underlying the North and South Plateaus over the site area. The primary differences are the lack of sand and gravel deposits overlying the South Plateau till deposits, the absence of till-sand within the southern Lavery till, and the degree of weathering and fracturing in the South Plateau till units.

Weathered Lavery Till—The surficial unit underlying the South Plateau is the Lavery till, which is the host formation for buried waste in the SDA (WMA 8) and the NDA (WMA 7). Weathered Lavery till is generally exposed at grade or may be overlain by a veneer of fine-grained alluvium (WVNS 1993f). On the South Plateau, the upper portion of the Lavery till has been extensively weathered and is physically distinct from unweathered Lavery till. The till has been oxidized from olive-gray to brown, contains numerous root tubes, and is highly desiccated with intersecting horizontal and vertical fractures (WVNS 1993d, WVNS and URS 2006). Vertical fractures extend from approximately 4 to 8 meters (13 to 26 feet) below ground surface into the underlying unweathered till. The average textural composition of the weathered Lavery till is 47 percent clay, 29 percent silt, 20 percent sand, and 4 percent gravel. The thickness of the weathered Lavery till ranges from 0.9 meters (3 feet) to 4.9 meters (16 feet) across the South Plateau (WVNS 1993d, WVNS and URS 2006). The hydrogeologic characteristics of the weathered Lavery till underlying the South Plateau are described in Section 3.6.2.1.

Till Fractures—Glacial till throughout western New York commonly contains systematically oriented joints and fractures. The origin of these features may lie in several mechanisms, including adjustments related to glacial rebound, stresses in the Earth's crust, stress release related to movement on the Clarendon-Linden fault system, and volumetric changes in the clay resulting from ion-exchange or osmotic processes (WVNS 1993f).

Research trenching conducted by the New York State Geological Survey studied joints and fractures during a hydrogeologic assessment of the Lavery till (Dana et al. 1979a). Based on trenching in an area to the east and southeast of the SDA, till joints and fractures were classified as: (1) prismatic and columnar joints related to the hardpan soil formation; (2) long, vertical, parallel joints that traverse the upper altered till and extend into the parent till, possibly reflecting jointing in the underlying bedrock; (3) small displacements through sand and gravel lenses; and (4) horizontal partings related to soil compaction. Prismatic and columnar joints may represent up to 60 percent of the observed till fractures and were postulated to have formed under alternating wet/dry or freeze/thaw conditions. Fracture density was observed to be a function of moisture content and weathering of the till, with more pervasive fracturing occurring in the weathered, drier soil and till. Densely spaced, vertical fractures with spacing ranging from 2 to 10 centimeters (0.8 to 3.9 inches) were restricted to the weathered till. In contrast, the most vertically persistent fractures were observed in the relatively moist and unweathered till. Vertical fractures and joints in the weathered till were systematically oriented to the northwest and northeast, with spacing typically ranging from 0.65 to 2.0 meters (2 to 6.5 feet) and fractures extending to depths of 5 to 7 meters (16 to 23 feet). Trenching identified one vertical fracture extending to a depth of 8 meters (26 feet) (Dana et al. 1979a). Fracture spacing in the unweathered till increased with depth in conjunction with a decrease in the number of observed fractures.

Open, or unfilled, fractures in the upper portion of the Lavery till provide pathways for groundwater flow and potential contaminant migration. Tritium was not detected in two groundwater samples collected from a gravel horizon at a depth of 13 meters (43 feet), indicating that modern (post-1952) precipitation has not infiltrated to a discontinuous sand lens encountered in the Lavery till. Analysis of physical test results on Lavery till samples by the New York State Geological Survey concluded that open fractures would not occur at depths of 15 meters (50 feet) below ground surface due to the plasticity characteristics of the till (Dana et al. 1979b, NYSGS 1979).

Unweathered Lavery Till—The characteristics of the unweathered Lavery till beneath the South Plateau are similar to the till occurring beneath the North Plateau. The unweathered till consists of olive-gray, dense, pebbly silty clay and clayey silt that is typically calcareous. The till contains minor discontinuous and randomly oriented pods or masses of stratified sand, gravel, and rhythmically laminated clay and silt. The Lavery till was deposited from an ice lobe that advanced into the ancestral Buttermilk Creek Valley through impounded lake waters (WVNS 1993d). The average textural composition of the unweathered Lavery till is 50 percent clay, 30 percent silt, 18 percent sand, and 2 percent gravel (WVNS 1993d). The till ranges in thickness from 4.3 to 27.4 meters (14 to 90 feet) beneath the South Plateau (WVNS 1993f, WVNS and Dames and Moore 1997). The hydrogeologic characteristics of the unweathered Lavery till are described in Section 3.6.2.1.

Kent recessional sequence—The Kent recessional sequence beneath the South Plateau consists of fine-grained lacustrine deposits, with coarser sediments occurring as pods or lenses within the lacustrine deposits (WVNS 1993d). The sequence outcrops along the western bank of Buttermilk Creek, as shown on Figure 3–7. Coarse-grained sand and gravel associated with kame delta deposits overlie the lacrustrine deposits on the east end of the South Plateau and are exposed along the west bank of Buttermilk Creek (Figures 3–6 and 3–7). The Kent recessional sequence attains a thickness of approximately 13 meters (43 feet) beneath the South Plateau. The hydrogeologic characteristics of the Kent recessional sequence underlying the South Plateau are described in Section 3.6.2.1.

3.3.1.2 Bedrock Geology and Structure

The Paleozoic bedrock section immediately underlying WNYNSC consists primarily of Devonian and older sedimentary rocks (**Figure 3–11**). The Paleozoic strata in the area have been deformed into a series of low-amplitude folds that trend east-northeast to northeast as a result of low-angle thrust faulting in the Paleozoic section that occurred during Alleghanian deformation of the Appalachian Mountains. The uppermost bedrock unit in the vicinity of the Project Premises and SDA is the Canadaway Group, which consists of shale, siltstone, and sandstone and totals approximately 300 meters (980 feet) in thickness. The regional dip of the bedrock layers is approximately 0.5 to 0.8 degrees to the south (Prudic 1986, WVNS 1993f). Locally, measurements of the apparent dip of various strata and two marker beds in selected outcrops along Cattaraugus Creek recorded a dip of approximately 0.4 degrees to the west near the northern portion of WNYNSC (CWVNW 1993). The upper 3 meters (10 feet) of shallow bedrock are weathered to regolith with systematically oriented joints and fractures. As observed in outcrop along Quarry Creek, the joints are not restricted to the upper 3 meters (10 feet) of the bedrock, but are developed throughout and continue at depth (Engelder and Geiser 1979, Prudic 1986).

A number of Paleozoic bedrock structures and other regional features have been identified in western New York (**Figure 3–12**). The Clarendon-Linden Fault Zone extends southward from Lake Ontario through Orleans, Genesee, Wyoming, and Allegany Counties, east of WNYNSC. The fault zone is composed of at least three north-south trending faults (**Figure 3–13**) and is aligned with the eastern edge of the underlying Precambrian Elzevir-Frontenac boundary zone (URS 2002b, WVNS 1992a). Satellite imagery compiled in 1997 for NYSERDA indicates the presence of two prominent bands of north-to-northeast-trending lineaments with the easternmost lineament coinciding with surface mapping and the inferred subsurface extent of the Clarendon-Linden Fault Zone (see Figure 3–12). The western band of north-to-northeast-trending lineaments is parallel to, and approximately 30 kilometers (19 miles) west of, a band of lineaments associated with the Clarendon-Linden Fault Zone and demarcates the western edge of the Elzevir-Frontenac boundary zone (URS 2002b, 2004). This structure continues into Cattaraugus County, where the lineaments become less abundant and less continuous. Seismic reflection profiles across this trend reveal faults affecting deeper Ordovician strata (URS 2004).

Section	Age (millions of years)	System	Series	Group	Unit	Approximate Depth (meters)
Paleozoic Section		Devonian	Upper	Canadaway (shale, siltstone, minor sandstone)	Undifferentiated	
	360					
					Perrysburg	330
				West Falls (shale, siltstone, sandstone)	Java	
					Nunda	
					Rhinestreet Shale	
				Sonyea	Middlesex Shale	
				Genesee (shale)		
			Middle		Tully Limestone	
				Hamilton (shale, sandstone, minor limestone)	Moscow	
					Ludlowville	
					Skaneateles	
					Marcellus	648
					Onondaga Limestone	
			Lower	Tristates	Oriskany Sandstone	
				Helderberg (limestone, dolostone)	Manlius	
					Rondout	
	408	Silurian	Upper	Salina (shale, dolostone, minor anhydrite and halite)	Akron Dolostone	
					Camillus Shale	
					Syracuse	
					Vernon	894
				Lockport (dolostone)	Lockport	
				Clinton	Rochester Shale	
					Irondequoit (Packer shell)	
			Lower	Clinton	Sodus	
					Reynales	
					Thorold Sandstone	985
				Medina	Grimsby (sandstone, red shale)	
					Whirlpool Sandstone	
	438	Ordovician	Upper		Queenston	1,477
					Oswego Sandstone	
					Lorraine	
					Utica Shale	
			Middle	Trenton-Black River (limestone, dolostone)	Trenton	
					Black River	
			Lower	Beekmantown (limestone)	Tribes Hill/Chuctanunda	1,831
	505	Cambrian	Upper		Little Falls Dolostone	
					Galway (Theresa)	2,066
					Potsdam Sandstone	2,118
	570	Precambrian	Middle	Grenville Basement Complex (crystalline rocks)		

Source: Modified from NYSDEC 2006a, NYSGS 1990, WVNS 1993f.
Note: Principal lithology in parentheses except where otherwise specified.

Figure 3–11 Bedrock Stratigraphic Column for the West Valley Demonstration Project Premises and Vicinity

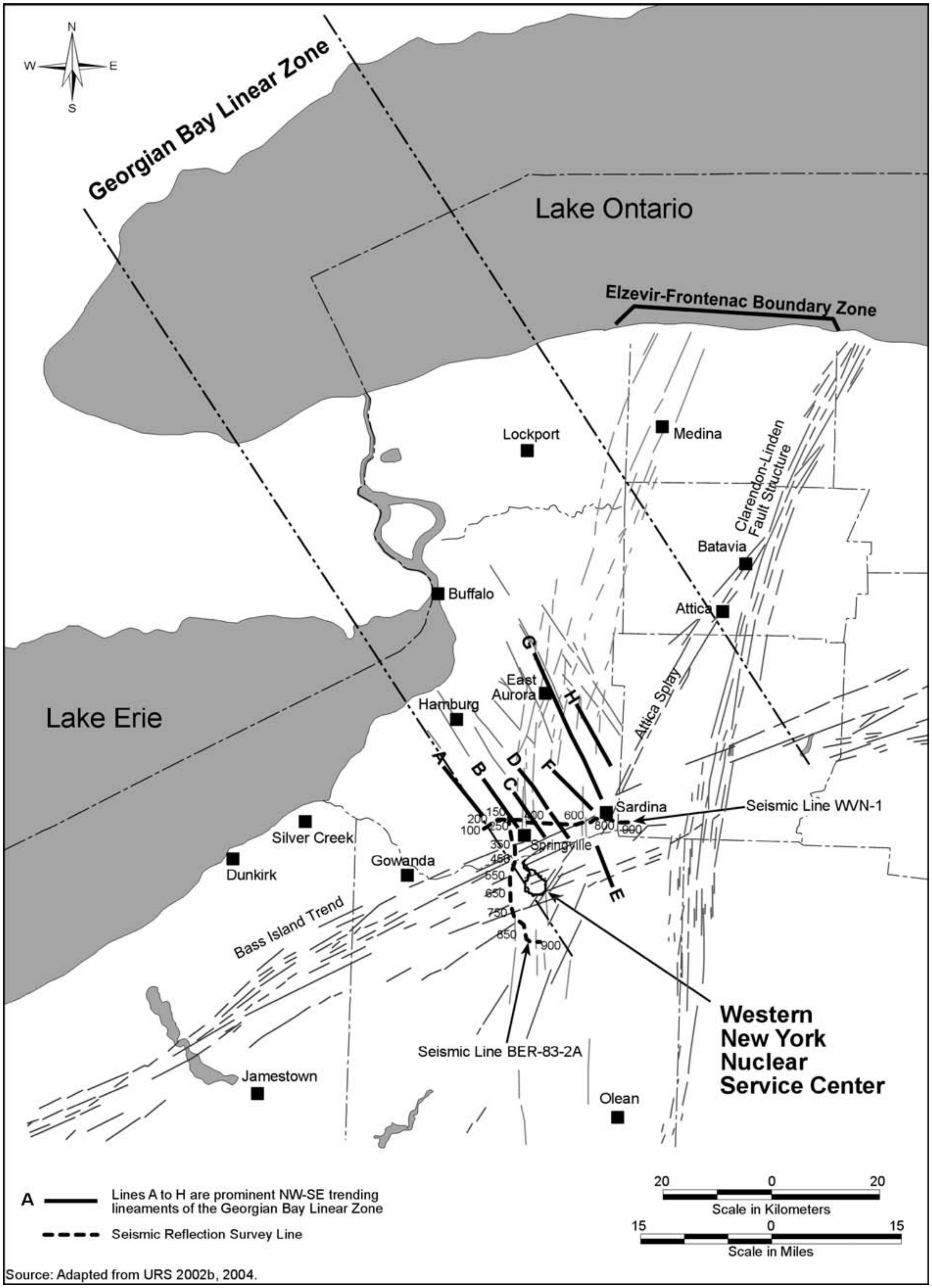


Figure 3–12 Selected Lineament Systems and Major Structural Features in Western New York

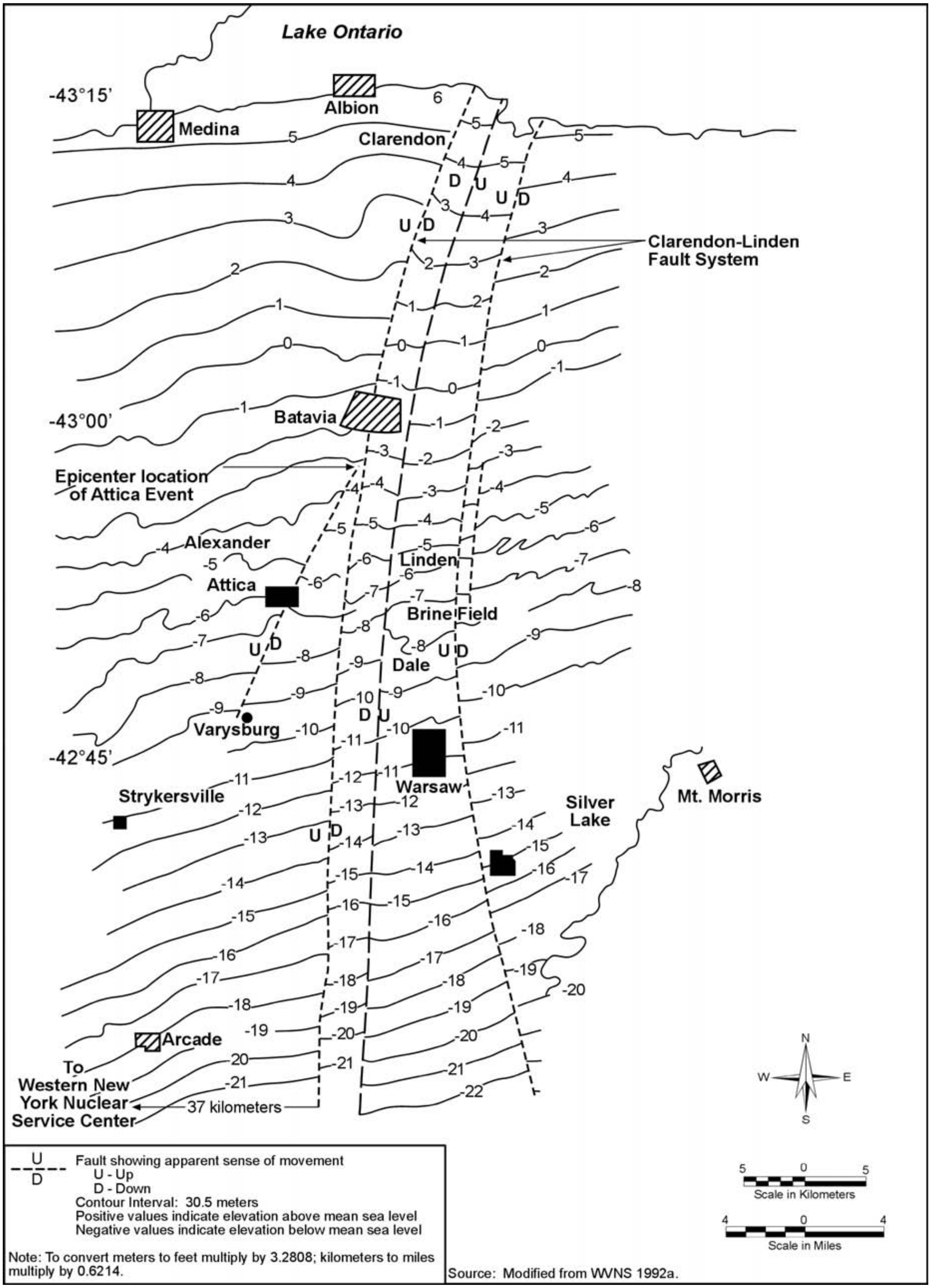


Figure 3–13 Clarendon-Linden Fault Zone Shown by Offsets of the Contours on Top of the Medina Group

Paleozoic Section

Seismic and stratigraphic data suggest that the Clarendon-Linden Fault Zone has been active since the early Paleozoic with a complicated movement history alternating between normal and reverse faulting (Fakundiny et al. 1978). Movement along the Clarendon-Linden Fault Zone has been attributed to reactivation of faults within the Elzevir-Frontenac boundary zone (URS 2002b).

The New York State Geological Survey suggested that surface displacement along the Clarendon-Linden Fault Zone in western New York was the result of smaller displacements occurring across numerous parallel or subparallel faults that may not be continuous along the entire length of the fault zone (URS 2002b). The location and character of the Clarendon-Linden Fault Zone were assessed by integrating surface stratigraphic offsets, geologic structure, soil gas data, and lineament studies (Jacobi and Fountain 2002). The study documented that the Clarendon-Linden Fault Zone extends from the south shore of Lake Ontario to Allegany County and that the fault reaches the bedrock surface in the study area. North-striking lineaments that are believed to represent the surface expression of the fault segments are rarely over a few kilometers to tens of kilometers in length. Structurally, the fault zone is composed of as many as 10 segmented north-striking parallel faults in the upper Devonian section. The fault segments are linked in the subsurface by northwest-striking and east-striking transfer zones. The fault segments and transfer zones form fault blocks that have semi-independent subsidence and uplift histories. The complex structure allows for fault segments to reactivate at different times and for tectonic stress to be accommodated on several different parallel faults (Jacobi and Fountain 2002, URS 2004).

The Attica Splay, a southwestern-trending fault traceable 10 kilometers (6 miles) southwest of Attica, branches from the western fault of the Clarendon-Linden Fault Zone near Batavia. The fault has been delineated through seismic reflection profiling as far southwest as Varysburg (Figure 3–13), located 37 kilometers (23 miles) from WNYNSC (WVNS 1992a, 1993f). Well data indicate that the Attica Splay continues to the southwest, either as a fault or flexure, to Java, 30 kilometers (19 miles) northeast of WNYNSC. The Attica Splay is the most active portion of the Clarendon-Linden Fault Zone (WVNS 1992a).

A seismic reflection survey completed in June 2001 (line WVN-1 on Figure 3–12) was approximately 29 kilometers (18 miles) long and located approximately 8 kilometers (5 miles) north of WNYNSC. The seismic line was specifically located to investigate north-, northwest-, or northeast-trending structures in the Precambrian basement and overlying Paleozoic bedrock. Approximately 26 kilometers (16 miles) of reprocessed seismic reflection data were also reviewed that were collected in 1983 along a north-south section of U.S. Route 219 (line BER 83-2A on Figure 3–12). The two seismic lines were evaluated to identify structures that may be present at depth and to evaluate potential correlations between satellite-imaged lineaments and structures identified on the seismic lines (URS 2002b). The seismic reflection lines near WNYNSC indicated the presence of high-angle faults in two stratigraphic intervals spanning the Precambrian to Devonian section and the Silurian to Devonian section. Several faults in the Precambrian to Devonian section were interpreted to continue up section into Middle Devonian strata, including two west-dipping normal faults near Sardinia that may continue to the alluvium-bedrock boundary. The Sardinia faults may represent the southwest continuation of the Attica Splay into southeastern Erie County. A thin band of northeast-trending lineaments that extends from Batavia, New York, and past Sardinia into Erie County may represent the surface expression of the Attica Splay (see Figure 3–13) (URS 2002b). The Clarendon-Linden Fault Zone is discussed in further detail in Section 3.5.

The Bass Island Trend is a northeast-trending oil- and gas-producing structure that extends from Ohio through Chautauqua and Cattaraugus Counties into southern Erie County (URS 2002b). The structure is a regional fold that resulted from a series of thrust faults with a northwest transport direction ramping up-section from the Upper Silurian Salina Group into the Middle Devonian section (Jacobi 2002, URS 2002b). The faults associated with the Bass Island Trend are no longer active. Lineaments identified by satellite mapping generally coincide with the Bass Island Trend where it has been identified in southwestern Chautauqua and Erie Counties (see Figure 3–12) (Jacobi 2002). Bedrock mapping in the south branch of Cattaraugus Creek, approximately 20 kilometers (12 miles) west of the Project Premises, delineated northeast-striking inclined bedding, folds, and faults that are associated with the Bass Island Trend (URS 2002b). Geologic mapping (Gill 1999, 2005) indicated that the subsurface structure is located approximately 8 kilometers (5 miles) northwest of the site.

The Georgian Bay Linear Zone is a 30-kilometer- (19-mile-) wide structural zone that extends from Georgian Bay to the southeast across southern Ontario, western Lake Ontario, and into western New York. The zone has been delineated by a set of northwest-trending aeromagnetic lineaments and a 1997 satellite mapping investigation identified seven prominent northwest-trending lineaments (lines A-H on Figure 3–12) that cross or potentially cross seismic line WVN-1. A variety of neotectonic structures and features have been identified in exposed bedrock and lakebed sediments within the zone. Earthquake epicenters in western Lake Ontario and in Georgian Bay appear to spatially align with the Georgian Bay Linear Zone (URS 2002b). The northwest-trending lineaments may represent the surface expression of faults occurring at depth along WVN-1 (URS 2002b).

Regional subsurface geologic mapping was conducted over portions of 18 towns and 4 counties surrounding WNYNSC to potentially identify faulted subsurface layers from well logs. The particular area of concentration was north and northeast of WNYNSC to assess structures possibly associated with the Attica Splay of the Clarendon-Linden Fault Zone. Three structure maps showing the elevation on the top of the Tully Limestone, the Onondaga Limestone, and the underlying Packer Shell horizon were prepared using well log and completion data for more than 720 wells from the New York State Department of Environmental Conservation (NYSDEC). The structure mapping showed no linear alignments to suggest that the main Clarendon-Linden fault system, or the Attica Splay of that fault system, intersects any portion of the site. Subsurface geologic mapping and interpretation of the Bass Island Trend structure indicates that this feature is located too far away from the site to have any direct impact on the subsurface geology (Gill 1999, 2005).

Precambrian Rocks

Precambrian-age rocks of the Grenville Province comprise the basement rock at the site. The Grenville Province has been subdivided into the central gneiss belt, the central metasedimentary belt, and the central granulite terrain. The central metasedimentary belt is further divided into the Elzevir and Frontenac terrains with the boundary zone between the two terrains referred to as the Elzevir-Frontenac boundary zone. The Elzevir-Frontenac boundary zone is a 1.2-billion-year-old shear zone 10 to 35 kilometers (6 to 22 miles) in width, extending from southern Ontario into western New York State. Seismic reflection data have interpreted the Boundary as a regional shear zone along which the Frontenac terrain was thrust to the northwest over the Elzevir terrain (URS 2002b). Seismic reflection profiling, aeromagnetic surveys, lineament studies, and other field surveys suggest that the central metasedimentary belt underlies WNYNSC (URS 2002b).

3.3.1.3 Geologic Resources

Cattaraugus County's principal non-fuel mineral product consists of sand and gravel. Construction aggregate production for the six-county mineral district in which WNYNSC is located totaled approximately 4.2 million metric tons (4.6 million tons) in 2002 (USGS and NYSGS 2003), roughly equivalent to 2.3 million cubic meters (3 million cubic yards) of material. More than 70 state-regulated commercial sand and gravel mines and gravel pits operate in Cattaraugus County, as well as a shale mine. Nearly 40 sand and gravel mines and gravel pits are operated in Erie County (NYSDEC 2005a). Surficial sand and gravel across WNYNSC may be suitable for aggregate (sand and gravel) production.

Cattaraugus County is perennially one of the top oil- and gas-producing counties in New York. Active oil production wells are concentrated in the western portions of the county with the majority of the gas production from the south-central and southeast portions of the county (NYSDEC 2005a). A total of 427 gas wells and 1,399 oil wells produced approximately 28.3 million cubic meters (1 billion cubic feet) of natural gas and 17.5 million liters (4.6 million gallons) of oil in the county in 2002 (NYSDEC 2004a). There were 16 active gas wells and 2 active oil wells in Ashford Township that produced 640,000 cubic meters (22.6 million cubic feet) of natural gas and 421,000 liters (111,300 gallons) of oil in 2002.

3.3.2 Soils

Characteristics of the natural soil underlying WNYNSC reflect the composition and textures of the Holocene alluvial and Pleistocene glacial deposits from which they are derived and consist of sand, gravelly silt and clay, clayey silt, and silty clay. The Churchville silt loam is found across the plateau areas, while the Hudson silt loam dominates in the Quarry Creek stream valley and the Varysburg gravelly silt loam dominates along the Franks Creek stream valley (WVNS 1993a). Churchville series soils generally consist of very deep, somewhat poorly drained soils that formed in clayey lacustrine sediments overlying loamy till. Hudson soils consist of very deep, moderately well-drained soils formed in clayey and silty lacustrine sediments. The Hudson soils occur on convex lake plains, on rolling-to-hilly moraines and on dissected lower valley side slopes. Varysburg soils consist of very deep, well-drained and moderately well-drained soils on dissected lake plains. The Varysburg soils formed in gravelly outwash material and the underlying permeable clayey lacustrine sediments (USDA NRCS 2005). The Churchville and Hudson silt loams are prone to erosion, particularly on slope areas and when vegetative cover is removed (WVNS 1993a).

Soil Contamination

Soil underlying the waste management areas at the Project Premises has been impacted by radiological and chemical contamination associated with over 40 years of facility operations. Radiological soil contamination has resulted from operational incidents, including airborne releases in 1968 that produced the Cesium Prong; liquid releases resulting in the North Plateau Groundwater Plume; waste burials; and spills during the transport or movement of contaminated equipment or materials. A site database documents spills that have occurred at the facility since 1989 and includes the location of each spill, as well as notifications and cleanup actions implemented for each incident.

The primary radiologically contaminated areas of soil are the Cesium Prong area containing cesium-137; the North Plateau strontium-90 Groundwater Plume; Lagoons 1 through 5 and the Solvent Dike in WMA 2; and waste burials in the NDA (WMA 7) and SDA (WMA 8). Additional areas of soil contamination identified in Resource Conservation and Recovery Act (RCRA) facility investigation sampling (WVNS and Dames and Moore 1997) as exceeding radiological background levels were located along drainage ditches around the Construction and Demolition Debris Landfill (CDDL); the Demineralizer Sludge Ponds; subsurface soil beneath the Low-Level Waste Treatment Facility; the Effluent Mixing Basins; and other areas within the Project Premises (WSMS 2009e, WVNSCO 2004). The volume of radiologically contaminated soil over the Project Premises is estimated to be approximately 1,184,200 cubic meters (1,549,000 cubic yards), as shown in **Table 3–4**. **Figures 3–14** and **3–15** depict specific locations where surface soil, sediment, and subsurface soil samples indicate radionuclide concentrations greater than background.

Chemical excursions from facilities have been infrequent and localized in extent. Migration of leachate consisting of 98 percent n-dodecane and 2 percent tributyl phosphate occurred from NDA Special Holes SH-10 and SH-11 in 1983 (WVNSCO 1985). Stabilization operations in 1986 resulted in the excavation and backfill of NDA Special Holes SH-10 and SH-11; exhumation of eight 3,785-liter (1,000-gallon) tanks containing solvent-impregnated absorbent; and removal and packaging of contaminated absorbent and soil. Interim measures consisting of a capped interceptor trench and a liquid pretreatment system were implemented by DOE to control potential migration of n-dodecane and tributyl phosphate from the NDA to Erdman Brook.

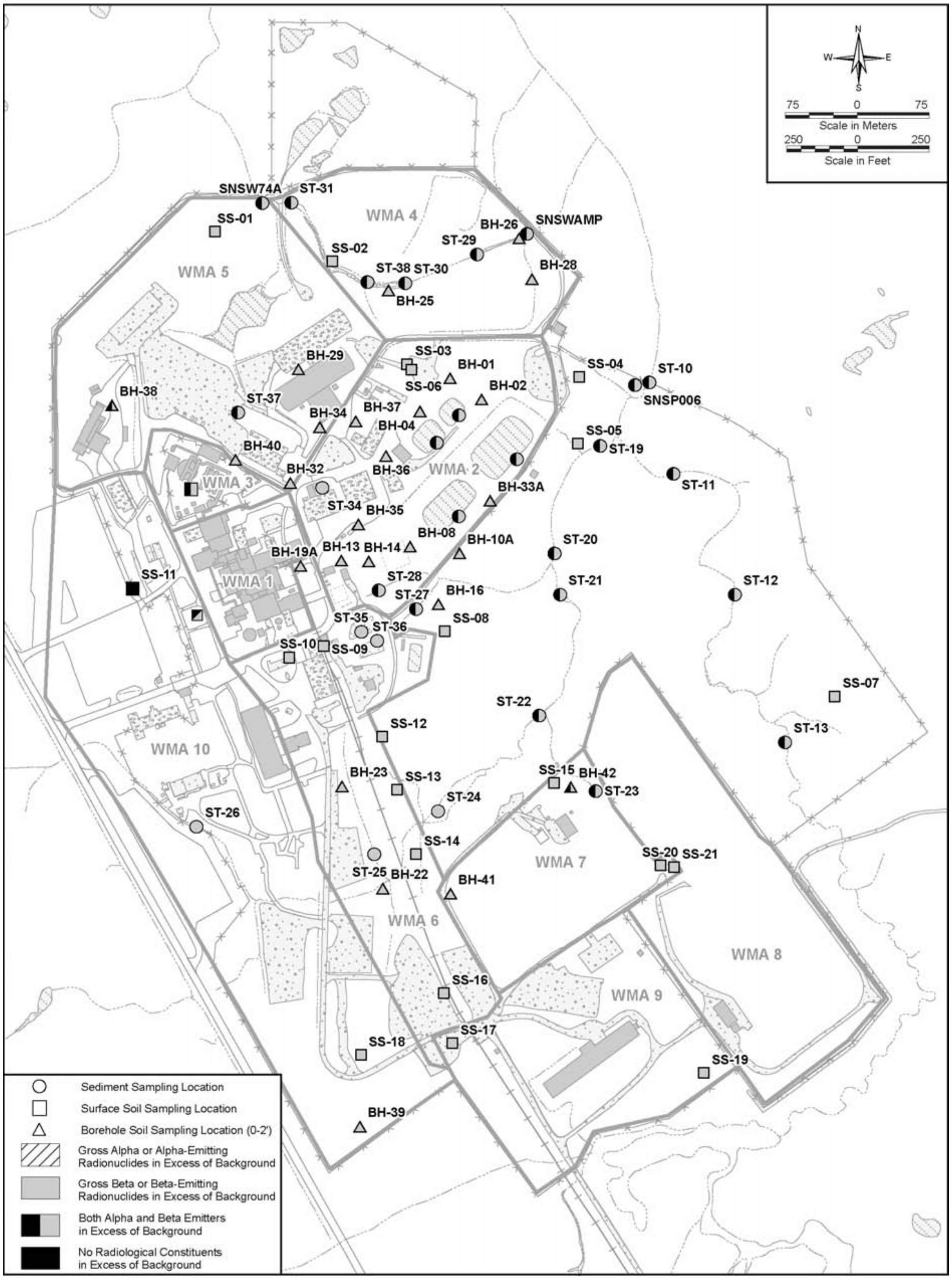


Figure 3–14 Surface Soil and Sediment Locations With Radionuclide Concentrations in Excess of Background

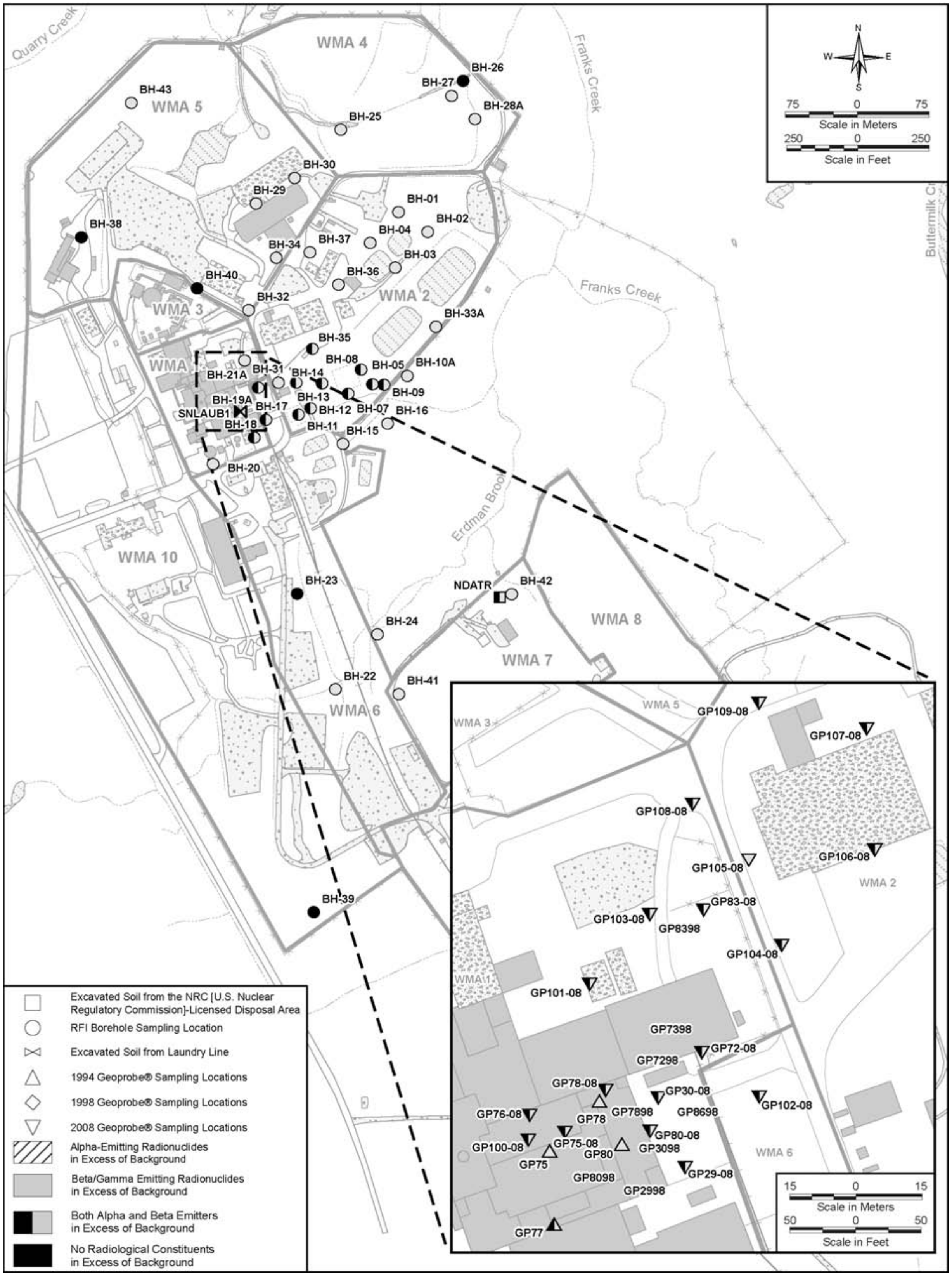


Figure 3–15 Subsurface Soil Locations With Radionuclide Concentrations in Excess of Background

Table 3–4 Estimated Volumes of Contaminated Soil on the West Valley Demonstration Project Premises

Source	***Area***	***Estimated Soil Contamination Volume (cubic meters)***
WMA 1 Soil Removal	WMA 1	75,000
WMA 2 Closure	WMA 2	39,000
WMA 3 Soil Removal	WMA 3	1,000
WMA 4 Soil Removal	WMA 4	23,000
WMA 5 Closure	WMA 5	3,000
WMA 6 Closure	WMA 6	1,200
WMA 7 Closure	WMA 7	186,000
WMA 8 Closure	WMA 8	371,000
WMA 9 Closure	WMA 9	0
WMA 10 Closure	WMA 10	0
WMA 11 Closure	WMA 11	0
WMA 12 Closure	WMA 12	7,000
North Plateau Groundwater Plume	WMA 5; 12	417,000
Cesium Prong	WMA 3, 4, 5	61,000
	Total	1,184,200

WMA = Waste Management Area.
Note: To convert cubic meters to cubic feet, multiply by 35.314.
Source: WSMS 2009a.

Localized chlorinated solvent, polynuclear aromatic hydrocarbon, and metal compounds were identified in RCRA facility investigation soil sampling as occurring at concentrations below or slightly exceeding NYSDEC Technical and Administrative Guidance Memorandum 4046 soil cleanup objectives or site background levels (WVNS and Dames and Moore 1997; WVNSCO 2004, 2007). The low-level chemical detections are consistent with human activity and the industrial nature of the site. The RCRA facility investigation did not include a recommendation for further action for soil mitigation. Based on the RCRA facility investigation results, Corrective Measures Studies (WVNSCO 2007) are ongoing at the following six onsite areas to evaluate the potential need for further characterization, remediation, and/or monitoring:

- CDDL
- NDA and the NDA Interceptor Trench Project
- SDA
- Lagoon 1
- Demineralizer Sludge Ponds
- Former Low-Level Waste Treatment Facility building (02 Building), neutralization pit, interceptors, and the Low-Level Waste Treatment Facility building

Metals concentrations in RCRA facility investigation soil samples from these facility areas slightly exceed background levels or Technical and Administrative Guidance Memorandum 4046 criteria. Organic constituents consisting of chlorinated solvents; volatile organic compounds (benzene, toluene, ethylbenzene, xylenes), and semivolatile organic compounds, including polynuclear aromatic hydrocarbon compounds, represent chemical constituents of concern associated with subsurface soil at the NDA. Polynuclear aromatic hydrocarbon compound concentrations exceeding the Technical and Administrative Guidance

Memorandum 4046 criteria have been detected in subsurface soil associated with Lagoon 1 (benzo[a]anthracene, benzo[a]pyrene, and chrysene) and the Demineralizer Sludge Pond (benzo[a]anthracene [692 micrograms per kilogram], benzo[a]pyrene [798.7 micrograms per kilogram], benzo[b]fluoranthene [1,286 micrograms per kilogram], and chrysene [990.5 micrograms per kilogram]). The presence of polynuclear aromatic hydrocarbon soil contamination has been attributed to proximity to human sources or buried asphalt (WVNSCO 2007). Chemical constituent concentrations at the remaining RCRA facility investigation Solid Waste Management Units were below the NYSDEC Technical and Administrative Guidance Memorandum 4046 soil cleanup objectives (WVNSCO 2007). Contamination of stream sediment is discussed in Section 3.6.1.

Cesium Prong

Uncontrolled airborne releases from the Main Plant Process Building ventilation system filters in 1968 released contaminated material from a 60-meter- (200-foot-) high plant stack. The releases carried contaminated material to portions of WNYNSC and an offsite area. The contaminated area has been investigated using aerial and ground level gamma radiation surveying and soil sampling. The methods and results of these surveys are described in the *Site Radiological Surveys Environmental Information Document* (WVNS 1993c) and the *WNYNSC Off-Site Radiation Investigation Report* (Dames and Moore 1995). The data from a 1979 aerial survey showed cesium-137 levels elevated above background levels in the Cesium Prong on the Project Premises, on the balance of the site, and outside of the WNYNSC boundary (**Figure 3–16)**.

Sampling data from the Cesium Prong within the boundary of WNYNSC is sparse. Four surface soil samples collected northwest of the Main Plant Process Building by NYSDEC in 1971 indicated cesium-137 activity ranging from 18.2 to 43.2 picocuries per gram. Strontium-90 activity in two of the samples ranged from 37 to 39 picocuries per gram. A subsequent cesium-137 survey conducted between 1993 and 1995 in an area on and off site of WNYNSC and within the Cesium Prong consisted of surface and subsurface soil sampling to measure activity levels since the time of cesium-137 deposition (Dames and Moore 1995). The 1995 survey included sample grid blocks in background areas, open fields and forested areas, and areas where the surface had been disturbed by human activity, such as residential yards and tilled farmland.

Cesium-137 levels decreased with depth in the undisturbed grids, with 70 percent of the activity on average in the upper 5 centimeters (2 inches), 25 percent of the activity in the 5-to-10-centimeter (2-to-4-inch) layer, and 5 percent of the activity in the 10-to-15-centimeter (4-to-6-inch) layer (Dames and Moore 1995). Higher cesium-137 levels were associated with occurrences of organic humus on the ground surface. The maximum localized cesium-137 activity was 44 picocuries per gram. For five undisturbed grid blocks, average cesium-137 activity in the upper 5-centimeter (2-inch) layer ranged from 2.7 to 25.4 picocuries per gram compared to an average background activity of 0.68 picocuries per gram. The overall results indicated that disturbance of the surface layers had either removed cesium-137, covered it with clean soil, or blended it with the soil to varying degrees (Dames and Moore 1995).

Aerial surveys and soil sampling in the Cesium Prong indicate that contaminated soil occurs on the Project Premises and on the balance of the site north of Quarry Creek. The estimated volume of contaminated soil (i.e., exceeding 25 millirem per year for cesium-137) in these two areas is approximately 61,000 cubic meters (2,100,000 cubic feet) (WSMS 2009a). The volume was based on the extent of a calculated 25 millirem per year area estimated by decaying the activity level measured during the 1979 aerial survey, to account for the elapsed time since the survey. The volume calculation assumed a soil removal depth of 15 centimeters (6 inches).

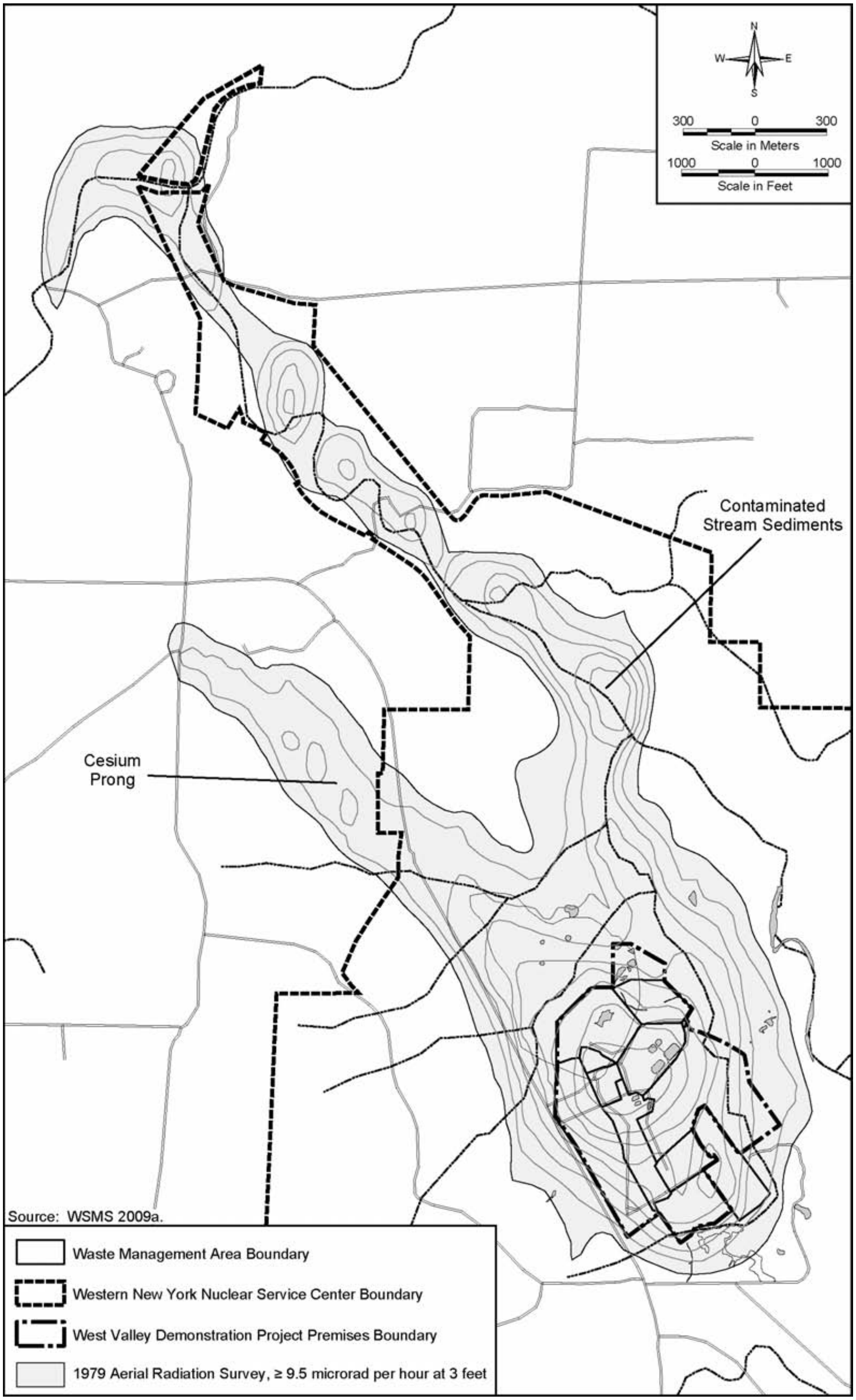


Figure 3–16 Area Affected by the Cesium Prong

3.4 Site Geomorphology

Erosion is occurring in the region and the greatest topographical changes occur after large storms. This section describes the nature of the erosion processes occurring on the site, identifies the general location of some features such as gullies and slumping, and summarizes the short-term erosion measurements that have been made on site. The location of features such as gullies, knickpoints, and major slump blocks change with time, particularly after major storms. These types of features are monitored by DOE and NYSERDA, particularly near areas where waste is stored, and mitigating measures are implemented, including the filling of gullies, the installing of erosion-resistant structures, or the local relocating of stream channels. These mitigating measures can also change the location and nature of erosion features.

Long-term predictions of erosion are developed in Appendix F of this EIS and used to support the estimates of unmitigated erosion that are summarized in Chapter 4, Section 4.1.10.3.3. The predictions developed in Appendix F consider the impact of severe storm events such as the unusual series of large storms that occurred in the region between August 8 and August 10, 2009, which produced high precipitation rates (15–18 centimeters [6–7 inches] over 3 days) and resulted in erosion on the Reservoir 1 spillway and on the Buttermilk Creek slide on the west bank to the east of the SDA.

The site region continues to adjust to the glaciation and retreat process that ended about 12,000 years ago. Since that time, glacial rebound of about 30 meters (100 feet) has occurred across WNYNSC (WVNS 1993f). As a result, the region is geomorphologically immature and stream profiles and patterns will continue to evolve in response to decelerating rebound and tilting (WVNS 1993f). Consequently, geomorphological studies at WNYNSC have focused on the major erosional processes acting on Buttermilk Creek and Franks Creek drainage basins near the Project Premises and the SDA. This section describes these processes – sheet and rill erosion, stream channel downcutting and valley rim widening, and gully advance – and where they occur. A more thorough treatment and predictive analysis of these processes across the site is presented in Appendix F of this EIS.

3.4.1 Sheet and Rill Erosion

Sheet and rill erosion on overland flow areas and mass wasting on hillslopes have been monitored at 23 hillslope locations along the stream valley banks adjacent to the Project Premises (URS 2001, WVNS 1993a). Twenty-one erosion frames were originally placed on hillslopes that are close to plant facilities and contain a variety of soil types and slope angles. Two erosion frames were placed near the edges of stream valley walls to monitor potential slumping of large blocks of soil. The frames were designed to detect changes in soil depth at the point of installation and were monitored from September 1990 through September 2001. Soil gain or loss has been detected at the frame locations still in place as further described in Appendix F, Section F.2.1. The largest soil gain or loss, indicating the greatest amount of soil movement, has occurred at frames located on the north and east slopes of the SDA. These soil erosion measurements have been taken over too short a time span to be reliable for long-term projections; however, they indicate that the sheet and rill erosion process has removed small quantities of soil at a few locations within the Franks Creek watershed. Sheet and rill erosion monitoring locations are shown on **Figure 3–17**.

3.4.2 Stream Channel Downcutting and Valley Rim Widening

The three small stream channels, Erdman Brook, Quarry Creek, and Franks Creek, that drain the Project Premises and SDA are being eroded by the stream channel downcutting and valley rim widening processes. These streams are at a relatively early stage of development and exist in glacial till material. These characteristics cause the streams to downcut their channels instead of moving laterally (WVNS 1993a).

Active stream downcutting can be observed at knickpoint locations along the longitudinal profile of the stream channels. A knickpoint is an abrupt change in the slope of the streambed, such as a waterfall, that is caused by a change in base level. The stream erodes the knickpoint area by carrying the fine-grained sediment downstream and leaving the coarse-grained sediment, gravel and cobbles, at the base of the vertical drop.

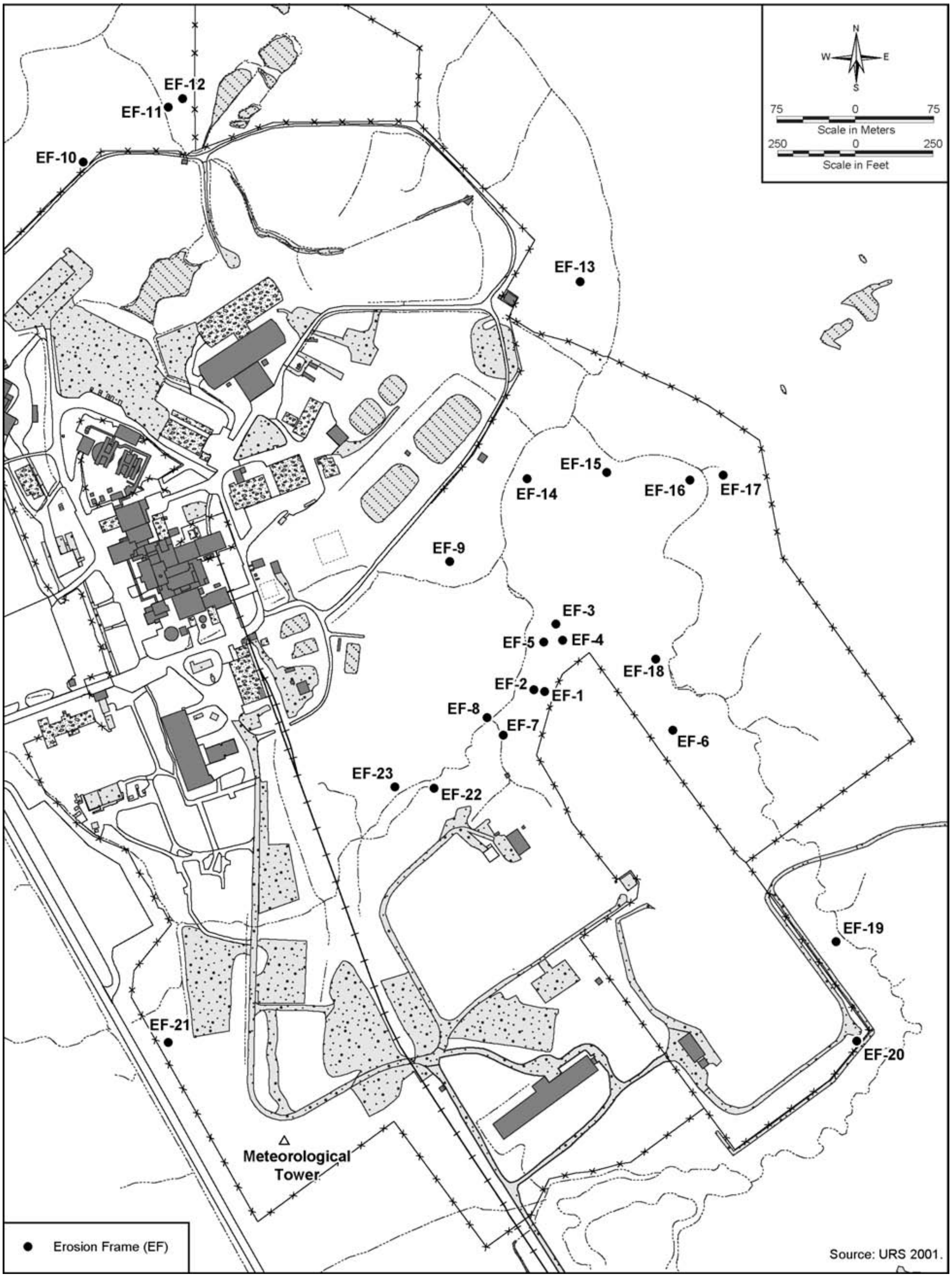


Figure 3–17 Location of Erosion Frame Measurements of Sheet and Rill Erosion

Stream turbulence from high-energy storm events agitates the accumulated gravel and cobbles and creates a scour pool. The knickpoint migrates upstream due to the movement of the gravel and cobbles by the erosive force of water, which erodes the knickpoint at its base. In addition, the channel is deepened by abrasion from the movement of gravel and cobbles downstream. As this process continues, the channel cross-section changes from a U-shaped, or flat-bottomed, floodplain with a low erosion rate to a V-shaped channel with a higher erosion rate (WVNS 1993i). The locations of knickpoints identified in a 1993 study are shown on **Figure 3–18**; however, due to the dynamic nature of the downcutting process, the knickpoints have likely continued to migrate upstream since that time. An example of this occurrence was observed in June 2009 for a knickpoint in Erdman Brook north of the SDA.

As the downcutting progresses, the streambanks are undercut, causing localized slope failures (i.e., slumps and landslides). This process commonly occurs at the outside of the meander loops and produces a widening of the stream valley rim (WVNS 1993i). While it is possible that an entire series of slump blocks on a slope can form at the same time, field observations have indicated that a single block initially forms. The redistribution of stresses and weight from the movement of the single block then adds to the forces already at work along the stream slope, eventually causing other slump blocks to form. Other factors that combine to affect slope stability include vegetative ground cover, local groundwater conditions, freeze-thaw cycles, and manmade loads (WVNS 1993a).

Three major slump block locations were initially identified on Franks Creek, one on Erdman Brook, and one on Quarry Creek. The blocks vary in length from about 1.5 meters (5 feet) to greater than 30 meters (100 feet) and tend to be about 1.0 to 1.2 meters (3 to 4 feet) in height and width when they initially form (WVNS 1993a). These slump block locations are shown on Figure 3–18 at station numbers F48, F63, E9, F102, and Q19, and represent areas where the rim widening process is most active. Slump block movement is also occurring on the Erdman Brook slope that forms the crest of Lagoon 3, also shown on Figure 3–18. Monitoring instrumentation is being used at this location to measure both shallow and deep-seated long-term creep (Empire Geo-Services 2006). The most erosion has occurred along a 67-meter (220-foot) length of slope along Erdman Brook north of the SDA (station number E9-E10); however, the rate of movement is not representative of the stream system as a whole because this portion of the stream is eroding through uncompacted fill, not native soil (WVNS 1993a). Slump block formation is an active mass wasting process at WNYNSC.

3.4.3 Gullying

The steep valley walls of the stream channels within the Buttermilk Creek drainage basin are susceptible to gully growth. Gullies are most likely to form in areas where slumps and deep fractures are present, seeps are flowing, and the slope intersects the outside of the stream meander loop. Gully growth is not a steady-state process, but instead occurs in response to episodic events, such as thaws and thunderstorms, in areas where a concentrated stream of water flows over the side of a plateau and in areas where groundwater movement becomes great enough for seepage to promote grain-by-grain entrainment and removal of soil particles from the base of the gully scarp—a process referred to as sapping. Sapping causes small tunnels (referred to as pipes) to form in the soil at the gully base, which contributes to gully growth by undermining and weakening the scarp until it collapses. Surface water runoff into the gully also contributes to gully growth by removing fallen debris at the scarp base, undercutting side walls, and scouring the base of a head scarp.

More than 20 major and moderate-sized gullies have been identified, with most shown on Figure 3–18. Some of these gullies have formed from natural gully advancement processes and others are the result of site activities. For example, runoff from the plant and parking lots directed through ditches to the head of a previously existing gully created a new gully at the upper reaches of the equalization pond outfall

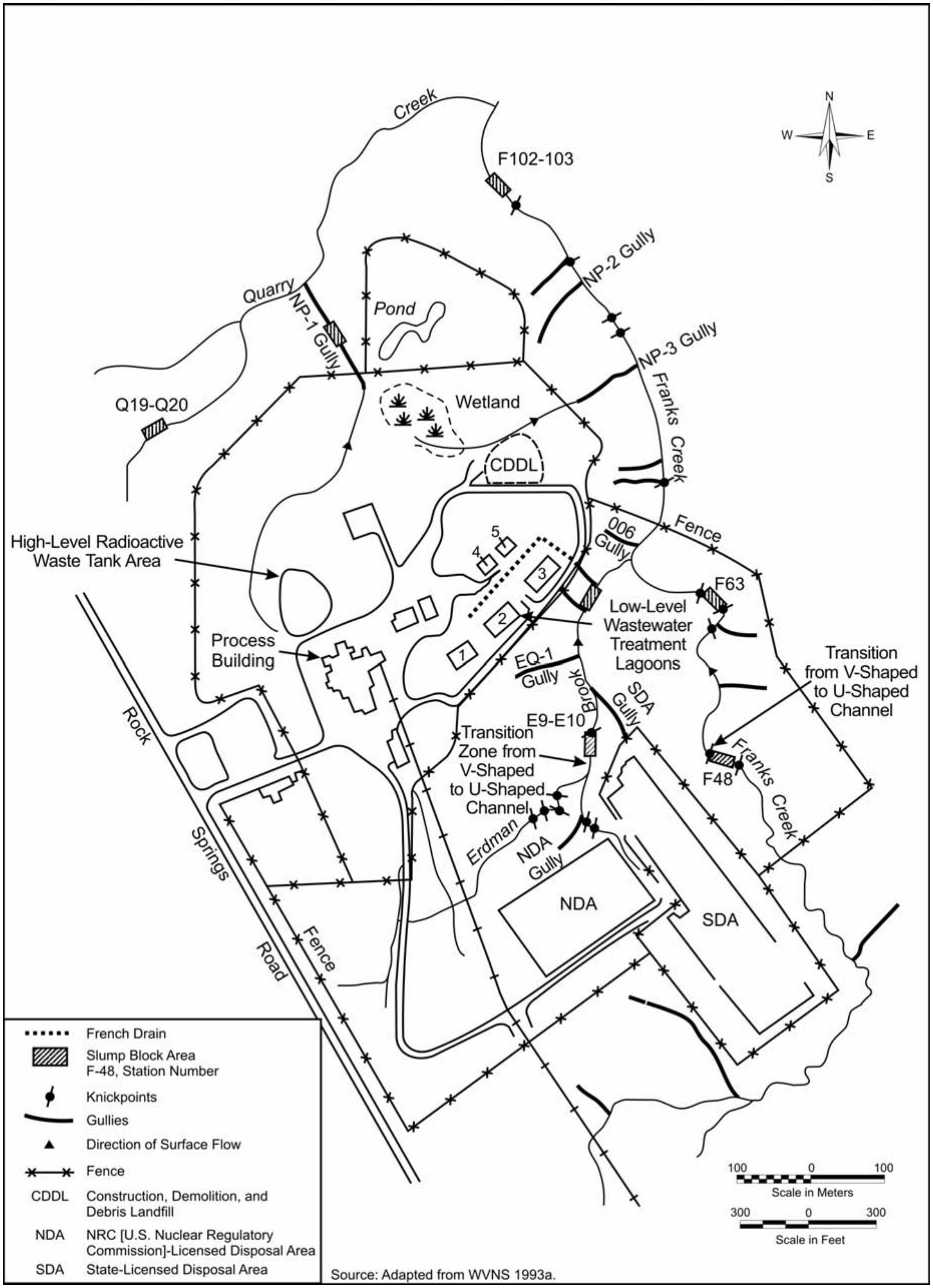


Figure 3–18 Gullies, Major Slump Blocks, Channel Transition, and Knickpoints in the Franks Creek Drainage Basin

(WVNS 1993a). Several of the gullies are active and migrating to the edge of the North and South Plateaus. One of the active gullies was located on Erdman Brook north of the SDA and is referred to as the SDA Gully on Figure 3–18. It was advancing toward the SDA before it was reconstructed to mitigate erosion in 1995. The other three active gullies are located along lower Franks Creek and are referred to as the NP-2, NP-3 and 006 Gullies (Figure 3–18) (WVNS 1993a).

3.4.4 Erosion Rates

The erosion rates from the geomorphic processes described in the preceding sections have been measured at numerous locations throughout the drainage basins, as summarized in **Table 3–5**. Rates of sheet and rill erosion were directly measured using erosion frames along the stream valley banks adjacent to the Project Premises. Rates of stream channel downcutting were determined from three indirect measurement methods: carbon-14 and optically stimulated luminescence age dating, measurement of stream channel longitudinal profile, and measurement of rate of slumping. The downcutting rates were translated into estimates of rates of stream valley rim widening using an estimate of stable slope angle for the stream valley and geometric considerations. Gully migration rates were determined using aerial photographs and the Soil Conservation Services' (now the Natural Resources Conservation Service) Technical Report-32 method (see Appendix F, Section F.2.3.3, of this EIS). These historical measurements are not predictions of future erosion rates for specific processes, but they do provide a perspective by which to judge the reasonableness of erosion projections. Appendix F details erosion study observations to date and presents the results of predictive modeling of site erosion over the short- and long-term.

Table 3–5 Summary of Erosion Rates at the Western New York Nuclear Service Center

Location	*Erosion Rate (meters per year)*	*Author and Study Date*	*Method*
Sheet and Rill Erosion	0 to 0.0045	URS Corporation (2001)	Erosion frame measurements (11-year average rate)
Downcutting of Buttermilk Creek	0.0015 to 0.0021	La Fleur (1979)	Carbon-14 date of terrace – depth of stream below terrace
Downcutting of Buttermilk Creek	0.005	Boothroyd, Timson, and Dunne (1982)	Carbon-14 date of terrace – depth of stream below terrace
Downcutting of Buttermilk Creek	0.0032	Mahan (2007)	Optically stimulated luminescence age dating of nine terraces along Buttermilk Creek
Downcutting of Quarry Creek, Franks Creek, and Erdman Brook	0.051 to 0.089	WVNS 1993a	Difference from 1980 to 1990 in stream surveys
Downcutting of Franks Creek	0.06	WVNS 1993a	Stream profile, knickpoint migration 1955 to 1989
Valley Rim Widening of Buttermilk Creek	4.9 to 5.8	Boothroyd, Timson, and Dana (1979)	Downslope movement of slump block over 2 years
Valley Rim Widening of Buttermilk and Franks Creeks and Erdman Brook	0.05 to 0.13	McKinney (1986)	Extrapolate Boothroyd data for 500 years
Valley Rim Widening of Erdman Brook	0.02 to 0.04	WVNS 1993a	Downslope movement of stakes over 9 years
SDA Gully Headward Advancement [Reconstructed in 1995]	0.4	WVNS 1993a	Gully advancement – Soil Conservation Services' Technical Report-32 method
NP3 Gully Headward Advancement	0.7	WVNS 1993a	Gully advancement – Soil Conservation Services' Technical Report-32 method
006 Gully Headward Advancement	0.7	WVNS 1993a	Gully advancement – Soil Conservation Services' Technical Report-32 method

Note: To convert meters to feet, multiply by 3.2808.

3.5 Seismology

This section contains information about the hazard to WNYNSC posed by earthquakes. The earthquake history of western New York and its vicinity is described in Section 3.5.1. The historical record is an important element in determining the location, size, and frequency of earthquakes that might affect WNYNSC. Although the earthquake record offers significant information about the earthquake potential of an area, the historic record is short relative to the time between large earthquakes, which can be thousands of years. The potential for earthquakes along faults and other tectonic features (even if they have not been discovered yet) is considered in Section 3.5.2. The historical seismicity and potential seismicity from tectonic features (both known and unknown) in western New York State are used to estimate the seismic hazard and liquefaction potential for WNYNSC. Sections 3.5.3, 3.5.4, and 3.5.5 include estimates of the ground motion hazard as typified by peak horizontal ground acceleration (PGA), probabilistic seismic hazard curves; which describe the relationship between some measure of ground motion and the probability of exceeding some value; and liquefaction potential.

3.5.1 Earthquake History for Western New York State and Vicinity

Historical earthquakes are one indication of the number and size of seismic events that might occur in the future. Before the introduction of seismographic instrumentation, the magnitude of an earthquake was approximated by its effects and the damage that was inflicted. The scale used to measure the effects and damage from earthquakes is the Modified Mercalli Intensity (MMI) scale, which ranges from I (no damage) to XII (complete destruction) (**Table 3–6**). Many factors contribute to the damage caused by an earthquake, including distance from the event, the rate of attenuation in the earth, geologic site conditions, and construction methods. Between 1732 and 2004, the historical earthquake record for western New York documents 142 events within a 480-kilometer (300-mile) radius of WNYNSC, with epicentral intensities of MMI-V to MMI-VIII and moment magnitudes (M) up to M 6.2 (USGS 2008). At WNYNSC, the resulting intensity of shaking was much less severe due to the distance from these events. Most regional earthquakes have occurred in the Precambrian basement and were not associated with identified geologic structures (URS 2002b).

The only historic earthquakes within a 480-kilometer (300-mile) radius of WNYNSC known to have produced intensities higher than MMI-III at WNYNSC were the 1929 Attica and the 1944 Cornwall-Massena earthquakes, which both produced an estimated MMI-IV at the site (WVNS 2004a, 2006).

The 1929 Attica earthquake occurred on August 12 with an epicenter about 48 kilometers (30 miles) northeast of WNYNSC. The earthquake produced MMI-VII shaking in the epicentral area and was felt over an area of about 130,000 square kilometers (50,000 square miles), including parts of Canada. In Attica, approximately 250 house chimneys collapsed or were damaged, and cracked walls and fallen plaster were common. Objects were thrown from shelves, monuments in cemeteries were toppled, and a number of wells went dry. In general, the degree of damage to structures could be related to the type of design and construction. On the basis of the recorded damage, an MMI-VII and a body-wave magnitude (m_b) 5.2 were assigned to this event based on previous hazard analyses for WNYNSC (WVNS 2004a). An MMI-VIII was ascribed to the 1929 Attica earthquake in other studies (Stover and Coffman 1993, USGS 2005b).

Earthquakes smaller than the 1929 event have occurred frequently in the Attica area (December 1929, 1939, and 1955; July and August 1965; January 1966; and June 1967). The largest of these were the two most recent events with epicentral intensities of MMI-VI and magnitudes of m_b 3.9. These earthquakes likely resulted in intensities of MMI-III or less at WNYNSC (USGS 2005c, WVNS 2004a). Earthquakes in the Attica, New York, area have generally been ascribed to the Clarendon-Linden fault system, although there is no definitive data that this is the case (WVNS 2004a, 2006).

Table 3–6 The Modified Mercalli Intensity Scale of 1931, with Generalized Correlations to Magnitude, and Peak Ground Acceleration

Modified Mercalli Intensity [a]	***Observed Effects of Earthquake***	***Approximate Magnitude*** [b, c]	***Class***	***Peak Ground Acceleration (g)*** [d]
I	Usually not felt except by a very few under very favorable conditions.	Less than 3	Micro	Less than 0.0017
II	Felt only by a few persons at rest, especially on the upper floors of buildings.	3 to 3.9	Minor	0.0017 to 0.014
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck.			
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy object striking building. Standing motorcars rock noticeably.	4 to 4.9	Light	0.014 to 0.039
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.			0.039 to 0.092
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	5 to 5.9	Moderate	0.092 to 0.18
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	6 to 6.9	Strong	0.18 to 0.34
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.	7 to 7.9	Major	0.34 to 0.65
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.			0.65 to 1.24
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.			1.24 and higher
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails greatly bent.	8 and higher	Great	1.24 and higher
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.	8 and higher	Great	1.24 and higher

[a] Intensity is a unitless expression of observed effects of earthquake-produced ground shaking. Effects may vary greatly between locations based on earthquake magnitude, distance from the earthquake, and local subsurface geology. The descriptions given are abbreviated from the Modified Mercalli Intensity Scale of 1931.

[b] Magnitude is a logarithmic measure of the strength (size) of an earthquake related to the strain energy released by it. There are several magnitude “scales” (mathematical formulas) in common use, including local “Richter” magnitude, body wave magnitude, moment magnitude (M), and surface wave magnitude. Each has applicability for measuring particular aspects of seismic signals and may be considered equivalent within each scale’s respective range of validity. For very large earthquakes, the M scale provides the best overall measurement of earthquake size.

[c] Correlations back to Modified Mercalli Intensity should be used with caution as they reflect the base or threshold level of shaking experienced in an earthquake with the given magnitude.

[d] Acceleration is expressed as a percent relative to the earth’s gravitational acceleration (*g*) (i.e., [*g*] is equal to 980 centimeters [32.2 feet] per second squared). Given values are correlated to Modified Mercalli Intensity based on measurements of California earthquakes only (Wald et al. 1999).

Sources: Compiled from USGS 2005a, 2005b; Wald et al. 1999.

The Cornwall-Massena earthquake occurred on September 5, 1944, with an epicenter 430 kilometers (267 miles) east-northeast of the site. It is the largest earthquake ever recorded within New York State. It produced MMI-VIII shaking at its epicenter and was felt over an area of about 450,000 square kilometers (174,000 square miles). In Massena, New York, the earthquake destroyed or damaged 90 percent of the chimneys, and many structures were rendered unsafe for occupancy. Many wells in St. Lawrence County, New York, went dry, and water levels were affected in streams and wells as far away as Westchester County and Long Island, New York (WVNS 2004a). The magnitude of the earthquake has been estimated at m_b 5.8.

Outside the western New York region, there is a zone of major seismic activity near LaMalbaie, Quebec, in the lower St. Lawrence River Valley. Large earthquakes occurred in the LaMalbaie area in 1638, 1661, 1663, 1732 and, most recently, in 1988 (USGS 2005c, WVNS 2004a, 2006). The earthquakes were felt over the entire eastern section of Canada and the northeastern United States. The 1988 M 5.8 earthquake did not produce intensities higher than MMI-III at the site. The intensities experienced at the site related to the pre-1988 earthquakes are unknown, but are not expected to have exceeded MMI-IV (WVNS 2004a, 2006).

3.5.2 Tectonic Features and Seismic Source Zones

Potential seismic sources, such as active faults and seismic source zones, are identified and described by scientists in their approaches to estimating seismic hazard. A *tectonic feature* considered to have seismic potential is a geologic structure such as a fault tens to hundreds of kilometers in extent that is either directly observable on the Earth's surface, or that may be inferred from geophysical investigations. A *seismic source zone* is an area in which the seismicity is considered to result from buried seismic sources that share similar seismic-tectonic characteristics. The seismicity in a seismic source zone is assumed to occur randomly with no clear association with any of the tectonic features that might be included in the seismic source model. Both tectonic features and seismic source zones are defined by characteristics such as earthquake recurrence rate (over the range of expected magnitudes) and the maximum magnitude that is likely to occur on the feature or within the area. In the northeastern United States, earthquakes not associated with an observable tectonic feature occur primarily in the Precambrian basement beneath the Paleozoic cover. These earthquakes represent either reactivation of preexisting faults or new ruptures in or near the old fault zones (Ebel and Tuttle 2002). The purpose of the seismic source zone is to account for the probability that an event might occur in an area with no history of earthquakes or on a previously unidentified tectonic feature. The maximum magnitude and recurrence rate for seismic source zones are derived from the historical seismicity within the zone, the type of crust that the zone represents, and other factors.

Tectonic features near WNYNSC that have been identified in seismic hazard studies include the Clarendon-Linden fault system, which marks the eastern boundary of the Elzevir-Frontenac boundary zone; the main fairway of the Elzevir-Frontenac boundary zone; north-northeast trending lineaments that appear to define the surface expression of the western side of the underlying Elzevir-Frontenac boundary zone; and the Bass Island Trend. The Elzevir-Frontenac boundary zone is an interpreted tectonic region of Proterozoic crust that has been geophysically mapped in New York State. There is no clear association between seismicity and the western band of north-northeast-trending lineaments that demarcate the western limit of the Elzevir-Frontenac boundary zone. The Bass Island Trend is defined by a series of buried thrust faults and associated folds. Earthquake activity has not been recorded along the Bass Island Trend, suggesting that this structure is not seismically active (URS 2002b).

As stated in Section 3.5.1, the source of earthquakes in and around Attica, New York have generally been ascribed to the Clarendon-Linden fault system, which is the most prominent tectonic feature near WNYNSC (Fakundiny and Pomeroy 2002, Jacobi and Fountain 1996). Induced seismicity associated with the Clarendon-Linden fault system has been correlated with high pressure injection of water into a brine well (Jacobi and Fountain 1996). One suggested source of seismicity is Paleozoic faulting involving repeated reactivation and upward propagation of basement faults and fractures into overlying strata (Boyce and Morris 2002). The 2002 study's hypothesis is that movement along the Elzevir-Frontenac boundary zone resulted in movement on the Clarendon-Linden fault system. There was no evidence found that the complete upper crustal section above the Precambrian basement is faulted (Ouassaa and Forsyth 2002). The apparent offsets identified in seismic reflection survey data were alternately attributed to changes in basal Paleozoic strata deposited within the relief of an unconformity; the response of parts of the Paleozoic section to glacial rebound; the result of sediment compaction and non-deposition over topographic relief along the unconformity; or a combination of the above (Ouassaa and Forsyth 2002). Seismicity is not evident along the entirety of the Clarendon-Linden fault system.

It was estimated from the maximum recorded earthquake magnitude for the Clarendon-Linden fault system that "it is probable that no earthquake with a magnitude greater than 6 occurred along these faults in the past 10,000 years" (Jacobi and Fountain 1996). The maximum credible earthquake for the study area was determined to be between magnitude 5.2 and 6 in the next 10,000 years, although it is believed that there is a small probability that an earthquake larger than magnitude 6 could occur (Jacobi and Fountain 1996). Paleoseismological evidence of activity along the fault system during the Quaternary has not been identified. Whether historic, or prehistoric liquefaction features were found in the liquefiable deposits in the area of the 1929 Attica earthquake and south of Attica along the fault zone (Tuttle et al. 1995, 1996). Various soft-sediment structures were observed, but all could be more reasonably attributed to glacial, sedimentological, or mass wasting processes (Tuttle et al. 1995, 1996; Young and Jacobi 1998). The lack of observed paleoliquefaction features may indicate that earthquakes larger than M 6 have not occurred along the Clarendon-Linden fault system during the last 12,000 years (Tuttle et al. 1995). However, smaller earthquakes may have occurred without leaving a detectable paleoliquefaction record. The 1929 Attica earthquake demonstrated that small-to-moderate earthquakes can occur on or near the fault system. Although the Clarendon-Linden fault system lacks paleoseismological evidence for Quaternary faulting, seismologic evidence indicates that the system was probably active during this century (Crone and Wheeler 2000).

3.5.3 Ground Motion Hazard Estimates

The most often used engineering measure of earthquake ground shaking is PGA. Thus, in estimates of the ground shaking hazard at a site, the horizontal PGA is often estimated using either deterministic or probabilistic techniques. For DOE sites, the latter approach is required by DOE orders and standards. Earthquake-induced ground shaking can be expressed as the force of acceleration relative to the earth's gravity (expressed in units of "*g*").

In deriving estimates of ground shaking hazard, characterizations of the location, geometry, maximum magnitude, and sense of slip are made regarding relevant seismic source zones and tectonic features affecting WNYNSC. The maximum earthquake has been alternately defined as the magnitude of the largest historically documented event (1929 Attica earthquake) for WNYNSC or the maximum earthquake predicted to affect a given location based on the known lengths and histories of active faults or estimates for a given seismic source zone. PGA estimates for WNYNSC included the effects of ground amplification due to the presence of soil and unconsolidated sediments (Dames and Moore 1992). Two important local geologic factors in site amplification are the thickness of soil and sediments and the shear-wave velocity of those materials.

Seismic Hazard Analyses 1970 to 2004

Earthquake hazard analysis has evolved since the construction of WNYNSC in the 1960s from deterministic to probabilistic analyses. A fundamental difference between these approaches is that deterministic analyses do not consider the frequency of earthquake occurrence, whereas a probabilistic analysis accounts for frequency of occurrence for the full range of possible earthquakes that could affect a site.

In a deterministic analysis, ground motions are estimated for a specified earthquake scenario given the magnitude of the earthquake, distance between the source of the event and the site, and site condition. Probabilistic seismic hazard analysis is a methodology used to estimate the frequency at which various levels of earthquake-induced ground motion will be exceeded at a given location (Savy et al. 2002). This frequency can be expressed as an annual probability or a probability in a given exposure period. For example, the International Building Code uses a 2 percent probability of exceedance in 50 years. This is the same as a return period of 2,475 years.

It should be noted that the input parameters used in either deterministic or probabilistic analyses are subject to a high degree of uncertainty. In the central and eastern United States, the short time record of historical earthquake events, the general absence of surface expression of causative faults, and a lack of understanding of the relationship between candidate geologic features and mid-plate or passive continental margin earthquakes contribute to this uncertainty.

Seismic hazard analyses have been developed for WNYNSC since 1970. The estimated PGA values are summarized in **Table 3–7**.

Table 3–7 Seismic Hazard Estimates

Study Author and Year	*Return Period (years)*	*Peak Horizontal Ground Acceleration (g)*	*Site Condition*
Dames and Moore (1970)	Deterministic	0.12	Soil
EDAC (1975)	135	0.042	Soil
NRC (1977)	Deterministic	0.10 to 0.13	Unknown
TERA (1981)	100 / 1,000	0.06 / 0.14	Soil
Dames and Moore (1983)	33 - 333	< 0.07	Rock
Dames and Moore (1992)	1,000	0.07	Soil
USGS (2002)	500 / 2,500	0.03 / 0.11	Rock

The Clarendon-Linden fault system and the St. Lawrence River Valley were identified as the major regional seismic source zones comprising potentially important sources of future earthquakes (Dames and Moore 1970). The study noted the occurrence of several small shocks in the region that could not be associated with a known geologic structure. Such events were attributed to local stress-related crustal readjustments or to some structural feature not identifiable from existing data. The maximum credible earthquake predicted to affect WNYNSC was assumed to be the largest documented historical event (WVNS 1992a) for the region (i.e., 1929 Attica event). A design-basis earthquake PGA of 0.12 *g* was suggested based on an earthquake of MMI-VII to MMI-VIII occurring about 37 kilometers from the site, near the Clarendon-Linden fault (Dames and Moore 1970).

Five different regional source zones were identified (the Clarendon-Linden structure; the Adirondacks; the Eastern Mesozoic Basins/Appalachian fold belts; the Ohio River Valley; and the Anna, Ohio area) (EDAC 1975). The most important in terms of hazard posed to WNYNSC was Source 1, which combined a structure trending east-west across the Niagara Peninsula with the Clarendon-Linden structure. The maximum magnitude was assumed to be equal to the largest historic event, the 1929 Attica event. A PGA value of 0.042 *g* was obtained for any time period greater than or equal to the return period of 135 years (EDAC 1975).

The NRC used the Central Stable region as a source of uniform seismicity for the WNYNSC hazard assessment. The hazard model was deterministic, although the mean rate of occurrence of an intensity greater than or equal to the site intensity was determined, then converted into a PGA with no uncertainty. The NRC determined PGA values of 0.10 - 0.13g (NRC 1977).

Four zones were identified (the Buffalo-Attica zone, background source zone, Southern St. Lawrence zone, and Central Appalachian Fold Belt) that were believed to contribute to the seismicity of the site region (TERA 1981). The Buffalo-Attica zone (Source 1) was divided into three sub-zones because of the proximity of the zone to the site. Zone IA consisted of the Clarendon-Linden structure and an inferred westward-trending structure. Zone IB included only the Clarendon-Linden structure. Zone IC covered a wider area that assumes that the Buffalo-Attica source extends to the site. Source 2 was described as a background source zone defined as the host region for the site. Source 3 was termed the Southern St. Lawrence zone, typified by continuous, moderate seismicity. The Central Appalachian Fold Belt, a zone of low activity, comprised Source 4. A probabilistic methodology was used that explicitly considered the uncertainties associated with zonation, the selection of the maximum earthquake, and the determination of the recurrence relationship for the Project Premises. The best-estimate hazard curve determined from the study indicated a PGA of 0.06g for the site with a return period of 100 years, and a 0.14g for a 1,000-year return period (TERA 1981).

Probabilities ranging from 0.05 to 0.25 were assigned to seven different source zone models, each with different source zones and maximum magnitudes (Dames and Moore 1983). The maximum magnitude for the dominant model (Hadley and Devine 1974) was M 6.3 ± 0.5 (Dames and Moore 1983, WVNS 1992a) with uncertainty in the maximum magnitude accounted for by equally weighting three values including the best-estimate and ± 0.5 magnitude units. Two attenuation relationships were used in the determination of the PGA at the site. An 84th percentile PGA of 0.07 *g* was estimated for a return period of 33 to 333 years (Dames and Moore 1983).

The Electric Power Research Institute/Seismicity Owners Group (EPRI/SOG) probabilistic seismic hazard methodology was used to develop seismic hazard estimates for WNYNSC (Dames and Moore 1992). The EPRI/SOG methodology incorporated historical earthquake catalog information and the expert opinions of six teams of earth scientists who described source zones with associated maximum magnitudes and seismicity patterns for the eastern United States. For most of the teams, the main contributor to the seismic hazard for WNYNSC was the Clarendon-Linden fault source acting in combination with a background source. Including site amplification effects, the calculated median PGA value was 0.07g for a return period of 1,000 years (WVNS 1992a).

In the most recent and comprehensive seismic hazard evaluation of the site, a site-specific probabilistic seismic hazard analysis was performed for a hard rock site condition (URS 2004). Site response analyses of the North Plateau and the South Plateau areas were performed to incorporate the effects of the general soil conditions in those portions of WNYNSC into the ground motion hazard estimates. The specific tasks performed in this study were to: (1) based on available data and information, identify all potential seismic sources in the region surrounding the site that may significantly contribute to its seismic hazard; (2) characterize the location, geometry, orientation, maximum earthquake magnitude, and earthquake recurrence of these seismic sources based on available data and information; (3) assess the effects of the subsurface geology on strong ground shaking at the site; and (4) estimate the horizontal ground motions for selected annual probabilities of exceedance by performing a probabilistic seismic hazard analysis.

In the study, 19 seismic sources were characterized and included in the probabilistic analysis: 15 regional seismic source zones and 4 fault systems or fault zones. The fault systems or fault zones included the Clarendon-Linden Fault Zone, the Charleston Fault Zone, the New Madrid fault system, and the Wabash Valley fault system. Gaussian smoothing of the historical seismicity was also incorporated into the analysis.

Based on the possible association with contemporary seismicity, there is a high probability that the Clarendon-Linden Fault Zone is active (URS 2004). The best-estimate maximum magnitudes for the Clarendon-Linden Fault Zone ranged from about M 6 to 7. Because of the short, discontinuous nature of the individual fault sections in the Clarendon-Linden Fault Zone (from a few kilometers to several tens of kilometers), it was judged unlikely that earthquakes of M 7 or larger could be generated by the Clarendon-Linden Fault Zone. The best-estimate recurrence interval for the fault is based on the observations that M > 6 earthquakes have been absent along the Clarendon-Linden Fault Zone in the past 12,000 years. If a relatively uniform recurrence interval for $M \geq 6$ earthquakes on the Clarendon-Linden Fault Zone is assumed, and there are no data to argue either way, then the preferred recurrence interval was 10,000 years.

To estimate ground motions, six state-of-the-art ground motion attenuation relationships for hard rock site conditions in the central and eastern United States were used. Based on the probabilistic seismic hazard analysis and the input of the seismic source model and attenuation relationships, PGA and 0.1 and 1.0 second horizontal spectral accelerations were calculated for three DOE-specified return periods (or annual exceedance probabilities), as shown in **Table 3–8**.

Table 3–8 Site-specific Mean Spectral Accelerations on Hard Rock

Return Period (years)	*Peak Horizontal Ground Acceleration (g)*	*0.1 Second Spectral Acceleration (g)*	*1.0 Second Spectral Acceleration (g)*
500	0.04	0.07	0.02
1,000	0.05	0.11	0.03
2,500	0.10	0.20	0.06

Source: URS 2004.

The largest contributor to the hazard at the site was the Clarendon-Linden Fault Zone at almost all return periods. The seismicity within the Southern Great Lakes seismic source zone (including the site) is the second-most important contributor to the mean PGA hazard. These observations are not surprising as the Clarendon-Linden Fault Zone is the only significant source in the site region and the historical seismicity is at a relatively low level. At 1.0 second spectral acceleration, the contributors to the hazard at the site are the same. The New Madrid fault system does not contribute significantly to the hazard at the site.

A site response analysis was also performed to estimate the ground motions at the WNYNSC site incorporating the site-specific geology, which includes about 30 to 50 meters (100 to 165 feet) of fill, soil, and glacial till over Paleozoic bedrock. Using a random vibration theory-based equivalent-linear site response approach and the available geotechnical data from the Waste Tank Farm and Vitrification Building, ground motions were calculated for the ground surface at the North and South Plateau areas. The results for two return periods are shown in **Table 3–9**.

Table 3–9 Site-specific Mean Spectral Accelerations on Soil for North and South Plateau Areas

Return Period (years)	*Peak Horizontal Ground Acceleration (g)*	*0.1 Second Spectral Acceleration (g)*	*1.0 Second Spectral Acceleration (g)*
500	0.05/0.03	0.09/0.08	0.04/0.05
2,500	0.14/0.11	0.24/0.22	0.11/0.14

Source: URS 2004.

The U.S. Geological Survey has developed state-of-the-art probabilistic National Hazard Maps since 1996 based on historic seismicity and information on active faults. Their map values are summarized in Table 3–7 for a firm rock site condition.

Estimates of the peak horizontal ground acceleration values at WNYNSC presented in this section show a range of values from 0.07 to 0.14 *g* at a return period of 1,000 years. The site adopted a design-basis earthquake with a peak horizontal ground acceleration of 0.10 *g* and a return period of 2,000 years. The design-basis earthquake was established in 1983 using a probabilistic assessment consistent with analyses for a typical nuclear power plant in the eastern United States. The design-basis earthquake was quantified in engineering terms using the NRC Regulatory Guide 1.60 response spectra (WVNS 2004a, 2006).

3.5.4 Liquefaction Potential

Liquefaction describes the behavior of unconsolidated, saturated soil and sediment that are induced to the consistency of a heavy liquid or reach a liquefied state as a consequence of excess porewater pressure and a decrease in effective stress. Liquefaction typically occurs where earthquake motion increases hydrostatic stresses in loose, saturated, granular soil or sediment. Earthquake-induced soil liquefaction may have potentially damaging effects on the integrity of facilities, including situations where the structure itself may survive design-basis ground accelerations only to be damaged by ground failure. The greatest potential for liquefaction occurs when the water table is within 3 meters (10 feet) of the surface. Geological deposits such as the sand and gravel layer on the North Plateau have the greatest potential for earthquake-induced liquefaction. Clay-rich deposits of glacial till, such as those found at WNYNSC, are generally not prone to liquefaction. There has been no evidence identified of earthquake-induced liquefaction in the last 12,000 years, either at the site of the 1929 Attica earthquake, where most of the modern seismicity in western New York is concentrated, or along the Clarendon-Linden fault (Tuttle et al. 2002).

Evidence of seismically induced ground failure, such as liquefaction, slumping, and fissuring, has not been observed on or near WNYNSC. This lack of evidence is consistent with the epicentral intensities of historic earthquakes occurring within a radius of 480 kilometers (300 miles) of WNYNSC and their projected intensity (MMI-IV) at the Project Premises. Seismic intensities of MMI-IV or less are typically associated with peak ground accelerations of less than 0.05 *g* and would not typically produce liquefaction in the soil materials at the site (WVNS 2004a, 2006).

Methods for evaluating liquefaction potential (Liao et al. 1988, Seed et al. 1983), using data from standard penetration testing, were applied to soil samples from 28 monitoring well locations on the North Plateau (WVNS 1992a). Standard penetration testing data were analyzed to estimate the probability of liquefaction at WNYNSC resulting from a magnitude 5.25 event corresponding to a peak ground acceleration of 0.15 *g*. The potential for liquefaction in the sand and gravel layer underlying the CDDL is estimated to be about 20 percent, 30 percent near the old meteorological tower in WMA 10, and less than 1 percent in the area near the former Chemical Process Cell Waste Storage Area in WMA 5. There are no foundations or steep slopes near these locations. The potential for liquefaction associated with stronger earthquakes is larger; however, the probability of such an earthquake at WNYNSC is low, based on the historical record. Near the old meteorological tower in WMA 10, the liquefaction potential increases to 60 percent (high) for a magnitude 7.5 earthquake. The liquefaction potential for all other sites would remain below 50 percent for such an event. A magnitude 7.5 event is larger than the maximum credible earthquake estimated for this region.

The liquefaction potential for the Lavery till and the Kent recessional units is less than that for the overlying sand and gravel. Cohesive, clay-rich glacial till, such as the Lavery till, is not easily liquefied (WVNS 1992a). Standard penetration test results from eight wells completed in the Kent recessional unit under the South Plateau indicate that there is less than a 1 percent chance of liquefaction from a horizontal ground acceleration of 0.15 *g* (WVNS 1993g). The areas of greatest liquefaction potential on WNYNSC do not contain facilities with large inventories of radioactive material. Liquefaction poses less of a hazard to the waste-containing areas (NDA, SDA) on the South Plateau because of their encapsulation in clayey till.

3.6 Water Resources

Water enters the area of the Project Premises and SDA as a result of precipitation (i.e., rain and snow), surface runoff from higher elevations, or groundwater infiltration from areas of higher head. Water exits the Project Premises and SDA by surface runoff, evapotranspiration (i.e., evaporation or transpiration from plants), or groundwater flow. Most of the water exits by evapotranspiration and surface runoff (WVNS 1993g).

3.6.1 Surface Water

Two perennial streams drain WNYNSC: Cattaraugus Creek and one of its tributaries, Buttermilk Creek (see **Figure 3–19**). Buttermilk Creek roughly bisects WNYNSC and flows generally north at an average rate of 1.8 cubic meters (64 cubic feet) per second to its confluence with Cattaraugus Creek at the northernmost end of the WNYNSC boundary. Cattaraugus Creek then flows generally west and empties into Lake Erie, about 78 kilometers (45 miles) downstream of the site. The Project Premises and SDA are entirely within the Buttermilk Creek drainage area of 76 square kilometers (29 square miles) that also encompasses most of WNYNSC (WVNS 2004a).

Three small intermittent streams drain the Project Premises and SDA: Erdman Brook, Quarry Creek, and Franks Creek (see Figure 3–1). Erdman Brook and Quarry Creek are tributaries to Franks Creek, which flows into Buttermilk Creek. Erdman Brook, the smallest of the three streams, receives runoff from the central and largest portion of the Project Premises and the SDA, including the disposal areas (WMAs 7 and 8), the Low-Level Waste Treatment Facility and Lagoons 1 through 5 (WMA 2), the Main Plant Process Building area (WMA 1), the central Project Premises (WMA 6), and a major part of the parking lots (WMA 10). Quarry Creek receives runoff from the High-Level Radioactive Waste Tank Farm and vitrification area (WMA 3), the north half of the northern parking lot (WMA 10), and the waste storage area (WMA 5). Franks Creek receives runoff from the east side of the Project Premises and the SDA, including the Radwaste Treatment System drum cell (WMA 9), part of the SDA (WMA 8), and the CDDL (WMA 4) (WVNS 2004a, 2006).

New York assigns water classifications to all waters in the state, defining the best usages of each body of water. The classification is the legal basis for water quality protection programs. Cattaraugus Creek, in the immediate downstream vicinity of WNYNSC, is identified as Class "B". Franks Creek and segments of Buttermilk Creek under the influence of site water effluents are identified as Class "C" (WVES and URS 2008). Class "B" waters are best used for primary and secondary contact recreation and fishing and are to be suitable for fish propagation and survival. The best usage of Class "C' waters is fishing, but these waters are also intended to be suitable for fish propagation and survival, as well as for primary and secondary contact recreation, although other factors may limit the use for these purposes (NYSDEC 1998a). None of the streams on WNYNSC is on New York State's current Clean Water Act Section 303(d) list as being impaired relative to attaining water quality standards and designated uses (NYSDEC 2004b).

An SPDES permit (NY0000973) for the site, issued by NYSDEC for the discharge of nonradiological liquid effluents to Erdman Brook and Franks Creek, specifies the sampling and analytical requirements for each outfall. NYSDEC issued a modified permit to DOE with an effective date of September 1, 2006, and an expiration date of February 1, 2009 (NYSDEC 2004c, WVES and URS 2008). This modified permit covers 5 primary outfalls (see **Figure 3–20**): outfall 001 (WNSP001, discharge from the Low-Level Waste Treatment Facility and the North Plateau Groundwater Recovery System via Lagoon 3); outfall 007 (WNSP007, discharge from the Sanitary and Industrial Wastewater Treatment Facility); outfall 008 (WNSP008, groundwater French drain effluent from the perimeter of the Low-Level Waste Treatment Facility storage lagoons); outfall 116 (WNSP116, a location in Franks Creek used to monitor compliance with the instream total dissolved solids limit from upstream sources and to adjust discharges from Lagoon 3 and the need for augmentation water); and outfall 01B (WNSP01B, an internal monitoring point for the Liquid Waste Treatment System evaporator effluent) (NYSDEC 2004c, WVNS and URS 2007). While still in the SPDES permit, outfall 008 (WNSP008) is no longer active, but is maintained as a potential point source. This outfall discharged groundwater and surface water runoff directed from the northeast side of the site's Low-Level Waste Treatment Facility lagoon system through a French drain to Erdman Brook until the outfall was capped off in May 2001 (WVNS and URS 2007). In addition to the 5 existing outfalls, the modified permit authorized discharges from 20 stormwater outfalls to include associated monitoring requirements and discharge limits.

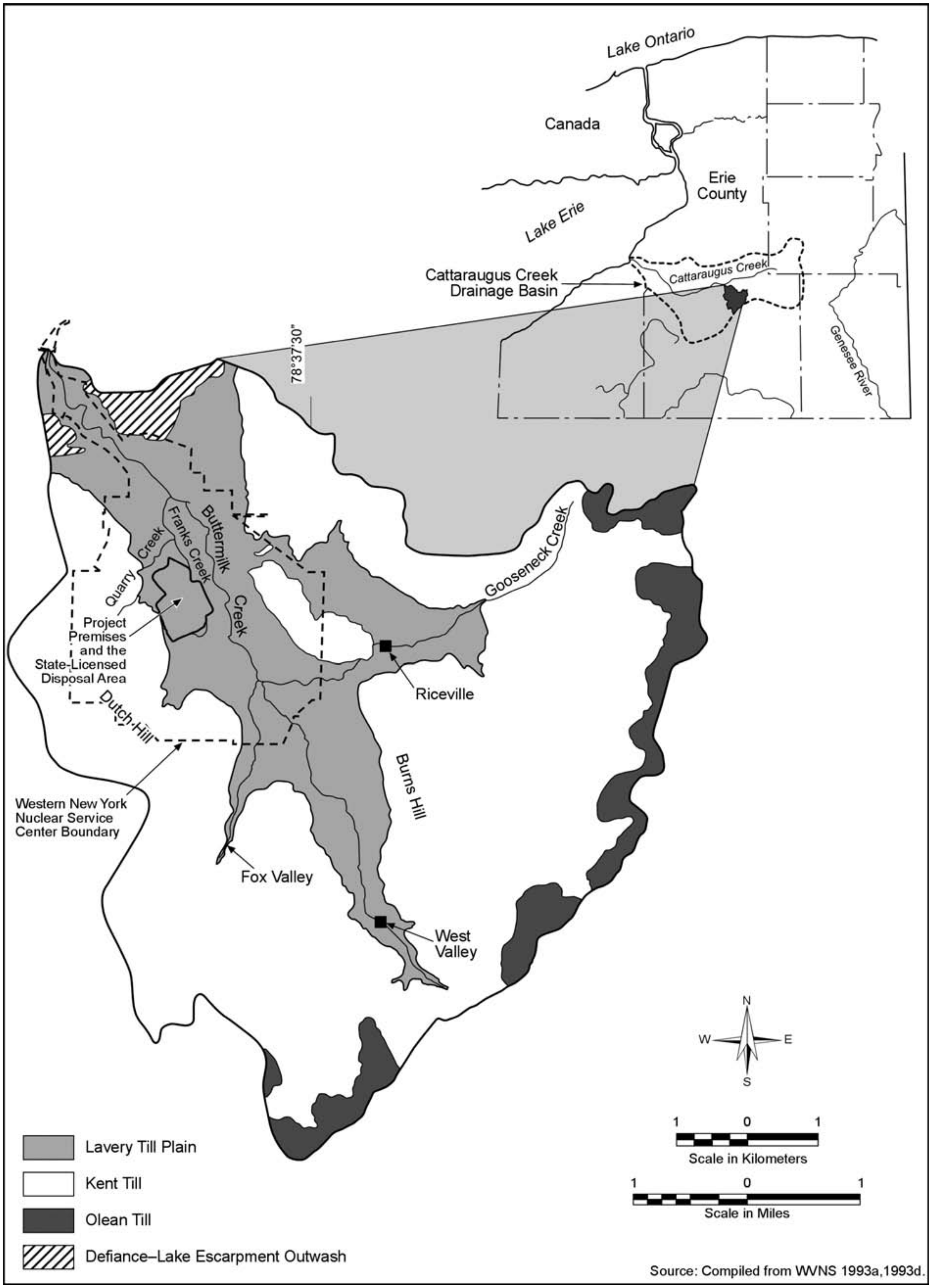


Figure 3–19 Buttermilk Creek Drainage Basin

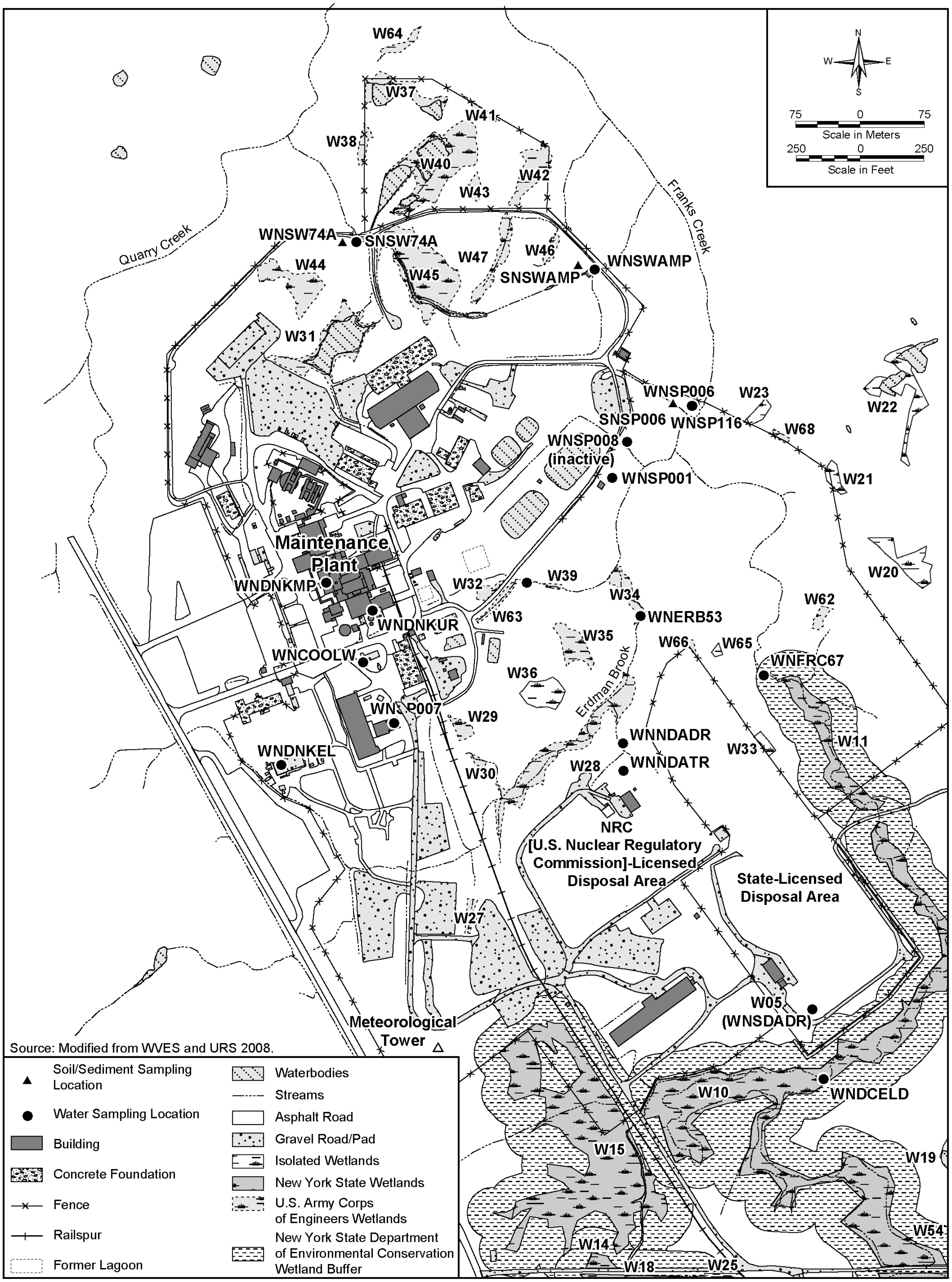


Figure 3–20 Onsite Surface Water and Soil/Sediment Sampling Locations

These 20 outfalls receive stormwater runoff from inactive waste disposal areas, areas where materials or wastes are stored or handled, and areas where construction or structure dismantlement or other soil disturbance activities may be performed. Among other changes, the modified permit added new requirements for reporting water treatment chemical usage, monitoring for chemical substances used for weed control, and preparing and implementing a Stormwater Pollution Prevention Plan (NYSDEC 2004c, WVNS and URS 2006). During 2007, none of the 1,531 effluent samples collected exceeded permitted values, resulting in a compliance rate of 100 percent (WVES and URS 2008). A permit renewal application was submitted to NYSDEC in July 2008 (WVES and URS 2008), along with followup information in December 2008. The modified permit will remain in effect until the application is approved (NYSDEC 2008e).

In September 2005, a new SPDES permit (NY0269271) was issued to NYSERDA for stormwater discharges from the SDA. The permit has an effective date of November 1, 2005, and an expiration date of October 31, 2010. This permit covers six outfalls (W01–W06) and specifies associated monitoring requirements and discharge limits. The permit also requires preparation and implementation of a Stormwater Pollution Prevention Plan (NYSDEC 2005b).

Two water supply reservoirs (part of WMA 12) are located south south-east (upstream) of the Project Premises and the SDA. The location of these reservoirs that were formed by blocking two intermittent tributaries to Buttermilk Creek with earthen dams is shown in Figure 3–2. The reservoirs drain numerous streams over a 1,255-hectare (3,000-acre) area. A short canal connects the reservoirs; the south reservoir drains to the north reservoir, which discharges into Buttermilk Creek through a sluice gate water level control structure. An emergency spillway is also located on the south reservoir (WVNS 2004a, 2006). Overtopping of the emergency spillway was originally designed to occur in the event of a 25-year storm (Dames and Moore 1986). However, some of the available storage in the reservoirs has been lost to sedimentation. In 1996, the spillway was regraded and stabilized using a geosynthetic to control erosion. Gabions are located at the toe of the slope (WVNS 2004a). In addition to the two water supply reservoirs and wastewater treatment lagoons in WMA 2, several small ponds are located across WNYNSC, including former borrow pits (Northern Borrow Pits) located in the northeast corner of the Project Premises (WVNS 2004a, WVNS and URS 2005). These ponds do not receive liquid effluent, but they were monitored for selected nonradiological and radiological parameters until 2005 (WVNS and URS 2006).

The streams draining the Project Premises and the SDA exhibit large flow variations. Peak streamflows occur either in spring from a heavy rainfall on snow cover with a frozen ground or in summer from thunderstorms. In the past, streamflow monitoring equipment was located at the Franks Creek–Quarry Creek confluence, the Erdman Brook–Franks Creek confluence, and at Erdman Brook just below the NDA. Peak flows measured on March 27, 1991, for the period from 1990 to 1991 were 9.6 cubic meters (340 cubic feet) per second at the confluence of Quarry Creek and Franks Creek, 4.6 cubic meters (161 cubic feet) per second where Franks Creek leaves the Project Premises, and more than 1.7 cubic meters (60 cubic feet) per second in Erdman Brook. Peak flow measured at the U.S. Geological Survey gauge station at the Bond Road Bridge over Buttermilk Creek, which operated from 1962 to 1968, was 111 cubic meters (3,910 cubic feet) per second on September 28, 1967 (WVNS 2004a).

Otherwise, the only current flow measurement equipment is a Parshall flume at monitoring point WNSP006 in Franks Creek, just downstream from outfall 001 (WNSP001). Data for this location are used to generate the total dissolved solids compliance calculation for outfall 116 (WNSP116). Measurements are only taken when Lagoon 3 discharges, and are reported in monthly discharge monitoring reports to NYSDEC. Since 1991, there have been hydraulic changes to the watershed with increased discharges into Erdman Brook and Franks Creek. For example, discharges at outfall 001 (WNSP001) have increased (primarily due to North Plateau Groundwater Plume pump and treat mitigation) by roughly 15 million liters (4 million gallons) per year since the original period when instream flow was measured (Malone 2006).

Flood levels for the 100-year storm (see **Figure 3–21**) show that no facilities on the Project Premises or the SDA are in the 100-year floodplain. This is partly attributable to the fact that Cattaraugus and Buttermilk Creeks, as well as Franks Creek, Quarry Creek, and Erdman Brook, are located in deep valleys such that floodwaters would not overtop their banks, flooding the plateau areas where facilities are located. Indirect flood effects, including streambank failure and gully head advancement from high streamflows in the short term, could impact Lagoons 2 and 3 (WMA 2), the NDA, and site access roads in several locations (WVNS 2004a, 2006). No 500-year floodplain map is currently available for the creeks bordering the Project Premises and the SDA.

An analysis of the probable maximum flood based on probable maximum precipitation has been performed for this EIS (see Appendix M for more detail). The probable maximum flood is generally more conservative than the 500-year flood because it is defined as the flood resulting from the most severe combination of meteorological and hydrologic conditions (DOE 2002c). The results of this analysis indicate that the probable maximum flood floodplain is very similar to the 100-year floodplain, particularly in areas adjacent to the industrialized or developed portions of the site, including areas where waste is stored or buried (URS 2008b). Most of the stream channels near the industrialized area have relatively steep sides and the probable maximum flood flow remains in these channels. The probable maximum flood floodplain is wider than the 100-year floodplain in areas where the topography is relatively flat, such as the extreme upper reaches of Erdman Brook and Franks Creek (WVNS 2004a, 2006, 2007).

3.6.1.1 Contaminant Releases and Water Quality

Several onsite surface water monitoring locations are maintained for sampling both radiological and nonradiological constituents (see Figure 3–20). Among these, WNSP006 is the Project Premises' main drainage point and is located immediately downstream of outfall 001 (WNSP001) in Franks Creek. The northeast swamp (WNSWAMP) is sampled to monitor surface water drainage and emergent groundwater from the northeastern portion of the site's North Plateau. The north swamp (WNSW74A) monitoring point is sampled to monitor drainage, including emergent groundwater to Quarry Creek from the northern portion of the North Plateau. Comparative samples are also collected from an upstream background monitoring location (Buttermilk Creek at Fox Valley Road, WFBCBKG) (**Figure 3–22**). WNSP006 is located more than 4.0 kilometers (2.5 miles) upstream from Thomas Corners Bridge (WFBCTCB), the last monitoring point before Buttermilk Creek leaves WNYNSC and the public has access to the creek waters. In 2007, two sets of grab samples for nonradiological parameters were collected from each of the aforementioned locations. Samples were specifically analyzed for selected organic and inorganic constituents and selected anions, cations, and metals. At surface water monitoring locations WFBCTCB and WNSP006, and background reference location WFBCBKG, the maximum concentrations of total iron exceeded the state water quality standards. The elevated iron concentrations are attributable to elevated background concentrations, runoff from industrial activities, fine sediments from placement of quarried materials delivered from offsite sources, and natural silts and fine sediments from soil erosion. With the exception of iron, the other nonradiological constituents remained within the range of historical values. Monitoring results for other nonradiological parameters are detailed in the *Annual Site Environmental Report* (WVES and URS 2008). In 2005, the sampling frequency of the offsite soil locations shown on Figure 3–22 was changed from annual to once every 3 years.

In addition to monitoring facility effluents for nonradiological constituents in accordance with permitted levels, radionuclide constituents in facility effluents, as well as in onsite and offsite surface water, are monitored as part of the site environmental monitoring program. Waterborne radiological releases are from two primary sources that include discharges from the Low-Level Waste Treatment Facility via Lagoon 3 and from groundwater seepage on the North Plateau that is contaminated with strontium-90 from prior operations. The discharge from the Low-Level Waste Treatment Facility from Lagoon 3 outfall 001 (WNSP001) into

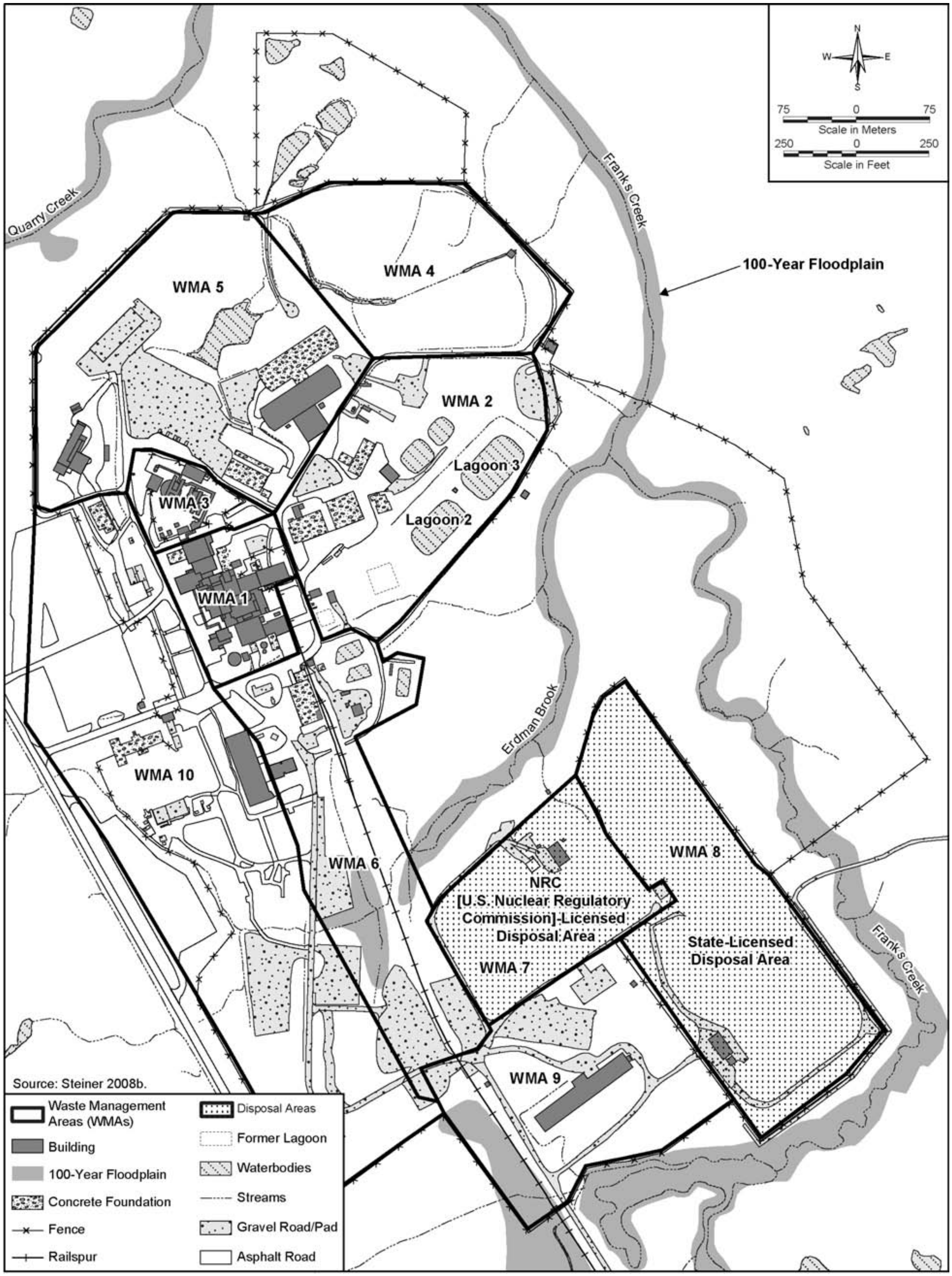


Figure 3–21 100-Year Floodplain Near the Project Premises

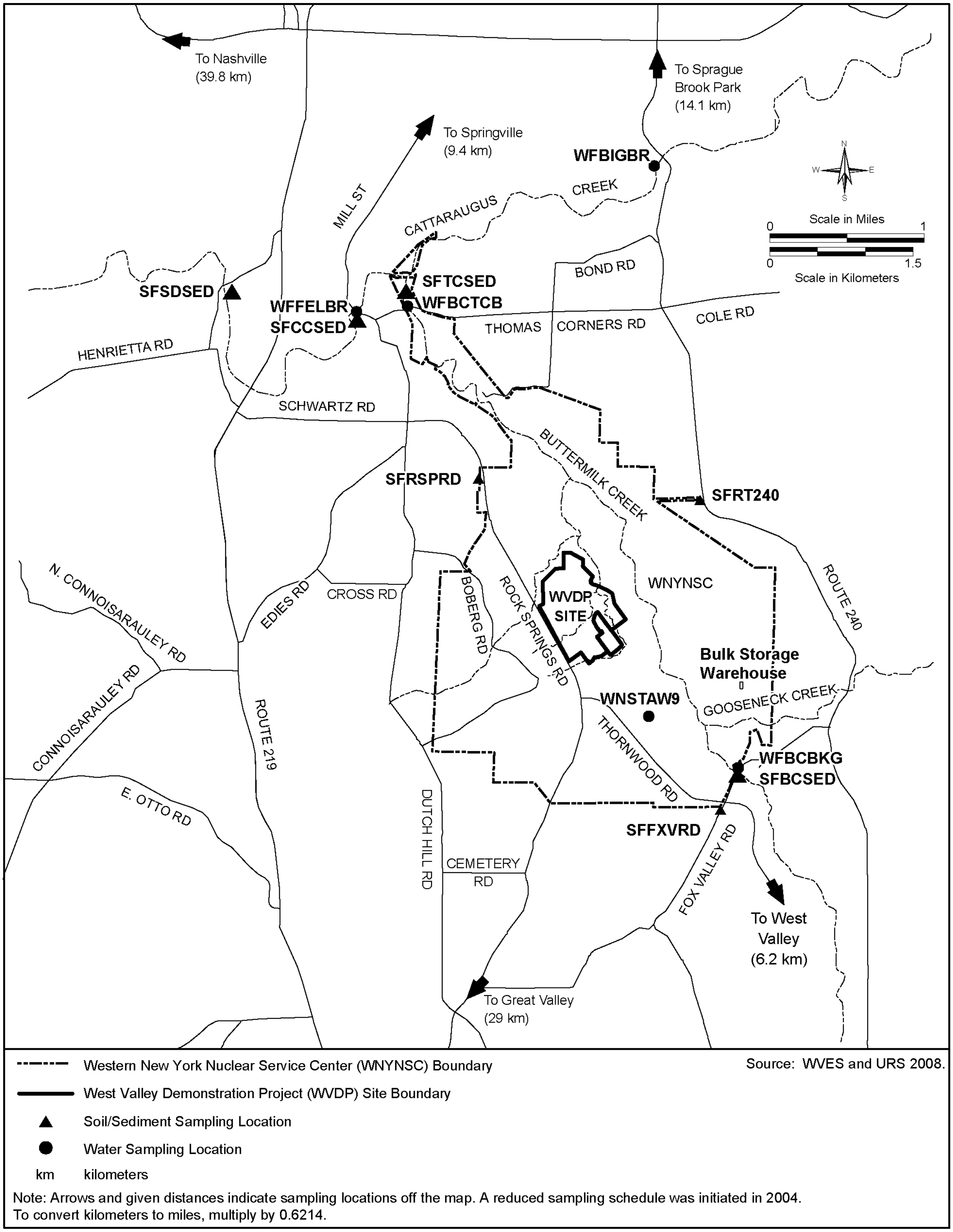


Figure 3–22 Offsite Surface Water and Soil/Sediment Sampling Locations

Erdman Brook is the primary controlled-point source of radioactivity released to surface water from the Project Premises. There were six batch releases from Lagoon 3 outfall in 2007, totaling about 40.7 million liters (10.8 million gallons). In total, discharges from Lagoon 3 contained an estimated 0.053 curies of tritium, 0.0011 curies of gross alpha, and 0.010 curies of beta-emitting radionuclides. These releases are further detailed by individual radionuclide in the *Annual Site Environmental Report* (WVES and URS 2008).

Several sets of Federal and state regulatory guidelines and standards are incorporated into the site monitoring programs (WVNS 2006). State guidelines and standards include New York State Water Quality Standards and Guidelines from 6 NYCRR Parts 701-704, New York State Department of Health (NYSDOH) Standards of Raw Water Quality from 10 NYCRR 170.4, and NYSDOH Maximum Contaminant Level Sources from 5 NYCRR 5-1.52. Federal guidelines and standards include EPA Maximum Contaminant Level Sources and Maximum Contaminant Level Goals (non-enforceable) from 40 CFR Part 141, and DOE Derived Concentration Guides from DOE Order 5400.5.[1]

Based on the results of routine monitoring for radiological constituents in 2007 at location WNSP006, gross beta, strontium-90, uranium-233/uranium-234, and uranium-238 average concentrations exceeded the range of the respective background values, but did not exceed applicable DOE Derived Concentration Guides, as summarized in **Table 3–10**. At the northeast swamp (WNSWAMP), average gross beta and strontium-90 concentrations of $2.94 \pm 0.06 \times 10^{-6}$ and $1.56 \pm 0.01 \times 10^{-6}$ microcuries per milliliter, respectively, exceeded background ranges in 2007. The average strontium-90 concentration also exceeded the DOE Derived Concentration Guide. At the north swamp (WNSW74A), average gross beta and strontium-90 concentrations of $1.36 \pm 1.95 \times 10^{-8}$ and $5.36 \pm 0.32 \times 10^{-9}$ microcuries per milliliter, respectively, exceeded background in 2007. The elevated gross beta concentrations at the north and northeast swamp locations are attributable to strontium-90 in groundwater seepage (WVES and URS 2008).

Table 3–10 Radiological Parameters Exceeding Background Ranges in Surface Water Downstream of the Project Premises at Franks Creek (WNSP006) in 2007

Parameter	*Average Concentration (Location WNSP006)*	*Background Range (Location WFBCBKG)*	*DOE Derived Concentration Guide* [a]
Gross Beta	$4.20 \pm 0.49 \times 10^{-8}$	$9.78 \times 10^{-10} – 3.87 \times 10^{-9}$	1.0×10^{-6} [b]
Strontium-90	$1.72 \pm 0.18 \times 10^{-8}$	$3.27 \times 10^{-10} – 5.63 \times 10^{-10}$	1.0×10^{-6}
Uranium-233/Uranium-234	$2.65 \pm 1.15 \times 10^{-10}$	$7.35 \times 10^{-11} – 1.12 \times 10^{-10}$	5.0×10^{-7}
Uranium-238	$2.16 \pm 1.01 \times 10^{-10}$	$2.62 \times 10^{-11} – 8.77 \times 10^{-11}$	6.0×10^{-7}

[a] DOE ingestion-based Derived Concentration Guides for a 100-millirem-per-year dose limit are provided as a guideline for radiological results.
[b] Gross beta as strontium-90.
Note: All units in microcuries per milliliter. Values are reported based on a 95 percent confidence level with the plus-or-minus (±) sign marking the confidence interval in which there is a 95 percent probability that the true value lies.
Source: WVES and URS 2008.

Surface water is also routinely monitored for radiological and other indicator constituents at several points around the NDA (WMA 7) and SDA (WMA 8) by DOE (see Figure 3–20). For the NDA, monitoring point WNNDATR is a sump at the lowest point in the collection trench system that intercepts groundwater from the northeastern and northwestern sides of the NDA. Water collected underground at this location is pumped to the Low-Level Waste Treatment Facility for treatment prior to discharge at outfall 001 (WNSP001). Surface water drainage downstream of the NDA is monitored at WNNDADR. Further downstream is monitoring point

[1] *It should be noted that the definition of a Derived Concentration Guide, per DOE 5400.5, is "the concentration of a radionuclide in air or water that, under conditions of continuous exposure for 1 year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 millirem."*

WNERB53 in Erdman Brook, which monitors surface water from the NDA before it joins with drainage from the Main Plant Process Building and lagoon areas. Strontium-90 and gross beta were elevated with respect to background levels in 2007 at all three NDA monitoring locations; tritium was elevated at WNNDADR and WNNDATR; and gross alpha was elevated at WNNDATR (WVES and URS 2008). All concentrations were below the DOE Derived Concentration Guides. Residual soil contamination from past waste burial activities is thought to be a source of the strontium-90 activity; however, the detection of strontium-90 and other identified contaminants from historical burial operations appears to be the result of shallow groundwater flow through the weathered till within the NDA and surface runoff. Tritium concentrations have generally decreased over time at both WNNDATR and WNNDADR, which may be partially attributable to radioactive decay (WVES and URS 2008).

For the SDA, semiannual sampling is performed from one of the six designated stormwater outfalls in accordance with the SDA SPDES permit. Immediately south of the SDA, point WNDCELD is sampled to monitor surface drainage from the area around the drum cell. To the north, location WNFRC67, in Franks Creek, is sampled to monitor drainage downstream of the drum cell and the eastern and southern borders of the SDA. In addition to routine samples collected by the site, samples are collected and analyzed by NYSDOH at the two stream sampling points that receive drainage from the South Plateau, WNFRC67 and WNERB53 (see Figure 3–20) (WVES and URS 2008).

In 2007, offsite surface water quality continued to be monitored at two locations, one on Buttermilk Creek and one on Cattaraugus Creek, in addition to the upstream background monitoring location on Buttermilk Creek at Fox Valley Road (WFBCBKG) and at a background location on Cattaraugus Creek at Bigelow Bridge (WFBIGBR). The average gross beta ($9.18 \pm 1.97 \times 10^{-9}$ microcuries per milliliter) concentration at the Thomas Corners Bridge location (WFBCTCB) downstream of the Project Premises in Buttermilk Creek, exceeded the Buttermilk Creek background range. At the Felton Bridge (WFFELBR) offsite location, downstream of the point where Buttermilk Creek enters Cattaraugus Creek, the average gross alpha concentration of $1.71 \pm 1.83 \times 10^{-9}$ microcuries per milliliter and the average gross beta concentration of $3.54 \pm 1.81 \times 10^{-9}$ microcuries per milliliter fell within the Cattaraugus Creek background ranges of 7.02×10^{-10} to 2.16×10^{-9} microcuries per milliliter and 1.64×10^{-9} to 1.37×10^{-8} microcuries per milliliter, respectively. This is the first point accessible by the general public, and these elevated concentrations may be attributed to small amounts of radioactivity moving from the site via Franks Creek. Taking into account seasonal fluctuations, gross beta activity has remained relatively constant at this location over the last decade (WVES and URS 2008).

Drinking water, derived from the onsite reservoir system upstream of the Project Premises and SDA, is monitored at the distribution point and at other site tap water locations to verify compliance with EPA and NYSDOH regulations. Samples are collected and analyzed for radionuclides, metals, nitrate, fluoride, cyanide, principal organic contaminants, residual chlorine, and biological constituents. Results indicated that, in 2007, the Project's drinking water continued to meet maximum contaminant level and drinking water standards of EPA, NYSDOH, and the Cattaraugus County Health Department (WVES and URS 2008).

3.6.1.2 Stream Sediment Contamination

Surface water and stream sediment quality downstream from the Project Premises and SDA has been impacted by past fuel reprocessing operations, primarily from previous discharges from Lagoon 3 (WMA 2) between 1966 and 1972. During that time, a yearly average of 0.7 curies of alpha emitters, 65 curies of beta emitters, and 3,500 curies of tritium were released from Lagoon 3 to Erdman Brook, which flows into Franks Creek (WSMS 2009e). Subsequent radioactive discharges from Lagoon 3 were related to facility operations from 1972 to the present. From 1975 to 1981 the discharges included contributions related to the treatment of SDA leachate and from other sources. Several of the discharged radionuclides, particularly cobalt-60, strontium-90, cesium-134, and cesium-137, have an affinity to become chemically attached to silt and accumulate in the streambeds. It is assumed that stream sediment within WMA 12 between the Lagoon 3 outfall on Erdman Brook and the confluence of Franks Creek and Quarry Creek is contaminated (WSMS 2009a). However, results from a 1990s RCRA facility investigation and current monitoring indicate additional contamination downstream from the confluences, as discussed in the following text.

Soil and sediment from three onsite drainage channels are sampled annually to track waterborne movement of contaminants (e.g., WVES and URS 2008). Stream sediments in onsite and offsite creeks continue to be monitored for radiological constituents. Onsite monitoring locations include Franks Creek where it leaves the security fence (SNSP006) to the northeast of Lagoon 3, the north swamp drainage swale (SNSW74A) in WMA 5, and the northeast swamp drainage swale (SNSWAMP) in WMA 4. These are locations where liquid effluents leaving the site are most likely to be radiologically contaminated. Results are compared to land use–specific threshold levels for decommissioning and decontamination of contaminated sites, established in accordance with the 2002 Memorandum of Understanding between the NRC and EPA, and to results from an upstream "background" location (Buttermilk Creek at Fox Valley Road, SFBCSED) that has not received Project Premises effluents. In 2006, the NRC, in a decommissioning guidance document (NRC 2006), provided concentration screening values (NUREG-1757 values) for common radionuclides in soil that could result in a dose of 25 millirem per year. For 2007, cesium-137 concentrations at locations SNSP006 and SNSWAMP were measured at $5.00 \pm 0.41 \times 10^{-6}$ and $1.66 \pm 0.13 \times 10^{-5}$ microcuries per gram, respectively. The cesium-137 concentration at SNSP006 was lower and the concentration at SNSWAMP was higher than both the industrial/commercial level and the NUREG-1757 values. The strontium-90 concentrations at these two locations in 2007 were $4.90 \pm 0.95 \times 10^{-7}$ and $1.71 \pm 0.06 \times 10^{-5}$ microcuries per gram, respectively. At SNSP006, the strontium-90 concentration was lower than both the industrial/commercial level and the NUREG-1757 value. At SNSWAMP, the strontium-90 concentration exceeded the NUREG-1757 value but was lower than the industrial/commercial level. The observed concentrations are due to both past and current releases of contaminated groundwater and site effluents. The cesium-137 and strontium-90 concentrations exceeded the 10-year averaged concentrations from the Buttermilk Creek background site of $3.74 \pm 2.76 \times 10^{-8}$ and $2.69 \pm 5.21 \times 10^{-8}$ microcuries per gram for cesium-137 and strontium-90, respectively. No other radiological constituent concentrations exceeded the applicable respective threshold level or NUREG-1757 values, but all three onsite locations exceeded comparable background concentrations for more than one radionuclide (WVES and URS 2008).

Sediments are collected off site at three locations downstream of the Project Premises and SDA, including Buttermilk Creek at Thomas Corners Road (SFTCSED) immediately downstream of site effluents, Cattaraugus Creek at Felton Bridge (SFCCSED), and Cattaraugus Creek at the Springville dam (SFSDSED). This third location is behind the Springville dam, where large amounts of sediment accumulate, including sediments that may have adsorbed radionuclides from the site. The 10-year averaged concentrations from a fourth location (SFBISED, Bigelow Bridge) are used as the upstream Cattaraugus Creek background for comparison purposes with the two Cattaraugus Creek locations. At the downstream Buttermilk Creek location (SFTCSED), the cesium-137 concentration of $5.38 \pm 0.51 \times 10^{-7}$ microcuries per gram measured in 2007 exceeded the 10-year averaged background concentration of $3.74 \pm 2.76 \times 10^{-8}$ microcuries per gram. The uranium-235/uranium-236 concentration ($1.44 \pm 2.02 \times 10^{-8}$ microcuries per gram) falls below the background concentration of $5.37 \pm 3.72 \times 10^{-8}$ microcuries per gram. The concentrations of cesium-137, gross beta emitters, potassium-40, uranium-233/uranium-234, and uranium-238 isotopes at the first Cattaraugus Creek location (SFCCSED) exceeded their respective background concentrations in 2007 as did cesium-137, potassium-40, uranium-232, uranium-233/uranium-234, uranium-235/uranium-236, and uranium-238 at the Springville dam location (SFSDSED). Most notably, the cesium-137 concentration at Cattaraugus Creek location SFCCSED was $1.03 \pm 0.22 \times 10^{-7}$ microcuries per gram as compared to a background concentration of $3.73 \pm 2.27 \times 10^{-8}$ microcuries per gram (WVES and URS 2008). No offsite strontium-90 sediment concentrations exceeded background levels for 2007.

Stream sediments were also collected from Franks Creek, Erdman Brook, Quarry Creek, and drainages at the North Plateau as part of a 1990s RCRA facility investigation (WVNSCO 1994). Three sampling locations – ST01, ST02, and ST03 – were located downstream of the Project Premises along Franks Creek and Buttermilk Creek. The data for these locations are available from the soils characterization environmental document (WVNSCO 1994) and indicate levels of gross alpha and gross beta activities also exceeding background levels.

3.6.2 Groundwater

As detailed in Section 3.3.1.1, the stratigraphic units of the North and South Plateaus are different, which is reflected in the hydrologic characteristics and hydraulic properties of the units that are used to define the hydrogeologic system and associated groundwater flow regime of the WNYNSC site and vicinity. In summary, on the North Plateau, the surficial sand and gravels are underlain by the Lavery till. The Lavery till on the North Plateau further contains the Lavery till-sand unit, a lenticular unit of limited extent. There is no sand and gravel unit at the surface on the South Plateau. The uppermost unit on the South Plateau is the weathered Lavery till, which is underlain by the unweathered Lavery till. The stratigraphy below these upper units on the North and South Plateaus is the same. The underlying units, presented in descending order, are the Kent recessional sequence, the Kent till, Olean till, and shale bedrock.

In the following sections, the hydrostratigraphy of the North and South Plateaus is summarized to include a description of the saturated zone, direction of groundwater flow, and the distribution and nature of groundwater contamination as derived from historical studies through the present. More-detailed data on and analysis of the hydrostratigraphic units and their properties as defined in support of the three-dimensional groundwater modeling, water balance information, and the long-term performance assessment are presented in Appendix E.

3.6.2.1 Hydrostratigraphy of the North and South Plateaus

Surficial Sand and Gravel (Thick-bedded Unit and Slack-water Sequence)

The deposits comprising the surficial sands and gravels on the North Plateau include an alluvial deposit (thick-bedded unit) and a lower glaciofluvial gravel and associated basal lacustrine deposit (slack-water sequence) that attain a maximum thickness of 12.5 meters (41 feet) near the center of the North Plateau (see Section 3.3.1.1). The surficial sands and gravels are further classified as an unconfined near-surface water-bearing unit (WVNS and Dames and Moore 1997).

The extent of the surficial sands and gravels is limited as it pinches out along the north, east, south, and west perimeters of the Plateau where it is incised by Quarry Creek, Franks Creek, Erdman Brook, and the slope of the bedrock valley, respectively (WVNS and Dames and Moore 1997, WVNS and URS 2006). The depth to the water table ranges from 0 meters (0 feet) where the water table in the sands and gravels intersects the ground surface and forms swamps and seeps along the periphery of the North Plateau to as much as 6 meters (20 feet) beneath portions of the central North Plateau where the thickest part of the sand and gravel layer occurs (WVNS 1993d). Groundwater in the sands and gravels demarcates the upper aquifer beneath the site (WVNS 2004a). Long-term water level trends suggest a pattern of high water levels from fall through spring and low water levels during the summer. Water levels are typically highest in the spring after snow melt and spring precipitation and lowest in summer when evapotranspiration is greatest and the volume of precipitation is relatively low (WVNS and Dames and Moore 1997). Precipitation occurring from December to April is lost mainly to rapid runoff and infiltration. For the warmer periods of May through November, precipitation is lost mainly to infiltration and subsequent evapotranspiration (WVNS 1993e).

Groundwater in the sands and gravels generally flows to the northeast across the North Plateau from the southwestern margin of the unit near Rock Springs Road toward Franks Creek, as shown on **Figure 3–23**. Groundwater near the northwestern and southeastern margins of the unit diverges from the predominant northeast flow path and flows toward Quarry Creek and Erdman Brook, respectively (see Figure 3–23). Flow is mostly horizontal, as the low hydraulic conductivity of the underlying Lavery till precludes any significant downward flow (WVNS 1993d, WVNS and Dames and Moore 1997, WVNS and URS 2006). Analyses of slug test data estimated average or mean horizontal hydraulic conductivity value of 4.2×10^{-4} centimeters per second (14 inches per day) for the sands and gravels while not distinguishing between the thick-bedded unit and slack-water sequence subunits (WVNS 1993d). This estimate, combined with a hydraulic gradient of 0.031 and an effective porosity of 0.22, was used to calculate a groundwater velocity of 18.6 meters (61 feet) per year (WVNS 1993d, WVNS and Dames and Moore 1997). It is notable that field testing over the last few years has utilized automated data acquisition and the 1991–2007 mean hydraulic conductivity (horizontal) for the thick-bedded unit has been estimated to be higher, at 3.2×10^{-3} centimeters per second (110 inches per day) (WVES and URS 2008). Using this range of hydraulic conductivities, the estimated groundwater velocity could be up to 140 meters (450 feet) per year.

The results of statistical and geostatistical characterizations of all thick-bedded unit hydraulic conductivity data—early and recent—provided to support this EIS are presented in Appendix E. These analyses demonstrate a significant difference between the earlier and more recent thick-bedded unit data, and determine the latter to be lognormally distributed with a minimum variance unbiased estimate of the mean of 1.6×10^{-2} centimeters (0.0063 inches) per second.[2]

There are human influences on the groundwater flow in the thick-bedded unit. The high-level radioactive waste tanks (WMA 3) and the Main Plant Process Building (WMA 1) locally impede groundwater flow through the sands and gravels. The high-level radioactive waste tanks and some areas of the Main Plant Process Building were excavated and constructed through the sand and gravel into the underlying till. The excavated areas near the high-level radioactive waste tanks and possibly near the Main Plant Process Building were backfilled with lower permeability materials, thereby impeding groundwater flow. Water is periodically (approximately every 1 to 2 weeks) pumped from the sand and gravel layer (thick-bedded unit) near the high-level radioactive waste tanks to maintain a groundwater elevation of about 424 to 424.7 meters (1,391 to 1,393 feet) above mean sea level (WVNS 1993d, WVNS and Dames and Moore 1997). Groundwater flow was also locally influenced by a French drain consisting of a 15-centimeter- (4-inch-) diameter perforated pipe located 3 meters (9.8 feet) below the ground surface along the northwest boundary of Lagoons 2 and 3 and the northeast boundary of Lagoon 3 (WMA 2). This drain was intended to prevent groundwater infiltration into Lagoons 2 and 3 and drained portions of the sand and gravel unit, discharging the intercepted groundwater into Erdman Brook via outfall 008 (WNSP008) (WVNS 1993d, WVNS and Dames and Moore 1997). This discharge point was capped off in 2001, and is periodically inspected to ensure that it does not discharge (WVNS and URS 2006).

Water balances have been estimated for the surficial sand and gravel unit (Yager 1987; WVNS 1993d, 1993e). Using external data (Kappel and Harding 1987), a two-dimensional numerical model was developed for the surficial sand and gravel on the North Plateau for the year 1983 (Yager 1987). As a part of the study, water budgets were developed for the sand and gravel unit—one from the data and one from the model. The total annual recharge to the sand and gravel was 66 centimeters (26 inches) per year with approximately 50 centimeters (20 inches) per year from precipitation, 12 centimeters (5 inches) per year from inflow from adjacent bedrock near Rock Springs Road, and 4 centimeters (1.6 inches) per year from leakage from the

[2] *A lognormal distribution is a single-tailed probability distribution of any random variable whose logarithm is normally distributed.*

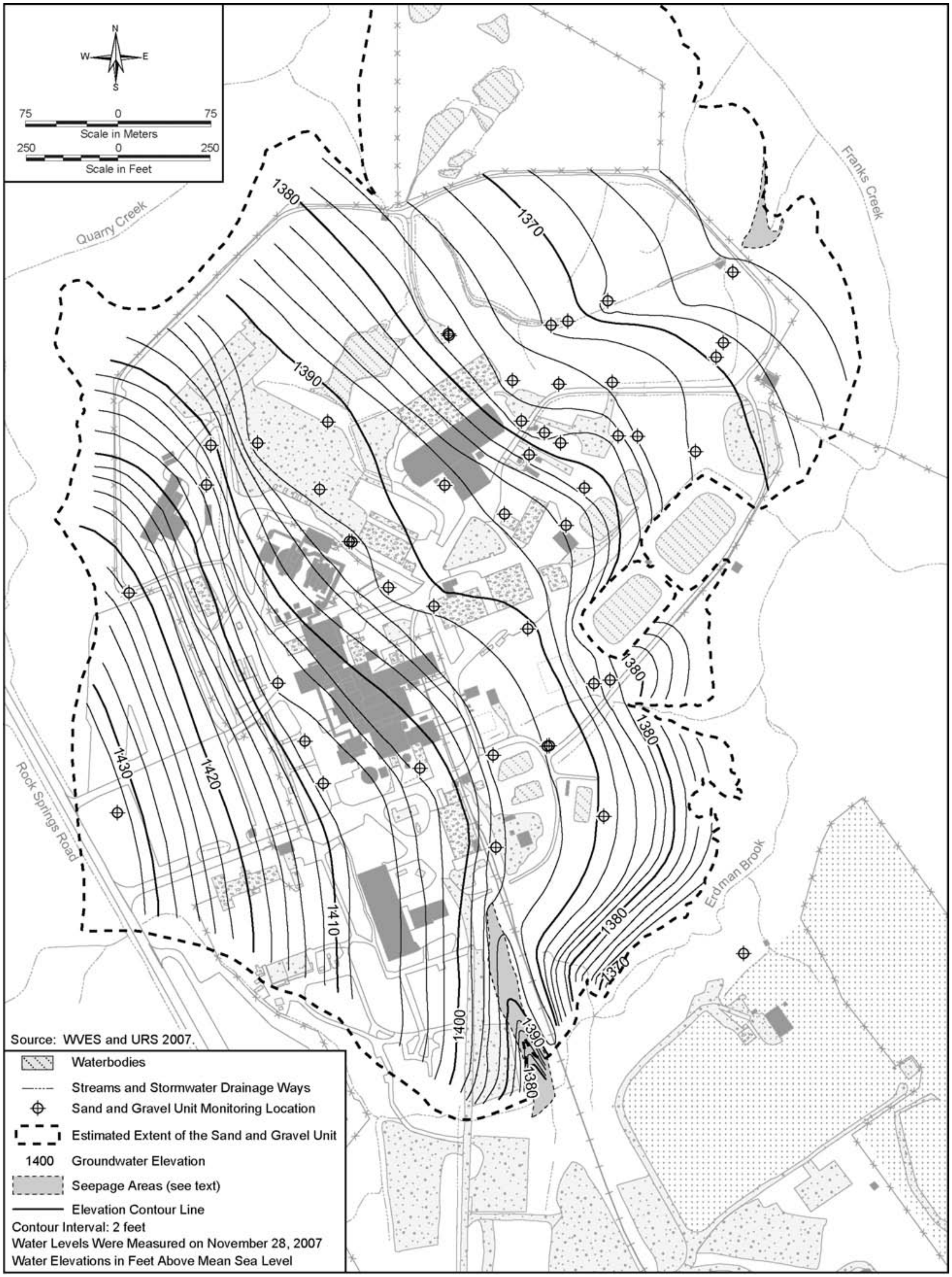


Figure 3–23 Groundwater Elevation and Flow in the Sand and Gravel Unit

Main Plant Process Building's outfall channel discharging into Erdman Brook. The estimated total discharge was less at 59 centimeters (23 inches) per year. Discharge to seeps and springs accounted for 21 centimeters (8 inches) per year, streams and channels 13 centimeters (5 inches) per year, discharge to the French drain (now closed off) and low-level radioactive waste treatment system 2 centimeters (0.8 inch) per year, evapotranspiration 18 centimeters (7 inches) per year, vertical leakage into the Lavery till 1 centimeter (0.4 inch) per year, and change in storage 4 centimeters (2 inches) per year.

The steady-state flow model water budget estimated a total recharge of 60.1 centimeters (24 inches) per year with 46.0 centimeters (18 inches) per year from the infiltration of precipitation, 10.4 centimeters (4.1 inches) per year from the bedrock inflow, and 3.7 centimeters (1.5 inches) per year from the outfall leakage (Yager 1987). Model-derived discharge estimates from the sand and gravel were evapotranspiration at 20.0 centimeters (8 inches) per year, stream channels at 12.2 centimeters (4.8 inches) per year, French drain and low-level radioactive waste treatment system at 4.3 centimeters (1.7 inches) per year, and seeps and springs at 23.5 centimeters (9.3 inches) per year. The net recharge or amount of water delivered to the water table is the precipitation less evapotranspiration or 26 centimeters (10 inches) per year.

In 1993, seasonal fluctuations from 35 wells installed in the sand and gravel were used to arrive at a spatially averaged annual recharge to the North Plateau (WVNS 1993d). The estimated recharge was 17.3 centimeters (6.8 inches) per year. The difference between this value and the recharge derived in the 1987 study was attributed to differences in the hydraulic conductivities used in the calculations—Yager's model hydraulic conductivities (~0.001-0.01 centimeters [~0.0004-0.004 inches] per second) being greater by approximately an order of magnitude. A review of the 1993 report notes that the 1993 calculations do not consider the effects of groundwater discharge from the North Plateau and hence, underestimate the recharge (Yager 1993). Also in 1993, water budget and hydrological analyses for the North Plateau arrived at a total steady-state annual precipitation of 100.1 centimeters (39 inches) per year, runoff at 25.5 centimeters (10 inches) per year, infiltration at 74.7 centimeters (29 inches) per year, drainage below 4 meters (13 feet) (recharge) at 15.8 centimeters (6 inches) per year, and evapotranspiration at 56.0 centimeters (22 inches) per year (WVNS 1993e). The estimate, 15.8 centimeters (6.2 inches) per year, of the recharge from precipitation in this study, is also significantly less than those made by Yager—50 centimeters (20 inches) per year and 46 centimeters (18 inches) per year. The 1993 review suggests that the runoff may have been over-estimated and recharge underestimated in these calculations (Yager 1993). Other analyses performed in the study produced North Plateau recharge estimates in the range of 5 centimeters (2 inches) per year to 12 centimeters (5 inches) per year.

Recognition and characterization of the slack-water sequence as a distinct subunit within the North Plateau surficial sand and gravel has occurred primarily over the last 10 years. The slack-water sequence exhibits higher observed horizontal hydraulic conductivities (1×10^{-3} centimeters per second to 1×10^{-1} centimeters per second [0.0004 inches per second to 0.04 inches per second]) (see Appendix E). Numerous thin horizontal clay layers occur in the slack-water sequence and hence, vertical hydraulic conductivities may be much less than the horizontal hydraulic conductivity. Observed water levels on the North Plateau and modeling studies suggest that the slack-water sequence is an important conduit in the transport of contamination from the vicinity of the Main Plant Process Building to discharge locations on the northern portion of the plateau (Yager 1987, WVNSCO 2002).

Unweathered Lavery Till Unit

The unweathered Lavery till underlies the sand and gravel unit on the North Plateau and the weathered Lavery till on the South Plateau. The Lavery till ranges in thickness from about 9 meters (30 feet) on average beneath the Main Plant Process Building area (WMA 1), to 21 meters (70 feet) beneath portions of WMA 5, and up to 37 meters (120 feet). The till is thickest between Franks and Buttermilk Creeks. The unweathered Lavery till is largely a silty clay to clayey silt till (WVNS 1993f, WVNS and Dames and Moore 1997). Groundwater in the unweathered Lavery till generally flows vertically downward toward the underlying Kent recessional sequence (Prudic 1986, WVNS 1993d, WVNS and Dames and Moore 1997). This unit is perennially saturated and has relatively low hydraulic conductivity in the vertical and horizontal dimensions and thus functions as an effective aquitard (WVNS and Dames and Moore 1997). Estimates of horizontal and vertical hydraulic conductivity from previous laboratory studies were 3.8×10^{-8} centimeters per second (1.3×10^{-3} inches per day) and 6.2×10^{-8} centimeters per second (2.1×10^{-3} inches per day), respectively. These results were consistent with field estimates. The 1991-2007 mean hydraulic conductivity of 6.4×10^{-7} centimeters per second (0.022 inches per day), was higher than earlier estimates (WVES and URS 2008). The unweathered Lavery till has been treated as isotropic in models incorporating it. Analyses of available hydraulic conductivity data for the unweathered Lavery till in support of the groundwater modeling effort produce similar estimates. The observed hydraulic gradient in the unweathered Lavery till is close to unity. Assuming a unit vertical hydraulic gradient, an isotropic hydraulic conductivity of 2×10^{-8} to 8×10^{-8} centimeters per second (6.8×10^{-4} to 2.7×10^{-3} inches per day), and effective porosity of 0.15 to 0.30, the estimated vertical groundwater velocity ranges from 0.02 to 0.16 meters per year (0.07 to 0.55 feet per year).

Weathered Lavery Till Unit

On the South Plateau, the Lavery till is exposed at the ground surface or is overlain by only a thin veneer of alluvium and is weathered and fractured to a depth of 0.9 to 4.9 meters (3 to 16 feet) (see Section 3.3.1.1). This unit (weathered Lavery till) is unique to the South Plateau. On the North Plateau, the weathered unit is much thinner or nonexistent (WVNS 1993d, WVNS and URS 2006). Groundwater in the weathered Lavery till unit generally flows to the northeast across the South Plateau from higher elevations at Rock Springs Road toward lower elevations in the stream valleys of Erdman Brook and Franks Creek. In the area around the NDA (WMA 7) and SDA (WMA 8), the prevailing groundwater flowpath is interrupted by the trenches, drains, and engineered features of these facilities (WVNS 1993d, WVNS and Dames and Moore 1997). In addition, both horizontal and vertical components are involved with groundwater flow through the weathered Lavery till as groundwater can move laterally and then downward into the underlying unweathered Lavery till (WVES and URS 2008). The 1991-2007 mean horizontal hydraulic conductivity was 2.0×10^{-5} centimeters per second (0.7 inches per day). The highest conductivities are associated with dense fracture zones found within the upper 2 meters (7 feet) of the unit (WVES and URS 2008). Statistical analyses of available hydraulic conductivity data for the weathered Lavery till in support of the groundwater modeling effort produce higher estimates, 2×10^{-4} to 5×10^{-4} centimeters per second (7 to 17 inches per day) (see Appendix E). However, the physical and geohydrological character of the weathered Lavery till is quite variable, reflecting extreme variations in extent of weathering, fracturing, and biointrusions. Hydraulic conductivities in the field for the weathered Lavery till range from the 10^{-8} centimeters per second (10^{-4} inches per day) values representative of the unweathered till to 10^{-3} centimeters per second (34 inches per day) where the material is highly modified by the processes mentioned.

Lateral groundwater movement in the weathered Lavery till is largely controlled by topography as expressed in the weathered till/unweathered till interface and the low permeability of the underlying unweathered Lavery till. The range of hydraulic conductivities and variation in gradients lead to horizontal velocity estimates on the order of feet per year to tens of feet per year. This flow may continue a short distance before slower vertical movement through the underlying unweathered till occurs, or in some circumstances, may continue until the groundwater discharges at the surface in a stream channel. Models for the South Plateau support only moderate lateral movement through the weathered till until the flow becomes directed downward into the unweathered Lavery till (Bergeron and Bugliosi 1988, Prudic 1986). These models were used as a starting point to examine how anisotropic characteristics in hydraulic conductivity impacted flow through the weathered Lavery till (Kool and Wu 1991). It was concluded that such factors can lead to greater lateral flow through the weathered till (Kool and Wu 1991). Fractures in the till were not explicitly modeled but are certainly a source of anisotropies in the hydraulic conductivity.

Lavery Till-Sand Unit

This intra-till unit occurs within the upper 6 meters (20 feet) of the Lavery till across portions of the North Plateau. It has been mapped as continuous beneath portions of the Main Plant Process Building and adjacent areas and further described in Section 3.3.1.1. Groundwater elevations in wells screened in the three separate till-sand zones have been monitored since 1990 (WVNS 1993d). Water level elevations in the main Lavery till-sand are above the top of the unit, indicating that both saturated and artesian (confining or semi-confining) conditions exist (WVNS 1993d, WVNS and Dames and Moore 1997).

Groundwater flows through this unit in an east-southeast direction toward Erdman Brook. However, surface seepage locations from the unit into Erdman Brook have not been observed (WVNS and Dames and Moore 1997, WVNS and URS 2006). This lack of seepage indicates that the till-sand is largely surrounded by the Lavery till. While fractures in the Lavery till may allow groundwater in the till-sand to discharge along the north banks of Erdman Brook, this process is occurring at a very slow rate. As a result, recharge to and discharge from the till-sand is likely controlled more by the physical and hydraulic properties of the Lavery till (WVNS 1993d). Discharge occurs as percolation to the underlying Lavery till. Recharge occurs as leakage from the overlying Lavery till and from the overlying sand and gravel unit, where the overlying Lavery till layer is not present (WVNS 1993d, WVNS and Dames and Moore 1997). Estimates of horizontal hydraulic conductivity for the Lavery till-sand range from 1.3×10^{-4} centimeters per second (4.4 inches per day) from slug tests to 6.2×10^{-5} centimeters per second (2.1 inches per day) based on particle-size analysis (WVNS 1993d, WVNS and Dames and Moore 1997). The 1991-2007 mean hydraulic conductivity was approximately 9×10^{-5} centimeters per second (3.1 inches per day) (WVES and URS 2008). Statistical analyses of available hydraulic conductivity data for the Lavery till-sand performed in support of the groundwater modeling effort produce similar values.

Kent Recessional Sequence Unit and Kent Till

Gravel, sand, silt, and clay of the Kent recessional sequence unit underlie most of the Project Premises (WVNS and Dames and Moore 1997). The unit thickens from west to east across the entire Project Premises, with the thickest portion mapped beneath the northeast corner of WMA 5. Beneath the North Plateau, coarse sediments mainly comprise the unit and either overlie finer lacustrine deposits or directly overlie older tills, while finer sediments mainly comprise the unit beneath the South Plateau, as further described in Section 3.3.1.1. The unit outcrops along the west bank of Buttermilk Creek to the east and southeast of the site (WVNS 1993d). Groundwater flow in the Kent recessional sequence is toward the northeast and Buttermilk Creek (WVNS 1993d, WVES and URS 2008). Recharge to the Kent recessional sequence comes from both the overlying till and the adjacent bedrock valley wall. Discharge occurs at bluffs along Buttermilk Creek and to the underlying Kent till (WVNS 1993d, WVNS and Dames and Moore 1997).

The upper interval of the Kent recessional sequence, particularly beneath the South Plateau, is unsaturated; however, the deeper lacustrine deposits are saturated and provide an avenue for slow northeast lateral flow to discharge points in the bluffs along Buttermilk Creek. The unsaturated conditions in the upper sequence are the result of very low vertical permeability in the overlying till, and thus there is a low recharge through the till to the Kent recessional sequence. As a result, the Kent recessional sequence acts as a drain to the till and causes downward gradients in the till of 0.7 to 1.0, even beneath small valleys adjacent to the SDA (WMA 8) on the South Plateau (WVNS 1993d, WVNS and Dames and Moore 1997). Previous estimates of hydraulic conductivity for the unit have varied greatly. Particle-size analysis suggested a horizontal hydraulic conductivity ranging from 8.4×10^{-5} centimeters per second (2.9 inches per day) for the coarser sediments to 8.4×10^{-6} centimeters per second (0.29 inches per day) for the lacustrine sediments. Some field testing indicated even lower hydraulic conductivities. Using an average hydraulic conductivity of 4.5×10^{-6} centimeters per second (0.15 inches per day), a hydraulic gradient of 0.023, and a porosity of 0.25, a horizontal velocity for the Kent recessional sequence of 0.12 meters (0.4 feet) per year was calculated

(WVNS 1993d, WVNS and Dames and Moore 1997). The 1991-2007 mean hydraulic conductivity for the unit is approximately 4.5×10^{-6} centimeters per second (0.15 inches per day) (WVES and URS 2008). Using this hydraulic conductivity value would yield an average groundwater velocity of approximately 0.13 meters (0.43 feet) per year. Analyses of available hydraulic conductivity data in the Kent recessional sequence material performed in support of the groundwater modeling effort produce higher values (see Appendix E).

As discussed in Section 3.3.1.1, the Kent till underlies the Kent recessional sequence unit beneath both the North and South Plateaus. The Kent till (and Olean till) is lithologically similar to the Lavery till, and it has been assumed that it does not provide a ready pathway for contaminant movement (WVNS 1997, WVES and URS 2008). The potential for movement through the deeper units is discussed in more detail in Appendix E.

Bedrock Unit

Outcrops of the Devonian shales and siltstones underlying the Project Premises are limited to the areas along the upper reaches of Quarry Creek and sparsely vegetated hilltops west of the site. Regional groundwater in the bedrock tends to flow downward within the higher hills, laterally beneath lower hillsides and terraces, and upward near major streams. The upper 3 meters (10 feet) of bedrock have been both mechanically and chemically weathered and contain abundant fractures and decomposed rock, which makes this layer more hydraulically transmissive than the underlying competent bedrock. Hydraulic conductivity in the weathered zone has been estimated at 1×10^{-5} centimeters per second (0.3 inches per day). Wells completed in this zone yield 40 to 60 liters per minute (10.6 to 15.9 gallons per minute) and correspond to the regional bedrock aquifer. The hydraulic conductivity of the underlying competent rock has been estimated at 1×10^{-7} centimeters per second (0.003 inches per day). The difference in conductivities between these two zones suggests preferential flow through the weathered portion, which would be directed downslope within the weathered zone toward the axis of the buried valley underlying WNYNSC (WVNS 1993d, WVNS and Dames and Moore 1997).

North Plateau Groundwater Contamination

Groundwater in portions of the sand and gravel unit in the North Plateau is radiologically contaminated as a result of past operations. The most significant area of groundwater contamination is associated with the North Plateau Groundwater Plume, which extends through portions of WMA 1 to WMA 6 and possibly into WMA 12, as shown on **Figure 3–24**. This figure reflects data as recent as 2007. NYSDEC first reported elevated measurements of radioactivity from samples collected from a spring-fed ditch located due north of the Main Plant Process Building (WVES 2007b) and later determined that the most likely source of the contamination was the spring, recharged by the surficial sand and gravel aquifer (WVES 2007b). Monitoring of offsite discharges and groundwater, at specific sampling locations, continued through the early 1990s. At that time a more comprehensive evaluation of groundwater conditions at the site was conducted to support the Project Premises RCRA facility investigation. In 1993, elevated gross beta concentrations were detected in surface water samples from the northeast swamp ditch located along the north side of the CDDL, near the northeast edge of the plateau aquifer (WVES 2007b). Topography and groundwater elevations in this area suggested that contaminated groundwater was the probable source of the impacted surface water.

In 1994, a Geoprobe® soil and groundwater investigation was initiated to characterize the lateral and vertical extent of the elevated groundwater gross beta concentrations on the North Plateau and to determine the isotopes present (WVNSCO 1995). The highest gross beta concentrations in soil and groundwater were found in areas south of the fuel receiving and storage area and southeast of the Main Plant Process Building. Strontium-90 and its daughter product, yttrium-90, were identified as the major contaminants present. On the basis of these data and an evaluation of potential sources, leaks from process lines within the Main Plant Process Building that occurred during NFS fuel reprocessing operations were identified as likely sources of the

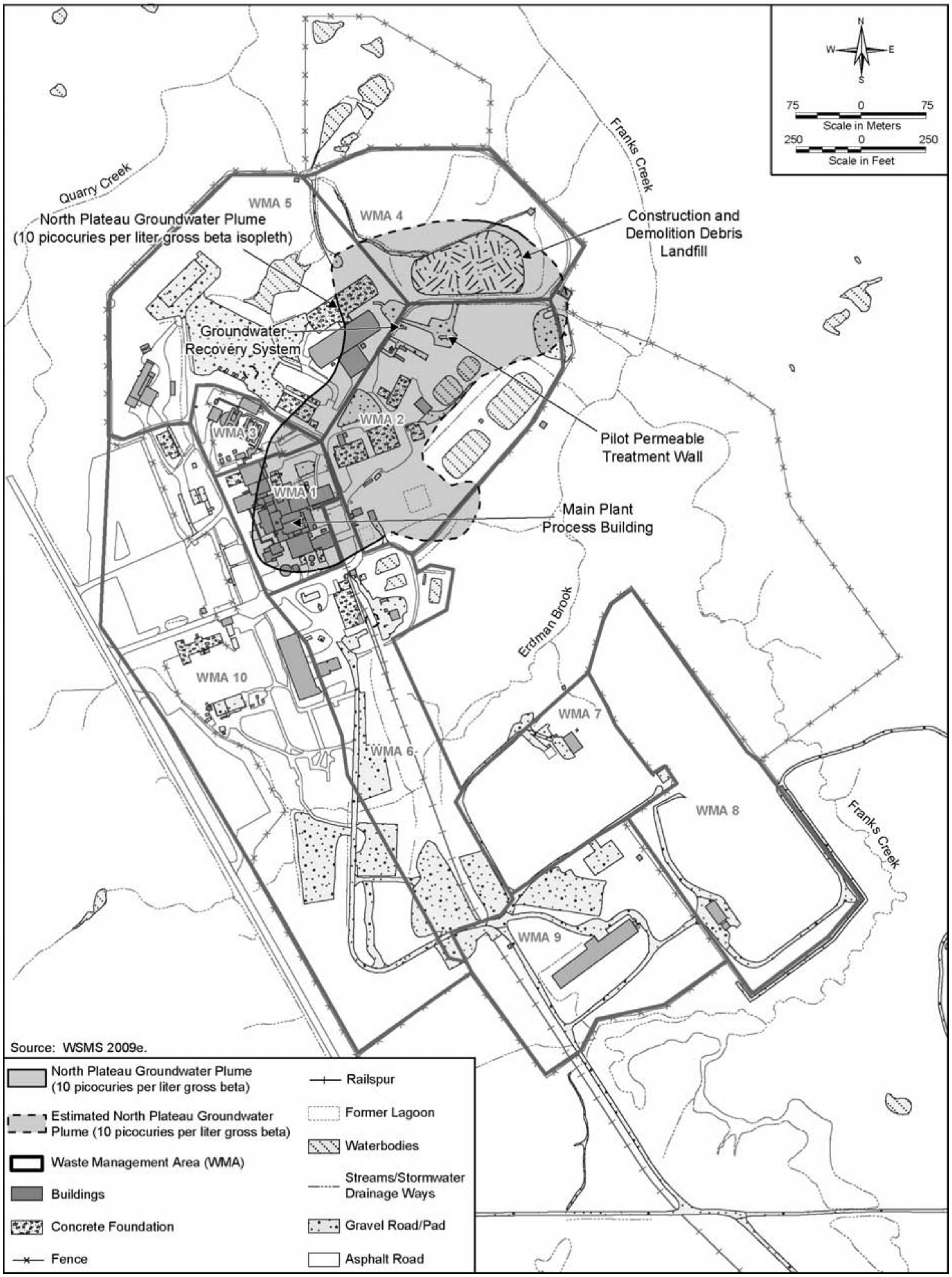


Figure 3–24 Extent of the North Plateau Groundwater Plume Showing the Gross Beta Concentrations Greater than or Equal to 10 Picocuries per Liter

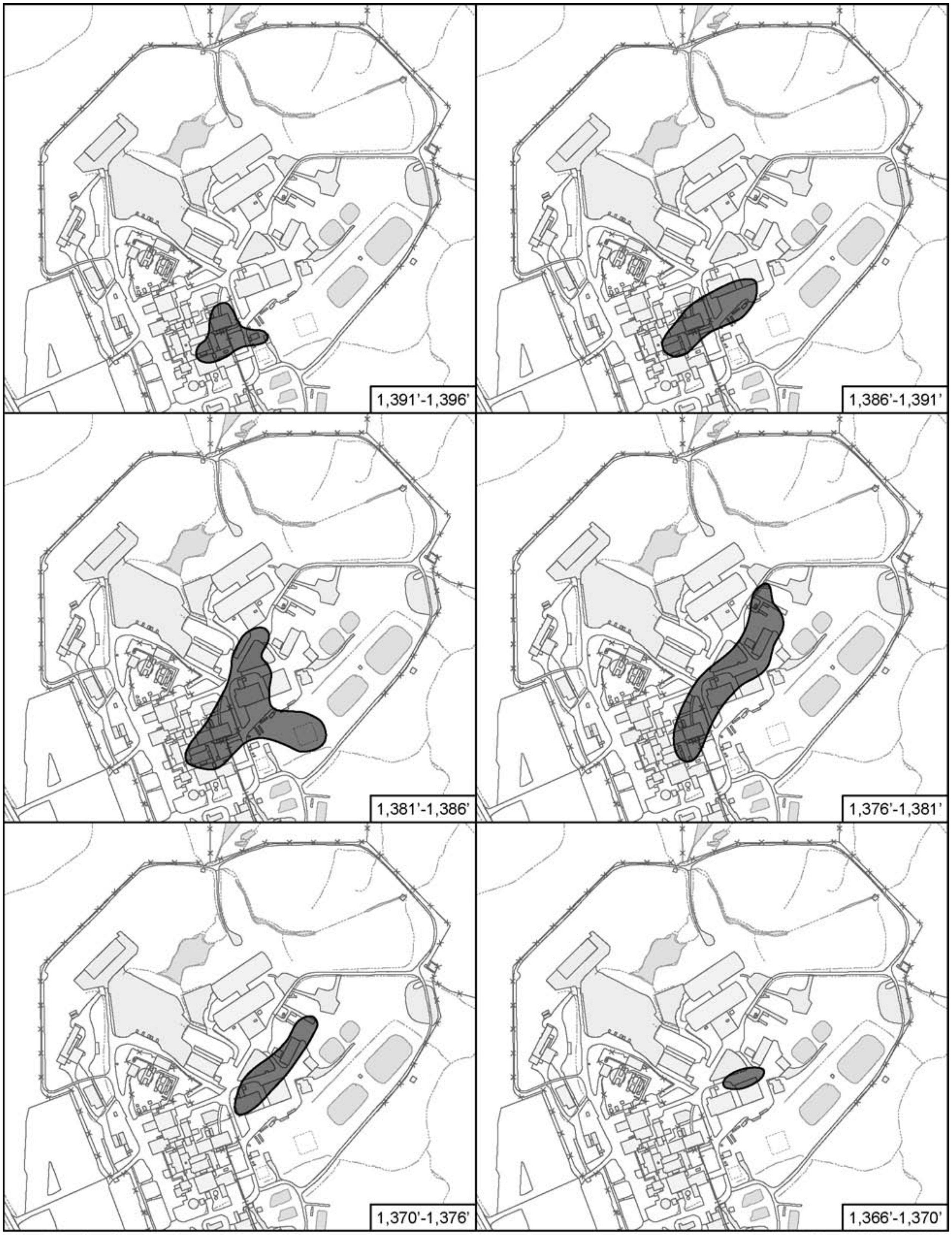
contamination. Elevated gross beta concentrations (greater than 1,000 picocuries per liter) comprised a groundwater plume extending northeastward from the southwest corner of the Main Plant Process Building to the area beneath the CDDL. The vertical extent appeared limited, with the body of the plume found in the surficial sand and gravel. A series of strontium-90 concentration isopleths (greater than 1,000 picocuries per liter) is shown on **Figure 3–25** at increasing depths in the sand and gravel as inferred from the 1994 data.

In 1997 a second Geoprobe® investigation indicated some advancement of the plume's leading edge near the western portion of the CDDL, and provided additional definition of the relatively narrow eastern plume lobe (WVNSCO 1999a). The report also registered the existence of a narrow layered geologic subunit within the sand and gravel unit, suggesting that this subunit appears to provide a preferential flowpath for plume migration. This narrow subunit was later defined as the "slack-water sequence," and the remaining portion of the sand and gravel unit was designated the "thick-bedded unit." Earlier, it was noted that there were higher hydraulic conductivities in the surficial sand and gravel in that vicinity and as well as the existence of an old stream channel eroded into the top of the Lavery till (Yager 1987).

In 1998, the area in the vicinity of the probable source was investigated (WVNSCO 1999a). This Geoprobe® study confirmed that the probable source was located near the southwest corner of the Main Plant Process Building. Strontium-90 concentrations in soil and groundwater samples collected during the investigation generally were lower than those measured in 1994, suggesting radiological decay and plume migration in the interim.

In 2001, 43 test borings were completed and 33 monitoring wells were installed near the leading edge of the plume in the vicinity of a pilot project, the permeable treatment wall (WVNSCO 2002). A number of hydraulic conductivity tests (both slug tests and pump tests) were performed, providing detailed hydrostratigraphic information that was used to evaluate contaminant migration across the North Plateau. This information was also used to implement groundwater flow and contaminant transport models for the strontium-90 groundwater plume (WVES 2007b).

The current monitoring program for the strontium-90 plume includes 74 active wells and the permeable treatment wall riser that are sampled biweekly, monthly, or quarterly for gross beta and/or strontium-90 (WVES 2007b). Water levels are also measured at these locations and at 10 piezometers surrounding the pilot permeable treatment wall. Data collected as part of the sitewide quarterly Groundwater Monitoring Program are also used to monitor the plume. The previous monitoring program included more frequent sampling, as well as isotopic analysis for strontium-90 at all North Plateau monitoring locations. In January 2005, the number of wells sampled monthly for strontium-90 was reduced to 12 wells. Quarterly strontium-90 sampling at the remaining 61 locations monitored monthly was replaced with quarterly gross beta sampling. Monitoring of the pumping wells remained on a biweekly schedule. Gross beta data can be used in lieu of direct strontium-90 analyses because historical monitoring has established that approximately one-half of the gross beta activity measured in the plume is attributable to strontium-90. The remaining activity is attributable to short-lived yttrium-90. The special sampling for water quality parameters in groundwater surrounding the permeable treatment wall was no longer required after the pilot permeable treatment wall evaluation was completed. Consequently, sampling from selected monitoring points near the pilot permeable treatment wall for calcium, potassium, and strontium was discontinued in January 2005. At the same time the analytical sampling was reduced, the frequency of water level measurements at all North Plateau monitoring wells was also reduced from biweekly to monthly (WVES 2007b).



Note: Elevation above sea level indicated in feet.

Source: Developed from WVNSCO 1995

Figure 3–25 Vertical Distribution of North Plateau Strontium-90 Plume in 1994 Geoprobe® Study

As shown on Figure 3–24, the North Plateau Groundwater Plume is currently a 200-meter- (650-foot-) wide by 500-meter- (1,640-foot-) long zone of groundwater contamination that extends northeast from the Main Plant Process Building in WMA 1 to the CDDL in WMA 4, where it splits into eastern and western lobes. Strontium-90 and its decay product, yttrium-90, are the principal radionuclides in this plume, with both radionuclides contributing equal amounts of beta activity. The highest strontium-90 concentrations have been found in groundwater on the east side of the Main Plant Process Building (WVES and URS 2008). Another portion of the plume extends approximately 100 meters (330 feet) east of the main body of the plume, where it continues beneath and to the east of Lagoon 1 in WMA 2. While the primary source of strontium-90 contamination in this portion of the plume is the Main Plant Process Building, former Lagoon 1 and, to a lesser extent, the Old Interceptors may also have been contributors (WVNS and URS 2007). Generally, mobile radionuclides such as tritium, strontium-90, iodine-129, and technetium-99 were able to migrate with the groundwater along the northeast groundwater flow path in the North Plateau. Less-mobile radionuclides, such as cesium-137, americium-241, plutonium isotopes, curium isotopes, and neptunium-237, are expected to have remained beneath the immediate source area because of the high sorptive capacity of the minerals in the sand and gravel unit (WSMS 2009e). While the chemical speciation is an important factor in the mobility of radionuclides, carbon-14 may exhibit a potentially unique dependence on the carbonate chemistry of the groundwater. The North Plateau Groundwater Plume is further described in Appendix C, Section C.2.13, of this EIS.

In November 1995, a Groundwater Recovery System was installed to mitigate the movement of strontium-90 contamination in groundwater in the western lobe of the plume and reduce groundwater seepage northeast of the Main Plant Process Building. Three recovery wells and an associated groundwater recovery facility, the North Plateau Groundwater Remediation System, installed near the leading edge of the western lobe of the Groundwater Plume, extract groundwater from the underlying sand and gravel unit (see Figure 3–24). This groundwater is then treated at the Low-Level Waste Treatment Facility using ion-exchange to remove strontium-90. After the groundwater is processed, it is discharged to Lagoon 4 or 5 of the Low-Level Waste Treatment Facility, and reaches Erdman Brook. Because Erdman Brook flows into Franks Creek, which in turn discharges to Buttermilk Creek, a receptor at the site boundary could be impacted by the groundwater that was processed at the Low-Level Waste Treatment Facility. Through calendar year 2007, approximately 186 million liters (49 million gallons) of groundwater had been treated, and approximately 8 curies of strontium-90 had been removed (WVES and URS 2008, WVES 2007b). Although the North Plateau Groundwater Remediation System has been effective in limiting the seepage of impacted groundwater to the ground surface, it has not completely mitigated the advance of the western lobe of the plume (Geomatrix 2007). Further, it has no impact on the eastern lobe of the plume, leading to the consideration of additional technologies and construction of a pilot-scale permeable treatment wall.

A pilot-scale permeable treatment wall was constructed in 1999 in the eastern lobe of the plume (see Figure 3–24). This passive, in situ remediation technology consists of a trench that is backfilled with clinoptilolite, a natural zeolite selected for its ability to adsorb strontium-90 ions from groundwater. The wall extends vertically downward through the sand and gravel unit to the top of the underlying Lavery till and is approximately 9 meters (30 feet) long by 3 meters (10 feet) wide (WVNS and URS 2006). The permeable treatment wall is further described in Appendix C, Section C.2.13.

As noted in the preceeding text, additional test borings and monitoring well installations had been completed in the vicinity of the permeable treatment wall during the fall of 2001 to obtain improved definition of hydrogeologic conditions. Monitoring and evaluation of water levels and radiological concentrations upgradient, within, and downgradient of the wall continued through 2005. The evaluation concluded that complex hydrogeologic conditions and disturbances from the installation are influencing groundwater flow into and around the pilot permeable treatment wall (WVNS and URS 2006). As part of WNYNSC sitewide groundwater surveillance monitoring, groundwater samples were collected as scheduled from 69 onsite locations in 2005, including 63 monitoring wells, 5 seepage points, and 1 sump/manhole. This groundwater surveillance encompasses the 5 hydrogeologic units previously described. The 2007 groundwater program continued to indicate that strontium-90 is still the major contributor to elevated gross beta values in the North Plateau Groundwater Plume. In 2007, 10 wells within the plume had gross beta concentrations that exceeded the DOE Derived Concentration Guide for strontium-90 (1.0×10^{-6} microcuries per milliliter [1,000 picocuries per liter]), as shown on **Figure 3–26**. The media or source of the water is nonspecific; therefore, the Derived Concentration Guides may be applied to groundwater. Derived Concentration Guides are applicable to ingested water. The source of the plume's activity can be traced to the soils beneath the southwest corner of the Main Plant Process Building, as discussed in the preceeding text. Lagoon 1, formerly part of the Low-Level Waste Treatment Facility, has been identified as a source of the gross beta activity at the remaining wells (Wells 8605 and 111) (WVNS and URS 2006). Figure 3–26 also presents isocontours for groundwater monitoring results for 1994, 2001, and 2007, to illustrate changes in the configuration of the plume's core area.

While elevated tritium concentrations (as compared to background levels) continued to be detected in several wells in 2007, essentially all sand and gravel monitoring locations where tritium concentrations have been elevated in the past now exhibit decreasing trends. Decreasing tritium concentrations are the result of the radiological decay and/or dilution of residual tritium activity associated with previous historical site fuel reprocessing operations. As a result, tritium concentrations at many locations are currently close to or within the background range of approximately 9×10^{-8} and 1×10^{-7} microcuries per milliliter (WVNS and URS 2007).

In addition to collecting samples from wells, groundwater was routinely collected from seeps on the bank above Franks Creek along the northeastern edge of the North Plateau. With the exception of two locations (SP04 and SP11), gross beta concentrations from all seep monitoring locations were less than or similar to those at the background seep location during 2007. At SP11, gross beta concentrations show an increasing trend since early 1999 and somewhat larger increases from 2001 through 2007. The North Plateau Groundwater Plume—predominantly strontium-90—is upgradient from the seep and the gross beta discharged into drainage ditches at SP11 is believed to be to a result of reinfiltration of strontium-90 contaminated water that has surfaced from the plume. At SP04, gross beta concentrations increased to approximately twice background in 2007. Although the observed concentrations at SP04 and SP11 were elevated above background, they are still well below the DOE Derived Concentration Guide (WVES and URS 2008).

In 2007, volatile and semivolatile organic compounds were measured at specific locations that have historically shown results above practical quantitation limits (WVES and URS 2008). In the vicinity of the CDDL at Well 8612, 1,1-dichloroethane; 1,1,1-trichloroethane; total 1,2-dichloroethylene; and dichlorodifluoromethane were detected. The presence of volatile organic compounds in that vicinity have been presumed to be the result of wastes buried in the CDDL. Tributyl phosphate was detected in Well 8605, installed in the vicinity of Lagoon 1. In the past, volatile organic compounds were repeatedly detected at a few additional monitoring locations, such as Wells 803 and 8609, just north of the Main Plant Process Building, and seepage monitoring locations GSEEP and SP12, along Franks Creek downgradient of the CDDL but recent analytical results from these monitoring locations have not detected those volatile organic compounds. Volatile organic compounds have not been positively detected at GSEEP since 1993, or at SP12 since 2002 (WVNS and URS 2007).

WNYNSC does not use groundwater for drinking or operational purposes, nor does it discharge effluent directly to groundwater. No public water supplies are drawn from groundwater downgradient of WNYNSC or from Cattaraugus Creek downstream of WNYNSC. However, groundwater upgradient of WNYNSC is used for drinking water by local residents, as further discussed in Section 3.6.2.3 (WVES and URS 2008).

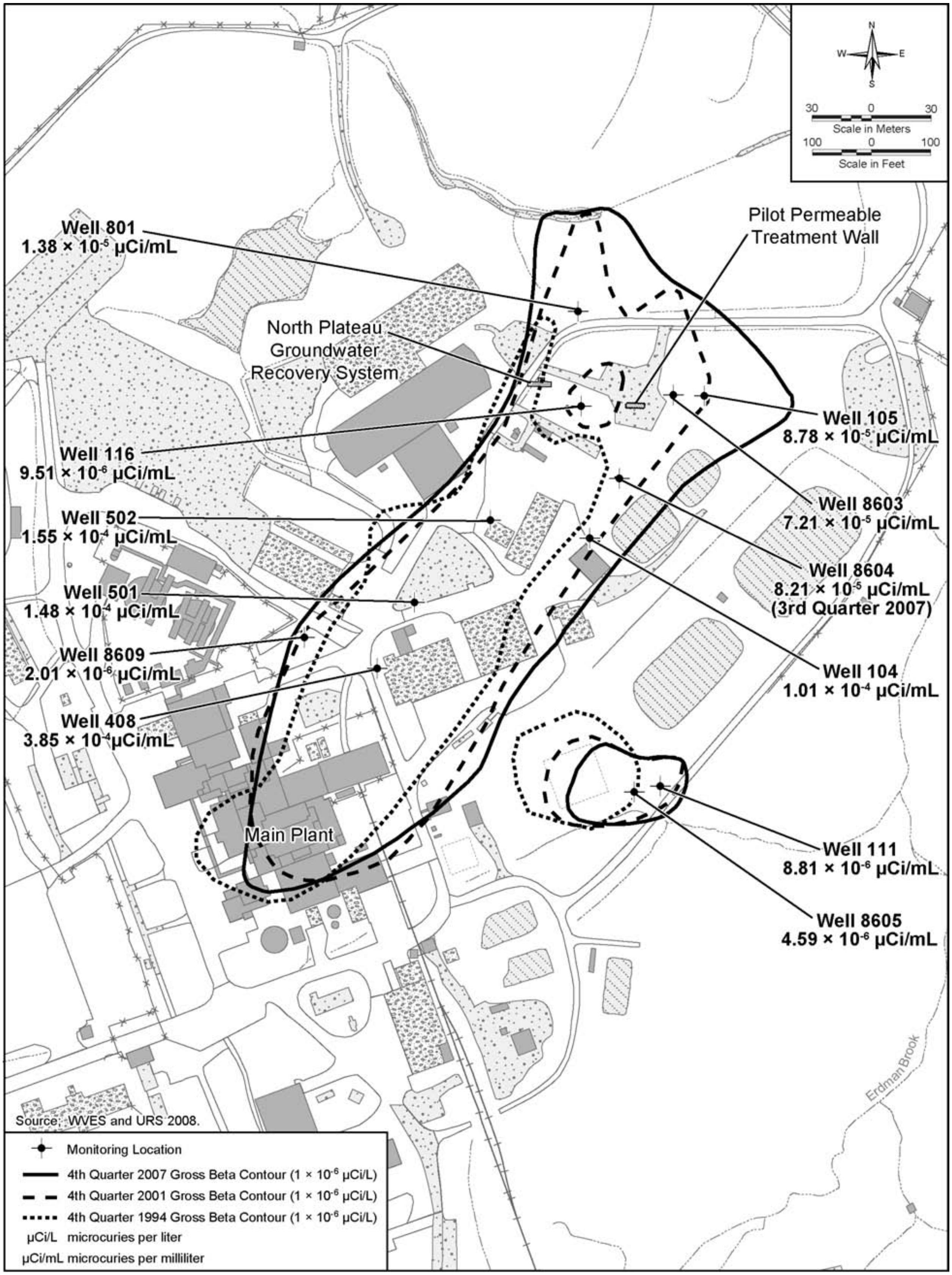


Figure 3–26 Extent of Core Area of North Plateau Gross Beta Plume in Sand and Gravel Unit

South Plateau Groundwater Contamination

On the South Plateau, radioactively contaminated groundwater has resulted from waste disposal and management activities at the NDA (WMA 7) and SDA (WMA 8). At both the NDA and SDA, radioactive waste was disposed of in trenches and holes within the Lavery till. Leachates exist in both NDA and SDA disposal holes and trenches (Bergeron et al. 1988, Kool and Wu 1991) and are contaminated with both radiological and chemical constituents leached from the buried wastes (Blickwedehl et al. 1989, Prudic 1986).

The SDA 1100-series wells along the perimeter of the SDA are sampled on a semiannual basis as a part of routine groundwater monitoring activities by NYSERDA. Analytical parameters monitored semiannually include gross alpha, gross beta, tritium, and field water quality parameters (conductivity, pH, temperature, and turbidity). Analytical parameters monitored annually included gamma-emitting radionuclides by gamma spectroscopy, four beta-emitting radionuclides (carbon-14, iodine-129, strontium-90, and technetium-99), and volatile organic compounds. There was one positive radionuclide detection in 2008—strontium-90 at 1107A at $6.59 \pm 0.78 \times 10^{-9}$ microcuries per milliliter (NYSERDA 2009b). Control charting of strontium-90 results for this well was initiated in 2003 because five positive detections previously had been reported, but the 2006 result did not exceed the reporting criteria. All volatile organic compound results in 2008 were reported as "not detected," and thus the volatile organic compound data are not included in this report. The 2008 water quality measurements were consistent with historical results.

A trench system was previously constructed along the northeast and northwest sides of the NDA to collect groundwater that was potentially contaminated with a mixture of n-dodecane and tributyl phosphate. No n-dodecane and tributyl phosphate was detected in groundwater near the NDA in 2005. Groundwater elevations are monitored quarterly in and around the trench to ensure that an inward gradient is maintained, thereby minimizing outward migration of potentially contaminated groundwater. Gross beta and tritium concentrations in samples from location WNNDATR, a sump at the lowest point of the interceptor trench, and from downgradient Well 909 screened in the Lavery till continued to be elevated with respect to background monitoring locations on the South Plateau. Concentrations were still well below DOE Derived Concentration Guides. During 2007, gross beta concentrations at WNNDATR increased from those measured during 2006 while tritium concentrations decreased. Overall, gross beta concentrations are increasing with time, while tritium concentrations have decreased over the last 10 years. Radiological indicator results at Well 909 have historically fluctuated. In general, upward long-term trends in both gross beta and tritium were discernible until 1999, when both trends declined, followed by relatively consistent results during recent years. Concentrations of both gross beta and tritium during 2007 were similar to those seen during 2006. Residual soil contamination near Well 909 is the suspected source of elevated gross beta concentrations, which are about the same as those at WNNDATR (WVES and URS 2008).

Two water quality and three radiological indicators are routinely determined in the Kent recessional sequence groundwaters at six wells as a component of the site groundwater monitoring program (WVES and URS 2008). The water quality indicators measured are conductivity and pH and the radiological indicators are gross alpha, gross beta, and tritium. Except for conductivity, for which no standard or guideline value is given, the applicable water quality and radiological limits, guidelines, and standards for these indicators are included in Appendix B–1 of the *West Valley Demonstration Project Annual Site Environmental Report for Calendar Year 2007* (WVES and URS 2008). In 2007, the radiological indicator concentrations were well below their respective applicable standards and guidelines and, except for the pH of 8.63 recorded at one well, which slightly exceeded the limit of 8.5, the pH remained within the range indicated in the standards.

3.6.2.2 Cattaraugus Creek Basin Aquifer System

The hydrologic units underlying WNYNSC are part of the Cattaraugus Creek Basin Aquifer System. EPA has designated this system a sole or principal source of drinking water (EPA 1987). A sole-source aquifer determination can be made if it is established that the aquifer in question provides at least 50 percent of the drinking water consumed in the area overlying the aquifer. Such a designation requires that EPA review federally assisted projects that could contaminate such aquifers through a recharge zone and create a significant hazard to public health. The aquifer's area encompasses approximately 842 square kilometers (325 square miles) of the southernmost part of the Lake Erie-Niagara River drainage basin in New York State, including portions of Cattaraugus, Erie, Wyoming, and Allegany Counties. The boundary of both the designated area and aquifer service area is the drainage divide of the Cattaraugus Creek Basin (see Figure 3–19). For purposes of the sole-source aquifer determination, the area is considered to include the entire townships of Freedom and Yorkshire and parts of Arcade, Sardinia, Concord, Ashford, Centerville, Rushford, Farmersville, Machias, Ellicottville, East Otto, Otto, Persia, Collins, Java, Wethersfield, and Eagle Townships in New York (EPA 2003).

Because the Cattaraugus Creek Basin is covered with permeable sediments, the recharge zone, where water percolates directly to the aquifer, includes the entire areal extent of the Cattaraugus Creek Basin Aquifer. This means that all projects with Federal financial assistance constructed in this basin are subject to EPA review to ensure that they are designed and constructed so as not to create a significant hazard to public health.

On a regional basis, the aquifer system consists of: (1) surficial, unconfined sand and gravel deposits; (2) confined sand and gravel lenses separated from the unconfined deposits above by relatively impermeable clay till and lacustrine sediments; and (3) fractured shale bedrock (EPA 2003). This comprises the whole of the approximately 80-meter- (250-feet-) thick hydrostratigraphic sequence defined beneath the North and South Plateaus of WNYNSC, including the saturated Holocene deposits, the Kent recessional sequence, the Kent and Lavery tills, and the upper fractured portions of the Canadaway Group.

3.6.2.3 Offsite Drinking Water

A 1985 survey of offsite groundwater use indicated 151 private wells located in the vicinity of the site (WVNS 2006). The types of well installations found in the survey included dug wells, drilled wells, augered wells, well-points, and springs. Wells are screened in both the shale bedrock and in alluvial gravel deposits. Groundwater samples were collected routinely from 9 offsite residential supply wells that represent the closest unrestricted use of groundwater near the site as a part of the routine groundwater monitoring program. Results from the radiological and chemical analyses of these samples were indistinguishable from background. None of the wells draws from groundwater units that underly the site. Sampling of these wells was discontinued in 2007 (WVES and URS 2008).

3.7 Meteorology, Air Quality, and Noise

3.7.1 Meteorology

The general climate of the region in which WNYNSC is located is classified as humid continental, which is predominant over the northeastern United States and common for mid-latitudes. Meteorological conditions at WNYNSC, which is 427 meters (1,400 feet) above mean sea level, are greatly influenced by the Great Lakes to the west and by the jet stream (polar front), where warm and cold air masses collide. Wind speeds in the region are generally light, with the strongest winds occurring during the winter months associated with the frequent passage of cold fronts. Precipitation is moderate and relatively evenly distributed throughout the year, with only slightly more precipitation falling during the summer season due to thunderstorms (NOAA 2007, WVNS 1993i).

Local and regional topographic features influence the climate at WNYNSC. The difference in elevation between the Lake Erie shoreline and the highest elevation in WNYNSC is approximately 370 meters (1,200 feet). This elevation change affects precipitation, wind direction, and wind speed. Atmospheric dispersion at the site is affected by local mountain (upslope) and valley (downslope) winds (WVNS 1993i).

Climatological data (temperature, wind speed, wind direction, and the standard deviation of the wind direction [sigma theta]) have been collected at WNYNSC since 1983. The meteorological tower is located in WMA 10 south of the Administration Building and Annex Trailer Complex as shown on Figure 3–1. The onsite meteorological tower is located to the south of the parking areas, inside the fenceline, near Rock Springs Road. It is located about 91 meters (300 feet) south-southwest of a warehouse, the nearest major structure, in an area that is mostly grass covered. The onsite meteorological tower is used to collect wind speed, wind direction, and temperature data at 60-meter (197-foot) and 10-meter (33-foot) elevations. Dewpoint, precipitation, and barometric pressure are also monitored at this location (DOE 2003e). The climatological baseline presented here is based on 5 years of WNYNSC meteorological data (1998 to 2002) and is representative of meteorological conditions at WNYNSC. A more-detailed climatological data record dating back more than 50 years is available from the Buffalo National Weather Service station, which is located 71 kilometers (44 miles) northwest of the site. These data include regional airflow, upper airflow patterns, and temperature. However, surface airflow data at this National Weather Service station may not be comparable to similar data measured at WNYNSC because of terrain differences between these locations and the close proximity of the Buffalo National Weather Service station to Lake Erie (WVNS 1993i).

The shifting boundaries of the jet stream subject the western New York region to extreme seasonal temperature variations. Further to the west and closer to the lakes, the mean temperatures are very similar, although disparities in the temperatures between Lake Erie and WNYNSC are a result of differences in the elevation (NOAA 2007, WVNS 1993i). The maximum temperature recorded on the site over the 5-year period, 1998 through 2002, was 32.7 degrees Centigrade (ºC) (91 degrees Fahrenheit [ºF]) in August, and the minimum was -23.6º C (-10º F) in January. Comparatively, the maximum temperature at the Buffalo National Weather Service Station over the 55-year period was 37.2º C (99º F), and the minimum was -28.9º C (-20º F) (NRCC 2003a, 2003b).

Annual precipitation is distributed evenly throughout the year, with more snow than rain in the winter. The site is not subject to flooding because it is located at a topographic high point within the region. Mean total water equivalent precipitation at WNYNSC averages approximately 102 centimeters (40 inches) per year. The WNYNSC region receives an annual average of 3 meters (10 feet) of snowfall, with commonly occurring snow squalls totaling 0.3 to 0.9 meters (1 to 3 feet) over a 2- to 3-day period (WVNS 1993i). Rains resulting from warm fronts are usually light but last for several days; cold fronts often cause heavier rainfall in shorter periods.

Wind speed and direction is affected by local terrain that produces a sheltering effect and lower wind speeds at WNYNSC, as well as more seasonal variation in direction than at the National Weather Service station in Buffalo. During an average month, the predominant wind direction is from the northwest from the late fall through early spring and from the south-southeast from the spring through most of the fall. The exception to this is July, where the predominant direction is northwest. At the National Weather Service station in Buffalo, the predominant wind direction only varies from the southwest to west throughout the year. Hourly averaged wind speeds are approximately 2.2 meters per second (5 miles per hour) on an annual basis, with the highest average wind speeds occurring in January and February and the lightest in August. The climatological average wind speeds at the Buffalo National Weather Service Station depict a similar pattern, but are significantly higher overall, averaging 5.3 meters per second (11.9 miles per hour) annually. Most of this increase can be attributed to the National Weather Service averaging methodology, which uses 1-minute averages to represent hourly values. The peak hourly averaged wind speed measured at WNYNSC during the 5-year period was 11.1 meters per second (24.8 miles per hour). At the National Weather Service station in Buffalo, the peak instantaneous wind gust over the last 50 years (1948 to 1998) was 40.7 meters per second (91.0 miles per hour) (NRCC 2003c, 2003d; NWS 2003).

Severe weather at WNYNSC occurs as straight-line winds and tornadoes. The dominant straight-line high-wind directions are from the southwest (67 percent) and the west (23 percent) (Fujita et al. 1979). Normally, higher wind speeds occur in winter and early spring months. Thunderstorms occur in this region approximately 30 days per year, most often in June, July, and August. Severe thunderstorms with winds greater than 22.4 meters per second (50 miles per hour) occur in western New York State. Remnants of tropical cyclones occasionally affect the western New York region, but the impact from these cyclones is usually increased local rainfall and rarely damaging winds (WVNS 1993i).

The frequency and intensity of tornadoes in western New York are low in comparison to many other parts of the United States. An average of about two tornadoes of short and narrow path length strike New York each year. From 1950 to 1990, 17 tornadoes were reported within 80 kilometers (50 miles) of WNYNSC (WVNS 2004a). The probability of a tornado striking a 2.6-square kilometer (1-square mile) section of WNYNSC was estimated to occur once every 10,000 years. For wind speeds less than or equal to 54 meters per second (121 miles per hour) or a hazard probability level of 2.5×10^{-5}, straight-line winds are the more likely cause; for higher wind speeds, tornadoes are more likely. Straight-line winds are the dominant form of severe weather at recurrence intervals of less than 100,000 years (McDonald 1981).

Favorable atmospheric dispersion conditions exist during periods of moderate-to-strong winds, unstable conditions, and maximum mixing heights. Mean morning mixing heights vary from 850 meters (2,788 feet) during winter to 450 meters (1,476 feet) in the summer; mean afternoon mixing heights are highest during summer (approximately 1,600 meters [5,249 feet]) and lowest during winter months (approximately 850 meters [2,788 feet]) (Holzworth 1972). Actual daily mixing heights will vary due to local wind and terrain influences. However, the most favorable dispersion conditions will occur during non-overcast daytime hours when wind speeds are moderate to strong.

3.7.2 Ambient Air Quality

3.7.2.1 Nonradiological Releases

New York State is divided into nine regions for assessing state ambient air quality. WNYNSC is located in Region 9, which comprises Niagara, Erie, Wyoming, Chautauqua, Cattaraugus, and Allegany Counties. EPA has both primary and secondary National Ambient Air Quality Standards designed to protect human health and welfare from adverse effects from the six criteria pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate matter, and lead. The most stringent of the Federal and state ambient standards for each of these pollutants are given in **Table 3–11**. The area encompassing WNYNSC and the surrounding area in Cattaraugus County is classified as an attainment area for all six criteria pollutants except for the northern portion of WNYNSC in Erie County, which is classified as nonattaining for the ozone 8-hour standard (40 CFR 81.333). Monitoring data for 2006 for the nearest state air pollutant monitors are shown in Table 3–11. These monitors are the closest to WNYNSC but collect data from the more populated areas of Buffalo and Niagara Falls, rather than the less populated rural area around WNYNSC. The only large sources at WNYNSC are two steam boilers. Emissions of criteria pollutants in Cattaraugus County are less than in Erie County, which includes Buffalo and Niagara Falls (EPA 2006a). Therefore, actual background concentrations at WNYNSC are expected to be lower.

Table 3–11 Ambient Air Quality Measurements for Buffalo, New York

Pollutant	*2006 Monitoring Data [a] (micrograms per cubic meter)*	*Standard [b] (micrograms per cubic meter)*	*Averaging Period*
Carbon monoxide [c]	7,000 3,500	40,000 10,000	1 Hour 8 Hours
Sulfur dioxide [c]	94 34 7.9	1,300 365 80	3 Hours 24 Hours Annual
Nitrogen dioxide [c]	30	100	Annual
Ozone [d]	163 [d]	157	8 Hours
Particulate matter with aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$) [c]	34 [f] 11	35 15	24 Hours Annual
Lead [g]	Not Applicable Not Applicable	1.5 0.15	Calendar Quarter 3-Month
Particulate matter with aerodynamic diameter less than or equal to 10 microns (PM_{10}) [e]	28 13	150 45	24 Hours Annual

[a] Maximum reported value for the year.
[b] National Ambient Air Quality Standards, 40 CFR Part 50; State Ambient Air Quality Standards, 6 NYCRR 257.
[c] Buffalo, New York – 185 Dingens Street (State/Local Air Monitoring Station).
[d] Erie County, Amherst, Audubon Golf Course (National/State/Local Air Monitoring Station). Monitored value represents the 3-year average of the fourth highest values for 2004 through 2006.
[e] Niagara Falls, New York – Frontier Avenue at 55th Street - 2005 data.
[f] 3-year average of 98th percentile values.
[g] No monitor exists in this part of the state. Data reported for 2004 included a value of 0.01 at a monitor in Niagara Falls.
Note: New York State also has a 3-hour ambient standard for nonmethane hydrocarbons and annual; 30-, 60-, and 90-day; and 24-hour standards for total suspended particulates. The total suspended particulate standards have been superseded by the Federal PM_{10} and $PM_{2.5}$ standards, although not yet officially adopted by the state. New York State also has ambient standards for beryllium, fluorides, hydrogen sulfide, and settleable particulates.
Sources: EPA 2007c, NYSDEC 2007.

The ambient air quality standards, other than those for ozone, particulate matter (PM)[3], lead, and those based on annual averages, are not to be exceeded more than once per year. The 24-hour PM_{10} standard is attained when the standard is not exceeded more than once per year over a 3-year average. The annual $PM_{2.5}$ standard is attained when the 3-year average of the weighted annual mean concentrations does not exceed the standard. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of the 98th percentile of the 24-hour concentrations does not exceed the standard. The 8-hour ozone standard is met when the average of the annual fourth-highest daily maximum 8-hour average concentration is less than or equal to the standard. The 3-month lead standard is met when the maximum 3-month rolling average concentration is less than or equal to the standard value over a 3-year period (40 CFR Part 50).

No Prevention of Significant Deterioration Class I areas exist within 100 kilometers (60 miles) of WNYNSC.

Criteria pollutants and various toxic pollutants are released from WNYNSC primarily from combustion sources such as boilers, standby diesel generators, motor vehicles, and construction and materials handling equipment.

[3] *PM_n = particulate matter with an aerodynamic diameter less than or equal to n micrometers.*

3.7.2.2 Radiological Releases

Airborne emissions of radionuclides released at the Project Premises during 2007 are shown in **Table 3–12**. Most of the sources of these releases would be shut down and prepared for demolition by completion of the Interim End State.

Table 3–12 Airborne Radioactive Effluent Released from Monitored Release Points in 2007

Isotope	*Release (curies)*
Gross Alpha	6.53×10^{-7}
Gross Beta	1.36×10^{-5}
Hydrogen-3	2.15×10^{-3}
Cobalt-60	1.12×10^{-7}
Strontium-90	2.48×10^{-6}
Iodine-129	3.8×10^{-5}
Cesium-137	4.89×10^{-6}
Europium-154	2.76×10^{-7}
Uranium-232	2.04×10^{-8}
Uranium-233/234	6.84×10^{-8}
Uranium-235/236	2.38×10^{-8}
Uranium-238	5.4×10^{-8}
Plutonium-238	6.53×10^{-8}
Plutonium-239/240	1.17×10^{-7}
Americium-241	2.35×10^{-7}

Source: WVES and URS 2008.

EPA, under the Clean Air Act and its implementing regulations, regulates airborne emissions of radionuclides. DOE facilities are subject to 40 CFR Part 61, Subpart H. Subpart H contains the national emission standards for emissions of radionuclides other than radon from DOE facilities. The applicable standard for radionuclides is a maximum of 10 millirem (0.1 millisievert) effective dose equivalent (EDE) to any member of the public in 1 year.

DOE holds permits for radiological air emissions under the National Emissions Standards for Hazardous Air Pollutants. The following emissions sources are monitored on a continuous basis for radionuclides: the Main Plant Process Building ventilation stack; the former vitrification heating, ventilation, and air conditioning system; the 01-14 Building ventilation stack; the Supernatant Treatment System ventilation stack; Contact Size-Reduction Facility exhaust (did not operate in 2007); Container Sorting and Packaging Facility exhaust; and the Remote-Handled Waste Facility (WVES and URS 2008). These air emission sources will have been shut down and prepared for demolition by completion of the Interim End State, except for the Permanent Ventilation System, which provides ventilation to the Supernatant Treatment System and waste storage tanks 8D-1, 8D-2, 8D-3, and 8D-4. Permitted portable outdoor ventilation enclosures are used to provide the ventilation necessary for the safety of personnel working with radioactive materials in areas outside permanently ventilated facilities or in areas where permanent ventilation must be augmented. One ambient air sampler continued operating in 2007 to monitor air near the onsite lag storage area. The combined emissions from the monitored sources resulted in doses that were calculated to be less than 1 percent of the 10 millirem-per-year EPA standard for total radionuclides (WVES and URS 2008).

3.7.3 Noise

Existing noise sources at WNYNSC include heating, ventilation, and air conditioning systems; material handling equipment (fork lifts and loaders); construction equipment; trucks; and automobiles. Noise levels produced by activities at WNYNSC are expected to be compatible with adjoining land uses. Noise levels near but not inside WNYNSC are generated predominantly by traffic movements and, to a much lesser degree, residential-, agricultural-, commercial-, and industrial-related activities. No data currently exist on the routine background ambient noise levels produced by activities at WNYNSC or noise levels near WNYNSC. The land uses in the area would indicate that the noise levels in the area would be low, and range from that typical of rural residential areas (L_{dn} [Day-Night Average Sound Level] 35 to 50 dBA [decibels A-weighted] [EPA 1974]) to levels typical of industrial locations. Noise measurements indicate one-hour equivalent sound levels ($L_{eq}(1)$) during offpeak traffic hours of 52 and 54 dBA along Schwartz Road and County Route 12, respectively (USDOT and NYSDOT 2003a). These data were collected in 1996 at least 15 meters (50 feet) from the road. These levels may be representative of roads near WNYNSC. Nearby noise-sensitive areas include residences located near the WNYNSC boundary such as those along Route 240 to the northeast; along Buttermilk Road to the east; along Fox Valley Road to the southwest; along Rock Spring Road to the south and northwest; along Dutch Hill Road to the southwest and west; and along Boberg Road to the west-northwest (URS 2002a).

3.8 Ecological Resources

Ecological resources include terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. Each resource area is addressed separately in the following text.

3.8.1 Terrestrial Resources

WNYNSC lies within the Eastern Deciduous Forest Floristic Province, near the transition between the beech-maple forest and hemlock–white pine–northern hardwood forest regions. Typical plant associations of both forest regions exist at the site along with some elements of the boreal forest (WVNS 1996). Currently, the site is nearly equally divided between forestland and abandoned farmland that has not been farmed, grazed, or logged since the 1960s. The relatively undisturbed nature of large portions of the area has allowed for natural succession, thus permitting native vegetation to become re-established (DOE 2003e). The abandoned farmland has reverted to successional old field, shrubland, and young forest plant communities (WVNS and URS 2004b).

WNYNSC provides habitat especially attractive to white-tailed deer (*Odocoileus virginianus*) and other various resident and migratory birds, reptiles, and small mammals. Although an overall sitewide wildlife management plan does not exist, NYSERDA sponsors a program to control the deer population by giving hunters limited access to WNYNSC (excluding the Project Premises) during the deer hunting season, a decision that is made on an annual basis (WVES and URS 2008). Specific controls are also in place for handling nuisance wildlife (e.g., woodchuck [*Marmota monax*]) before site safety is compromised. While methods of control vary, humane treatment of the animals during control activities is a priority and they are performed by trained personnel. Wildlife that is caught or found dead is surveyed for radiological contamination before final disposition (WVNS 2005).

Amphibians and Reptiles—Over 35 species of amphibians and reptiles may occur on or near WNYNSC; however, only 10 amphibians and 1 reptile species actually have been observed. The observed species frequent aquatic and wetland habitats. Amphibians observed on the site include the northern dusky salamander (*Desmognathus fuscus*), American toad (*Bufo americanus*), northern leopard frog (*Rana pipiens*), bull frog (*Rana catesbeiana*), and wood frog (*Rana sylvatica*). Although no reptiles other than snapping turtles (*Chelydra serpentina*) have been recorded on the site, several snake species, including rat snakes

(*Elaphe* spp.), garter snakes (*Thamnophis* spp.), and king snakes (*Lampropeltis* spp.), are likely to be present (WVNS 1996).

Birds—Approximately 175 species of birds have been recorded on or near WNYNSC. Diversity of bird populations and species varies seasonally due to migration. Permanent residents account for 10 percent of the regional bird list and include the American crow (*Corvus brachyrhynchos*), black-capped chickadee (*Poecile atricapillus*), blue jay (*Cyanocitta cristata*), dark-eyed junco (*Junco hyemalis*), downy woodpecker (*Picoides pubescens*), European starling (*Sturnus vulgaris*), great horned owl (*Bubo virginianus*), northern cardinal (*Cardinalis cardinalis*), red-tailed hawk (*Buteo jamaicensis*), rock dove (*Columba livia*), ruffed grouse (*Bonasa umbellus*), and wild turkey (*Meleagris gallopavo*). Nonpermanent bird species make up the majority of the recorded populations, with 67 percent classified as summer residents, 19 percent as migrants, and 4 percent as visitors, which visit but do not breed in the area (WVNS 1996).

Mammals—More than 50 mammal species potentially inhabit WNYNSC, with at least 22 having been observed. Large mammals known to inhabit the site include the white-tailed deer, which is representative of the general region (WVNS 1996). As noted previously, NYSERDA has initiated a program to control the deer population on the site (WVES and URS 2008).

Other mammals observed at WNYNSC include several species of bats, beaver (*Castor canadensis*), Eastern chipmunk (*Tamias striatus*), Eastern cottontail (*Sylvilagus floridanus*), Eastern gray squirrel (*Sciurus carolinensis*), meadow jumping mouse (Z*apus hudsonicus*), muskrat (*Ondatra zibethicus*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), red squirrel (*Tamiasciurus hudsonicus*), and woodchuck (*Marmota monax*) (WVNS 1996).

3.8.2 Wetlands

Wetlands perform numerous environmental functions that benefit ecosystems as well as society, such as removing excess nutrients from the water that flows through them. The benefit derived from nutrient removal is improved or maintained water quality. This in turn promotes clean drinking water, safe recreation, and secure fish and wildlife habitat. Further, wetlands absorb, store, and slowly release rain and snowmelt water, which minimizes flooding, stabilizes water flow, retards runoff erosion, and controls sedimentation. Wetlands filter natural and manufactured pollutants by acting as natural biological and chemical oxidation basins. Water is frequently cleaner leaving a wetland than entering. Wetlands can also be helpful in recharging groundwater and serve as groundwater discharge sites, thereby maintaining the quality and quantity of surface water supplies. Wetlands are one of the most productive and valuable habitats for feeding, nesting, breeding, spawning, resting, and providing cover for fish and wildlife (NYSDEC 2003).

The most recent wetland delineation was conducted in July and August of 2003 and verified in November 2005 on approximately 152 hectares (375 acres) of WNYNSC, including the Project Premises and adjacent parcels to the south and east of the Project Premises (Wierzbicki 2006, WVNS and URS 2004b). Wetland plant communities identified within the limits of the assessment area include wet meadow, emergent marsh, scrub shrub, and forested wetland. The investigation identified 68 areas comprising approximately 14.78 hectares (36.52 acres) as jurisdictional wetlands, with each area ranging from 0.004 to 2.95 hectares (0.01 to 7.3 acres) as shown on **Figures 3–27** and **3–28**.

A field investigation conducted on November 2, 2005, by the U.S. Army Corps of Engineers in conjunction with review of relevant reports and maps, confirmed the 2003 wetlands delineation results that there are 14.78 hectares (36.52 acres) of wetlands. Twelve wetlands, totaling 0.98 hectare (2.43 acres), were observed to exhibit no surface water connection to a water of the United States, and were at that time considered isolated, intrastate, and nonnavigable wetlands. It was concluded that 13.8 hectares (34.09 acres) of wetlands

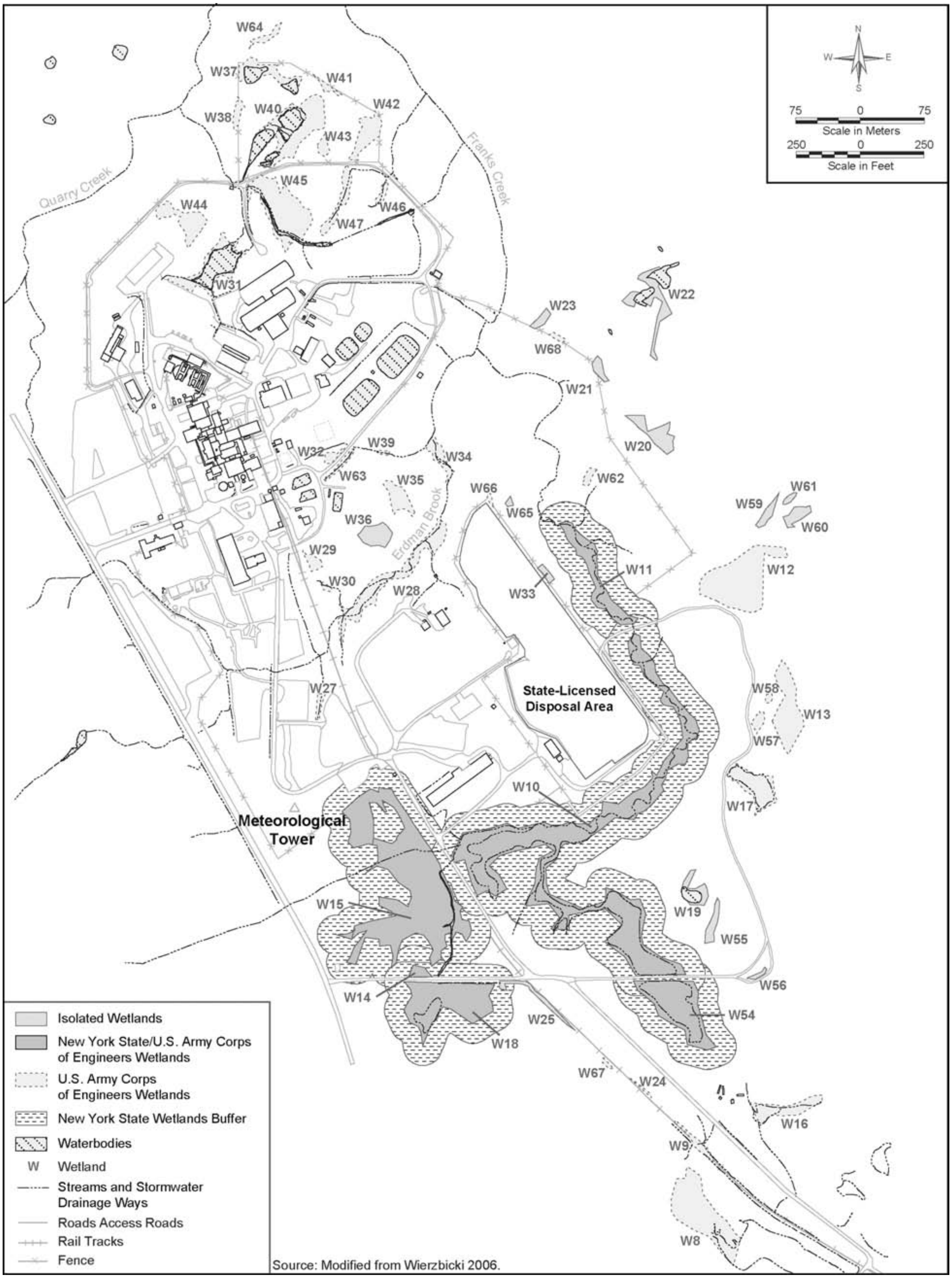


Figure 3–27 Wetlands in the Vicinity of the West Valley Demonstration Project Premises

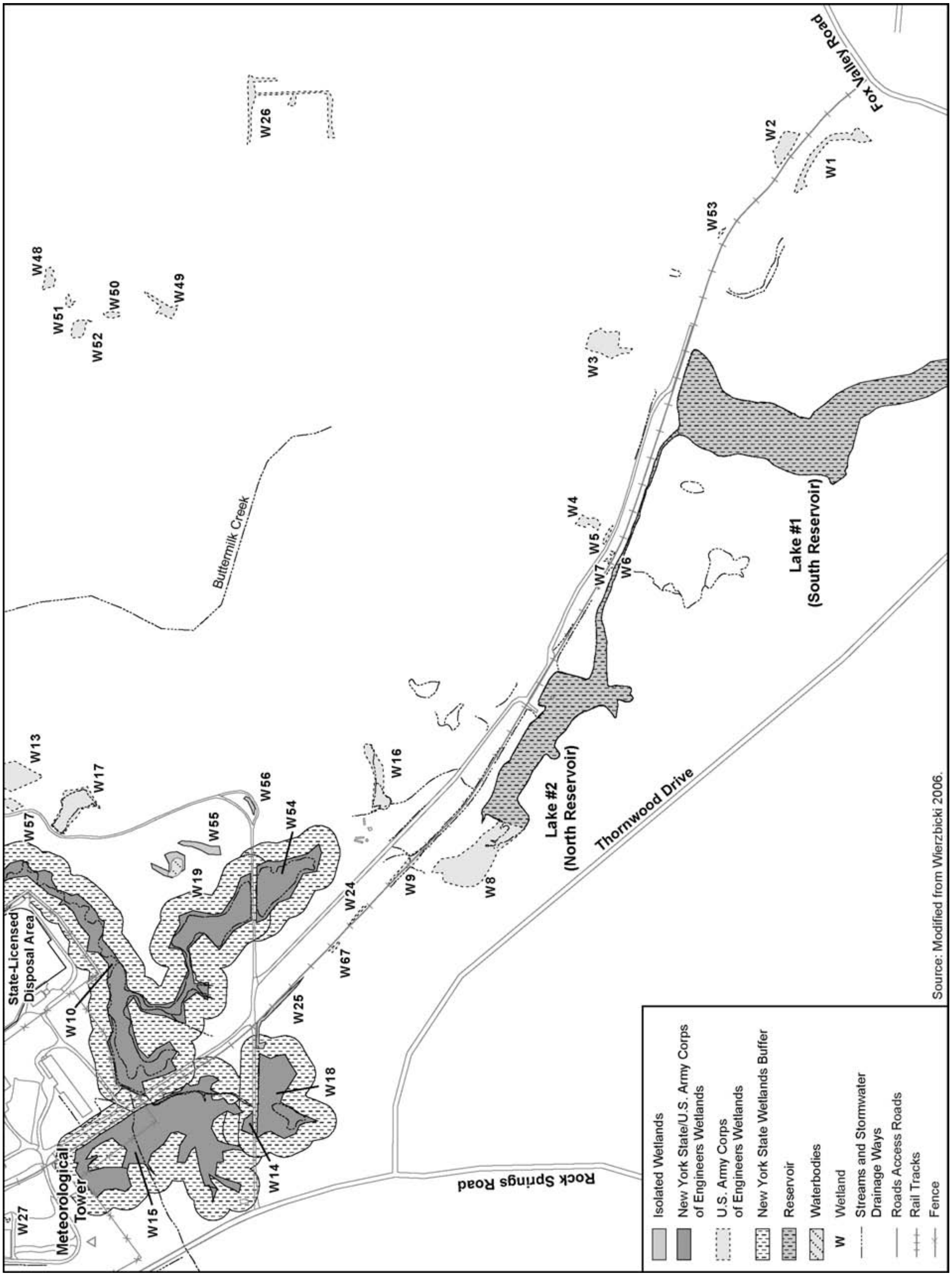


Figure 3–28 Wetlands in the Southern Vicinity of the West Valley Demonstration Project Premises

were waters of the United States subject to regulation under Section 404 of the Clean Water Act. These waters were determined to be part of an ecological continuum constituting a surface water tributary system of Buttermilk Creek, Cattaraugus Creek, and Lake Erie. The U.S. Army Corps of Engineers approved DOE's wetland determination application on January 26, 2006, which will remain valid for a period of 5 years unless new information warrants revision prior to the expiration date (Senus 2006).

Since the 2005 wetland review, the U.S. Army Corps of Engineers, in conjunction with the EPA, has provided new guidance regarding the agency's determination of jurisdiction over "wetlands adjacent to, but not directly abutting, a relatively permanent tributary" (i.e., isolated wetlands) (EPA and ACE 2007). This guidance states that the Corps will decide jurisdiction of such a wetland "…based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water." The guidance goes on to state that the "…analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters." Although a specific analysis has not been conducted, the twelve isolated wetlands identified in 2003 are similarly situated to the site tributaries as are other jurisdictional wetlands. Further, they could be expected to function similarly since, like many jurisdictional wetlands, nearly all are wet meadows. Thus, based on the new guidance DOE has conservatively reevaluated the twelve isolated wetlands as jurisdictional thereby giving a total area of regulated wetlands of 14.78 hectares (36.52 acres).

In addition to being considered jurisdictional by the U.S. Army Corps of Engineers, certain wetlands are also regulated by New York as freshwater wetlands. Article 24 of New York State's Freshwater Wetlands Act regulates draining, filling, construction, pollution, or any activity that substantially impairs any of the functions and values provided by wetlands that are 5 hectares (12.4 acres) or larger. New York State also regulates work within a 30.5-meter (100-foot) adjacent area around designated freshwater wetlands. Although there are no wetlands currently mapped by NYSDEC, six wetlands (W10, W11, W14, W15, W18, and W54) encompassing 7.0 hectares (17.3 acres) and delineated in the 2003 field investigation appear to be hydrologically connected (see Figure 3–27). The majority of these wetlands are located just south of the south Project Premises fence (WVNS and URS 2004b). On December 28, 2005, NYSDEC Region 9 concurred with the wetland delineation conducted in 2003. NYSDEC concluded that the six wetland areas are hydrologically connected, exceed 5 hectares (12.4 acres) and therefore in aggregate constitute an Article 24 state jurisdictional wetland (Ermer 2005). These wetland areas are dominated by wet meadow plant communities but also include emergent marsh, scrub shrub (shrub swamp), and forested wetland (deciduous swamp) plant communities. The characteristics of this area are consistent with the New York State Freshwater Wetlands classification system definition of a Class IV wetland (of the four classes, Class I has the highest value) (WVNS and URS 2004b). The classification system recognizes that different wetland types have different values and applies different standards for permit issuance.

Several onsite surface water monitoring locations are maintained for sampling both radiological and nonradiological constituents; two of these are associated with site wetlands (see Figure 3–20). The northeast swamp (WNSWAMP) is sampled to monitor surface water drainage and emergent groundwater from the northeastern portion of the site's North Plateau. The north swamp (WNSW74A) monitoring point is sampled to monitor drainage including emergent groundwater to Quarry Creek from the northern portion of the North Plateau. Sampling results are discussed in Section 3.6.1.

3.8.3 Aquatic Resources

Aquatic habitat within the Project Premises consists of stream channels, including Franks Creek, Erdman Brook, and Quarry Creek; four active Low-Level Waste Treatment Facility lagoons; two utility wastewater sludge ponds; one effluent mixing basin (equalization pond); and various maintained stormwater drainages.

Two large reservoirs, located in the southern part of the site, overflow to Buttermilk Creek, which then flows northwest to Cattaraugus Creek (WVES and URS 2008). At least 20 fish species have been observed in the creeks on WNYNSC, including the Eastern blacknose dace (*Rhinichthys atrarulus*), bluntnose minnow (*Pimephales notatus*), creek chub (*Semotilus atromaculatus*), northern hogsucker (*Hypentelium nigricans*), shiner (*Notropis* spp.), stonecat (*Noturus flavus*), white sucker (*Catostomus commersonii*), and brown trout (*Salmo trutta*). Unique to Cattaraugus Creek, probably due to the presence of the deep pool near the Route 240 bridge, were largemouth bass (*Micropterus salmoides*), sunfish (*Lepomis* spp.), and horny head chub (*Nocomis biguttatus*). Rainbow darter (*Etheostoma caeruleum*) were found only in Buttermilk Creek, and fantail darter (*Etheostoma flabellare*) were observed only in Quarry Creek. There is less fish diversity in the ponds and reservoirs, in which sunfish are the most common species, than in the creeks. Blacknose dace, largemouth bass, shiners, and sunfish have been seen in the north reservoir; only sunfish have been seen in the south reservoir. Bluegill (*Lepomis macrochirus*) live in the farmer's pond located off Route 240 to the east and brown bullhead (*Ameiurus nebulosus*) and white crappie (*Pomoxis annularis*) were observed in the beaver pond near Boberg Road to the west of the site (WVNS 1996).

Downstream from WNYNSC (below Springville Dam) Cattaraugus Creek is a meandering stream that supports several species of trout, as well as smallmouth bass (*Micropterus dolomieu*), bullhead, yellow perch (*Perca flavescens*), pumpkinseeds (*Lepomis gibbosus*), rock bass (*Ambloplites rupestris*), and walleye (*Stizostedion vitreum*). Recreational fishing is popular along the lower reaches of the creek (Boyer et al. 2009).

3.8.4 Threatened and Endangered Species

Consultations with the U.S. Fish and Wildlife Service and New York Natural Heritage Program, as well as previous studies, have identified a number of special status species that could occur on the site (see **Table 3–13)**. Critical habitat for the species identified in the table does not occur on the site.

Although the state-endangered rose pink (*Sabatia angularis*) was reported on the site in 1992, a field botanical investigation conducted in 2000 failed to find it again (DOE 2003e). The bald eagle (*Haliaeetus leucocephalus*), which has been delisted in the lower 48 states by the U.S. Fish and Wildlife Service (72 FR 37346), is listed in New York as threatened and may be an occasional transient to the site. Delisting the bald eagle as a threatened species under the Endangered Species Act does not affect the protection provided under the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, or New York State laws (Doran 2008). The clay-colored sparrow (*Spizella pallida*) has not been recorded on the site but has been found within the vicinity (Seoane 2008). A northern harrier (*Circus cyaneus*) was observed on the site during a spring 1991 biological survey; however, there is little suitable habitat on the site for this species as it prefers open wet meadows for hunting (WVNS 1992b).

The clubshell (*Pleurobema clava*) and rayed bean (*Villosa fabalis*), although reported in Cattaraugus County, were not found in Buttermilk or Cattaraugus Creeks when those streams were surveyed in 1991 (WVNS 1992b). Additionally, they were not reported by the New York Natural Heritage Program when that organization was consulted concerning state-listed species potentially present in the vicinity of the site (Seoane 2008).

Although not protected by Federal or state regulations, the cobblestone (*Cicindela marginipennis*) and Appalachian tiger beetles (*Cicindela ancocisconensis*) are ranked as critically imperiled and imperiled, respectively, by the New York Natural Heritage Program. The former species has been found on a cobble bar along Cattaraugus Creek downstream from the confluence of Buttermilk and Cattaraugus Creeks while the latter has been found in the vicinity of the confluence of these two streams (Seoane 2008).

Table 3–13 Threatened, Endangered, and Other Special Status Species Occurring in the Vicinity of the Western New York Nuclear Service Center

Common Name	*Scientific Name*	*Federal Status*	*State Status*	*Natural Heritage New York State Rank*
Plants				
Rose pink	*Sabatia angularis*		Endangered	
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	Delisted [a]	Threatened	
Clay-colored Sparrow	*Spizella pallida*			Imperiled
Northern harrier	*Circus cyaneus*		Threatened	
Freshwater Mussels				
Clubshell	*Pleurobema clava*	Endangered	Endangered	
Rayed bean	*Villosa fabalis*	Candidate	Endangered	
Beetles				
Appalachian tiger beetle	*Cicindela ancocisconensis*			Imperiled
Cobblestone tiger beetle	*Cicindela marginipennis*			Critically imperiled

[a] Effective August 8, 2007, the bald eagle was removed from the list of threatened wildlife in the lower 48 states (72 FR 37346).

Federal:

Delisted – Removed from the list of threatened and endangered species.
Candidate – Current information indicates the probable appropriateness of listing as endangered or threatened.
Endangered – In danger of extinction throughout all or a significant portion of its range.
Threatened – Likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

State:

Endangered – Any native species in imminent danger of extirpation or extinction in New York State.
Threatened – Any native species likely to become an endangered species within the foreseeable future in New York State.

New York State Natural Heritage State Rank:

Critically imperiled – Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making it especially vulnerable in New York State.
Imperiled – Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.

Sources: DOE 2003e; Doran 2008; NYSDEC 2008c, 2008d; Seoane 2008; WVNS 1992b.

3.8.5 Radiological Impact to Biota

DOE uses environmental monitoring data to estimate the impacts of radionuclides in the environment on terrestrial and aquatic plants and animals on or near WNYNSC. To assess the impact of exposure of biota to radiological contamination at the site, DOE compares the concentration of radionuclides in measured surface and sediment samples to screening level concentration limits established for terrestrial and aquatic systems. The screening level limits are established in DOE Order 5400.5. The calculations were prepared using DOE Technical Standard "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (DOE 2002d).

DOE has determined that the radionuclides that contributed the largest component of both aquatic and terrestrial dose to biota were strontium-90 and cesium-137. DOE has concluded that populations of aquatic and terrestrial biota on WNYNSC are not being exposed to doses in excess of the existing DOE dose standard for native aquatic animals and international standards for terrestrial organisms. The biota most likely to be adversely affected via the aquatic and terrestrial pathways were populations of riparian animals (animals that live along banks of streams or rivers, such as the raccoon), and terrestrial animals (such as the deer mouse). Both of these animals are found in WNYNSC (WVES and URS 2008).

3.9 Cultural Resources

The most recent cultural resources study of WNYNSC took place between June and December 1990 and involved two stages: (1) literature search and sensitivity assessment; and (2) field investigation (Pierce 1991). The study area consisted of approximately 146 hectares (360 acres) that may be affected by future plans and/or WNYNSC closure. The study area was subdivided into 30 study units (A through Y, and AA through EE) based on a number of factors including ease of access, vegetation, and topographic features. The study area included narrow linear parcels paralleling tributaries to Buttermilk Creek as far as its confluence with Cattaraugus Creek, parcels adjacent to the Project Premises, and a parcel encompassing the Bulk Storage Warehouse area in WMA 11 as shown on **Figure 3–29**.

A variety of field methods were employed, singly and in combination, throughout the study area: intensive walkover reconnaissance, exposed creek bank and terrace inspection, and shovel testing. In addition to occasional isolated historic cultural material recovered during surface inspections and/or shovel testing, the investigation yielded one prehistoric and eight historic archaeological sites, and two historic standing structures. The variety of cultural resources identified in the study area reinforced the belief that a microcosm of local and regional lifeways and settlement patterns might be found there. Western New York has a long and varied culture history ranging from the prehistoric past through European-American settlement to the nuclear age (Pierce 1991). Based on the background research and preliminary walkover inspection, the cultural resource sensitivity within the study area was considered to be moderate to high for locating unrecorded prehistoric and/or historic resources. However, these sensitivities were moderated by the extremely high degree of natural erosion and manmade impacts that have occurred within the study area.

The study concluded that unrecorded archaeological sites are probably present within WNYNSC. However, they were not located in the study area and are more likely to be found on the higher terrace or upland and headwater locations (Pierce 1991). Further, the New York State Historic Preservation Office has determined that facilities on the Project Premises are not eligible for inclusion in the National Register of Historic Places (Kuhn 1995).

3.9.1 Prehistoric Resources

A scraping tool was found in Study Unit E west of the access road leading into the borrow pit (Study Unit Y). The site is situated in a former agricultural field and orchard on a slight ridge overlooking an intermittent drainage leading to Erdman Brook. Fourteen additional shovel test pits were excavated in the vicinity, and no other cultural material was recovered, nor were any cultural features (e.g., hearths, pits) observed. The artifact is considered to be a “stray find” because it was isolated and not in association with other prehistoric cultural material or features (Pierce 1991).

3.9.2 Historic Resources

Of the eight historic sites and two historic structures found during the study, three additional investigations would likely be required prior to any further disturbance as indicated in the following description of the resources (Pierce 1991).

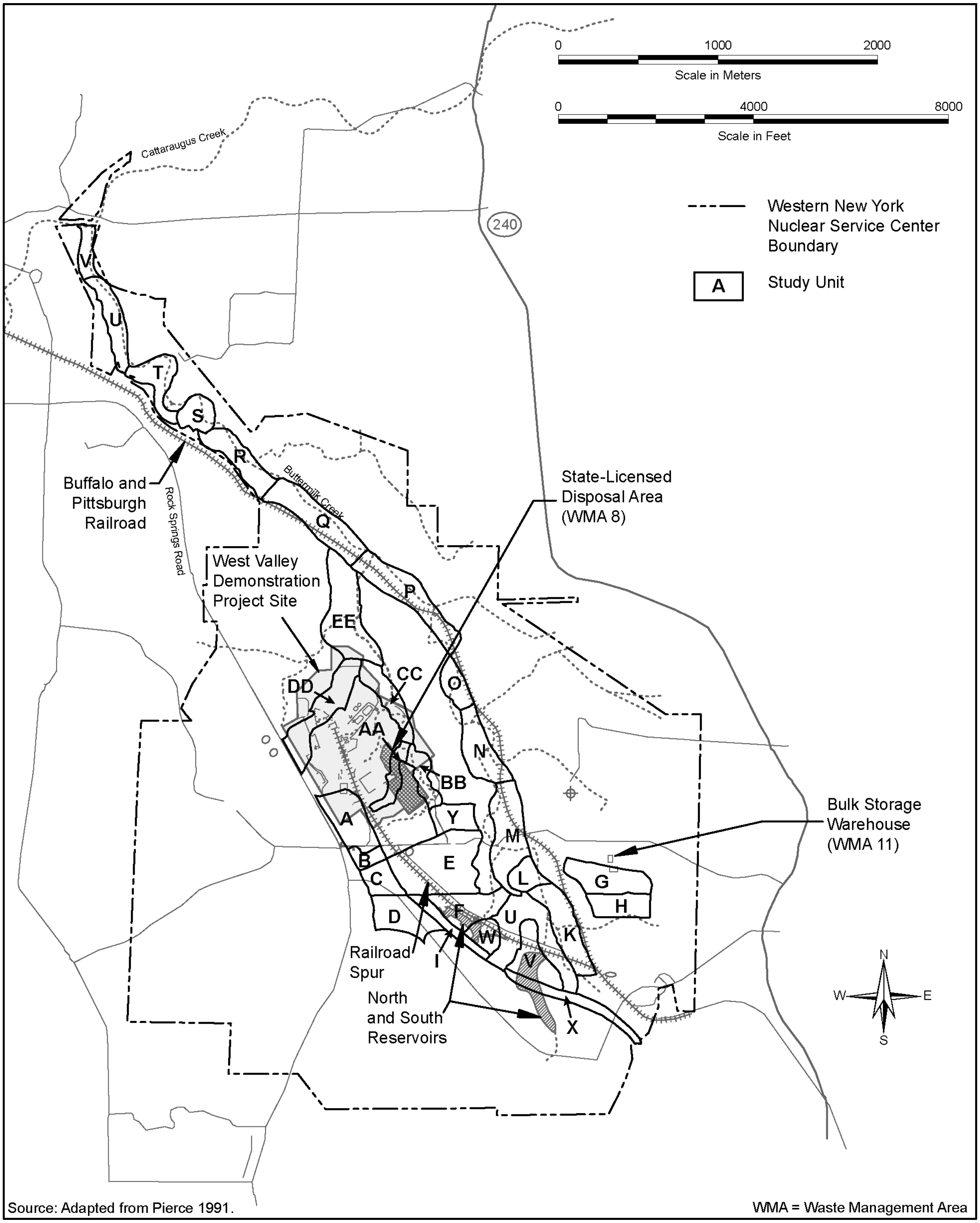


Figure 3–29 Cultural Resources Study Units

Goodemote/Spittler Farmstead Site (Study Unit A)—Isolated historic artifacts were recovered that were primarily farm-related, including several rusting metal objects (e.g., nails, pitchfork fragments, and iron plate), and two ceramic whiteware shards. Historical maps indicate there were two farmsteads in the vicinity, but the recovered artifacts were thought to be from the Goodemote/Spittler Farmstead. The barns, residences, and outbuildings of both farmsteads were demolished in the early 1960s during the development and construction of the reprocessing plant. The artifacts recovered from this site do not, in themselves, possess characteristics that would make them eligible for the National Register of Historic Places because they are typical items utilized in the daily routine of a farm and are considered to be isolated from the primary center of the farmstead, which was completely destroyed. No additional cultural resource investigations are believed necessary for this area (WVNS 1994a).

Buttermilk Hill Schoolhouse (Study Unit C)—The District 14 Schoolhouse was a one-and-a-half-story frame structure located at the northeast corner of Rock Springs and Buttermilk Hill Roads and appeared on historic maps of the area somewhere between 1869 and 1920. No cultural material was recovered during shovel testing and, because the structure lacks architectural uniqueness and integrity, this resource was not considered to be eligible for the National Register of Historic Places (Pierce 1991). The schoolhouse was demolished in 2007. No additional cultural resource investigations are believed necessary for this area (WVNS 1994a).

Twentieth Century Hunting Camp (Study Unit D)—Located at the north edge of the north reservoir, this hunting camp was formerly accessible by an unimproved dirt and grass road. The 6-by-7.6 meter (20-by-25 foot), one-story, frame structure is constructed of plywood with packing crate walls. Half-logs had been applied to its exterior, probably to give it the appearance of a log cabin. The cabin has a gable roof on one half with a salt-box-type roof on the other. Its wooden floor, now deteriorated, was once set on concrete piers formed in bushel baskets. The structure appeared to have been divided into two rooms, a living area with a fieldstone and concrete fireplace, and a kitchen area containing a deteriorating gas stove and refrigerator. Because of its recent age and lack of association with historic periods or events, this resource does not possess characteristics that would make it eligible for the National Register of Historic Places. No additional cultural resource investigations are believed necessary for this area (WVNS 1994a).

Frank Farmstead Site (Study Unit D)—This site originally contained a residence, barn, outbuilding, and semi-circular drive. Subsurface testing at this site recovered a concentration of ceramics (datable to the second quarter of the nineteenth century) and construction materials (e.g., bricks, nails, glass, and roofing material). Some mixing and burning of materials was apparent, which was consistent with the information on the demolition procedures used following condemnation of the farmstead in the 1960s. The Frank Farmstead site could provide information on the early settlers to the area, as the Frank family was the first to settle in the town of Ashford in the early 1800s. The Frank Farmstead site appears to maintain integrity in the configuration of the structures that were once there. A comparison of the artifacts from this site with those of other early German settlements in western New York may provide information on the similarity or uniqueness of the Ashford population. The site may also provide information on the cultural behavior of one family through time, as the farmstead was occupied by the Franks until its demolition.

Fleckenstein Farmstead Site (Study Unit L)—Historical maps and interviews conducted indicated a farmstead might be found and the walkover investigation verified a farmstead complex consisting of the remains of three foundations and ornamental shrubbery. Two of the foundations, one of which is probably a residence, are composed of fieldstone and concrete, while the remains of the barn are made of cobbles and rocks. Very few artifacts were recovered from the shovel testing and, with the exception of two ceramic fragments, no datable cultural deposits were recovered. None of this material meets the eligibility criteria for the National Register of Historic Places.

Hoyt's Siding Site (Study Unit O)—This site consists of the remains of a railroad stop constructed sometime between 1869 and 1920. Artifacts recovered include railroad debris, a rectangular concrete slab, and railroad tracks. No shovel test pits were excavated at this site (WVNS 1994a).

Capron Farmstead Site (Study Unit S)—This site was found on the earliest map available for the study area, with a date of 1869. Preliminary walkover reconnaissance identified a house foundation, a bridge, a U.S. Geological Survey gauging station, a concrete foundation, and a barn or mill foundation. The bridge was built sometime after 1949, when it replaced an earlier structure that was constructed in 1932. Shovel testing at this site produced ceramics, metal fragments, milk cans, bricks, and fragments of mechanical items. None of the materials dated to the earlier occupation; however, the area near the possible residence was not tested (WVNS 1994a).

Late Twentieth Century Hunting Camp (Study Unit U)—The remains of an apparent hunting camp were located adjacent to Buttermilk Creek. A building was thought to be located in the camp and it appears to have been square with a gable roof and an associated unidentified concrete structure. No artifacts were recovered and because of the recent age of the materials, no excavations were conducted. Due to the contemporary date of this site and the fact that it is not unique to the area, it is not considered to be significant and does not possess characteristics that would make it eligible for the National Register of Historic Places. No additional cultural resource investigations are believed necessary for this area (WVNS 1994a).

Rider/Harvey/Whiteman Silo/Barn Site (Study Unit AA)—This site consists of the remains of a concrete and fieldstone silo pad with a barn foundation. Historic maps and resident interviews indicated that the silo/barn remnants probably belonged to the former Rider/Harvey/Whiteman Farmstead, which was demolished during the construction of the reprocessing plant and railroad. Because of severe disturbances, this site is not considered to be significant. No additional cultural resource investigations are believed necessary for this area (WVNS 1994a).

Erdman/Gentner Trash Midden (Study Unit DD)—This site represents a late 1950s to early 1960s residential and agricultural trash deposit. It contained an unusually high number of metal pails, which reinforces information that the Erdman/Gentner farm functioned as a dairy farm. Other artifacts include other metal objects (e.g., lawn chairs, nails, and bedsprings), bottles, glass fragments, and ceramics. The material found is not inconsistent with material found elsewhere on recent farm sites; the midden contained recent datable artifacts (e.g., 1950s ceramics, bottle), as well as material related to daily subsistence and maintenance activities conducted on farms (e.g., dairying, maple sugaring). None of the midden material nor its context make it eligible for the National Register of Historic Places. No additional cultural resource investigations are believed necessary for this area (WVNS 1994a).

3.9.3 Traditional Cultural Resources

Although American Indian archaeological materials are limited at WNYNSC, other traditional use areas may be present. WNYNSC is approximately 24 kilometers (15 miles) upstream from the Cattaraugus Indian Reservation, land reserved for the Seneca Nation. Communications with the Seneca Nation are ongoing to address potential impacts on their cultural sites and resources as a result of implementing the selected alternative. Specifically, the Seneca Nation requests that planning and decisions regarding the site take into consideration, in detail, their way of life, the herbs they gather and consume, and the degree of their subsistence on aquatic life within Cattaraugus Creek (Snyder 1993). See Chapter 5, Section 5.6, of this EIS regarding communications with the Seneca Nation.

3.10 Socioeconomics

This section contains a brief description of the socioeconomic conditions of a two-county ROI, an area in western New York State composed of Cattaraugus and Erie Counties, that is most directly affected by ongoing activities at WNYNSC. Approximately 95 percent of the employees currently reside in these counties (Malone 2003). This socioeconomic characterization focuses on the regional economic characteristics, population and demographic characteristics, housing and public services, utilities, and transportation.

3.10.1 Regional Economic Characteristics

WNYNSC is one of the largest employers in Cattaraugus County and, as of February 2008, employed 384 people directly, including contractors and security, DOE, and NYSERDA personnel (WVES 2008). Employment at WNYNSC also creates additional employment in the ROI. WNYNSC contributes to the economic condition of the region through the wages it pays and the goods and services it purchases. It is estimated that WNYNSC generates indirect employment of approximately 412 jobs. Therefore, the total employment that can be attributed to WNYNSC activities in the ROI is approximately 796 jobs.

In fiscal year 2008, it was estimated that WNYNSC paid approximately $27 million for base annual salaries (WVES 2008). WNYNSC also purchased about $11 million in goods and services from firms in the local area in fiscal year 2006 (WVES 2008). As of March 2008, the average salary for the largest employer at WNYNSC was $70,168 (WVES 2008), which was higher than the average salary for all industrial sectors for both Cattaraugus and Erie Counties (BLS 2008).

Annual payments of approximately $500,000 are made from WNYNSC to local municipalities in the ROI in lieu of property taxes. The West Valley Central School District is the largest recipient of the payments at about $280,000. The Town of Ashford receives $160,000, and Cattaraugus County receives $60,000. These payments are provided to compensate local governments for any loss in revenue that could have been earned if the site was not publicly owned (WVES 2008).

Based on 2007 annual information, in the distribution of employment by industry sector, the largest number of workers in the ROI are Federal, state, and local government employees (17.5 percent in the ROI), followed by professional and business services (12.8 percent), health care and social assistance (12.7 percent), and retail trade (11.1 percent) (NYSDOL 2008a). In 2007, as a percentage of the civilian labor force, the unemployment rates for Cattaraugus and Erie Counties were 5.1 percent and 4.6 percent, respectively, which were in line with the New York State average of 4.5 percent (NYSDOL 2008b). In 2006, approximately 3.2 percent of the Cattaraugus and Erie County workforce who did not work from home commuted an hour or more to work (DOC 2006). This may be indicative of the approximate percentage of people leaving these counties to work elsewhere.

3.10.2 Population and Demographic Characteristics

The population distributions within 80 kilometers (50 miles) and 480 kilometers (300 miles) of the site are shown on **Figures 3–30** and **3–31**, respectively (DOC 2008a, ESRI 2008, Census Canada 2008). Annual census population estimates indicate a steady decline in overall population levels in the two counties surrounding WNYNSC since their peak in 1993. The total population in these counties decreased by 1.8 percent between the 1990 census and the 2000 census (DOC 2002). From 2000 through 2008, the census estimates indicate that the population in these two counties decreased by another 4.3 percent (DOC 2009a). The demographic profile of the ROI population is shown in **Table 3–14**. In 2007, persons self-designated as minority individuals comprised about 19 percent of the total population. This minority population is composed largely of Black or African American residents (DOC 2009b).

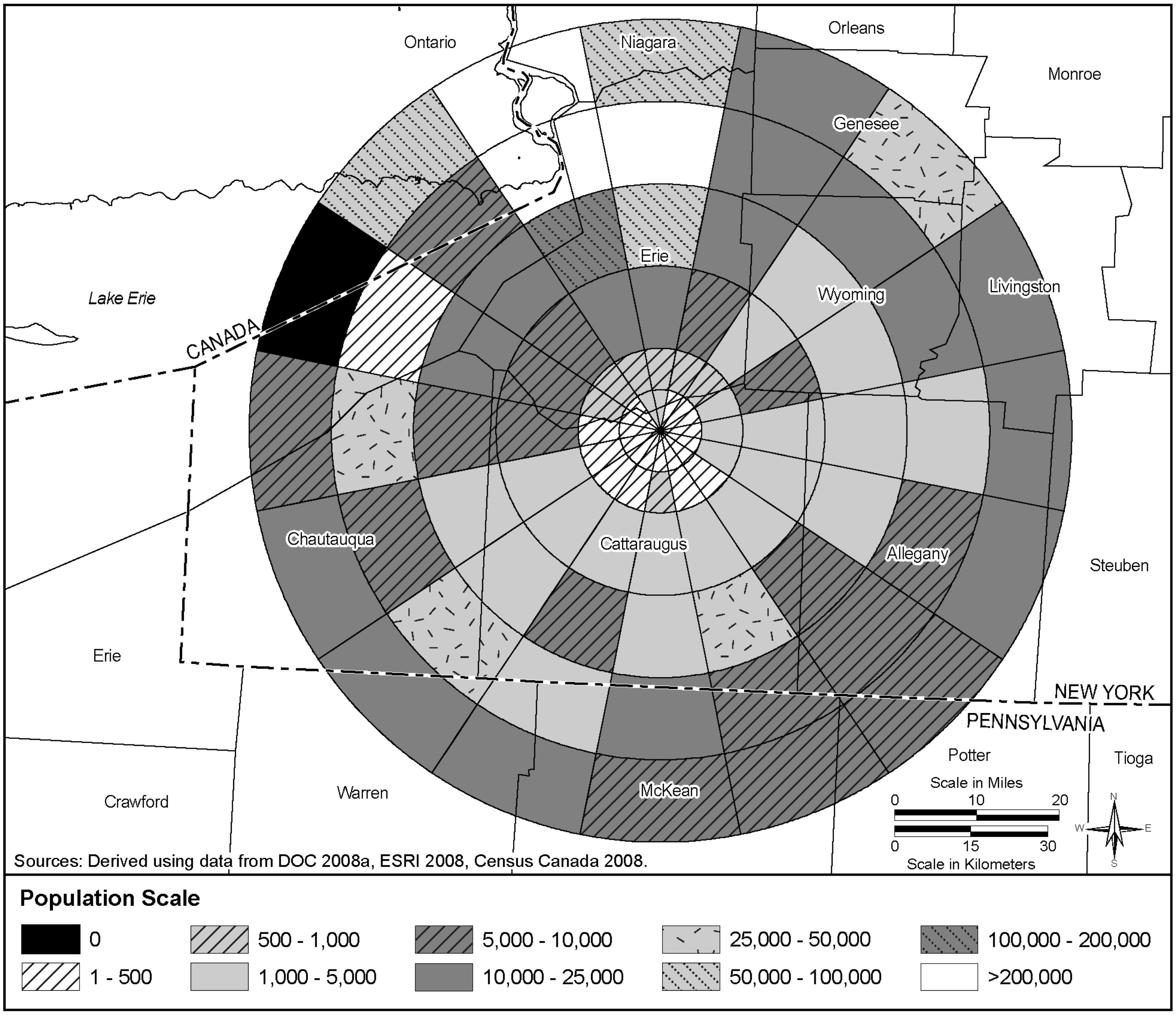


Figure 3–30 Population Distribution within 80 Kilometers (50 miles) of the Site

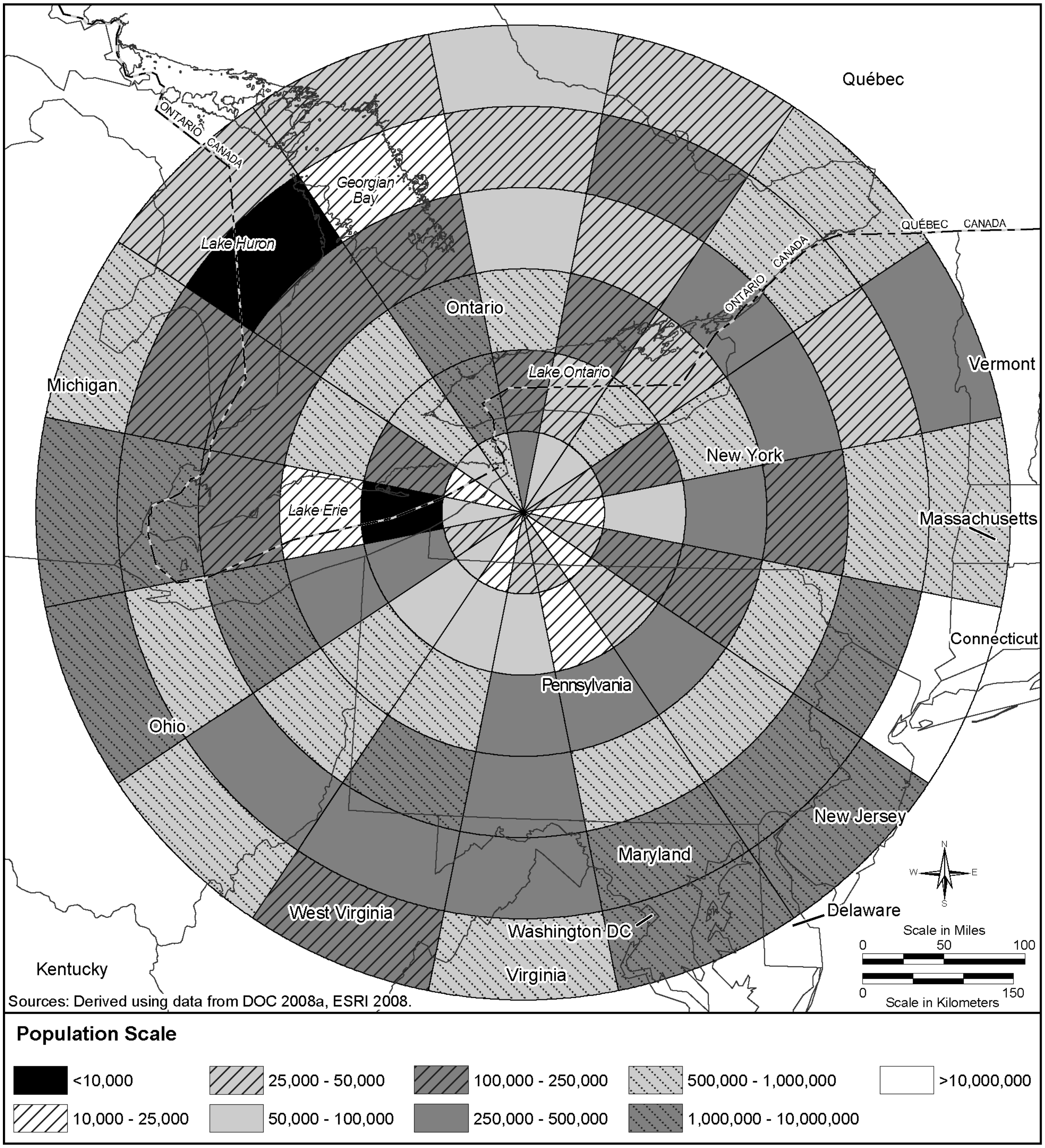


Figure 3–31 Population Distribution within 480 Kilometers (300 miles) of the Site

Table 3–14 Demographic Profile of the Population in the Western New York Nuclear Service Center Region of Influence

	Cattaraugus County		***Erie County***		***Region of Influence***	
Population						
2008 population	79,688		909,845		989,533	
2000 population	83,955		950,265		1,034,220	
Percent change from 2000 to mid-2008	-5.1		-4.3		-4.3	
Race (2007)	***Total***	***Percent***	***Total***	***Percent***	***Total***	***Percent***
White, not of Hispanic Origin	74,718	93.3	726,168	79.5	800,886	80.6
Black or African American [a]	684	0.9	121,432	13.3	122,116	12.3
American Indian and Alaskan Native [a]	2,238	2.8	4,479	0.5	6,717	0.7
Asian [a]	348	0.4	17,705	1.9	18,053	1.8
Native Hawaiian and Other Pacific Islander [a]	0	0.0	0	0.0	0	0.0
Some other race [a]	309	0.4	14,784	1.6	15,093	1.5
Two or more races [a]	1,366	1.7	14,148	1.5	15,514	1.6
White Hispanic	424	0.5	14,622	1.6	15,046	1.5
Total minority	5,369	6.7	187,170	20.5	192,539	19.4
Total Hispanic [b]	915	1.1	34,015	3.7	34,930	3.5
Total (2007) [b]	80,087	100.0	913,338	100.0	993,425	100.0

[a] Includes persons who designated themselves as Hispanic or Latino.
[b] Includes all persons who designated themselves as Hispanic or Latino regardless of race.
Sources: DOC 2007, 2009a, 2009b.

Income information for the two-county ROI is included in **Table 3–15**. The median household incomes in Cattaraugus and Erie Counties are below the median household income level for New York State. Cattaraugus County is below the state level by approximately $12,500, and Erie County is below the state level by about $8,400. Erie County's median household income, $45,076, is 10 percent higher than Cattaraugus County's household income. According to census estimates, 13.8 percent of the population in Erie County was below the official poverty level in 2006, while 16.5 percent of the population in Cattaraugus County was below the poverty level, as compared to 13.7 percent of the state (DOC 2009b).

Table 3–15 Income Information for the Western New York Nuclear Service Center Region of Influence

	Cattaraugus County	***Erie County***	***New York***
Median household income 2007 ($)	41,060	45,076	53,514
Percent of persons below the poverty line (2006)	16.5	13.8	13.7

Source: DOC 2009b.

3.10.3 Housing and Public Services

3.10.3.1 Housing

Erie County housing inventory accounted for 91.3 percent of housing units in the ROI in 2007 (DOC 2009a). More than half of the homes in the ROI in 2007 were attached or unattached single-family units (58 percent). In 2007, the estimated vacancy rate for all available housing was 3.6 percent of units for sale or rent, excluding seasonally vacant units (DOC 2009b). The majority of available units were rental units. The renter vacancy rate of the ROI was 7.4 percent; meanwhile, the homeowner vacancy rate was much lower, at 1.5 percent.

3.10.3.2 Public Services

This section contains a description of public services available in the area surrounding WNYNSC, including public safety, public health, and education.

Public Safety

The New York State Police and the Cattaraugus County Sheriff's Department have overlapping jurisdictions for the local area. Any assistance needed may be obtained from the state or county police departments (DOE 2003e). The State Police substation in Ellicottville has jurisdiction over WNYNSC. Another State Police substation located in Machias, about 12.8 kilometers (8 miles) away, would provide backup assistance (Mogg 2003). There is a Cattaraugus County Sheriff's substation at WNYNSC, with 3 to 4 officers that would respond to emergencies at WNYNSC (WVES 2008). Backup support is available from Cattaraugus County's entire Sheriff's Department, which is composed of 100 full- and part-time sworn officers (DCJS 2008). The nearest station in Cattaraugus County is in Ellicottville. In 2007, there were 1,966 full- or part-time sworn police officers in the two county ROI. The ratio of sworn officers to every one thousand people in the ROI was 2.0. Sworn officers to population ratios for Cattaraugus and Erie Counties were 2.2 and 2.0, respectively. The New York State ratio of sworn officers to every thousand people was 3.1. These ratios do not include state troopers as they patrol larger regional jurisdictions throughout the state (DCJS 2008).

The West Valley Volunteer Hose Company provides fire protection services to WNYNSC and the Town of Ashford. The West Valley Volunteer Hose Company, which is part of the West Valley Fire District I, has 70 active volunteers (Gentner 2008) and provides emergency response to WNYNSC through a Letter of Agreement. WNYNSC also has a Letter of Agreement with West Valley Fire District I for emergency services (Chilsom 2003). Responders are trained and briefed annually by NYSERDA and the Radiation and Safety Department at WNYNSC on hazards at the site. Responders have limited training and capability to assist in chemical or radioactive occurrences. The West Valley Volunteer Hose Company has an agreement with the bordering towns' fire departments for mutual assistance in situations needing emergency backup. These neighboring volunteer fire departments are the William C. Edmunds Fire Company (East Otto), Ellicottville Volunteer Fire Department, Machias Volunteer Fire Department, Chaffee-Sardinia Memorial Fire Department, Delevan Volunteer Fire Department, East Concord Volunteer Fire Department, and Springville Volunteer Fire Department (DOE 2003e).

Public Health

The Cattaraugus County Health Department provides health and emergency services for the entire county, with the closest locations to WNYNSC in the towns of Machias and Little Valley. The Bertrand Chaffee Hospital in Springville in Erie County is the closest hospital to WNYNSC, located approximately 6 kilometers (4 miles) north on Route 39 in Springville. This facility has 24 certified[4] beds and will likely remain the primary health services supplier in the area. A written protocol for emergency medical needs at WNYNSC provides the basis for support in the event of emergency from Bertrand Chaffee Hospital (DOE 2003e) and the Erie County Medical Center. Cattaraugus County has 2 hospitals: Olean General Hospital in Olean with 186 certified beds and TLC Health Network in Gowanda with 34 certified beds. Erie County has 12 hospitals with a total of 3,094 certified beds as of May 2009. The ongoing changes to the New York State Health Care System are expected to result in additional mergers and closings of hospitals in Erie County. By the end of 2009, it is estimated that there will be 11 hospitals operating a total of 2,925 certified beds. By mid-2011, these numbers are expected to drop to 10 hospitals operating 2,717 certified beds. These changes are part of New York State's effort to improve the quality, and affordability of health care, and to make it more responsive to current health care needs by creating greater access to primary and preventive care while eliminating duplication of

[4] *Certified beds are the number of beds a hospital is licensed to operate.*

services (NYSDOH 2009). The New York State Physician Profile listed 1,132 physicians in Erie County and 76 in Cattaraugus County (NYS Physician Profile 2009).

Education

There are 13 school districts in Cattaraugus County and 29 in Erie County (NYSED 2008). These districts provide preschool through high school education. In the 2007–2008 school year, there were 14,331 students enrolled in public schools in Cattaraugus County and 126,925 in Erie County. Erie County has a student–teacher ratio of about 11.9 students per teacher, while Cattaraugus County has a ratio of 10.8 students per teacher (NYSED 2009).

3.11 Human Health and Safety

Public and occupational health and safety issues include the determination of potential adverse effects on human health that could result from acute and chronic exposure to ionizing radiation.

3.11.1 Radiation Exposure and Risk

3.11.1.1 Environmental Monitoring Program Overview

Exposure of human beings to radioactivity would be primarily through air, water, and food. At WNYNSC, all three pathways are monitored, but air and surface water pathways are the two primary short-term means by which radioactive material can move off site.

The onsite and offsite monitoring programs at WNYNSC include measuring the concentrations of alpha and beta radioactivity, conventionally referred to as "gross alpha" and "gross beta," in air and water effluents. Measuring the total alpha and beta radioactivity from key locations produces a comprehensive picture of onsite and offsite levels of radioactivity from all sources.

More-detailed measurements are also made for specific radionuclides. Strontium-90 and cesium-137 are measured because they have been previously detected in WNYNSC waste materials. Radiation from other important radionuclides such as tritium or iodine-129 is not sufficiently energetic to be detected by gross measurement techniques, so it is analyzed separately using more sensitive methods. Heavy elements such as uranium, plutonium, and americium require special analysis to be measured because they exist in very small concentrations in WNYNSC environs.

3.11.1.2 Radiation Exposure

Major sources and levels of background radiation exposure to individuals in the vicinity of the site are shown in **Table 3–16**. Annual background radiation doses to individuals are expected to remain constant over time. Background radiation doses are unrelated to site operations.

Normal operational releases of radionuclides to the environment from site operations provide another source of radiation exposure to individuals. Types and quantities of radionuclides released from operations in 2007 are listed in the *Annual Site Environmental Report, Calendar Year 2007* (WVES and URS 2008). Estimated doses from these releases are summarized in the following text in this section.

Airborne Emissions

The EPA, under the Clean Air Act and its implementing regulations, regulates airborne emissions of radionuclides. DOE facilities are subject to 40 CFR Part 61, Subpart H. Subpart H contains the national emission standards for emissions of radionuclides other than radon from DOE facilities. The applicable standard for radionuclides is a maximum of 10 millirem (0.1 millisieverts) EDE to any member of the public in 1 year.

Table 3–16 Ubiquitous Background and Other Sources of Radiation Exposure to Individuals in the United States Unrelated to Western New York Nuclear Service Center Operations

Source	*Effective Dose (millirem per year)*
Ubiquitous background [a]	310
Medical	300
Consumer	13
Industrial, security, medical, educational, research	0.3
Occupational	0.5
Total (rounded)	620

[a] Cosmic radiation doses are lower at lower elevations and higher in the mountains. Variation in the external terrestrial dose is a function of the variability in the amount of naturally occurring uranium, thorium, and potassium in the soil and in building materials.

Source: NCRP 2009.

Maximum Dose to an Offsite Individual—Based on the nonradon airborne radioactivity released from all sources at the site during 2007, it was estimated that a person living in the vicinity of the site could have received a total EDE of 0.0010 millirem from airborne releases. This maximally exposed offsite individual would be located 1.9 kilometers (1.2 miles) north-northwest of the site and was assumed to eat only locally produced foods. The EPA limit for exposure through the air pathway is 10 millirem per year.

Collective Dose to the Population—Based upon the latest U.S. census population data collected in 2000, about 1.54 million people were estimated to reside in the United States within 80 kilometers (50 miles) of the site. This population received an estimated dose of 0.0058 person-rem total EDE from radioactive airborne effluents released during 2007.

Waterborne Releases

Waterborne releases from the site involve routine batch releases from Lagoon 3, effluent from the Sewage Treatment Facility, and drainage from the North Plateau. Doses to an offsite individual and population are estimated on the basis of radioactivity measurements supplied by the environmental monitoring program.

Maximum Dose to an Offsite Individual—Based on the radioactivity in liquid effluents discharged from the site during 2007, an offsite individual could receive a maximum EDE of 0.066 millirem, based on liquid effluent releases and drainage from the North Plateau.

Collective Dose to the Population—As a result of radioactivity released in liquid effluents during 2007, the population living within 80 kilometers (50 miles) of the site would have received a collective EDE of 0.32 person-rem.

Dose from All Pathways

The potential dose to the public from both airborne and liquid effluents released from the site during 2007 is the sum of the individual dose contributions. The calculated maximum EDE from all pathways to a nearby resident was 0.067 millirem. This is a small fraction (0.067 percent) of the 100-millirem annual limit in DOE Order 5400.5.

The total collective EDE to the population within 80 kilometers (50 miles) of the site was 0.33 person-rem, with an average EDE of 0.00021 millirem per individual. The estimated population dose from estimated airborne radon releases, calculated annually, was approximately 0.33 person-rem.

Figures 3–32 and **3–33** show the calculated annual dose to the hypothetical maximally exposed individual and the collective dose to the population, respectively, over the last 10 years. The doses represented by these data confirm the continued small (less than 0.07 millirem per year) addition to the radiation dose of 620 millirem per year that the average individual in the population around WNYNSC receives from ubiquitous background and other sources of radiation (NCRP 2009).

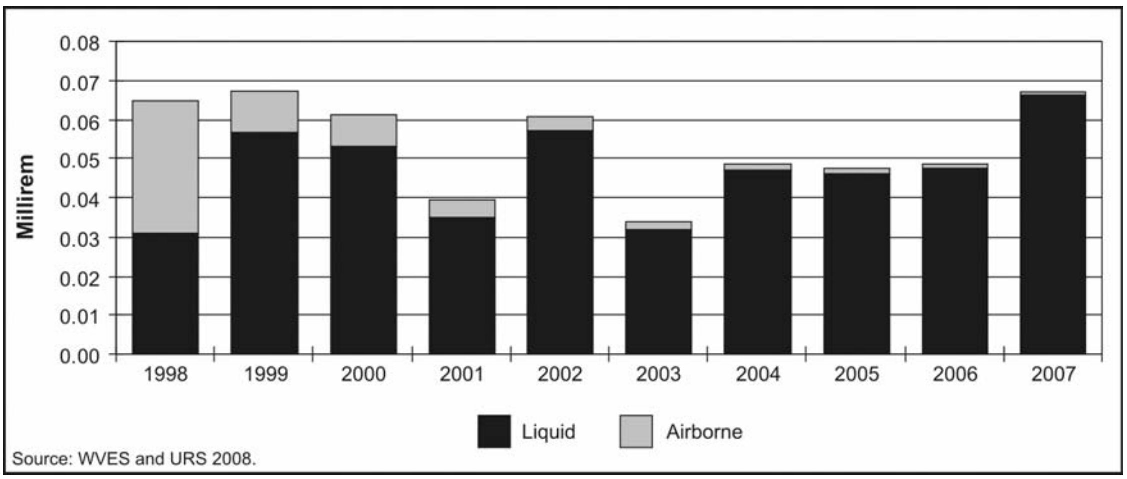


Figure 3–32 Effective Dose Equivalent from Liquid and Airborne Effluents to a Maximally Exposed Individual Residing Near the Western New York Nuclear Service Center

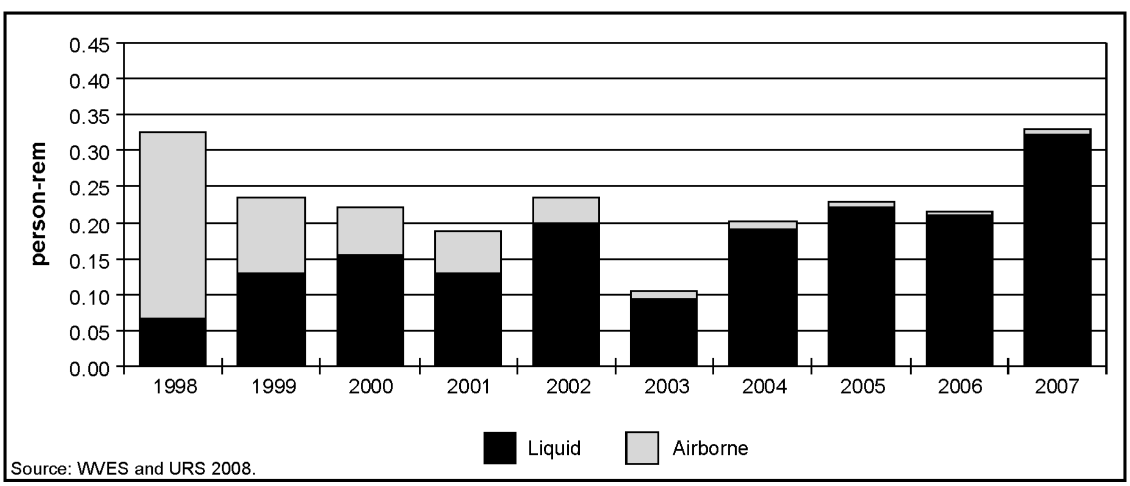


Figure 3–33 Collective Effective Dose Equivalent from Liquid and Airborne Effluents to the Population Residing within 80 Kilometers (50 miles) of the Western New York Nuclear Service Center

3.11.2 Health Effect Studies

Both NYSDOH and the U.S. National Cancer Institute maintain statistical records of cancer incidence and mortality rates. Cancer incidence and mortality rates for the counties surrounding the site are compared to those for New York State for the time period of 2000 to 2004 in **Table 3–17** (NYSDOH 2007). When compared to New York State, excluding New York City as it is not representative of the rural demographics of the counties on and around the site, Cattaraugus County and its collocated counties have cancer incidence rates comparable to the state's. The Cattaraugus County death rate from cancer is lower than 23 of the 62 counties in the state and its cancer incidence rate is lower than 41 of the 62 counties for the time period of 2000 to 2004. Furthermore, comparison of Cattaraugus County cancer incidence and mortality rates to that of adjacent counties does not show that it has a higher rate (it is lower than some and higher than others). There is no statistically significant trend that indicates that the cancer incidence of the population around the site is different than other counties or the State of New York.

Table 3–17 Comparison of 2000 to 2004 Cancer Rates for Counties around the West Valley Demonstration Project and New York State

Cancer Incidence per 100,000 people	*Cattaraugus County*	*Allegany County*	*Chautauqua County*	*Erie County*	*Wyoming County*	*New York State (excluding New York City)*
Incidence - Male	581.4	587.6	627.1	590.6	621.5	571.1 (594.1)
Incidence - Female	451.5	445.4	406.2	437.6	444.7	427.4 (451.5)
Annual Deaths - Male and Female	204.9	221.7	205.0	210.3	207.0	189.7

Source: NYSDOH 2007.

The National Cancer Institute analyses (NCI 2008) show that the Cattaraugus County cancer death rate is similar to that for United States through 2004, with a stable trend (i.e., not increasing or decreasing) for all cancers from 2000 to 2004. From 1976 through 1998, the Cattaraugus County invasive malignant tumor incidence rate among both males and females was lower than that of New York State (excluding New York City) and comparable during the period from 2000 to 2004. It is important to note that cancer incidence rate is related, among other factors, to the availability and use of medical services in each county.

All cancer incidence and death rate statistical data from the State of New York (NYSDOH 2007) and the National Cancer Institute (NCI 2008) from 1976 to 2004 substantiate that the region around the site does not exhibit any unusual or excessive cancers in the public population, but rather is typical of the immediate area, New York State, and the United States. There is no identifiable increase in cancer risk in the area around WNYNSC.

3.11.3 Chemical Exposure and Risk

Hazardous chemicals can cause cancer- and noncancer-related health impacts. Effective administrative and design controls that decrease hazardous chemical releases to the environment and help achieve compliance with permit requirements (e.g., air emission and the National Pollutant Discharge Elimination System permit requirements) minimize health impacts on the public. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts on the public may result from inhaling air containing hazardous chemicals released to the atmosphere. Risks to public health from other possible pathways, such as ingestion of contaminated drinking water or direct exposure, are lower than those from the inhalation pathway.

Exposure pathways to workers during normal operations may include inhaling contaminants in the workplace atmosphere and direct contact with hazardous materials. The potential for health impacts varies among facilities and workers, and available individual monitoring information is insufficient for a meaningful estimate of individual worker impacts. However, DOE policy requires that conditions in the workplace be as free as possible from recognized hazards that cause, or are likely to cause, illness or physical harm. In general, workers are protected from workplace hazards through adherence to Occupational Safety and Health Administration and EPA standards that limit workplace atmospheric and drinking water concentrations of potentially hazardous chemicals. Worker exposure to hazardous chemicals in the workplace is minimized by techniques such as appropriate training, use of protective equipment, monitoring of the workplace environment, limits on duration of exposure, and engineered and administrative controls. Monitoring and controlling hazardous chemical usage in operational processes help ensure that workplace standards are not exceeded and worker risk is minimized.

The site complies with the Emergency Planning and Community Right-to-Know Act for reporting chemical inventories and toxic release inventories at WNYNSC. The site also complies with all Toxic Substances Control Act requirements pertaining to asbestos and PCB regulations. For 2006, the site reported the following chemicals in quantities above the Emergency Planning and Community Right-to-Know Act 312 Threshold Planning Quantities: hydrogen peroxide solution (35 percent), portland cement, ion exchange media, liquid nitrogen, diesel fuel No. 2, sodium hydroxide, oils of various grades, gasoline, and sulfuric acid. This information is annually submitted to state and local emergency response organizations and fire departments, specifying the quantity, location, and hazards associated with chemicals stored at the site (WVES and URS 2008).

Underground and aboveground storage tanks are used for temporary storage of certain hazardous process chemicals. RCRA regulations cover the use and management of underground tanks for storage of petroleum and hazardous substances and establish minimum design requirements to protect groundwater resources from releases. New York State also regulates underground storage tanks through two programs: petroleum bulk storage (6 NYCRR Parts 612-614) and chemical bulk storage (6 NYCRR Parts 595-599). State registration and minimum design requirements are similar to those of the Federal program, except that petroleum tank fill ports must be color-coded using American Petroleum Institute standards to indicate the product being stored (WVNS and URS 2007).

A single 2,080-liter (550-gallon), double-walled, steel underground storage tank, upgraded in 1998 to bring it into compliance with the most recent EPA requirements (40 CFR 280.21), is used to store diesel fuel for the Supernatant Treatment System/Permanent Ventilation System standby power unit. This tank is equipped with aboveground piping, an upgraded interstitial leak detection system, and a high-level warning device, and therefore meets the state requirements of 6 NYCRR Parts 612–614. This is the only underground petroleum storage tank currently in use at the site. There are no underground chemical bulk storage tanks at the site (WVNS and URS 2007).

New York State regulates aboveground petroleum and chemical bulk storage tanks under 6 NYCRR Parts 612–614 and Parts 595–599, respectively. These regulations require secondary containment, external gauges to indicate the content levels, monthly visual inspections of petroleum tanks, and documented daily, annual, and 5-year inspections of chemical tanks. Petroleum tank fill ports also must be color-coded, and chemical tanks must be labeled to indicate the product stored. Petroleum bulk storage is also addressed through the Spill Prevention, Control, and Countermeasures plan prepared in accordance with 40 CFR Part 112. Ten remaining registered petroleum bulk storage tanks (nine aboveground and one underground) are periodically inspected and maintained (WVES and URS 2008).

The site regularly applies a NYSDEC-registered biocide to control algae and waterborne pathogens in the site cooling water tower system. Control of the organisms is necessary to minimize the potential for cooling system damage due to fouling from algae buildup and the potential for worker exposure to waterborne pathogens such as *Legionella* (WVNS and URS 2007).

3.11.4 Occupational Health and Safety

The calculated WNYNSC injury rates and associated data for the years 1999 through 2004, as well as the 6-year average are presented in **Table 3–18**. The 6-year average is below the average associated with related industries, as published by the Bureau of Labor Statistics. In addition, the industry rates at WNYNSC have significantly decreased between 1999 and 2004. Worker safety at WNYNSC has improved with the implementation of DOE's Voluntary Protection Program, which promotes safety and health excellence through cooperative efforts among labor, management, and government at DOE contractor sites.

Table 3–18 Injury Rates at West Valley Nuclear Services Company

Calendar Year	*Lost Workday Injury Rate* [a]	*Recordable Injury Incidence Rate* [a]
1999	1.14	1.99
2000	0.89	1.77
2001	1.60	3.09
2002	1.69	2.62
2003	0.14	0.43
2004	0.0	0.16
6-Year Average	0.91	1.68
National Average for Waste Management and Remediation Services Industry [b]	3.9	6.5
National Average for Industrial Inorganic Chemicals Manufacturing Industry [b]	1.4	2.7
National Average for Heavy and Civil Engineering Construction Industry [b]	3.0	5.3

[a] Rates are per 100 full-time workers.
[b] 2006 rates from the U.S. Bureau of Labor Statistics, Industry Injury and Illness Data (BLS 2007).
Sources: DOE 2002f, 2005c; BLS 2007.

With respect to radiological occupational exposure at WNYNSC, DOE reports a collective total EDE of 16.5 person-rem for 2000, 22.2 person-rem for 2001, 30.5 person-rem for 2002, 41.7 person-rem for 2003, 39.7 person-rem for 2004, 14.5 for 2005 and 16.1 for 2006 (DOE 2003a, 2004a, 2006a). This equates to an average dose to workers with a measurable total EDE of 67 millirem in 2000, 95 millirem in 2001, 128 millirem in 2002, 201 millirem in 2003, 165 millirem in 2004, 69 millirem in 2005, and 85 millirem in 2006 (DOE 2007). Although collective occupational doses increased during the period of cleanup operations in the 2002–2004 timeframe, there were no instances of a worker at WNYNSC receiving a dose in excess of the total EDE 10 CFR 835 annual regulatory limit of 5 rem (DOE 2003a, 2004a, 2006a).

Incidents involving worker radiation exposure occur from time to time. One of the more serious worker radiation exposure incidents occurred in January 2005, when a waste container liner holding debris from cleanup of the Vitrification Cell was moved into the adjoining crane maintenance room without a required detailed radiation survey. A worker placing packaged radioactive waste into the liner and a technician performing radiological surveys of this waste received unplanned radiation exposure from an unidentified hot spot on the liner, which measured 50 rem per hour 2 inches from the surface. While exposures to the worker and technician exceeded the contractor's daily limit of 100 millirem, their cumulative exposure totals for the year were small fractions of the 5 rem annual regulatory limit for radiation workers (Mellor 2005, WVNSCO 2005).

The site historic worker injury rates and radiological occupational exposure are significantly lower than other related industries and regulatory guidelines. This comparison is indicative of the practices, procedures, and controls used for occupational health and safety.

3.11.5 Accident History

The following summary addresses site accidents that are known to have resulted in environmental impacts and others that might have, based on available operating records and evidence in the form of measured contamination. Note that the term *accidents* is used here in a broad sense to also include releases of radioactivity and hazardous materials that are known to have impacted the environment as a consequence of: (1) unintentional releases, (2) planned releases, (3) facility design, (4) site practice, (5) site hydrogeology, and (6) combinations of these factors.

Insofar as practical, accidents are divided into those that occurred during the period when NFS was responsible for the site and those that occurred during the period after which WVDP was established. Accidents involving radioactivity are first discussed, followed by those involving hazardous materials. This subsection concludes with a discussion of the integrity of underground tanks and lines.

3.11.5.1 Nuclear Fuel Services Period – 1966 through 1981

Accidents Involving Radioactivity

Chapter 2 of this EIS contains a brief description of the environmental consequences of two significant radiological accidents that occurred at the site, the radioactive nitric acid spill that was the dominant contributor to the North Plateau Groundwater Plume and the 1968 uncontrolled releases that resulted in the extended area of surface soil contamination known today as the Cesium Prong. Both took place during reprocessing operations.

The spill identified as the major source of the North Plateau Groundwater Plume involved an estimated 760 liters (200 gallons) of recovered nitric acid that leaked from Line 7P-240-1-C in the off-gas operating aisle, ran down the walls of the off-gas cell and the adjacent southwest stairwell below, and leaked under the Main Plant Process Building through a floor expansion joint (WVNSCO 1995). Strontium-90 and its decay product, yttrium-90, are the principle radionuclides of health concern in this plume. In addition, leakage from Lagoon 1, principally water containing tritium, also contributes to the gross beta activity in the plume. The potential dose effects of tritium are, however, small in comparison with the potential effects from strontium-90. More details on the sources and extent of the plume and the estimated inventory of the activity involved are shown in Appendix C, Section C.2.13. This release impacted WMAs 1 through 6.

The uncontrolled, airborne releases in 1968 occurred when a high-efficiency particulate air filter in the main ventilation system failed and part of the filter media was drawn into the blower, cut into pieces, and discharged out the main stack (Urbon 1968). The consequences of this accident were underestimated by NFS, who stated initially that “radioactivity [within the plant exclusion fence] was retrieved during cleanup operations” (Urbon 1968). The scope of this release became more apparent in a series of aerial radiological surveys begun in the late 1960s that culminated in 1984 (EG&G/EM 1991). The offsite effects were later more fully defined in an investigation sponsored by NYSERDA (Luckett 1995).

Other accidents involving radioactivity that occurred during reprocessing operations include:

- In February 1967, a spill occurred during a waste transfer from the General Purpose Evaporator (7C-5) to Tank 8D-2. Approximately 2,100 liters (555 gallons) of high-activity liquid from Line 7P-170-2-C in the Acid Recovery Pump Room entered the room sump and drained to the Old Interceptor in WMA 2. Radioactivity from this spill contaminated the interceptor to the point where 30 centimeters (12 inches) of concrete were poured on the interceptor bottom to reduce resulting high radiation levels (Winchow 1967). This release may have also impacted soils beneath this portion of the Main Plant Process Building.

- In 1967, an underground process pipeline (7P-160) used to convey radioactive liquids from Tank 7D-13 to either the general purpose evaporator or the interceptor, failed underground outside the southwest corner of the Process Building. "In August of 1974, the area around Tank 7D-13 was excavated to repair a sanitary sewer line. Radioactive groundwater and soil were encountered in the excavation. Tank 7D-13 required shielding to protect individuals working in the excavation. An exposure rate of 200 millirem per hour beta-gamma was measured in the excavation and groundwater leakage into the sanitary sewer pipeline was believed responsible for elevated gross beta (1.0×10^{-5} microcuries per milliliter) and strontium-90 levels of 1.0×10^{-6} microcuries per liter, observed in the sewage outfall from 1972 through 1974" (WVNSCO 1995).

- In 1967, contaminated groundwater "flowing underground from the general plant area" was discovered during construction of the New Interceptors, indicating the presence of contaminated groundwater and subsurface soil in WMAs 1 and 2 before the January 1978 release from Line 7P-240-1-C in the off-gas operating aisle (Taylor 1967).

- In 1967, three fires occurred in the Main Plant Process Building General Purpose Cell in which spent fuel cladding (zirconium hulls) ignited, two of which activated the cell fire suppression system (Lewis 1968). Airborne radioactivity from these fires apparently did not impact the environment.

- In 1967 and 1968, other small fires occurred from time to time in the Chemical Process Cell when high-temperature reactions involving uranium or zirconium hulls burned holes in dissolver baskets (Lewis 1968, Urbon 1968). Airborne radioactivity from these fires apparently did not impact the environment.

- On March 8, 1968, failure of a dissolver off-gas system filter in the Main Plant Process Building resulted in a radioactivity release through the Main Plant Process Building stack, causing releases to reach the monthly allowance 2 days later, which included 0.28 curies of particulate activity (North 1968). This release may have produced minor impacts downwind.

- On March 20, 1968, failure of a vessel off-gas system filter in the Main Plant Process Building resulted in a radioactivity release through the Main Plant Process Building stack, causing the March 1968 releases to exceed the monthly allowance by 15 percent (North 1968). This release may have produced minor impacts downwind.

- Several leaks during the 1968 to 1977 period were associated with condensate line 8P-46-6-A5 from Tank 8D-2 in the section between the Equipment Shelter and the west wall of the Acid Recovery Pump Room. This 6-inch carbon steel line, a portion of which was rerouted in 1967, was maintained under vacuum and an unexpected 62,000-liter (16,400-gallon) liquid volume increase in Tank 8D-2 was attributed to groundwater leaking into this line being drawn into the tank. Leaks from this line may have impacted subsurface soil and groundwater in WMAs 1 and 3, but the impacts likely would have been small as the line was maintained under vacuum (Duckworth 1977, NYSERDA 2006a).

- A 1970–1971 investigation of unexpected tritium and gross beta contamination in Erdman Brook led to the discovery of contamination in the sanitary sewer system that resulted in discharge of approximately 0.5 curies of gross beta and 0.05 curies of strontium-90 from the Old Sewage Treatment Plant into this stream through the treated sewage outfall (Duckworth 1972). This release impacted water and sediment in Erdman Brook and downstream.

- In August 1974, a failed sanitary sewer line located near underground Tank 7D-13 was discovered to be contaminated by groundwater in the area; leakage into the sewer line was believed to be responsible for elevated gross beta and strontium-90 concentrations observed in the sewage outfall during the 1970 to 1972 period that impacted water and sediment in Erdman Brook and downstream (WVNSCO 1995).

- Numerous spills of radioactive liquid and/or radioactive debris occurred inside various areas of the Main Plant Process Building—including pieces of spent fuel and spent fuel cladding—that did not appear to affect the environment.

- Numerous releases of airborne radioactivity occurred inside Main Plant Process Building areas, some of which led to installation of a new ventilation system in 1970 (Michalczak 2003). Minor environmental impacts from increased stack emissions may have resulted.

- Migration of tritium from Lagoon 1 that impacted subsurface soils and groundwater in WMA 2 eventually led to closure of this unlined lagoon in 1984 (WVNSCO 1994).

- Releases of radioactive liquid effluents contributed to sediment contamination in Franks Creek, Buttermilk Creek, and Cattaraugus Creek, the scope of which became evident in 1968 (Barasch and Beers 1971) and by later aerial radiation level measurements.

Note that spills of radioactive materials inside the Main Plant Process Building process cells were an anticipated consequence of plant operations and these cells were designed to contain them. Consequently, such spills generally did not impact outside areas.

Low-level radioactive contamination in surface soil in the Cesium Prong area has likely been naturally spread by precipitation into ditches and channels that received surface water runoff from this area. This phenomenon may have enlarged the area impacted by the deposition of airborne radioactivity from the Main Plant Process Building stack, although detailed data that show this effect are not available.

From 1966 to 1971, Lagoons 1, 2, and 3 were used sequentially. These lagoons discharged to Erdman Brook. The 02 Building and Lagoons 4 and 5 were built in 1971 to actively treat wastewater before discharge to Erdman Brook. Liners were installed in Lagoons 4 and 5 in 1974 after Lagoons 1, 2, and 3 were suspected of leaking wastewater to the underlying sand and gravel.

Another phenomenon related to site hydrology is the seepage of groundwater to the surface and in drainage ditches in swampy areas of WMA 4. Gradual migration of radioactivity in the North Plateau Groundwater Plume eventually led to radioactivity in this plume reaching the surface in the seep locations, resulting in contaminated surface soil and drainage ditch sediment in these areas.

Releases Involving Hazardous Materials

Some of the radioactivity releases described in the preceeding text contained hazardous contaminants. Additional hazardous materials releases involved the solvent dike, which received runoff from the Solvent Storage Terrace located on the Main Plant Process Building from 1966 to 1987. Radioactive tributyl phosphate and n-dodecane spilled from solvent tanks in the Solvent Storage Terrace were conveyed through a floor drain and related underground piping to the dike. The solvent dike was removed from service in 1987 by removing and packaging the berm and radiologically contaminated soil and sediment, along with the drain line.

3.11.5.2 West Valley Demonstration Project Period – 1982 to Present

The site documents accidents involving radioactivity and hazardous materials using a tiered system based on accident seriousness. All are investigated and actions are taken to prevent recurrences and similar problems. The potential environmental consequences are also evaluated and considered in connection with the site environmental monitoring program, which addresses compliance with regulatory standards for environmental releases (WVNS and URS 2005).

Accidents Involving Radioactivity

Accidents with actual or potential environmental consequences related to radioactive contamination include:

- A radioactive release to the ground, apparently associated with outdoor storage of contaminated equipment and waste was discovered in 1983 at the old hardstand located at the west end of Lag Storage Areas 3 and 4 in WMA 5. This hardstand consisted of an outdoor laydown area with an asphalt surface approximately 45 meters by 45 meters (150 feet by 150 feet), surrounded by unpaved ground and woods. Gamma radiation levels as high as 1,500 millirem per hour were measured 5 centimeters (2 inches) above the ground surface. In 1983, aboveground portions of contaminated trees were removed. In 1984, approximately 1,302 cubic meters (46,000 cubic feet) of contaminated soil, asphalt, tree stumps, roots, and other vegetation were removed from this area and placed in the decommissioned Lagoon 1 in WMA 2. Note that this release apparently occurred entirely during the NFS period. A 1995 estimate of the activity in the old hardstand debris placed in Lagoon 1 totaled approximately 18 curies, including the short-lived progeny of strontium-90 (yttrium-90) and cesium-137 (barium-137m) (Keel 1984, WVNSCO 1994, 1995, 1997a).

- In 1985, a spill of approximately 1,900 liters (500 gallons) of radioactive condensate from Tank 8D-1 from a leaking valve filled a valve pit west of Tank 8D-2, ran onto the ground into a buried culvert, and entered a drainage ditch in WMA 2, necessitating removal of contaminated soil in the Waste Tank Farm area (WVNSCO 1985). This release primarily impacted surface soil in WMA 3.

- In 1986, a spill of low-level contamination occurred at the pipe chase on the roof of the Utility Room in WMA 1; it did not result in any environmental impact (WVNSCO 1986a).

- In 1986, a small amount of contaminated sludge was spilled on the concrete sidewalk outside of the 02 Building in WMA 2 that was readily decontaminated (WVNSCO 1986b).

- In 1987, 19 to 38 liters (5 to 10 gallons) of slightly radioactive condensate from a portable ventilation unit filter spilled on the ground near Tank 8D-2 in WMA 3; this release did not produce any measurable contamination in the soil (WVNSCO 1987a).

- In 1987, a small amount of contaminated liquid spilled from a 208-liter (55-gallon) drum containing spent resin at the Lag Storage Area hardstand in WMA 5, resulting in removal of a small amount of contaminated soil (WVNSCO 1987b).

- In 1997, a small spot of relatively high-activity, previously unidentified soil contamination was found in WMA 2 north of Lagoon 5 during a radiological survey near environmental characterization activities (WVNSCO 1997c).

- In 1999, approximately 230 liters (60 gallons) of demineralized flush water overflowed a manhole at the Equalization Basin, resulting in no environmental impact (WVNSCO 1999b).

- During late September and early October 2001, there was an unplanned release from the main plant stack of small amounts of cesium-137 from the Waste Tank Farm ventilation system dissolved in condensed water vapor. The radioactivity release rate was too low to result in any stack monitoring alarms and the total amount of radioactivity released was well within regulatory limits. The release was discovered during routine radiation surveys conducted during mid-November 2001 when workers found fixed radioactivity in unexpected locations near the main plant stack. Procedures and processes were modified to prevent a recurrence (WVNS and URS 2002).

- In 2003, a breach in a riser was found from Line 15WW-569, a laundry water conduit. Approximately 3,400 liters (900 gallons) per day was released through the breach (DOE 2003f). The line was repaired.

- In 2004, two radiologically contaminated bees' nests were found when a walkway was removed between the Vitrification Test Facility and a nearby trailer in WMA 2. Experience indicated that the nests were likely built with mud from one of the lagoons (WVNSCO 2004). This incident is representative of cases where low-level radioactive contamination has been found to be spread by insects or small animals from time to time.

- In 2005, two small fires occurred inside the Vitrification Cell in the Vitrification Facility that did not result in release of radioactivity outside the building (DOE 2005b).

Other documented radioactive spills that did not impact the environment occurred inside the Main Plant Process Building, 01-14 Building, Vitrification Facility, former Radwaste Processing Building, Drum Cell, former Lag Storage Area 3, and Low-Level Waste Treatment Facility Area buildings.

Accidents Involving Hazardous Materials

The number of documented Project Premises accidents involving hazardous materials has been small compared to the number involving radioactivity. Representative hazardous materials spills include the following:

- In 2000, mercury from a previous spill was discovered in the Utility Room while workers were removing a cover plate to gain access to a floor drain piping cleanout plug (WVNSCO 2000a).

- In 2000, a small amount of nitric acid leaked onto the floor of the Cold Chemical Room during repair of nitric acid valves (WVNSCO 2000b).

3.11.5.3 Underground Tank and Underground Line Integrity

No documented leaks from underground storage tanks have occurred. Several leaks from underground lines that carried radioactive liquid or gas are known to have occurred, as identified and explained in Sections 3.11.5.1 and 3.11.5.2.

High-Level Radioactive Waste Tanks

The assumed integrity of underground storage Tanks 8D-1, 8D-2, 8D-3, and 8D-4 is based on the absence of documented leaks and other factors, such as:

- The presence of the reinforced concrete tank vaults, which provide secondary containment for these tanks and annular spaces that facilitate monitoring for possible tank leakage;

- The leak detection systems associated with Tanks 8D-1 and 8D-2, which employ instruments to monitor liquid levels in the pans under each tank and in the tank vaults, along with recorders and alarm systems;
- The analytical results of samples of in-leakage of surface water or groundwater into the vaults of Tanks 8D-1 and 8D-2, which have experienced such in-leakage;
- The results of monitoring of the sump level in the common vault for Tanks 8D-3 and 8D-4;
- The use of operating procedures to ensure actual parameters associated with liquid transfers correspond with expected conditions, to identify anomalies such as unexpected liquid losses;
- The absence of unexplained liquid losses;
- Analytical data from groundwater monitoring hydraulically downgradient from the tanks, which have not identified radioactive contamination from possible tank leakage; and
- Analytical data from the RCRA facility investigation of the tank farm area do not indicate a release of RCRA-defined hazardous contaminants from the tanks (WVNSCO 1997b).

Other Underground Tanks

The assumed integrity of other underground tanks, including the concrete interceptors that are open to the atmosphere, is based on factors such as:

- The absence of documented leaks and unexplained liquid losses;
- The use of operating procedures to ensure actual parameters associated with liquid transfers correspond with expected conditions, to identify anomalies such as unexpected liquid losses;
- Analytical data from groundwater monitoring hydraulically downgradient from the tanks, which have not identified radioactive contamination from possible tank leakage; and
- Analytical data from the RCRA facility investigation of the Low-Level Waste Treatment Facility, which do not indicate a release of RCRA-defined hazardous contaminants from the tanks (WVNSCO 1997a).

Underground Lines that Carried High-Activity Liquid

The assumed integrity of underground lines that carried high-activity liquid, identified and discussed in Section 3.11.5.1, is based on factors such as:

- Construction materials that provided durability and corrosion resistance. Stainless steel piping joined by field welds was used for lines that carried high-activity liquid or chemical solutions.
- The use of double-walled pipe or stainless steel conduits that provided secondary containment for high-activity lines. The Waste Transfer Lines that carried plutonium-uranium extraction and thorium extraction waste from the Main Plant Process Building to Tanks 8D-2 and 8D-4, respectively, are of double wall construction. The Waste Transfer Lines that run from the high-level radioactive waste tanks to the Vitrification Facility in the High-Level Waste Transfer Trench are also double walled.

The underground lines that run from the M-8 Riser of Tank 8D-2 to the Supernatant Treatment System Building are enclosed in a 50-centimeter (20-inch) stainless steel pipe.

Any major leaks would likely have been identified at the time they occurred, based on considerations such as:

- The use of operating procedures to ensure that actual parameters associated with liquid transfers correspond with expected conditions, to help identify anomalies such as unexpected liquid losses.
- The leak detection system in the annular space between the inner and outer walls of the waste transfer piping in the High-Level Waste Transfer Trench provided added assurance that these lines did not leak, and the concrete pipe trench provided assurance that any leaks from these lines would not have reached the surrounding soil.

Other Underground Lines

The assumed integrity of other underground lines is based on similar factors, such as:

- Equipment design;
- The use of operating procedures to ensure actual parameters associated with liquid transfers correspond with expected conditions, to identify anomalies such as unexpected liquid losses;
- The results of groundwater monitoring associated with the Project Premises environmental monitoring program, especially samples from nearby wells hydraulically downgradient of the lines; and
- The results of subsurface soil sample analysis associated with RCRA facility investigations.

The environmental impacts of any undetected leaks would not likely be widespread because the constant downward slope provided to promote gravity flow would minimize the volume of any leaks that may have occurred.

Conclusions

Such design features, controls, and monitoring programs provide reasonable assurance that there have been no leaks from the high-level radioactive waste tanks or from underground lines that carried high-activity liquid, and that the probability of leaks from other tanks or underground lines that have produced widespread environmental impacts is low.

Most incidents at the Project Premises are typical of industrial sites and do not involve any radioactivity or radiation exposure. The following five incident descriptions are illustrative of these types of events (DOE 2002e, 2003b, 2003c, 2003d, 2004c).

- On July 8, 2004, a worker repositioning a pipe dislodged an 11-kilogram (25-pound) piece of temporary grating that fell and grazed another worker's head. Medical examination resulted in no treatment required for this worker.
- On February 1, 2003, a large mass of ice was discovered to have fallen from a roof scupper and damaged a roof located 9.1 meters (30 feet) below. A temperature rise caused the ice mass to break free from the roof. No workers were injured as a result of this event.
- On January 30, 2003, a quality control inspector discovered counterfeit bolts on one ratchet lever tie-down strap that was going to be used to secure a low-level radioactive waste container to a pallet for shipping. All other bolts were inspected and found to be satisfactory, and the suspect bolts were confiscated and replaced prior to any use of the strap. No injuries resulted from this incident.

- On May 30, 2002, a 54.5-kilogram (120-pound) crane load block (hoist hook) and its 9-kilogram (20-pound) wire rope fell to a lower floor, just missing a worker standing near the point of impact. Crane hoist limitations, inadequate prejob briefing, and inadequate operator training were found to be the root cause of this event. No workers were injured in this incident.
- On May 31, 2000, electricians were in the process of moving electrical conduits and receptacles with an indication that the circuit breaker feeding the affected circuit was deenergized. However, before beginning their work, the electricians noticed that pilot lights on a battery pack that was connected to the same circuit were illuminated, indicating that the circuit was still energized. The cause of this situation was found to be multiple errors in the labeling of circuits and circuit breakers. No workers were injured in this incident.

3.12 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority and low-income populations. Minority persons are those who identified themselves in the 2000 census as Hispanic or Latino, Asian, Black or African American, American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, some other race, or multiracial (with at least one race designated as a minority race under Council of Environmental Quality guidelines). Persons whose income was below the Federal poverty threshold in 2000 are designated as low-income.

Demographic information obtained from the U.S. Census Bureau was used to identify low-income and minority populations within 80 kilometers (50 miles) of the site (DOC 2008a, 2008b). The 80-kilometer (50-mile) radius encompasses all or part of 10 counties in New York (Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Niagara, Orleans, Stueben, and Wyoming), 3 counties in Pennsylvania (McKean, Potter, and Warren), and 8 census subdivisions in Ontario, Canada (Dunnville, Fort Erie, Niagara Falls, Pelham, Port Colborne, Thorold, Wainfleet, and Welland).

Census data are compiled at a variety of levels corresponding to geographic units. In order of decreasing size, the areas used are states, counties, census tracts, block groups, and blocks. A block is the smallest geographic unit for which the Census Bureau tabulates 100 percent data from the census short form, which includes population questions related to household relationship, sex, race, age, ethnicity, and housing tenure. The census long form is sent to approximately one out of six households, and contains all of the questions from the short form as well as additional detailed questions relating to social, economic, and housing characteristics. The additional data generated from the long form is referred to as sample data. A "block group" is geographically the smallest unit for which the Census Bureau tabulates sample data used to identify low-income populations. As such, block groups are the smallest unit for which both ethnicity and economic data are available, and were therefore used in this analysis to identify minority and low-income populations that reside in the United States. Block groups consist of all the blocks in a census tract with the same beginning number.

Minority populations are identified in block groups where either the minority population percentage of the block group is significantly greater than the minority population percentage in the general population or if the minority population of the block group exceeds 50 percent. The term "significantly" is defined by NRC guidance as 20 percentage points (69 FR 52040). The minority population percentage of New York State in 2000 was 38 percent; therefore, the lower threshold of 50 percent was used in this analysis to define the term "minority population." In the 13 U.S. counties surrounding the site, 1,505 block groups were identified to be wholly or partially included in the 80-kilometer (50-mile) radius. Two hundred and twenty-eight of these block groups were identified to contain minority populations. The minority population distribution within an

80-kilometer (50-mile) radius within the United States is shown on **Figure 3–34**. In 2001, the percentage of Canadians identifying themselves as a minority in all of the 8 Canadian census subdivisions within the 50-mile radius of WNYNSC was far lower than the minority population percentage in all of Ontario (20 percent) and Canada (16.1 percent). The average minority population percentage in the potentially affected areas in Canada in 2001 was approximately 4.9 percent (Census Canada 2001).

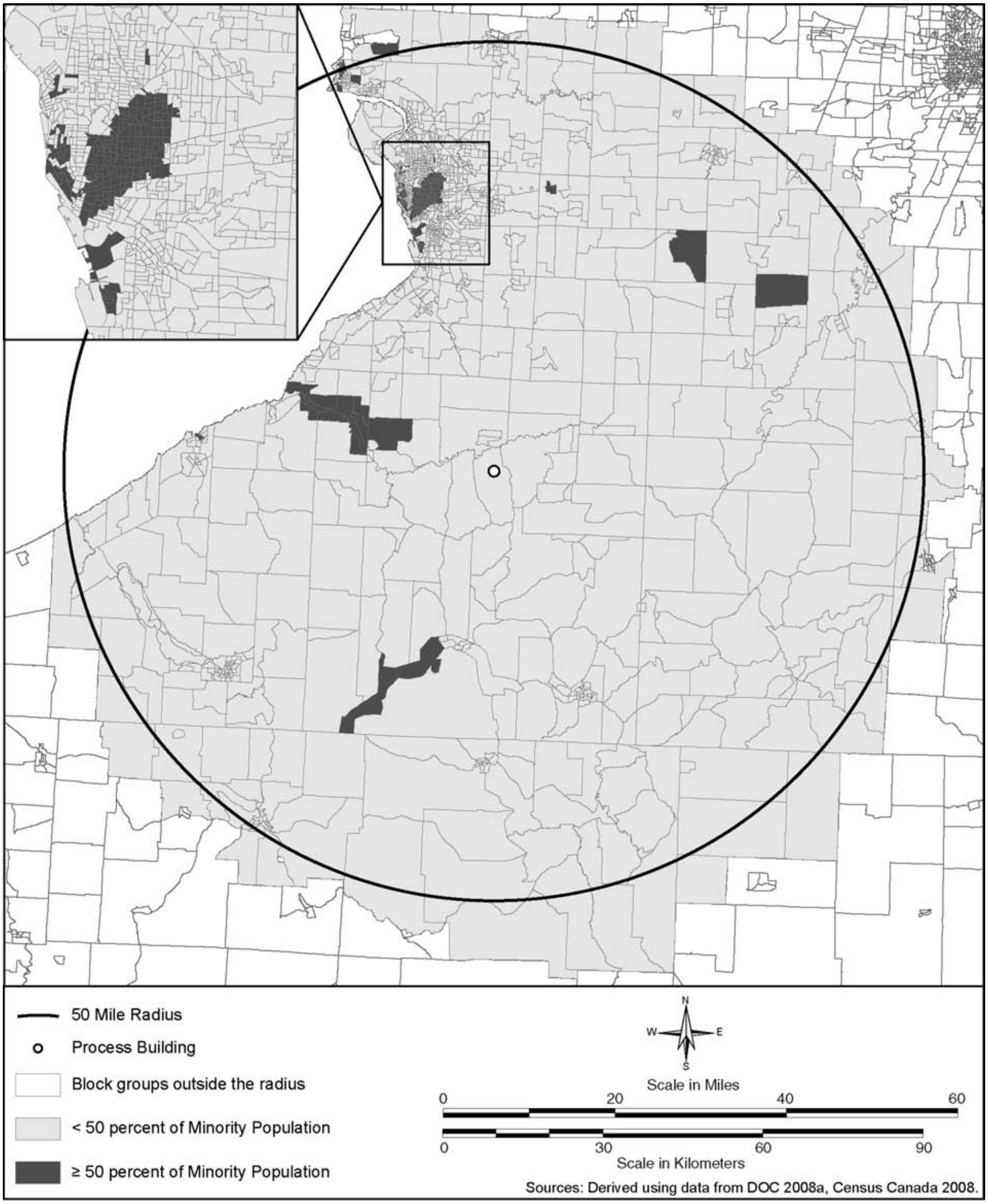


Figure 3–34 Minority Population Distribution within an 80-Kilometer (50-mile) Radius of the Site

There are four American Indian Reservations within the potentially affected area, three belonging to the Seneca Nation (Allegany, Cattaraugus, and Oil Springs) and one, the Tonawanda Reservation, belonging to the Tonawanda Senecas. The closest (25 kilometers [15 miles]) to WNYNSC is the Cattaraugus Reservation, which has a minority population of 90 percent. The Allegany Reservation, which is 35 kilometers (20 miles) from WNYNSC, consists of 23 percent minorities; the Tonawanda Reservation, which is 60 kilometers (40 miles) from WNYNSC, consists of 48 percent minorities; and the Oil Springs Reservation, which is 40 kilometers (25 miles) from WNYNSC, consists of 9 percent minorities. Several other census block groups with minority populations in excess of 50 percent exist in the Buffalo metropolitan area. The total minority population within the 80-kilometer (50-mile) radial distance from WNYNSC accounts for approximately 14 percent of the population in the area, or about 240,000 people. The racial and ethnic composition of this population is predominantly African-American and Hispanic.

Low-income populations in the United States are identified in block groups in the same manner as minority populations as discussed previously. As shown on **Figure 3–35**, the percentage of people whose income in 1999 was below the poverty level in New York State was 14.6 percent; therefore, a threshold of 34.6 percent was chosen as the criteria for identifying low-income populations. Of the 1,505 block groups in the potentially affected area, 165 were identified to contain low-income populations above the threshold. In 2001, the percentage of Canadians considered to be living in poverty in the 8 census subdivisions within the 80-kilometer (50-mile) radius of WNYNSC is consistent with the poverty rates for Ontario (14.2 percent) and Canada (16.2 percent) (Census Canada 2001, CCSD 2007). The average rate of poverty (incidence of low-income) in the potentially affected areas in Canada in 2001 was approximately 13.1 percent (Census Canada 2001).

3.13 Waste Management and Pollution Prevention

3.13.1 Waste Management

The categories of waste that currently exist at WNYNSC include nonhazardous waste, hazardous waste, low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, and high-level radioactive waste. These waste types are defined in Chapter 2, Section 2.1, of this EIS in a text box. Further, under NRC requirements in 10 CFR 61.55, commercial low-level radioactive waste is divided into classes. Those classes are Class A, Class B, and Class C. The limits on concentrations of specific radioactive materials allowed in each class are shown in **Table 3–19**. Radioactive waste not meeting the criteria for these classes falls into a fourth class, known as Greater-Than-Class C.

- Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A waste must meet the minimum requirements set forth in 10 CFR 61.56(a). If Class A waste also meets the stability requirements set forth in 10 CFR 61.56(b), it is not necessary to segregate the waste for disposal. Low-level radioactive waste may also be categorized as low-specific-activity waste for the purposes of transportation analyses. Low-specific-activity wastes have low specific activity, are nonfissile, and meet certain regulatory exceptions and limits. Low-specific-activity wastes may be transported in large bulk containers.
- Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in 10 CFR 61.56.
- Class C waste is waste that not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in 10 CFR 61.56.

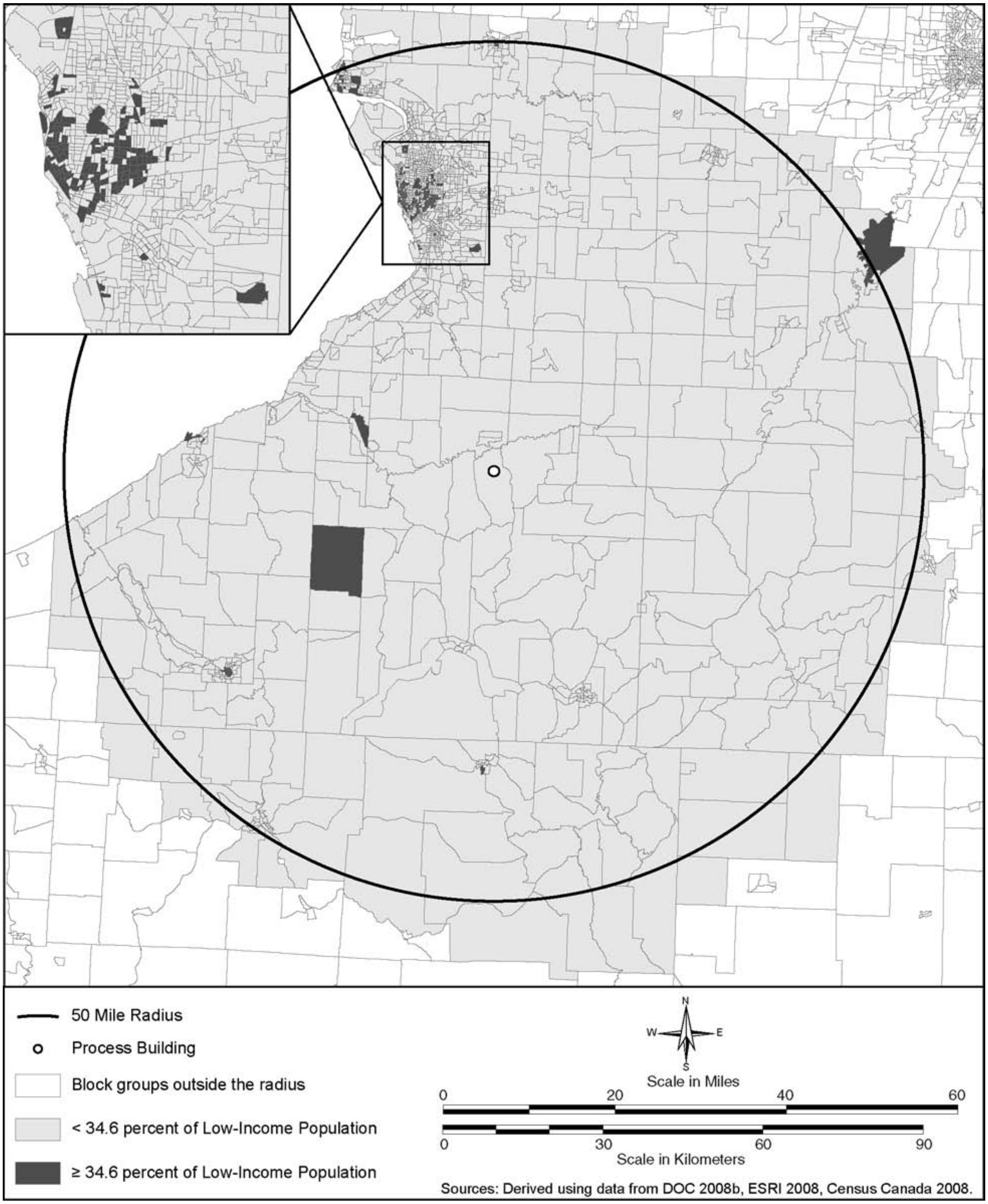


Figure 3–35 Low-Income Population Distribution within an 80-Kilometer (50-mile) Radius of the Site

Table 3–19 Nuclear Regulatory Commission Radioactive Waste Classification Criteria – Abbreviated

Radionuclide	***Class A***	***Class B***	***Class C***	***Greater-Than-Class C***
Tritium (curies per cubic meter)	≤ 40	No limit	No limit	No limit
Carbon-14 (curies per cubic meter)	≤ 0.8	—	> 0.8 to 8	> 8
Cobalt-60 (curies per cubic meter)	≤ 700	No limit	No limit	No limit
Nickel-63 (curies per cubic meter)	≤ 3.5	> 3.5 to 70	> 70 to 700	> 700
Strontium-90 (curies per cubic meter)	≤ 0.04	> 0.04 to 150	> 150 to 7,000	> 7,000
Technetium-99 (curies per cubic meter)	≤ 0.3	—	> 0.3 to 3	> 3
Iodine-129 (curies per cubic meter)	≤ 0.008	—	> 0.008 to 0.08	> 0.08
Cesium-137 (curies per cubic meter)	≤ 1	> 1 to 44	> 44 to 4,600	> 4,600
Alpha-emitting transuranic nuclides with half-life greater than 5 years (nanocuries per gram)	≤ 10	—	> 10 to 100	> 100
Plutonium-241 (nanocuries per gram)	≤ 350	—	> 350 to 3,500	> 3,500
Curium-242 (nanocuries per gram)	≤ 2,000	—	> 2,000 to 20,000	> 20,000

Source: 10 CFR 61.55.

- Greater-Than-Class C waste is waste that exceeds the low-level radioactive waste Class C criteria of 10 CFR 61.55 and is generally not acceptable for near-surface disposal. There may be some instances where Greater-Than-Class C waste would be acceptable for near-surface disposal and these instances will be evaluated on a case-by-case basis.

Vitrified high-level radioactive waste in stainless steel canisters is currently stored in the High-Level Waste Interim Storage Facility in the Main Plant Process Building. Low-level radioactive waste is stored in steel drums and boxes either outside on hardstands or inside storage structures. Hazardous and mixed low-level radioactive wastes are packaged, treated (neutralized), and disposed of on site; packaged and treated on site and disposed of off site; or packaged on site and treated and disposed of off site. Untreatable mixed low-level radioactive waste is being stored on site pending a decision on disposition of these materials per the Federal Facility Compliance Act Consent Order and Site Treatment Plan (WVES 2007a).

The site has a radioactive waste management program that implements DOE Order 435.1. The *WVDP Waste Acceptance Manual* contains a description of how radioactive waste is managed at the site. Hazardous wastes are managed in accordance with 6 NYCRR Parts 370–374 and 376. Mixed low-level radioactive waste is treated in accordance with applicable hazardous and radioactive waste requirements, and the WVDP Site Treatment Plan, which contains proposed schedules for treating mixed low-level radioactive waste to meet RCRA land disposal restrictions. Hazardous and mixed low-level radioactive waste activities are reported to NYSDEC annually in the *WVDP's Annual Hazardous Waste Report*, which specifies the quantities of waste generated, treated, and disposed of, and identifies the treatment, storage, and disposal facilities used (WVES and URS 2008).

The wastes that are currently generated by DOE and contractor activities at WNYNSC will be phased out as these activities near completion. The *West Valley Demonstration Project Waste Management Environmental Impact Statement* (*WVDP Waste Management EIS*) (DOE 2003e) and *WVDP Waste Management EIS Supplement Analysis* (DOE 2006b) were prepared to determine how DOE should disposition the operations and decontamination wastes that are in storage or will be generated over a 10-year period. DOE did not evaluate nonhazardous and hazardous waste management in the *WVDP Waste Management EIS*. In addition, the wastes evaluated in the *WVDP Waste Management EIS* do not include wastes generated by the alternatives evaluated in this *Decommissioning and/or Long-Term Stewardship EIS*.

In the Record of Decision (ROD) for the *WVDP Waste Management EIS* (70 FR 35073), DOE decided to partially implement Alternative A, the Preferred Alternative. Under Alternative A of the *WVDP Waste Management EIS*, DOE is shipping low-level radioactive waste and mixed low-level radioactive waste off site for disposal in accordance with all applicable regulatory requirements, including permit requirements, waste acceptance criteria, and applicable DOE Orders. DOE is currently disposing of low-level radioactive waste and mixed low-level radioactive waste at commercial sites, the Nevada Test Site near Mercury, Nevada, or a combination of commercial and DOE sites, consistent with DOE's February 2000 decision regarding low-level radioactive waste and mixed low-level radioactive waste disposal (65 FR 10061). Waste handling and disposal activities at the commercial disposal site in Utah are regulated by the State of Utah under a Radioactive Material License (UT2300249). Low-level radioactive waste and mixed low-level radioactive waste handling and disposal activities at the Hanford Site and the Nevada Test Site are described in the *Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997a), and the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE 1996b). Disposal of low-level radioactive waste and mixed low-level radioactive waste at the Hanford Site is contingent upon DOE's meeting the terms of the Settlement Agreement with the Washington State Department of Ecology, in the case of the *State of Washington v. Bodman* (Civil No. 2:CB-CV-05018-AAM).

DOE has deferred a decision on the disposal of transuranic waste from WVDP, pending a determination by DOE that the waste meets all statutory and regulatory requirements for disposal at the Waste Isolation Pilot Plant (WIPP). The impacts of disposal of transuranic waste at WIPP are described in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997b). DOE is preparing an EIS to examine the disposal of Greater-Than-Class C low-level radioactive waste and similar DOE waste streams for which disposal is not currently available (72 FR 40135). Because of the uncertainty in the defense determination, DOE plans to include transuranic waste from the Project Premises in the scope of the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement*; however, WVDP transuranic waste may be determined to be defense-related and eligible for disposal at WIPP.

Consistent with the *Waste Management Programmatic Environmental Impact Statement High-Level Waste* ROD (64 FR 46661), DOE will store canisters of vitrified high-level radioactive waste on site until disposition decisions are made and implemented.

The *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project (WVDP DD&R EA)* (DOE 2006c) and Finding of No Significant Impact (FONSI) (DOE 2006d) were issued and signed on September 14, 2006. The Environmental Assessment (EA) identified 36 facilities that are (or by 2011 will be) no longer required to safely monitor, maintain, or support future removal of vitrified high-level radioactive waste, or the closure of other onsite facilities. DOE issued the FONSI, based on the analysis contained in the EA, determining that the Proposed Action did not constitute a major Federal action significantly affecting the quality of the human environment (WVNS and URS 2007). DOE is currently in the process of decontamination, demolition, and removal of these facilities, and disposal of the resulting wastes.

The waste volumes that need to be managed at the site are shown in **Table 3–20**. These are based on the volumes of waste that are currently in storage and projections of additional wastes that could be generated from ongoing operations and decontamination, demolition, and removal of unneeded facilities over a 10-year period. These volumes do not include wastes generated by the alternatives evaluated in this *Decommissioning and/or Long-Term Stewardship EIS*.

Table 3–20 10-Year Projected Waste Volumes (cubic meters) [a]

Waste Type	*WVDP Waste Minimization Plan* [b]	*WVDP Waste Management EIS* [c]	*WVDP DD&R EA* [d]	*Total* [e]
Nonhazardous Waste	9,157	Not estimated	16,380	25,537
Hazardous Waste	4.9	Not estimated	1,994	1,999
Total Low-level Radioactive Waste	–	23,235	2,124	25,359
Class A Low-level Radioactive Waste	–	14,768	2,124	16,892
Class B Low-level Radioactive Waste	–	2,191	0	2,191
Class C Low-level Radioactive Waste	–	6,276	0	6,276
Mixed Low-level Radioactive Waste Class A	–	670	77	747
Total Transuranic Waste	–	1,388	0	1,388
Contact-handled Transuranic Waste	–	1,133	0	1,133
Remote-handled Transuranic Waste	–	255	0	255
High-level Radioactive Waste	–	275 canisters	0	275 canisters

EA = Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project; WVDP Waste Management EIS = West Valley Demonstration Project Waste Management EIS, WVDP DD&R.

[a] Does not include wastes generated by the alternatives evaluated in this *Decommissioning and/or Long-Term Stewardship EIS*.

[b] 10-year nonhazardous and hazardous waste volumes estimated using 2004 generation rates (WVNS 2004b). Converted conservatively assuming a density of 500 kilograms per cubic meter of waste.

[c] 10-year waste volumes from the *WVDP Waste Management EIS* (DOE 2003e) and *WVDP Waste Management EIS Supplement Analysis* (DOE 2006b).

[d] 4-year waste volumes from the *WVDP DD&R EA* (DOE 2006c).

[e] If the waste incidental to reprocessing process is not applied, approximately 310 cubic meters (11,000 cubic feet) of waste would be added to the inventory of high-level radioactive waste already stored on the site, and the amount of low-level radioactive waste and transuranic waste would be reduced by about 160 cubic meters (5,700 cubic feet) and 150 cubic meters (5,300 cubic feet), respectively.

Note: To convert cubic meters to cubic feet, multiply by 35.314.

After the *WVDP Waste Management EIS* was issued, the transuranic waste volumes were updated. The current transuranic waste inventory volume is estimated at approximately 760 cubic meters (27,000 cubic feet) of contact-handled waste and 1,100 cubic meters (38,000 cubic feet) of remote-handled waste. In addition, another approximately 200 cubic meters (7,000 cubic feet) of contact-handled transuranic waste and 85 cubic meters (3,000 cubic feet) of remote-handled transuranic waste are projected to be generated during ongoing decontamination activities through the end of fiscal year 2011 (Chamberlain 2008).

In accordance with past site practices, industrial waste is currently shipped to landfills in Model City, New York, and Angelica, New York, for disposal. Hazardous waste is shipped to a landfill in Indianapolis, Indiana, for disposal (DOE 2006c). Digested sludge from the site sanitary and industrial wastewater treatment facility is shipped to the Buffalo Sewer Authority for disposal (WVES and URS 2008).

Wastes subject to offsite disposal under the decisions made in the *WVDP Waste Management EIS* ROD are being processed and stored in several buildings in the Project Premises until shipped off site. Vitrified high-level radioactive waste is currently stored in the Main Plant Process Building. Low-level radioactive waste and transuranic wastes are stored in Lag Storage Areas 3 and 4 and the Chemical Process Cell Waste Storage Area. Volume reduction of oversized contaminated materials occurs in the Remote-Handled Waste Facility (DOE 2003e). As described in the *WVDP DD&R EA* (DOE 2006c), Lag Storage Area 3 and the Chemical Process Cell Waste Storage Area are scheduled for decontamination, demolition, and removal by 2010. In addition, under the Interim End State, the Main Plant Process Building and the Remote-Handled Waste Facility are scheduled to be gutted and decontaminated by 2011 (Bower 2007).

Lag Storage Areas 3 and 4: Lag Storage Areas 3 and 4 are low-level, and mixed low-level radioactive waste RCRA interim status storage facilities. They are twin structures located about 152 meters (500 feet) northeast of the Main Plant Process Building. Originally built in 1991 and upgraded in 1996 (Lag Storage Area 3) and 1999 (Lag Storage Area 4), these buildings provide enclosed storage space for waste containers. Lag Storage Areas 3 and 4 have operating capacities of 4,701 cubic meters (166,018 cubic feet) and 4,162 cubic meters (146,980 cubic feet), respectively (DOE 2003e). Wastes currently stored in these buildings are being removed and disposed of under the ROD for the *WVDP Waste Management EIS* (70 FR 35073). Lag Storage Area 3 is scheduled for decontamination, demolition, and removal by 2010 (DOE 2006c).

Located just inside and to the west of the Lag Storage Area 4 south wall roll-up door is the Container Sorting and Packaging Facility. This engineered area was added in 1995 for contact sorting of previously packaged wastes. On the south side of Lag Storage Area 4, there is an enclosed shipping depot to enhance the WVDP's ability to ship wastes off site for disposal (DOE 2003e).

Chemical Process Cell Waste Storage Area: The Chemical Process Cell Waste Storage Area, about 274 meters (900 feet) northwest of the Process Building, was constructed in 1985 as a storage area primarily for radioactively contaminated equipment removed from the Chemical Process Cell. Painted carbon steel waste storage boxes of various sizes are stored within the Chemical Process Cell Waste Storage Area. These boxes, which contain contaminated vessels, equipment, and piping removed from the Chemical Process Cell, are stored in the center area of the enclosure. This center area is surrounded by hexagonal concrete shielding modules. These modules provide line-of-sight shielding around the waste boxes they encircle. Additional carbon steel waste boxes were placed on the east and west ends of the enclosure for additional shielding. This outer layer of waste boxes contains low dose low-level radioactive waste equipment and material removed from cleanup activities carried out in the Product Purification Cell and Extraction Cell 3 (DOE 2003e). Wastes currently stored in this building are being removed and disposed of under the *WVDP Waste Management EIS* ROD (70 FR 35073). The Chemical Process Cell Waste Storage Area is scheduled for decontamination, demolition, and removal by 2010 (DOE 2006c).

Main Plant Process Building: The Main Plant Process Building is composed of a series of cells, aisles, and rooms constructed of reinforced concrete and concrete block. Several cells in rooms in the Main Plant Process Building were decontaminated to prepare them for reuse as interim storage space for high-level radioactive waste or as part of the Liquid Waste Treatment System. Among the areas decontaminated was the Chemical Process Cell. The Chemical Process Cell currently stores 275 canisters of high-level radioactive waste vitrified in a borosilicate glass matrix (DOE 2003e). The Main Plant Process Building is scheduled to be gutted and decontaminated by 2011 (Bower 2007).

Tank Farm: The Tank Farm includes four waste storage tanks (8D-1, 8D-2, 8D-3, and 8D-4). Built between 1963 and 1965, the waste storage tanks were originally designed to store liquid high-level radioactive waste generated during fuel reprocessing operations. The two larger tanks, 8D-1 and 8D-2, are reinforced carbon steel tanks. Each of these tanks has a storage capacity of about 2.8 million liters (750,000 gallons) and is housed within its own cylindrical concrete vault. Tank 8D-2 was used during reprocessing as the primary storage tank for high-level radioactive waste, with 8D-l as its designated spare. Both were modified by WVDP to support high-level radioactive waste treatment and vitrification operations. The two smaller tanks are stainless steel tanks with a storage capacity of about 57,000 liters (15,000 gallons) each. A single concrete vault houses both of these tanks. Tank 8D-3, once designated as the spare for 8D-4, is currently used to store decontaminated process solutions before they are transferred to the Liquid Waste Treatment System for processing. Tank 8D-4 was used to store liquid acidic thorium extraction waste generated during a single reprocessing campaign. DOE manages these tanks in such a way as to minimize the risk of contamination leaching into the surrounding stream corridors (DOE 2003e). A tank and vault drying system is being installed in the Waste Tank Farm. Prior to the starting point of this EIS, this system will be used to dry the liquid heels remaining in the tanks. This system will remain in place until removed during decommissioning activities.

Remote Handled Waste Facility: Wastes that have high surface radiation exposure rates or contamination levels require processing using remote-handling technologies to ensure worker safety. These remote-handled wastes are processed in the Remote-Handled Waste Facility (DOE 2003e).

The Remote-Handled Waste Facility is located in the northwest corner of the Project Premises, northwest of the STS Support Building and southwest of the Chemical Process Cell Waste Storage Area. Primary activities in the Remote-Handled Waste Facility include confinement of contamination while handling, assaying, segregating, cutting, and packaging remote-handled waste streams. Equipment in the Remote-Handled Waste Facility can cut relatively large components into pieces small enough to fit into standard types of waste containers (DOE 2003e).

The wastes to be processed in the Remote-Handled Waste Facility are in the form of tanks, pumps, piping, fabricated steel structures, light fixtures, conduits, jumpers, reinforced concrete sections, personal protective equipment, general rubble, and debris. Wastes from the Remote-Handled Waste Facility are packaged in 208-liter (55-gallon) drums and B-25 boxes (DOE 2003e). The Remote-Handled Waste Facility began operations in June 2004 (WVNS and URS 2005). The Remote-Handled Waste Facility is scheduled to be gutted and decontaminated by 2011 (Bower 2007).

3.13.2 Waste Minimization and Pollution Prevention

The site maintains a program of reducing and eliminating the amount of waste generated from site activities. Each year, waste reduction goals are set for all major waste categories and then tracked against these performance goals. The emphasis on good business practices, source reduction, and recycling minimizes the generation of low-level radioactive waste; mixed low-level radioactive waste; hazardous waste; industrial wastes; and sanitary wastes. The following items were recycled during 2007 (WVES and URS 2008):

- Office and mixed paper – 24.2 metric tons (26.6 tons),
- Corrugated cardboard – 15.4 metric tons (16.9 tons),
- Stainless steel – 39.2 metric tons (43.1 tons),
- Copper – 1.77 metric tons (1.9 tons),
- Iron – 348 metric tons (383 tons),
- Batteries – 2.57 metric tons (2.82 tons),
- Concrete – 429 metric tons (471 tons), and
- Wood – 1.34 metric tons (1.47 tons).

A hazardous waste reduction plan that documents efforts to minimize the generation of hazardous waste is filed with NYSDEC every 2 years and updated annually (70 FR 35073).

The Waste Minimization and Pollution Prevention Awareness Plan established the strategic framework for integrating waste minimization and pollution prevention into waste generation and reduction activities, the procurement of recycled products, the reuse of existing products, and the use of methods that conserve energy. The program is a comprehensive and continuous effort to prevent or minimize pollution, with the overall goals of reducing health and safety risks and protecting the environment (WVES and URS 2008).

As a participant in the EPA's now discontinued National Environmental Performance Track Program, DOE committed to reduce energy use and air emissions. Accomplishments during 2007 include reducing (WVES and URS 2008):

- Total energy usage by 15.6 percent;
- Liquid nitrogen usage by 45.3 percent; and
- Sulfur oxide (SOx) emissions by 61.4 percent.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4 describes the environmental impacts of the alternatives evaluated in this *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*. A detailed discussion of each alternative is presented in Chapter 2. The impact analyses presented in Section 4.1 of this chapter address those areas of the environment where the potential exists for environmental impacts. Section 4.2 addresses cost-benefit considerations, and Section 4.3 discusses incomplete and unavailable information. Intentional destructive acts are described in Section 4.4. The cumulative impacts are presented in Section 4.5. Resource commitments, including unavoidable adverse environmental impacts, the relationship between short-term use of the environment and long-term productivity, and irreversible and irretrievable commitments of resources, are presented in Section 4.6. A summary comparison of the environmental impacts of the alternatives is presented in Chapter 2, Section 2.6.

This chapter presents the results of the analysis of consequences (impacts) of the alternatives described in Chapter 2 of this environmental impact statement (EIS). The analysis is organized by resource area. Site information for these resource areas is presented in Chapter 3 and provides the basis for the impact analyses.

The level of documentation provided in this EIS for each resource area is consistent with its significance, where significance includes the severity, nature, and extent of environmental impact and the potential for controversy. This approach is consistent with Council on Environmental Quality and U.S. Department of Energy (DOE) National Environmental Policy Act (NEPA) guidance to focus the presentation in an EIS on the impacts of significance.

The analysis of potential impacts of EIS alternatives addresses two different groups of site activities: those associated with *decommissioning* site facilities, and those associated with *site monitoring and maintenance* (including site access control), possibly including a *long-term stewardship* program under some alternatives. Decommissioning activities occur over finite periods of time and include construction and eventual disposition of temporary facilities, removal or stabilization of buried radioactive waste, and stabilization of the site against erosion. The impacts of decommissioning are quantified over the period of decommissioning for each decommissioning alternative. For purposes of this EIS, site monitoring and maintenance refers to those activities necessary to ensure protection of human health and the environment before closure of a site, while long-term stewardship refers to those activities (including engineered and institutional controls) necessary to ensure protection of human health and the environment following closure of a site.[1] Impacts from site monitoring and maintenance activities, and stewardship activities as appropriate for some alternatives, are quantified in this EIS on an annual basis.[2] These concepts are summarized for each alternative:

---

[1] *Long-term stewardship includes engineered and institutional controls designed to contain or to prevent exposure to residual contamination and waste such as monitoring and maintenance activities, record-keeping activities, inspections, groundwater monitoring and treatment, access control, posting signs, and periodic performance reviews.*

[2] *Data for much of the analysis in this chapter are drawn from a series of technical reports addressing each of the alternatives considered in this EIS (WSMS 2009a, 2009b, 2009c, 2009d). Data in the technical report for the Sitewide Removal Alternative are presented over a 60-year decommissioning period (WSMS 2009a). Data in the technical report for the Sitewide Close-In-Place and No Action Alternatives are presented over 60-year periods of decommissioning and/or site monitoring and maintenance (WSMS 2009b, 2009d) to facilitate comparisons with data presented in the technical report for the Sitewide Removal Alternative. Data in the technical report for the Phased Decommissioning Alternative are presented over the 30-year period analyzed for Phase 1 of this alternative (WSMS 2009c). (See Chapter 2, Figures 2–6 through 2–9.)*

- *Sitewide Removal Alternative* – Decommissioning is assumed to occur over 60 years, during which time site monitoring and maintenance activities would continue. Following decommissioning, the entire Western New York Nuclear Service Center (WNYNSC) would be available for release for unrestricted use, and there would be no need for a long-term stewardship program. There may be a need for a limited amount of site monitoring and maintenance associated with temporary onsite storage of orphan waste in the Container Management Facility pending the availability of offsite waste disposal capacity.

- *Sitewide Close-In-Place Alternative* – Decommissioning is assumed to occur over 7 years, although the Interim Storage Facility would operate for an additional 25 years before being decommissioned in year 33. Site monitoring and maintenance activities would continue during decommissioning activities. A long-term stewardship program would be put into place after decommissioning activities are complete and would last into perpetuity.

- *Phased Decisionmaking Alternative* – Phase 1 of this alternative, which for purposes of analysis is assumed to last up to 30 years, includes decommissioning activities for some of the waste management areas (WMAs), combined with characterization of site contamination and additional studies to help determine the best technical approach to complete decommissioning of the remaining facilities. Decommissioning activities during Phase 1 are assumed to occur over 8 years, although the Interim Storage Facility would operate for an additional 21 years before being decommissioned in year 30. Site monitoring and maintenance activities would also continue until Phase 2 is complete. Phase 2 actions for the Project Premises could range from in-place closure, after which a long-term stewardship program could be implemented, to removal of remaining waste and residual contamination. For the State-Licensed Disposal Area (SDA), Phase 2 actions that will be considered include at least: complete exhumation, close in place, and continued active management consistent with SDA permit and licensing requirements.

  The impacts for the entire Phased Decisionmaking Alternative are presented as a range. If the Phase 2 decision is removal of all remaining WMAs, the impacts for the entire Phased Decisionmaking Alternative (both Phase 1 and Phase 2) would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure of all remaining WMAs, the impacts for the entire Phased Decisionmaking Alternative would be bounded by a combination of the Sitewide Removal and Sitewide Close-In-Place Alternatives. For the SDA, if the Phase 2 decision is continued active management, certain impacts, such as potential radiation doses to an onsite intruder assuming loss of institutional controls, would be bounded by those for the No Action Alternative.

- *No Action Alternative* – There would be no decommissioning activities under this alternative, although there would be a continuing site monitoring and maintenance program that for purposes of analysis is assumed to last into perpetuity.

The comparison of alternatives in this EIS is organized into sections that present impacts for specific resource areas. Except for Section 4.1.10, Sections 4.1.1 through 4.1.13 address the potential short-term impacts resulting from implementing the three decommissioning alternatives, as well as impacts resulting from implementing the No Action Alternative. Section 4.1.10 addresses the potential long-term impacts that could result from leaving waste and residual contamination on site. Section 4.2 addresses cost-benefit considerations, Section 4.3 addresses incomplete and unavailable information, Section 4.4 addresses intentional destructive acts, Section 4.5 addresses cumulative impacts, and Section 4.6 addresses resource commitments.

Short-term refers to the active project under each alternative during which implementation (most of the construction, operation, and decommissioning activities) would take place.

Long-term is defined as the timeframe beyond implementation of each alternative.

With respect to long-term impacts, this EIS includes a detailed quantitative analysis of impacts associated with the Sitewide Close-In-Place and No Action Alternatives, because both alternatives would leave waste and residual contamination on site. Potential long-term impacts associated with the Sitewide Removal and Phased Decommissioning Alternatives are addressed in less detail. The quantitative analysis of long-term impacts includes assessments of impacts to individuals and populations assuming two different scenarios for institutional controls: (1) continued maintenance of institutional controls, and (2) future loss of institutional controls. Regarding the latter analysis, it is assumed that after 100 years, there would be no further site monitoring and maintenance efforts, possibly leading to unmitigated erosion, as well as breakdowns in access control measures so that persons could inadvertently intrude onto WNYNSC and be exposed to contamination. For purposes of analysis, it is furthermore assumed that, once lost, there would be no reinstatement of institutional controls or any measures taken to preclude or mitigate the calculated doses and risks. It is believed that neither situation would be likely given the expected continuance of regulatory and public health institutions, Federal and state regulations such as those for monitoring public water supplies, and the ability to detect radionuclides and hazardous constituents in water and other environmental media.

The assumed 100-year institutional control period is conservatively adapted from DOE Manual 435.1-1, which states that for performance assessments prepared by DOE for low-level radioactive waste disposal facilities, "institutional controls shall be assumed to be effective in deterring intrusion for at least 100 years following closure" (DOE 1999a). Unlike the DOE performance assessments, for which temporary loss of institutional controls is assumed (DOE 1999a); permanent loss of institutional controls is assumed for this EIS.

4.1 Analysis of Impacts

4.1.1 Land Use and Visual Resources

Land and visual resources could be impacted by decommissioning actions at WNYNSC. Indicators of land resource impact are land area disturbed during decommissioning and land area available for release for unrestricted use. The analysis of impacts on visual resources was conducted based on projected changes in visual resource classification using the Bureau of Land Management's Visual Resource Management (VRM) Class system (DOI 1986). VRM Class I provides for very limited management activity, where the level of change to the landscape should be very low and must not attract attention. Under VRM Class II, management activities may be seen, but should not attract the attention of the casual observer, such as solitary small buildings or dirt roads. Management activities under VRM Class III may attract attention, but should not dominate the view of the casual observer. Finally, under VRM Class IV, management activities may dominate the view and become the major focus of viewer attention.

A summary of the impacts of each alternative on land and visual resources is presented in **Table 4–1**.

Table 4–1 Summary of Land and Visual Resources Impacts

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Land Disturbance (hectares)	An estimated 33.2 hectares of previously disturbed land would be affected. Additionally, 16.6 hectares of newly disturbed land would result from remediation of the Cesium Prong. Ultimately, all disturbed land (49.8 hectares) would be restored to a more natural state. Removal actions would occur over a 60-year period.	An estimated 18.6 hectares of previously disturbed land would be affected. Additionally, 10.1 hectares of non-disturbed land would be affected by erosion control measures. Not all disturbances would occur at once, but would take place over about 7 years.	An estimated 11.3 hectares of previously disturbed land would be affected under Phase 1 of this alternative over about 8 years. Under Phase 2, additional land disturbance could range from 17.4 to 38.4 hectares. There would be no change in the amount of land disturbed if the Phase 2 decision for the SDA is continued active management.	No additional land would be disturbed.
Land Available for Release (hectares)	Following completion of removal actions, the entire WNYNSC site (1,351 hectares) would ultimately be available for release for unrestricted use, except for about 24.3 hectares used for orphan waste storage in the Container Management Facility.	Ultimately, 1,118 hectares would be available for release for unrestricted use after completion of the in-place closure actions and decay of the Cesium Prong.	Under Phase 1, approximately 693 hectares would be available for release for unrestricted use. If the Phase 2 decision is removal of remaining waste and contamination, the total land available for release under this alternative would be about 1,351 hectares. Less land would be available for release if the Phase 2 decision for the SDA is continued active management. If the decision is in-place closure, the total land available for release would be about 1,118 hectares. The same amount of land would be available for release if the Phase 2 decision for the SDA is continued active management.	About 693 hectares would be available for release for unrestricted use.
Visual Resources	The disturbed portion of WNYNSC would retain its current VRM Class IV rating during decommissioning activities. Except for of the area around the Container Management Facility, the disturbed area would transition to a higher VRM Class II rating following completion of decommissioning activities.	The disturbed portion of WNYNSC would maintain its VRM Class IV rating following decommissioning activities. Land released for unrestricted use would retain its VRM Class II rating.	The disturbed portion of WNYNSC would maintain its VRM Class IV rating during and following completion of Phase 1. Land released for unrestricted use would retain its VRM Class II rating. Following Phase 2, the VRM rating of the site could range from the entire site being rated Class II to most of it being rated Class II, while that portion to be retained would be rated Class IV.	No change in the visual character of the site. The disturbed portion of WNYNSC would retain its VRM Class IV rating.

SDA = State-Licensed Disposal Area, VRM = Visual Resource Management, WNYNSC = Western New York Nuclear Service Center.

Note: To convert hectares to acres, multiply by 2.471.

4.1.1.1 Sitewide Removal Alternative

Land Use

Under the Sitewide Removal Alternative, all site facilities would be removed, soils and sediments would be decontaminated, and all radioactive, hazardous, and mixed low-level radioactive wastes would be shipped off site for disposal when disposal facilities become available. A number of new temporary facilities would be constructed to support removal activities.

Approximately 11.3 hectares (28 acres) of new temporary facilities and structures would be constructed in areas already in use. Land required for use as laydown areas, excavations for foundations, and other activities conducted in conjunction with construction of the new facilities would result in a total construction land disturbance of approximately 14.2 hectares (35 acres), all of which would be within existing disturbed areas.

Additional land disturbance would occur in association with excavation of the North Plateau Groundwater Plume and Cesium Prong. In total, these excavation actions would lead to the disturbance of approximately 35.6 hectares (88 acres). This total consists of about 19.0 hectares (47 acres) of previously disturbed land and about 16.6 hectares (41 acres) of the Cesium Prong located outside the disturbed portion of the site. Ultimately, all disturbed land (49.8 hectares [123 acres]) would be restored to a more natural state. These 49.8 hectares (123 acres) of disturbed land consists of 33.2 hectares (82 acres) of previously disturbed land and 16.6 hectares (41 acres) of newly disturbed land.

Following the removal of buildings and structures, the excavation of waste, and the remediation of the Groundwater Plume and Cesium Prong, all 1,351 hectares (3,338 acres) of WNYNSC would be available for release for unrestricted use. The exact amount and timing of land release from WNYNSC under this alternative would be the result of interactions among the New York State Energy Research and Development Authority (NYSERDA), the U.S. Nuclear Regulatory Commission (NRC), DOE (until completion of WVDP), and other Federal and state agencies having jurisdiction. About 24.3 hectares (60 acres) may need to be retained for operation of the Container Management Facility pending the availability of disposal capacity for orphan waste.

Visual Resources

Construction of new temporary buildings would not change the current VRM Class IV rating of the disturbed portion of the site. Most of the removal activities would take place within the disturbed portion of WNYNSC and would have minimal additional negative visual impact. However, actions to remediate areas of the Cesium Prong located outside the disturbed area, while temporary, would be visible from nearby public vantage points, Route 240, or higher elevations. Upon completion of all decommissioning activities, disturbed areas would be graded and revegetated to stabilize exposed soils. At this stage, except for the Container Management Facility which may be needed for orphan waste storage, WNYNSC would no longer appear industrial and would become more consistent with a higher VRM rating (Class II), where the natural landscape would play a more prominent role.

4.1.1.2 Sitewide Close-In-Place Alternative

Land Use

Under the Sitewide Close-In-Place Alternative, approximately 0.4 hectare (1 acre) of new temporary facilities and structures would be constructed in areas already in use. Adding land required for construction laydown and other purposes (i.e., 0.4 hectare [1 acre]) would result in a total land disturbance of approximately 0.8 hectare (2 acres), all of which would occur within the existing disturbed portion of the site. An additional 17.8 hectares (44 acres) of land would be required for the installation and maintenance of engineered barriers and multi-layer caps in previously disturbed areas. Overall, 18.6 hectares (46 acres) of previously disturbed land would be affected. Erosion control measures, including installation of water control structures and work in and adjacent to Quarry and Franks Creeks and Erdman Brook would newly disturb 10.1 hectares (25 acres) (WSMS 2009b). Overall, as much as 28.7 hectares (71 acres) of WNYNSC land could be disturbed under the Sitewide Close-In-Place Alternative, approximately two-thirds of which would be located within previously disturbed areas of the Project Premises.

Under the Sitewide Close-In-Place Alternative, a substantial portion of WNYNSC would be made available for reuse without restriction. After completion of decommissioning actions and decay of the Cesium Prong, more of the site would be available for unrestricted release. However, it is likely that land would need to be retained for access control, for use as buffer zones around facilities on the North and South Plateaus, and for maintenance and erosion control. Although the exact amount and timing of land release from WNYNSC under this alternative would be the result of interactions among NYSERDA, the NRC, and DOE (until completion of WVDP), and other Federal and state agencies having jurisdiction, the area ultimately available for release for unrestricted use is estimated to be about 1,118 hectares (2,762 acres) (see **Figure 4–1**).

Visual Resources

Construction of new temporary buildings at WNYNSC would not change the VRM Class IV rating of the disturbed portion of the site. Following completion of decommissioning activities, the visual character of the disturbed portion of the site would improve; however, it is likely that manmade features (e.g., the North and South Plateau caps would be rock covered) would still dominate much of the view. Thus, the VRM Class IV rating of the area would not change. The Class II rating of the less-developed balance of the site, much of which would be available for release for unrestricted use, would not change.

4.1.1.3 Phased Decisionmaking Alternative

Land Use

Phase 1 of the Phased Decisionmaking Alternative would result in removal of facilities such as the Main Plant Process Building and the Low-Level Waste Treatment Facility Area lagoons. Approximately 0.4 hectares (1 acre) of new temporary facilities and structures would be constructed in areas already in use. Adding land required for construction laydown and other purposes (0.4 hectare [1 acre]) would result in a total land disturbance of approximately 0.8 hectare (2 acres), all of which would occur within the existing disturbed portion of the site.

Additional land disturbance would occur in association with the actual removal of facilities and construction of engineered barriers in previously disturbed areas. These actions would involve approximately 10.5 hectares (26 acres). Overall, approximately 11.3 hectares (28 acres) of WNYNSC could be disturbed under Phase 1 of this alternative. Under Phase 1, approximately 693 hectares (1,712 acres) would be available for release for unrestricted use (see **Figure 4–2**). The exact amount and timing of land release from WNYNSC under this alternative would be the result of interactions among NYSERDA, NRC, DOE (until completion of the WVDP), and other Federal and state agencies having jurisdiction.

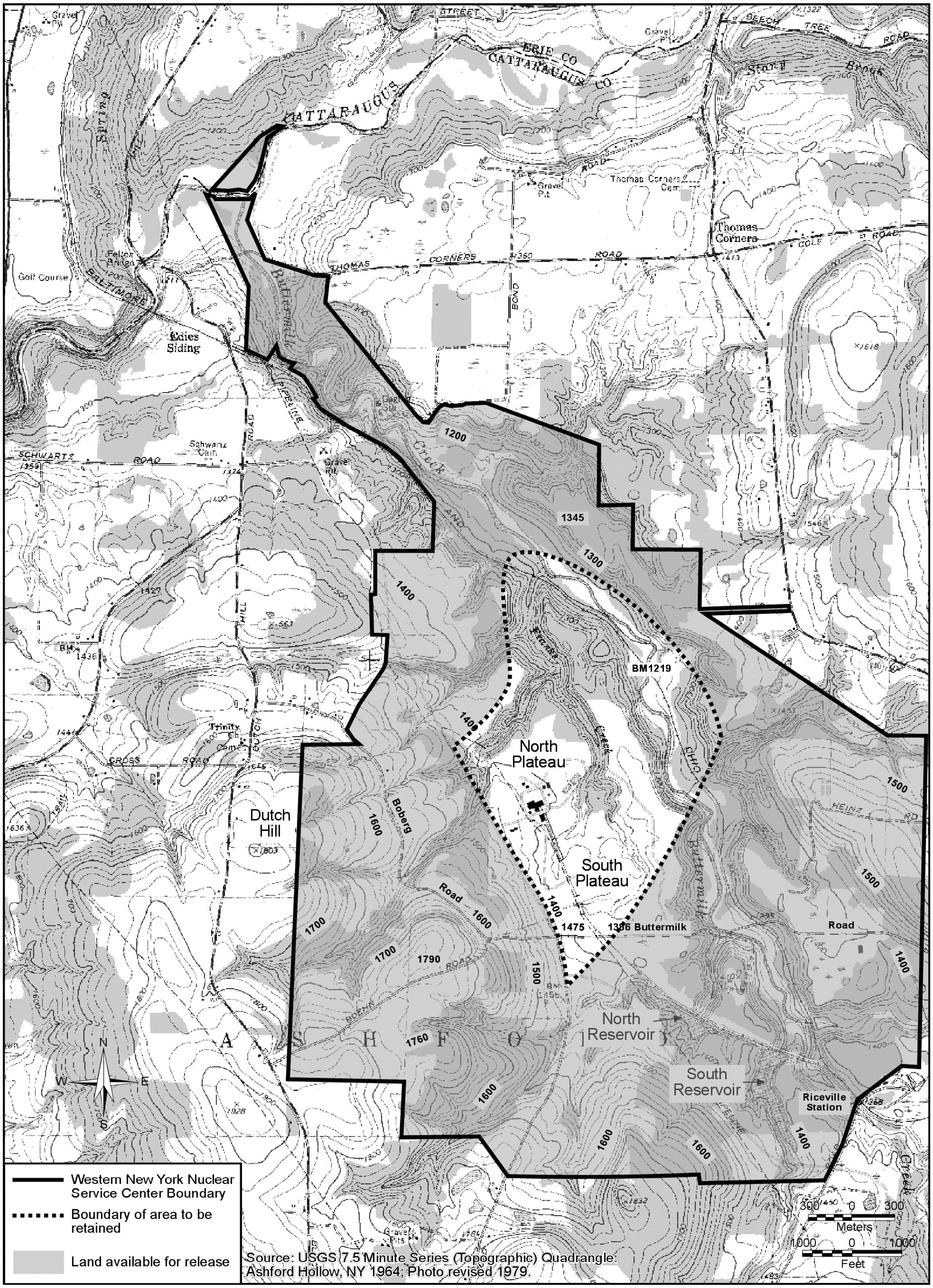


Figure 4–1 Estimate of Portion of the Western New York Nuclear Service Center Land Available for Release for Unrestricted Use After Decommissioning Actions Under the Sitewide Close-In-Place Alternative

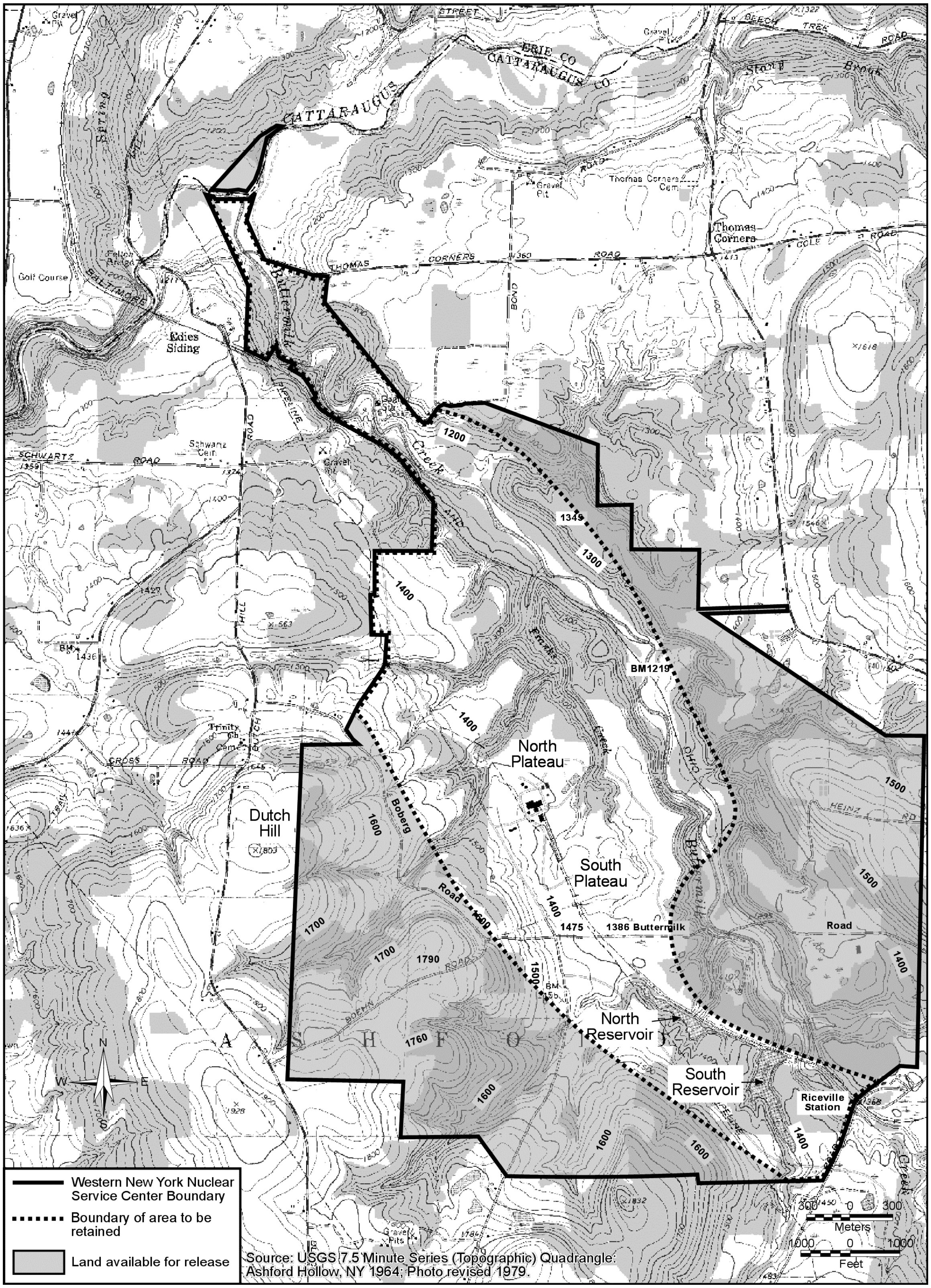


Figure 4–2 Estimate of Nonimpacted Portion of the Western New York Nuclear Service Center Land Available for Release for Unrestricted Use Under the Phased Decisionmaking (Phase 1) and No Action Alternatives

The amount of land impacted by Phase 2 activities, as well as the acreage potentially available for release following decommissioning, would depend on the specific approach taken. Thus, during Phase 2, additional land to be disturbed could range from 17.4 hectares (43 acres) to 38.4 hectares (95 acres), depending on whether decommissioning activities reflect those of the Sitewide Close-In-Place Alternative or the Sitewide Removal Alternative. A decision to continue active management of the SDA would not affect the amount of undisturbed land impacted by closure activities because the SDA is already in a disturbed state.

With regard to the amount of land potentially available for release for unrestricted use, if the Phase 2 decision is removal of remaining waste and contamination, the remaining 658 hectares (1,626 acres) of the site could be available (i.e., all 1,351 hectares [3,338 acres] of WNYNSC). Less land (approximately 6.1 hectares [15 acres], plus a buffer area) would be available for release, however, if the Phase 2 decision for the SDA is continued active management. If the Phase 2 decision is in-place closure, approximately 425 hectares (1,050 acres) beyond those released during Phase 1 could be available for release for unrestricted use while 233 hectares (576 acres) would be retained indefinitely (i.e., as addressed in Section 4.1.1.2, a total 1,118 hectares [2,762 acres] would be available for release for unrestricted use). There would be no change in the amount of land that would be retained indefinitely or available for release if the Phase 2 decision for the SDA is continued active management.

Visual Resources

Removal of all North Plateau facilities, except the Waste Tank Farm and many of its supporting facilities, under Phase 1 of the Phased Decisionmaking Alternative, would result in a somewhat improved appearance for that portion of the site. However, due to the overall disturbed appearance of the area, its VRM Class IV rating would not change. The Class II rating of the less-developed balance of the site would not change.

Following Phase 2, the visual character of the site would depend on the actions taken during that phase. The appearance of the site would be consistent with a VRM Class II rating if decommissioning activities followed those of the Sitewide Removal Alternative. If they more closely reflected those of the Sitewide Close-In-Place Alternative, only those portions of the site to be released would have a more natural visual appearance consistent with a VRM Class II rating. The visual character of areas to be retained would be improved to some extent as a result of implementation actions, but would still present a disturbed appearance consistent with a VRM Class IV rating. If the Phase 2 decision for the SDA is continued active management, the appearance of the SDA would be consistent with a VRM Class IV rating whether the Phase 2 decision for the remaining waste and contamination is removal or in-place closure.

4.1.1.4 No Action Alternative

Land Use

The No Action Alternative would involve continued management and oversight of WNYNSC. No decommissioning decisions would be made, nor decommissioning actions taken. As such, no additional land would be required for construction of new facilities. However, under this alternative, it is estimated that it would be possible to release 693 hectares (1,712 acres) of land not needed for continued management and oversight (see Figure 4–2). The exact amount and timing of land release from WNYNSC under this alternative would be the result of interactions among NYSERDA, NRC, DOE (until completion of WVDP), and other Federal and state agencies having jurisdiction.

Visual Resources

Implementation of the No Action Alternative would not involve any new construction that would further impact the visual landscape of WNYNSC. Accordingly, the appearance of disturbed and undisturbed portions of the site from nearby public vantage points, Route 240, or higher elevations would remain unchanged. Thus, the VRM Class IV and Class II ratings of the disturbed and undisturbed portions of the site would remain unchanged (see Chapter 3, Section 3.1.2).

4.1.2 Site Infrastructure

For all alternatives considered in this EIS, the levels of utility use would be well within existing site capacities. Traffic volumes on local roads affected by the activities addressed in any of the alternatives in this EIS are expected to be comparable to or smaller than traffic volumes associated with WNYNSC activities in recent years. A summary of the impacts of each EIS alternative on infrastructure is presented in **Table 4–2**.

Site infrastructure includes the utility systems required to support construction, operations, decommissioning, removal, or stabilization of facilities. It includes electric power and electrical load capacities, natural gas and liquid fuel (i.e., fuel oil, diesel fuel, and gasoline) capacities, and water supply system capacity. Site infrastructure also includes local road networks such as those shown in Chapter 3, Figure 3–3.

This section addresses utility use and traffic congestion that could be associated with implementing the EIS alternatives. Radiological risks from transport of radioactive waste from WNYNSC are addressed in Section 4.1.12. Physical (nonradiological) risks from possible traffic accidents involving waste shipments and construction material deliveries are also addressed in Section 4.1.12.

Table 4–3 provides comparisons of the impacts of each alternative on utility resource use. Electrical power and natural gas uses are presented for the peak years of utility use, and are compared against site capacities for these resources. Peak potable water use is also presented, but the comparison against site capacity is conservatively presented for total water use rather than potable water use. Total water use is the sum of the projected use of potable, nonpotable, and augmentation water. Table 4–3 also presents, for each alternative, the total electrical power, natural gas, and potable water use for the entire decommissioning effort, the annual averages for these resources during the periods when decommissioning takes place, and the annual averages for these resources for the post-decommissioning monitoring and maintenance periods.

Liquid fuel use is not summarized in Table 4–3 because it is not considered a limiting resource in that supplies can be replenished as needed from offsite sources. Similarly, sanitary sewage demands would not impact site treatment capacity because peak employment levels for all alternatives are expected to be comparable to or smaller than employment levels in recent years.

Utility use varies by alternative, depending on the intensity of the decommissioning activities proposed for each alternative. None of the alternatives would use utility resources in annual quantities exceeding about 21 percent of available site capacities. Care is needed, however, in comparing utility resource use across the alternatives.

Utility resource use for the Phased Decisionmaking Alternative reflects Phase 1 activities, and additional utility resource use would be associated with Phase 2 activities as they are defined in the future (see Table 4–61). As an upper bound, however, the total utility resource use under the entire Phased Decisionmaking Alternative (Phase 1 plus Phase 2) could range up to that under the Sitewide Removal Alternative. Following decommissioning under Phase 2, the annual use of utilities would depend on the need to maintain any contamination left in place, on the need for operation of a facility such as the Container Management Facility for orphan waste storage, and on the possible Phase 2 decision to continue active management of the SDA. Also note that utility resource use would essentially end after completion of decommissioning activities for the Sitewide Removal Alternative, except for utilities used during operation of the Container Management Facility, but would continue indefinitely into the future under the Sitewide Close-In-Place Alternative after completion of decommissioning activities. Utility use would also continue indefinitely into the future under the No Action Alternative.

Table 4–2 Summary of Infrastructure Impacts

Infrastructure	***Sitewide Removal Alternative***	***Sitewide Close-In-Place Alternative***	***Phased Decisionmaking Alternative***	***No Action Alternative***
Utility requirements: electrical power, natural gas, and water	The largest total [a] utility use for decommissioning among all alternatives. Peak annual utility use would represent 10 to 17 percent of the capacities of existing systems. There would be no utility use following decommissioning except for possible continued operation of the Container Management Facility.	Less total [a] utility use for decommissioning compared to the Sitewide Removal Alternative. Peak annual utility use would represent 13 to 21 percent of the capacities of existing systems. Following decommissioning, utilities would be required as part of a long-term stewardship program for the site.	Phase 1 of this alternative would require less total [a] utility use for decommissioning than the Sitewide Close-In-Place Alternative. Peak annual utility use would represent 8.4 to 14 percent of the capacities of existing systems. Including Phase 2, the total utility use for decommissioning under this alternative could range up to that for the Sitewide Removal Alternative. However, if the Phase 2 decision for the SDA is continued active management, the total utility use for decommissioning would be reduced; following Phase 2 decommissioning, annual utility use would be bounded by that for the No Action Alternative.	No decommissioning takes place for this alternative. Utilities would be required for site monitoring and maintenance. Peak annual utility use would represent 2.8 to 4.6 percent of the capacities of existing systems.
Traffic volume	Third largest number of peak daily vehicle trips to and from the site. Elevated traffic volumes would occur over the 60-year period of decommissioning, and would represent about 4.2 times the average daily traffic volume of the No Action Alternative.	Largest number of peak daily vehicle trips to and from the site, including about 8.9 times the peak daily number of trucks as the Sitewide Removal Alternative. Elevated traffic volumes would occur over 7 rather than 60 years. Represents about 6.9 times the average daily traffic volume of the No Action Alternative. Because traffic volumes are likely to be comparable to those in recent years, road capacity would likely not be exceeded.	Phase 1 of this alternative would have a larger number of peak daily vehicle trips to and from the site than the Sitewide Removal Alternative, but about the same number of peak daily truck trips. Elevated traffic volumes could occur over 8 rather than 60 years. Represents about 4.7 times the average daily traffic volume of the No Action Alternative. For Phase 2, the peak daily traffic volume could range up to that for the Sitewide Close-In-Place Alternative. Peak daily traffic volumes during Phase 2 would be reduced if the Phase 2 decision for the SDA is continued active management. Elevated traffic volumes could occur for several years, depending on the Phase 2 decision.	Less than one-quarter the number of total peak daily vehicle trips of other alternatives. Traffic volume would be composed almost totally of personnel vehicles.

SDA = State-Licensed Disposal Area.

[a] For the Sitewide Removal Alternative, total decommissioning utility use is for all activities over 60 years; for the Sitewide Close-In-Place Alternative, total decommissioning utility use is over 7 years, plus operation and decommissioning of the Interim Storage Facility; for Phase 1 of the Phased Decisionmaking Alternative, total decommissioning utility use is over 8 years, plus operation and decommissioning of the Interim Storage Facility.

Table 4–3 Utility Use and Peak Traffic Volumes for Each Alternative

Indicator	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Electricity (megawatt-hours)				
Peak annual electricity use (percent of site capacity) [a]	18,000 (17)	22,000 (21)	14,000 (14)	4,800 (4.6) [b]
Total electricity use during decommissioning [c]	720,000	110,000	98,000	NA [d]
Average annual electricity use during decommissioning	12,000	16,000	12,000	NA [d]
Annual electricity use after decommissioning [e]	930	1,100	2,100	3,600 [d]
Natural Gas (cubic meters)				
Peak annual natural gas use (percent of site capacity) [a]	2,800,000 (10)	3,500,000 (13)	2,300,000 (8.4)	780,000 (2.8) [b]
Total natural gas use during decommissioning [c]	120,000,000	18,000,000	16,000,000	NA [d]
Average annual natural gas use during decommissioning	2,000,000	2,600,000	2,000,000	NA [d]
Annual natural gas use after decommissioning [e]	150,000	180,000	340,000	570,000 [d]
Water (liters)				
Peak annual potable water use (percent of site capacity is for total water use) [a, f]	15,000,000 (11)	19,000,000 (14)	13,000,000 (8.8)	4,300,000 (3.0) [b]
Total potable water use during decommissioning [c]	620,000,000	98,000,000	85,000,000	NA [d]
Average annual potable water use during decommissioning	10,000,000	14,000,000	11,000,000	NA [d]
Annual potable water use after decommissioning [e]	810,000	960,000	1,800,000	3,100,000 [d]
Traffic Volume (peak number of vehicles per day) [g]				
Trucks	38	340	39	Negligible [h]
Waste shipments	15	3	15	Negligible [h]
Material deliveries	23	340	24	Negligible [h]
Personnel vehicles [i]	600	700	660	150
Total [j]	630 (6.5 - 7.9)	1,040 (12 - 15)	700 (7.3 - 9.0)	150 [h]

NA = not applicable.

[a] The value is the peak annual utility resource demand for all activities, with the percent of site capacity in parentheses.

[b] Peak activities for the No Action Alternative occur at intervals of about 20 to 25 years.

[c] For the Sitewide Removal Alternative, total utility use is for all activities over 60 years; for the Sitewide Close-In-Place Alternative, total utility use is over 7 years, plus operation and decommissioning of the Interim Storage Facility; for Phase 1 of the Phased Decisionmaking Alternative, total utility use is over 8 years, plus operation and decommissioning of the Interim Storage Facility.

[d] Decommissioning does not occur under the No Action Alternative. Annual average utility resource use may be determined by averaging use over 60 years of projected annual site monitoring and maintenance, including periodic activities such as roof replacement, as analyzed in the No Action Alternative technical report (WSMS 2009d).

[e] For the Sitewide Removal Alternative, the value reflects the continued operation of the Container Management Facility for orphan waste storage. For the Sitewide Close-In-Place Alternative, the average was determined over 53 years of projected site monitoring and maintenance, not including operation and decommissioning of the Interim Storage Facility. For the Phased Decisionmaking Alternative (Phase 1), the average was determined over 22 years of projected site monitoring and maintenance, not including operation and decommissioning of the Interim Storage Facility. The averages include periodic activities such as replacement of permeable treatment wall media.

[f] Total water is the sum of potable water, nonpotable water, and augmentation water.

[g] Peak daily traffic volumes were estimated by averaging construction delivery and waste shipment traffic over the years when waste shipments and construction material deliveries would principally occur (see footnote i), and estimating personnel vehicles for peak employment years. The volumes reflect daily traffic to and from the site.

[h] Under the No Action Alternative, there would be an average of about 33 waste shipments per year, or an average of 1 waste shipment roughly every 7 to 8 working days, and few deliveries of construction materials.

[i] Waste shipments and construction material deliveries would principally occur over periods of 60, 7, and 8 years, respectively, under the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives. Peak two-way daily personnel traffic levels during these years are listed in the table. Average two-way daily personnel vehicle traffic levels during these years are, respectively, about 500, 640, and 470 trips.

[j] The values in parentheses represent the percent increase in total peak daily traffic on U.S. Route 219 compared to the average daily No Action Alternative traffic level, assuming all traffic to and from WNYNSC uses U.S. Route 219.

Notes: Utility and traffic projections given to 2 significant figures. Totals may not add because of rounding. To convert from cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Sources: WSMS 2009a, 2009b, 2009c, 2009d.

Under all alternatives, as remaining utility connections and system components are shut down as decommissioning activities progress, utility resources could be provided by different means. Electrical power could be supplied by temporary service connections and by portable diesel-fired generators. Potable water could be trucked to the point of use. Portable sanitary facilities could be used by decommissioning personnel, which would constitute a relatively small percentage of the total water demand.

Table 4–3 also presents peak daily traffic volumes to and from WNYNSC in terms of WNYNSC personnel vehicles and trucks (waste shipments from WNYNSC to offsite facilities and deliveries of construction and other materials to WNYNSC). To provide a peak estimate of traffic volumes, all shipments and deliveries for this section were conservatively assumed to be by truck. Traffic volumes were estimated considering traffic both to and from WNYNSC (each vehicle entering WNYNSC was assumed to leave the same day). Personnel vehicle traffic volumes are listed for peak years of projected direct employment assuming one vehicle (car) per worker.[3] The percent increases in peak truck and total vehicle daily traffic volumes over those projected for the No Action Alternative are presented assuming all traffic to and from WNYNSC is routed through U.S. Route 219.

The Sitewide Close-In-Place Alternative would have the largest impact on roads providing access to WNYNSC. As shown in Table 4–3, the peak daily traffic volume under the Sitewide Close-In-Place Alternative would be about 1,040 vehicles, as opposed to about 630 vehicles under the Sitewide Removal Alternative and 700 vehicles under Phase 1 of the Phased Decisionmaking Alternative. Almost all of the truck traffic for the Sitewide Close-In-Place Alternative would be due to deliveries of construction and other material. The truck traffic would be spread over 7 years for the Sitewide Close-In-Place Alternative, but would occur over 60 years for the Sitewide Removal Alternative. Peak personnel vehicle traffic volumes would be somewhat larger under the Sitewide Close-In-Place Alternative than under the Sitewide Removal Alternative; however, peak personnel vehicle traffic would occur for only a few years under the Sitewide Close-In-Place Alternative, but the Sitewide Removal Alternative would continue at levels somewhat smaller than the peak for a longer period of time. The Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives would each result in more than four times the average daily traffic as the No Action Alternative.

The peak daily traffic under Phase 2 of the Phased Decisionmaking Alternative would depend on the scope of Phase 2 activities. If the Phase 2 decision is removal of remaining waste and contamination, the peak daily traffic volume would be comparable to that of the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure, the peak daily traffic volume would be comparable to that of the Sitewide Close-In-Place Alternative. Regarding the second option, much of the daily traffic would consist of trucks making deliveries of construction and other materials. Reduced daily traffic would be expected if the Phase 2 decision for the SDA is continued active management. This is because no activities would be undertaken to either remove the SDA or close it in place, thereby eliminating the transport of waste and construction materials associated with these activities.

Chapter 3, Section 3.2.5, of this EIS discusses and illustrates (see Figure 3–3) the existing road networks near WNYNSC, including U.S. Route 219, which is a major arterial highway in the area and currently operates at Level of Service D near WNYNSC. Conservatively assuming all traffic to and from WNYNSC uses

[3] Although some workers may share rides with other workers, leading to fewer vehicles entering WNYNSC than the number of workers, some workers may also temporarily leave the site, to return the same day.

U.S. Route 219,[4] the peak daily traffic level associated with the Sitewide Removal Alternative would be about 6.5 to 7.9 percent larger on U.S. Route 219 than the average traffic volume associated with the No Action Alternative. A slightly larger increase is projected for Phase 1 of the Phased Decisionmaking Alternative. A still-larger increase (12 to 15 percent) is projected for the Sitewide Close-In-Place Alternative. The projected increase under the Sitewide Removal Alternative, however, would last about 60 years, while the projected increase under the Sitewide Close-In-Place Alternative would last about 7 years, and the projected increase under Phase 1 of the Phased Decisionmaking Alternative would last about 8 years.

Phase 2 of the Decisionmaking Alternative could result in increased traffic on U.S. Route 219 that could range up to that of the Sitewide Close-In-Place Alternative, assuming that the scope of activities for Phase 2 emphasizes in-place closure of facilities such as the SDA or NDA. This increased traffic, however, would be over a relatively short period of time, compared to that required for removing these facilities. In the latter case, the increase in daily traffic on U.S. Route 219 would be smaller (i.e., more comparable to that for the Sitewide Removal Alternative), but would last for a longer period of time.

Under any of the alternatives, however, traffic volumes should be comparable to or smaller than those associated with WNYNSC activities in recent years. Employment at WNYNSC was 1,054 workers in 1993 (DOE 1996a), about 500 in 2003 (DOE 2003e), and 384 as of August 2006 (see Chapter 3, Section 3.10.1). Conservatively discounting daily truck shipments and using the same assumptions for employee vehicles as those for the alternatives in this EIS, the daily traffic levels would have been about 2,100 in 1993, 1,000 in 2003, and 770 in 2006. The projected peak daily traffic level under the Sitewide Close-In-Place Alternative (1,040 vehicles), which is the projected largest of any of the alternatives, would be about half the assumed 1993 traffic level, about equal to the 2003 traffic level, and about 35 percent larger than the 2006 level.

Although implementing any alternative would likely not cause traffic levels to exceed those experienced in the past, if large enough to be of concern, traffic levels on roads such as U.S. Route 219 could be mitigated as addressed in Chapter 6, Section 6.10, of this EIS. Truck deliveries to the site or truck shipments off site could be timed to avoid peak traffic volume hours when work shifts change. Roads could be improved to increase the capacity of traffic entering or exiting the site, or realigned to reduce points of congestion; turning lanes could be created for entering and exiting WNYNSC; or traffic signals could be installed at important intersections. Employee programs and incentives for ridesharing could be implemented, as could employee programs that provide flexible hours or staggered work shifts. Shipment or delivery of some wastes or materials by rail would also mitigate traffic congestion.

If constructed, the planned extension of the U.S. Route 219 freeway from its current terminus at Route 39 in Springville, New York (a few miles north of WNYNSC), to Interstate 86 near Salamanca, New York, should also mitigate any local traffic pressures. The freeway extension will parallel existing U.S. Route 219, which will be retained (USDOT and NYSDOT 2003b). Completion of a 6.8-kilometer (4.2-mile) extension of the freeway to Peters Road in Ashford, New York (west-northwest of WNYNSC), is expected in winter 2009/2010 (NYSDOT 2008a). Completion of the entire 45-kilometer (28-mile) extent of the freeway is expected in winter 2014/2015 (NYSDOT 2008b).

It is not expected that traffic volumes in the two-county Region of Influence (ROI) would be substantially affected by implementing any of the alternatives. Projected direct and indirect employment levels (see Section 4.1.8) can be used as an indicator for likely regional traffic volumes. The average direct and indirect employment levels for the decommissioning periods under the Sitewide Removal, Sitewide Close-In-

[4] *A 2006 Environmental Assessment for the West Valley Demonstration Project estimated a daily total traffic volume of 6,100 to 7,500 vehicles along U.S. Route 219 between its intersection with New York Route 39 in Springville and the intersection with Cattaraugus County Route 12 (East Otto Road), of which approximately 18 percent (1,100 to 1,350 vehicles) was truck traffic (DOE 2006c).*

Place, and Phased Decisionmaking (Phase 1) Alternatives would be roughly 3 to 4 times as large as the average for the No Action Alternative (about 155 direct and indirect), and these increased employment levels would last longer under the Sitewide Removal Alternative than under the Sitewide Close-In-Place and Phased Decisionmaking Alternatives. Nonetheless, the levels for any alternative would represent only a tiny fraction of the population in the ROI, which comprised about 990,000 persons in 2008.[5] The average levels for the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternative decommissioning periods would respectively represent about 0.05 percent, 0.07 percent, and 0.05 percent of the 2008 population. Finally, the largest average direct and indirect employment level for any of the alternatives (660 for the Sitewide Close-In-Place Alternative) would be still smaller than WNYNSC employment levels as recently as 2006 (about 800 direct and indirect). Therefore, the impact on regional traffic volumes under any of the alternatives is expected to be small.[6] This conclusion is expected to be the same considering the peak employment levels that could be required under Phase 2 of the Phased Decommissioning Alternative.

4.1.2.1 Sitewide Removal Alternative

Implementing this alternative would enable the release of all WMAs for unrestricted use. Several new facilities would be constructed, operated, and ultimately closed in support of removal actions, requiring use of utility resources.

During decommissioning, removal of WMA 8 (the SDA) would have the largest demand of any activity for electricity, natural gas, and potable water. This is partly a reflection of the relatively long period of time over which WMA 8 removal would take place and the intensity of the removal activities required, including heavy equipment use and the construction, operations, and eventual demolition of environmental enclosures. Annual utility resource requirements for WMA 8 removal would range from about 2,700 to 8,200 megawatt-hours of electrical power, 430,000 to 1.3 million cubic meters (15 million to 46 million cubic feet) of natural gas, and 2.3 million to 7.1 million liters (610,000 to 1.9 million gallons) of potable water.

For purposes of this analysis, the Interim Storage Facility is projected to operate until it is demolished during years 36 through 38 of the alternative timeline. For each of these 3 years, demolition activities would require about 661 megawatt-hours of electrical power, 110,000 cubic meters (3.7 million cubic feet) of natural gas, and 570,000 liters (150,000 gallons) of potable water.

Considering all activities, electrical power, natural gas, and potable water use would each peak in year 20. Peak annual electricity, natural gas, and total water use would be about 17 percent, 10 percent, and 11 percent, respectively, of the capacities of WNYNSC utility systems.

Following completion of decommissioning activities, there could be some annual utility resource use associated with onsite storage of orphan waste. To estimate utility resource use in this event, it was assumed that the Container Management Facility would continue to operate following completion of removal activities. Annual electrical power, natural gas, and potable water requirements for Container Management Facility operations would be, respectively, about 930 megawatt-hours; 150,000 cubic meters (5.2 million cubic feet); and 810,000 liters (210,000 gallons) (WSMS 2009a).

---

[5] From Chapter 3, Section 3.10.2, the population in the ROI (Cattaraugus and Erie Counties) declined from 1,034,220 in 2000 to 989,533 in 2008. The largest projected average direct and indirect employment level for any of the alternatives (660 persons) would represent only about 1.5 percent of this population decline.

[6] Also see the conclusion of Section 4.1.8, Socioeconomics, of this chapter. None of the alternatives would have any appreciable impact on the demographic characteristics of the ROI. It is expected that the in-migration of workers, if any, to support closure or long-term management operations at WNYNSC under any of the alternatives would be small. This lack of worker in-migration supports the conclusion that regional traffic volumes would not be significantly affected by implementing any of the alternatives addressed in this EIS.

Shipments of waste and deliveries of construction materials under this alternative would generally occur throughout the life of the 60-year decommissioning period. The average two-way truck traffic over 60 years would be about 38 daily trips, representing 2.8 to 3.5 percent of the truck traffic reported on U.S. Route 219 in the 2006 *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project* (DOE 2006c). The two-way personnel vehicle traffic would peak at about 600 daily trips in year 26, experience a low of 74 daily trips in year 60, and average about 500 daily trips over the 60-year decommissioning period.

The combined two-way truck and personnel vehicle traffic would peak at about 630 daily trips. Assuming all truck and personnel traffic to and from WNYNSC would be routed through U.S. Route 219, daily truck and personnel traffic on U.S. Route 219 would increase by 6.5 to 7.9 percent compared to the daily traffic associated with the No Action Alternative. Trucks alone would increase by about 2.8 to 3.4 percent, while personnel vehicles alone would increase by about 7.3 to 8.9 percent.

4.1.2.2 Sitewide Close-In-Place Alternative

Decommissioning under this alternative would have reduced total utility resource requirements compared to the Sitewide Removal Alternative. Decommissioning would be largely completed in about 7 years, although for purposes of analysis the Interim Storage Facility was assumed to operate until year 32, and would be decommissioned in year 33. Long-term stewardship would ensue after decommissioning is complete and would last indefinitely into the future. For 4 of the 7 years that decommissioning would take place, the largest utility resource use would be associated with WMA 8 closure. Annual electrical power, natural gas, and potable water requirements for WMA 8 closure would be about 5,100 megawatt-hours; 810,000 cubic meters (29 million cubic feet); and 4.4 million liters (1.2 million gallons), respectively. Annual operation of the Interim Storage Facility would require about 140 megawatt-hours of electricity; 22,000 cubic meters (790,000 cubic feet) of natural gas; and 120,000 liters (32,000 gallons) of potable water. Decommissioning the Interim Storage Facility would require about 1,700 megawatt-hours of electricity; 270,000 cubic meters (9.4 million cubic feet) of natural gas; and 1.4 million liters (380,000 gallons) of potable water.

For all three utility resources, peak annual demands are projected to occur in year 6. Peak annual electricity, natural gas, and total water use would be about 21 percent, 13 percent, and 14 percent, respectively, of the capacities of WNYNSC utility systems. There would be no impact on site sanitary sewage treatment capacity because, although peak direct employment levels are the largest of any alternative in this EIS, they are smaller than site employment levels in the recent past.

Following the 7-year decommissioning period, annual utility requirements would be for site security, site environmental monitoring, and maintenance of erosion controls and the caps for WMA 7 (the NDA), WMA 8, and the North Plateau Groundwater Plume. In addition, utilities would be required about every 20 years to replace media for the North Plateau Groundwater Plume permeable treatment wall, and about every 35 years to replace security system equipment. Considering all these activities (but not operation and closure of the Interim Storage Facility), average annual utility use would include about 1,100 megawatt-hours of electricity; 180,000 cubic meters (6.3 million cubic feet) of natural gas; and 960,000 liters (250,000 gallons) of potable water. Each replacement of media for the permeable treatment wall would alone require about 220 megawatt-hours of electricity; 36,000 cubic meters (1.3 million cubic feet) of natural gas; and 190,000 liters (51,000 gallons) of potable water. Each replacement of security system equipment would alone require about 300 megawatt-hours of electricity; 48,000 cubic meters (1.7 million cubic feet) of natural gas; and 260,000 liters (69,000 gallons) of potable water.

Almost all of the waste shipments and construction material deliveries for this alternative would occur over the first 7 years of the implementation period when most decommissioning would take place, and would reflect the need for large quantities of soil, sand, gravel, and other materials (see Table 4-61). The average two-way truck traffic would be about 340 daily trips, almost all of which would be due to deliveries of construction materials, and would represent 25 to 31 percent of the truck traffic reported on U.S. Route 219 in the 2006 environmental assessment (EA) (DOE 2006c). The two-way personnel vehicle traffic would peak at about 700 daily trips in year 2, experience a low of 36 daily trips in year 34, and average 640 daily trips over the 7-year decommissioning period.

The combined two-way truck and personnel vehicle traffic would peak at about 1,040 daily trips. Assuming all traffic to and from WNYNSC would be routed through U.S. Route 219, the total daily truck and personnel vehicle traffic flow on U.S. Route 219 would increase by 12 to 15 percent compared to the daily traffic associated with the No Action Alternative. (Trucks alone would increase by about 25 to 31 percent, while personnel vehicles alone would increase by about 8.9 to 11 percent.) Peak daily truck traffic would be about 8.9 times greater than that estimated for the Sitewide Removal Alternative. Traffic volumes for all vehicles would be about 65 percent larger than those under the Sitewide Removal Alternative but would last for a far shorter time period. Impacts could be mitigated, if needed, by administrative controls such as those discussed above.

4.1.2.3 Phased Decisionmaking Alternative

Decommissioning under Phase 1 of this alternative is projected to occur over 8 years. Thereafter, for purposes of this analysis, the Interim Storage Facility was assumed to operate until year 29 and be decommissioned in year 30.

During the first 4 years, decommissioning of WMA 1 (the Main Plant Process Building and Vitrification Facility Area) would have the largest requirements for electrical power, natural gas, and potable water. Over 8 years, annual electrical power use for this activity would range from about 1,900 to 10,000 megawatt-hours; annual natural gas use would range from about 310,000 to 1.6 million cubic meters (11 million to 57 million cubic feet); and annual potable water use would range from about 1.7 million to 8.8 million liters (440,000 to 2.3 million gallons). Annual operation of the Interim Storage Facility would require about 140 megawatt-hours of electricity; 22,000 cubic meters (790,000 cubic feet) of natural gas; and 120,000 liters (32,000 gallons) of potable water. Decommissioning the Interim Storage Facility would require about 2,000 megawatt-hours of electricity; 320,000 cubic meters (11 million cubic feet) of natural gas; and 1.7 million liters (450,000 gallons) of potable water.

Peak utility resource use during closure, considering all activities, would be concentrated in year 1. Peak annual electricity, natural gas, and total water use would be about 14 percent, 8.4 percent, and 8.8 percent, respectively, of the capacities of WNYNSC utility systems.

Following the 8-year decommissioning period, utilities would be used for site security, site environmental monitoring, and site maintenance including maintenance of WMA 3 (Waste Tank Farm Area), WMA 7, and WMA 8. Utilities may also be required for one-time replacements of media for the North Plateau Groundwater Plume permeable treatment wall and the geomembrane covering WMA 8. Considering all these activities (but not operation and closure of the Interim Storage Facility), average annual utility use would include about 2,100 megawatt-hours of electricity; 340,000 cubic meters (12 million cubic feet) of natural gas; and 1.8 million liters (490,000 gallons) of potable water. Each replacement of the WMA 8 geomembrane would alone require about 1,200 megawatt-hours of electricity; 190,000 cubic meters (6.7 million cubic feet) of natural gas; and 1.0 million liters (270,000 gallons) of potable water. Each replacement of media for the permeable treatment wall would alone require about 220 megawatt-hours of electricity; 36,000 cubic meters (1.3 million cubic feet) of natural gas; and 190,000 liters (51,000 gallons) of potable water.

Utility use under Phase 2 of this alternative would depend on future decisions. As a first approximation, the total utility use for decommissioning under the Phased Decisionmaking Alternative (Phase 1 plus Phase 2) could range up to that under the Sitewide Removal Alternative. Following decommissioning under Phase 2, use of utilities would depend on the need to maintain any contamination left in place, on the need for operation of a facility such as the Container Management Facility for storage of orphan waste, and on the possible Phase 2 decision to continue active management of the SDA. A Phase 2 decision to continue active management of the SDA would reduce the total decommissioning utility use for this alternative. Following decommissioning, annual utility use at the site would be bounded by that for the No Action Alternative.

Most waste shipments and construction material deliveries for Phase 1 of this alternative would occur over an 8-year period when decommissioning takes place. Assuming all waste shipments and construction material deliveries occur during these 8 years, the two-way truck traffic would be about 39 daily trips, representing 2.9 to 3.5 percent of the truck traffic reported on U.S. Route 219 in the 2006 environmental assessment (DOE 2006c). The two-way personnel vehicle traffic would peak at about 660 daily trips in year 3, experience a low of 98 daily trips in year 9, and average about 470 daily trips over the 8-year decommissioning period.

The combined two-way truck and personnel vehicle traffic volume would peak at about 700 daily trips. Assuming all traffic to and from WNYNSC would be routed through U.S. Route 219, the total daily truck and personnel vehicle traffic flow on U.S. Route 219 would increase by 7.3 to 9.0 percent compared to the daily traffic associated with the No Action Alternative. (Trucks alone would increase by about 2.8 to 3.5 percent, while personnel vehicles alone would increase by about 8.3 to 10 percent.) The peak daily impacts for Phase 1 would be slightly larger than those for the Sitewide Removal Alternative. Additional impacts could occur from implementation of Phase 2, and would depend on the extent of the Phase 2 activities and the timing for their implementation. Conservatively discounting waste and material removed from the site during Phase 1, peak daily traffic volumes for Phase 2 could range up to that for the Sitewide Close-In-Place Alternative. Peak daily traffic volumes would be reduced if the Phase 2 decision for the SDA is continued active management, due to the elimination of the need to transport waste and construction materials associated with removal or close-in-place activities at the SDA.

4.1.2.4 No Action Alternative

Annual activities would include sitewide monitoring and maintenance. Assumed periodic replacement of building roofs and permeable treatment wall media and refurbishment of the geomembrane covers for the SDA and NDA would result in increased utility resource use about every 20 to 25 years. Considering all activities, annual average utility demands would include about 3,600 megawatt-hours of electricity; 570,000 cubic meters (20 million cubic feet) of natural gas; and 3.1 million liters (830,000 gallons) of potable water. Each Main Plant Process Building roof replacement would alone require about 1,300 megawatt-hours of electricity; 200,000 cubic meters (7.2 million cubic feet) of natural gas; and 1.1 million liters (290,000 gallons) of potable water. Each SDA geomembrane refurbishment would alone require about 1,400 megawatts-hours of electricity; 230,000 cubic meters (8.1 million cubic feet) of natural gas; and 1.2 million liters (330,000 gallons) of potable water. Each NDA geomembrane refurbishment would alone require about 530 megawatt-hours of electricity; 85,000 cubic meters (3.0 million cubic feet) of natural gas; and 450,000 liters (120,000 gallons) of potable water. Considering all activities, peak annual electricity, natural gas, and total water use would be about 4.6 percent, 2.8 percent, and 3.0 percent, respectively, of the capacities of WNYNSC utility systems.

Under this alternative, there would be an annual average of about 33 offsite shipments of waste, or 1 shipment roughly every 7 to 8 working days. There would be a small increase in construction material shipments during the periods of roof replacement and SDA and NDA geomembrane refurbishment, but the construction effort would not be large. (Construction materials would be dominated by roofing materials, geomembranes, and similar materials.) Assuming all traffic to and from WNYNSC would be routed through U.S. Route 219, the average daily truck traffic would represent about 0.02 percent of the truck traffic reported on U.S. Route 219 in the 2006 environment assessment (DOE 2006c). The direct employment level would be about 75 persons, resulting in an average employee traffic level of about 150 daily trips.

4.1.3 Geology and Soils

Decommissioning activities at WNYNSC would impact geologic and soil resources. Geologic and soil resources within Cattaraugus County (see Chapter 3, Section 3.3.1.3) consist predominantly of commercial aggregate (sand and gravel) mining and oil and gas production. Oil and gas resources are developed within Cattaraugus County. In the Town of Ashford, for example, wells have been developed to depths of up to about 2,300 meters (7,500 feet) below land surface (NYSDEC 2009).

The geology and soil resources that could be impacted by decommissioning activities would represent a limited portion of WNYNSC (approximately 49.8 hectares [123 acres] of the 1,351 hectares [3,338 acres]) and a very small fraction of Cattaraugus County resources. Two measures were used to assess the impact of the alternatives on geologic and soil resources. The first measure was the consumption of geologic resources (e.g., soil, sand, gravel, and clay/bentonite), under a given alternative, to replace or restore removed or contaminated materials. The second measure considered the impact of changes in the distribution of the geologic resources within WNYNSC. Resource consumption or redistribution volumes under all levels of removal or restoration were considered to impact the overall availability of materials over the WNYNSC and Cattaraugus County region. Impacts on geologic resources by alternative are summarized in **Table 4–4**.

The preliminary engineering analysis conducted for each of the alternatives developed estimates of the volumes of geologic material that would be required to implement each alternative (WSMS 2009a, 2009b, 2009c, 2009d). **Table 4–5** presents a summary of the estimated volumes that would be required to fill areas of exhumation for the Sitewide Removal and Phased Decisionmaking (Phase 1) Alternatives and to construct the engineered caps for the Sitewide Close-In-Place Alternative.

An evaluation was also completed to determine the availability of rock, aggregate, soil, and products derived from rock and mineral resources to support construction, operations, and closure activities under each of the alternatives (NYSDEC 2008b). The land area to be disturbed and geologic resources consumed, the depth and extent of required excavation work, and the land areas occupied during operations were calculated. Specifically included in this analysis was the provision for borrow materials from onsite quarries and borrow pits. Based on the volume requirements for the different alternatives and limited onsite resources, supplemental borrow materials would be needed from offsite regional sources.

4.1.3.1 Sitewide Removal Alternative

Under the Sitewide Removal Alternative, contaminated soil would be removed and replaced from offsite sources. Approximately 1.2 million cubic meters (1.6 million cubic yards) of soil, sand, gravel, and clay/bentonite would be required, along with concrete, cement, and some grout. The greatest requirements are for soil, concrete, clay, sand, and gravel. Permitted sand and gravel resources in Cattaraugus County consist of approximately 710 hectares (1,750 acres), with an estimated 3,984 life-of-mine acreage (NYSDEC 2008b). Life-of-mine acreage is the total number of acres of mineral reserves that will be mined over the duration of mining at a location, including lands previously reclaimed, areas currently affected by mining, and areas to be affected in the future. Substantial sand and gravel resources are located east of WNYNSC along the Highway 16 corridor in Cattaraugus County (Martin 2000). Clay and till resources are not extensively mined in Cattaraugus County (NYSDEC 2008b); therefore, a borrow area for clay backfill would need to be located.

Table 4–4 Summary of Geology and Soil Resource Impacts

Impact	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Consumption of Geologic Resources	The Sitewide Removal Alternative would require use of a moderate amount of geologic resources (1,211,000 cubic meters of soil, sand, gravel, and clay/bentonite) to replace excavated areas of waste and contamination and to restore local hydrogeologic properties and topography.	The Sitewide Close-In-Place Alternative would require use of a greater amount of geologic resources (2,192,000 cubic meters of soil, sand, gravel, and clay/bentonite) to construct the onsite engineered caps.	Phase 1 would require use of a smaller amount of geologic resources (167,000 cubic meters of soil, sand, gravel, and clay/bentonite) to replace excavated areas of waste and contamination and to restore local hydrogeologic properties and topography. Depending on the Phase 2 decision, impacts of this alternative would be bounded by those for the Sitewide Removal and Sitewide Close-In-Place Alternatives because of the possible combination of removals, treatments, and engineered cap construction. Impacts would be reduced if the Phase 2 decision for the SDA is continued active management.	Contaminated soil aggregate resources would remain contaminated. There would be no impact on aggregate resource needs because no backfill materials would be required.
Redistribution of Geologic Resources	There is short-term potential for material movement due to erosion as areas are being excavated and filled before the re-establishment of ground cover. Natural erosion would also occur after area restoration is complete.	There is short-term potential for material movement due to exposed geologic material while the engineered caps are being constructed. Some natural erosion would also occur after the area is contoured and vegetated, but it should be less than the Sitewide Removal Alternative because there would be active erosion control measures.	There is short-term potential for material movement due to erosion as the Phase 1 areas are excavated and backfilled before the re-establishment of ground cover. Depending on the Phase 2 decision, the nature of longer-term geological resource redistribution by erosion would be bounded by those for the Sitewide Removal, Sitewide Close-In-Place, and No Action Alternatives. Fully restored areas would erode naturally following establishment of ground cover. Areas associated with cap construction could experience slightly accelerated erosion surrounding the caps because of the topographic contouring of the caps (to minimize ponding), relatively impermeable membrane layers in the cap constructions, and the presence of erodible soils outside the caps. If the Phase 2 decision for the SDA is continued active management, best management practices would be required indefinitely to minimize erosion for the SDA.	Over the short-term, there would be a slower erosion rate than for the other alternatives because of the lack of land disturbance activities under the No Action Alternative. Best management practices would be required indefinitely.

Note: To convert from cubic meters to cubic feet, multiply by 35.314.

Table 4–5 Major Geologic and Soil Resource Requirements

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Soil (cubic meters)	1,107,000	917,000	95,300	Negligible
Sand and gravel (cubic meters)	31,700	1,099,000	1,150	Negligible
Clay/bentonite (cubic meters)	72,200	176,000	70,100	Negligible
Total	1,211,000	2,192,000	167,000	Negligible

Note: Totals may not add precisely due to rounding. To convert from cubic meters to cubic feet, multiply by 35.314.
Sources: WSMS 2009a, 2009b, 2009c, 2009d.

The construction activities to support removal actions, as well as the removal actions themselves, would create a potential for temporarily accelerated runoff and soil erosion in the disturbed portions of the site. The use of best management practices for runoff and erosion control during construction and WMA closure would be effective in minimizing short-term effects of landscape alteration. Surface runoff and drainage from disturbed areas would be controlled, collected, and conveyed to sediment basins. Areas susceptible to erosion from surface flows would be protected through the use of sediment ponds, rip-rap, silt fences, or other techniques. Mitigation measures are described in Chapter 6 of this EIS. Over the longer term, vegetative cover would be re-established over the areas of removal, and erosion would proceed at a near-natural rate in the previously disturbed areas.

4.1.3.2 Sitewide Close-In-Place Alternative

Under the Sitewide Close-In-Place Alternative, surface topography on the North and South Plateaus would be impacted by the construction of layered engineered caps. Approximately 2.2 million cubic meters (2.9 million cubic yards) of soil, sand, gravel, and soil/bentonite would be required, along with less concrete and cement than for the Sitewide Removal Alternative, but substantially greater amounts of grout. Most of the material would be used for construction of engineered caps. The major requirements for geologic material (soil, sand and gravel, and rock) could be met from local sources. The requirements for grout to stabilize wastes and residual radioactive waste in piping and other equipment; stabilize disposal holes and trenches at the NDA and the SDA, respectively; and stabilize equipment and structures within the Waste Treatment Facility and Main Plant Process Building could be met through commercial sources. Concrete demands would be less under this alternative, commensurate with reduced need for new surface facilities construction (WSMS 2009b).

Subsidence associated with cap construction over the burial areas would be minimized through grout injection to fill voids around the buried waste in the NDA and SDA.

Construction of the engineered caps would create the potential for temporarily accelerated runoff and soil erosion in the disturbed portions of the site. The use of best management practices for runoff and erosion control during construction of the cap would minimize short-term erosion. Surface runoff and drainage from disturbed areas would be controlled, collected, and conveyed to sediment basins. Areas susceptible to erosion from surface flows would be protected through the use of sediment ponds, rip-rap, silt fences, or other techniques. Mitigation measures are described in Chapter 6 of this EIS. Over the longer term, erosion would proceed at a rate lower than the natural rate as a result of engineered measures that would be taken to reduce the rate of erosion and, where possible, repair damage caused by erosion.

4.1.3.3 Phased Decisionmaking Alternative

Geologic and soil resource use under Phase 1 of the Phased Decisionmaking Alternative would be substantially less than that for the Sitewide Removal and Sitewide Close-In-Place Alternatives (see Table 4–5). Construction activities supporting removal actions, as well as the removal actions themselves, would create a potential for temporarily accelerated runoff and soil erosion in the disturbed portions of WNYNSC. Disturbed areas, however, would be smaller than those for the other two alternatives because the removal actions of Phase 1 would be localized. Impacts would be mitigated using similar mitigation measures as those discussed in Sections 4.1.3.1 and 4.1.3.2. Impacts and mitigation measures for the remaining facility areas, including the South Plateau, would be similar to those described in Section 4.1.3.4 for the No Action Alternative.

The Phase 2 decision may result in removal of remaining contamination and structures, in-place closure, or, in the case of the SDA, continued active management. Depending on the Phase 2 decision, geologic resource use under this alternative would be bounded by those for the Sitewide Removal and Sitewide Close-In-Place Alternatives because of the possible combination of removals, treatments, and engineered cap construction.

There would be reduced geologic resource use if the Phase 2 decision for the SDA is continued active management.

Depending on the Phase 2 decision, the nature of longer-term geological resource redistribution by erosion would be bounded by those for the Sitewide Removal, Sitewide Close-In-Place, and No Action Alternatives. Fully restored areas would erode naturally following establishment of ground cover. Areas associated with cap construction could experience slightly accelerated erosion surrounding the caps because of the topographic contouring of the caps (to minimize ponding), relatively impermeable membrane layers in the cap constructions, and the presence of erodible soils outside the caps. If the decision for the SDA is continued active management, best management practices would be required indefinitely to minimize erosion for the SDA.

4.1.3.4 No Action Alternative

Under the No Action Alternative, contaminated geologic resources, including sand and gravel and clay till on the North Plateau and clay till on the South Plateau beneath WNYNSC WMAs, would remain in place and contaminated. Under this alternative, mineral resource requirements (e.g., soil, sand, gravel, and clay/bentonite) would be negligible.

In the short term, there would be less potential for erosion than for the other alternatives because of the lack of land disturbing activities. Use of best management practices for runoff and erosion control would minimize erosion. These actions would continue indefinitely.

4.1.4 Water Resources

Water resource impacts would occur as a result of some of the decommissioning actions at WNYNSC. Construction and excavation activities could lead to increased stormwater runoff, erosion and/or sedimentation, and short-term changes in surface water flow paths. Direct impacts on surface water could result from temporary or permanent grading, rerouting, or filling of surface water resources. Indirect impacts could result from potentially increased or impeded surface flows or be caused by flooding. Groundwater quality could be affected if there are localized changes to groundwater flow or changes in infiltration rates with consequent changes to recharge rates of surface water to the groundwater system. Unplanned spills or releases during the construction and operations phases of planned activities could impact surface water and groundwater quality.

A summary of impacts of each alternative on water resources is presented in **Table 4–6**.

Table 4–6 Summary of Impacts on Water Resources

Potential Short-term Impacts Affecting Water Quality	***Sitewide Removal Alternative***	***Sitewide Close-In-Place Alternative***	***Phased Decisionmaking Alternative***	***No Action Alternative***
Floodplain	The Interim Storage Facility may extend into the probable maximum flood floodplain. Only temporary removal actions would occur in the 100-year floodplain.	The Interim Storage Facility may extend into the probable maximum flood floodplain. Engineered barriers on the South Plateau and erosion control features would intrude into the 100-year and PMF floodplain.	For Phase 1, the Interim Storage Facility may extend into the probable maximum flood floodplain. Only temporary removal actions would occur in the 100-year and PMF floodplain. Overall impacts (Phase 1 and Phase 2) would be bounded by those for the Sitewide Close-In-Place and Sitewide Removal Alternatives. Similar or smaller impacts would result if the Phase 2 decision for the SDA is continued active management.	No impact.

Potential Short-term Impacts Affecting Water Quality	***Sitewide Removal Alternative***	***Sitewide Close-In-Place Alternative***	***Phased Decisionmaking Alternative***	***No Action Alternative***
Surface water flow	Construction or contaminant removal activities of short duration may result in short-term impact on surface flows. Surface water flow patterns would be reestablished upon completion of the alternative.	Installation of engineered barriers and erosion control features would result in small-scale, localized changes in surface water flow patterns.	Stream sediments would not be remediated for Phase 1, with no impact on surface water flow. Overall impacts (Phase 1 and Phase 2) would range between those for the Sitewide Close-In-Place and Sitewide Removal Alternatives. If the Phase 2 decision for the SDA is continued active management, overall short-term impacts would be bounded by those for the Sitewide Close-In-Place and Sitewide Removal Alternatives while long-term impacts would be bounded by those for the No Action Alternative.	No change in flow.
Surface water quality	Construction and excavation activities would increase sediment generation that would be locally intercepted and managed to minimize sediment discharges to surface streams. Contaminated water would be treated prior to permitted discharge to surface streams.	Construction activities would increase sediment generation that would be locally intercepted and managed to minimize sediment discharges to surface streams. Surface water quality would be improved following decommissioning and would be monitored over the long term.	Phase 1 excavation activities would increase sediment generation that would be locally intercepted and managed to minimize sediment discharges to surface streams. Surface water quality would be improved following Phase 1 decommissioning actions. Overall impacts (Phase 1 and Phase 2) would be bounded by those for the Sitewide Close-In-Place and Sitewide Removal Alternatives. If the Phase 2 decision for the SDA is continued active management, overall short-term impacts would be bounded by those for the Sitewide Close-In-Place and Sitewide Removal Alternatives while long-term impacts would be bounded by those for the No Action Alternative.	Contaminated water would be treated prior to permitted discharge to surface streams. No change in impact.
Groundwater flow	Existing groundwater flow patterns would be re-established upon completion of the alternative.	Groundwater flow patterns would be modified because of installation of engineered barriers designed to increase the hydrogeologic isolation of contaminated material.	For Phase 1, groundwater flow patterns would be modified slightly in the immediate area of the Main Plant Process Building and Waste Tank Farm as a result of the local groundwater barrier designed to limit groundwater flow between the Main Plant Process Building excavation area and the remaining portion of the North Plateau Groundwater Plume. Overall impacts (Phase 1 and Phase 2) would be bounded by those for the Sitewide Close-In-Place and Sitewide Removal Alternatives If the Phase 2 decision for the SDA is continued active management, overall impacts would be bounded by those for the Sitewide Removal, Sitewide Close-In-Place, and No Action Alternatives.	No change in flow.
Groundwater quality	Groundwater quality would improve as a result of removal actions.	General groundwater quality would be improved as a result of increased hydrologic isolation of radionuclides and hazardous materials. Long-term groundwater quality would be monitored.	Groundwater quality in the immediate areas of the Phase 1 removal actions would improve as a result of the removal activities. Overall impacts (Phase 1 and Phase 2) would be bounded by those for the Sitewide Close-In-Place and Sitewide Removal Alternatives. If the Phase 2 decision for the SDA is continued active management, overall impacts would be bounded by those for the Sitewide Removal, Sitewide Close-In-Place, and No Action Alternatives.	No change.

PMF = probable maximum flood, SDA = State-Licensed Disposal Area.

4.1.4.1 Sitewide Removal Alternative

Surface Water Flow and Quality

Contamination removal actions in and around surface streams would result in temporary localized changes in surface water flow patterns. Streamflow would be temporarily diverted from stream sections where contaminated sediment would be removed. Surface water flow patterns would be reestablished upon completion of the alternative. Sediment removal in or potentially affecting surface water would be performed in accordance with NYSDEC regulations and guidance for the management of dredged material. These requirements would be specified in a site-specific control plan before beginning such operations.

Impacts as a result of construction and contamination removal actions across the developed portion of the site would be minimal. Construction and contamination activities under this alternative would result in exposed soils across the site, especially during decommissioning. Proper controls and construction practices would be applied to mitigate potential impacts from stormwater runoff, such as erosion and deposition of exposed soils. The following mitigation controls could minimize impacts from runoff: runoff interceptor trenches or swales, filter or silt berms/fences, sediment barriers or basins, rock-lined ditches/swales, slope-shaping and retaining fences, surface water runoff management, stormwater drainage structures, and waste management systems (NYSDEC 2005c). The restoration of stream areas would also include the installation of geotextiles, which would assist the reduction of the amount of soil carried away by stream flow and stormwater runoff (WSMS 2009a). As a result of the effectiveness of these mitigation methods, long-term impacts to channel morphology, stream flow and quality are not expected to occur. Upon completion of removal actions, topsoil would be applied as necessary to restore the preexisting surface contour. Native vegetation would also be restored to minimize exposed soils.

Construction and contamination removal operations would create the potential for spilled materials from construction equipment, including diesel fuel or petroleum, oils, and lubricants. The impacts of fuel, oil, or lubricant spills could be minimized by keeping the equipment in good repair and conducting maintenance operations in areas designed for such operations. In the event of a spill, New York State responds to reports of petroleum and other hazardous material releases through the Spill Response Program maintained by NYSDEC (NYSDEC 2009).

Nonhazardous sanitary wastewater (i.e., domestic sewage) would be managed via the existing sanitary wastewater collection and treatment system during the construction and operations phases of this alternative, and then via portable sanitary facilities during infrastructure removal. Routine operational impacts on surface water quality would be minimal as there would be no untreated discharge of effluents to surface water during operations.

Liquid effluents from the new Waste Tank Farm Waste Processing Facility would be released to Lagoons 4 and 5, emptied into Lagoon 3, and discharged in accordance with a State Pollutant Discharge Elimination System (SPDES) permit (see Chapter 3, Section 3.6.1, of this EIS). Treated leachate from the new Leachate Treatment Facility would be conveyed to treated water storage tanks where it would be sampled and analyzed for retreatment or discharge in accordance with an SPDES permit. The volume of contaminated water produced would be monitored and limited, to the extent practicable, and treated prior to discharge. Surface water quality impacts from the operation of these two process systems would be minor.

Long-term surface water quality would be improved by implementing the Sitewide Removal Alternative because less residual contamination would be on site and natural features to prevent erosion would be restored.

Floodplains

Preliminary analysis using current topography indicates the only facility near the probable maximum floodplain (PMF) would be the planned Interim Storage Facility. A more-detailed analysis would be required as part of detailed design of the Interim Storage Facility to minimize potential impacts, if any, to the floodplain. (For more information on PMF, see Appendix M of this EIS.) There would be no construction in the 100-year floodplain under this alternative. There would be temporary stream flow diversion in Erdman Brook and Franks Creek, however, to allow for the excavation of stream sediment. Runoff controls would also be installed to prevent the migration of disturbed sediment downstream of this excavation (WSMS 2009a).

No adverse impacts to the 100-year or PMF floodplain areas in the WNYNSC vicinity would result from implementation of the Sitewide Removal Alternative, and the peak flowrate within the flood plain would not be affected.

Groundwater Flow and Quality

There would be no adverse impacts to groundwater flow or quality under the implementation of the Sitewide Removal Alternative. Existing groundwater flow patterns would resume upon completion of the alternative. Groundwater quality would improve as a result of removal actions.

Contamination removal operations, particularly on the North Plateau, would include use of engineered barriers to control local groundwater flow during removal operations. Groundwater in the area of the North Plateau Groundwater Plume would be isolated using a sheet pile barrier installed around the perimeter of the area to be excavated. Plume dewatering would be initiated using several groundwater sumps and a series of interconnected subsurface drains.

Area excavations would be backfilled with clean soils and graded to restore the area to an appearance that approximates natural conditions for the site. Over the long term, implementing the Sitewide Removal Alternative would have a positive impact on groundwater quality. Waste and contamination would be sufficiently removed to allow for unrestricted use of WNYNSC groundwater (see Section 4.1.10.2 of this chapter).

4.1.4.2 Sitewide Close-In-Place Alternative

Surface Water Flow and Quality

Construction of the multi-layer caps would result in localized changes in surface water flow patterns around the North and South Plateau caps.[7] Multi-layer cap construction activities would be coordinated with the installation of stream erosional controls, to mitigate the impacts of cap construction on adjacent stream banks (WSMS 2009b). There would also be changes in the localized flow pattern in Erdman Brook and Franks Creek as a result of proposed erosion control features and the extension of the multi-layered engineered caps on the South Plateau. The objectives of the erosion control structures are to control surface water runoff to mitigate gully erosion progress and to reduce streambed erosion. The erosion control structures would be regularly inspected to ensure that they are functioning as designed and to identify signs of blockage and/or physical damage. Corrective maintenance would be performed in response to the inspections and would include clearing debris and silt blocking erosion control structures and performance of local regrading, where necessary. Once the erosion control system installation is complete, temporary erosion and sediment controls, the bypass pumping system (to bypass the stream sections being worked on), surface water diversion systems,

[7] *Multi-layer caps or engineered barriers are physical controls designed to isolate or contain wastes or hazardous materials (e.g., caps, entombment of facilities, contaminant immobilization).*

and other temporary construction facilities would be removed (WSMS 2009b). Surface water flow patterns would be re-established upon completion of these activities.

The construction of close-in-place features such as the slurry walls and multi-layer caps would result in exposed soils that would be a source for sedimentation in Quarry Creek, Erdman Brook, and Franks Creek following precipitation events (WSMS 2009b). Sedimentation can have adverse ecological impacts, as well as impacts on the channel hydraulics and geomorphology (see Appendix M, Section M.2.1, Floodplains). Sedimentation would create an adverse impact to water quality, but would be localized and of short duration. However, these impacts would be minimized by limiting exposed surfaces and intercepting and treating runoff from exposed areas prior to release. Erosion and sediment controls could include runoff interceptor trenches or swales, filter or silt berms/fences, sediment barriers or basins, rock-lined ditches/swales, slope-shaping and retaining fences, surface water runoff management, stormwater drainage structures, and waste management systems (NYSDEC 2005c). After close-in-place actions are complete for a specific area, rock and vegetated soils would be used to reduce sedimentation to natural rates. Sitewide, surface water quality would be improved following completion of close-in-place actions because there would be less industrial activity at WNYNSC with fewer surfaces that would be exposed to erosion.

Close-in-place actions would create the potential for spilled materials from construction equipment, including diesel fuel or petroleum, oils, and lubricants. The impacts of fuel, oil, or lubricant spills would be minimized by keeping the equipment in good repair and conducting maintenance operations in areas designed for such operations. In the event of a spill, New York State responds to reports of petroleum and other hazardous material releases through the Spill Response Program monitored by NYSDEC (NYSDEC 2009).

Surface waters would be monitored as part of the long-term stewardship program to detect any transport of radiological and hazardous constituents from the WNYNSC WMAs through groundwater to onsite streams (Erdman Brook, Franks Creek, and Buttermilk Creek), with ensuing flow into Cattaraugus Creek. The long-term impacts that could result from this transport process, assuming no mitigation, are analyzed in this EIS and reported in Section 4.1.10. Based on a review of reasonably foreseeable scenarios, transport of contaminants from the WMAs through groundwater is not expected to have a major effect on long-term surface water quality under this alternative (see Section 4.1.10). If unmitigated erosion is assumed to occur, however, there could be long-term impacts to surface water quality such as increased sedimentation.

Floodplains

Preliminary analysis indicates that the proposed location for the Interim Storage Facility is near the PMF floodplain, and additional analysis would be necessary during detailed design for this facility. In addition, the multi-layer caps for the NDA and SDA on the South Plateau would intrude into the 100-year floodplain, and the conceptual design for long-term erosion control features extends into the 100-year floodplain of Erdman Brook and Franks Creek (see Appendix M, Figure M–8, of this EIS). These erosion control structures would increase water flow around two sides of WMA 8 in the proximity of the floodplain. This redirection of water to Franks Creek would increase the potential for erosion from the increased flow. Additional analysis on the impact of these facilities on the floodplain would have to be developed during the detailed design phase if this alternative were selected.

Groundwater Flow and Quality

No impacts on groundwater quality would be expected to result from implementing decommissioning actions. Engineered barriers installed as part of the Interim End State would be maintained to slow the movement of the North Plateau Groundwater Plume while the radionuclides in the plume decay. Similarly, during decommissioning, engineered barriers including barrier walls and engineered caps would be installed over the larger inventories of radioactive and nonradioactive contamination in WMAs 1, 2, 3, 7, and 8. These barriers would be designed to direct local groundwater flow away from these inventories, thereby reducing transport of surface and subsurface contamination into groundwater. In addition, the radionuclides would decay over time. Groundwater monitoring would be a major component of the long-term stewardship program, which is intended to ensure the effectiveness of engineered barriers and other controls in isolating and retarding the movement of contamination..

4.1.4.3 Phased Decisionmaking Alternative

Surface Water Flow and Quality

Phase 1 removal actions would not impact surface water flow patterns or quantity. Stream sediments would not be remediated during Phase 1, but would be monitored and maintained (WSMS 2009c).

Phase 1 removal actions would result in exposed soils that would be a source of sediment following precipitation events. The impacts of sediment generation would be minimized by limiting exposed surfaces and intercepting and treating runoff from exposed surfaces prior to permitted discharge. Erosion and sediment controls could include runoff interceptor trenches or swales, filter or silt berms/fences, sediment barriers or basins, rock-lined ditches/swales, slope-shaping and retaining fences, surface water runoff management, stormwater drainage structures, and waste management systems (NYSDEC 2005d). After removal actions are complete for a specific area, topsoil would be applied as necessary, and the preexisting surface contour would be re-established along with native vegetation to restore natural sediment minimization features. Sitewide, surface water quality would be improved following completion of Phase 1 actions because there would be less industrial activity at WNYNSC and fewer surfaces that would be exposed to erosion.

Phase 1 removal actions would create the potential for spilled materials from construction equipment, including diesel fuel or petroleum, oils, and lubricants. The impacts of fuel, oil, or lubricant spills could be minimized by keeping the equipment in good repair and conducting maintenance operations in areas designed for such operations. In the event of a spill, New York State responds to reports of petroleum and other hazardous material releases through the Spill Response Program maintained by NYSDEC (NYSDEC 2009).

Nonhazardous sanitary wastewater (i.e., domestic sewage) would be managed by the existing sanitary wastewater collection and treatment system during facility construction and operation, and then by portable sanitary facilities during infrastructure removal. Routine operational impacts on surface water quality would be minimal as there would be no untreated discharge of effluents to surface water during operations (WVNS 2004a).

The overall impact of the Phased Decisionmaking Alternative would depend on the Phase 2 decision. If the Phase 2 decision is for total removal of all remaining waste and contamination, overall impacts on surface water flow and quality would be similar to those under the Sitewide Removal Alternative. If the Phase 2 decision is continued active management of the SDA and removal of remaining waste and contamination for the rest of the site, short-term impacts would be less because of reduced decommissioning activities; long-term impacts would be bounded by those for the No Action Alternative (see Section 4.1.4.4). If the Phase 2 decision in-place closure of all remaining waste and contamination, overall impacts would be closer to those under the Sitewide Close-In-Place Alternative because of the presence of the engineered multi-layered caps and erosion control features that would extend into Erdman Brook and Franks Creek. If the Phase 2 decision is continued active management of the SDA and removal of remaining waste and contamination for the rest of the site, short-term impacts would be less because of less exposed soil due to fewer construction activities; long-term impacts would be bounded by those for the No Action Alternative.

Floodplains

No construction proposed under Phase 1 of this alternative (the Interim Storage Facility) would be located in the 100-year floodplain. The Cesium Prong would be managed in place, dams and reservoirs would be monitored and maintained, and contaminated sediment would not be removed from Erdman Brook and Franks Creek. Most of the impacts on the PMF floodplain due to implementation of Phase 1 would be similar to those identified for the 100-year floodplain; preliminary analysis using current topography indicates the only facility in or near the PMF floodplain would be the planned Interim Storage Facility. A more-detailed analysis would be required as part of detailed design of the Interim Storage Facility to minimize potential impacts, if any, on the floodplain.

The overall impacts of the Phased Decisionmaking Alternative would depend on the Phase 2 decision. If the Phase 2 decision is removal of remaining waste and contamination, overall impacts would be similar to those under the Sitewide Removal Alternative (no long-term impacts on the floodplain except for potential impacts from the Interim Storage Facility). Similar impacts would result if the Phase 2 decision for the SDA is continued active management. If the Phase 2 decision is in-place closure, overall impacts would be closer to those under the Sitewide Close-In-Place Alternative because the engineered multi-layered caps and erosion control features would extend into the 100-year floodplain. If the Phase 2 decision is continued active management of the SDA and in-place closure of the remaining waste and contamination, impacts would be less than those for the Sitewide Close-In-Place Alternative because there would be no multi-layer cap and erosion control features constructed at the SDA that could intrude into the 100-year floodplain.

Groundwater Flow and Quality

The downgradient portion of the subsurface hydraulic barrier installed to control groundwater during removal of the Main Plant Process Building would remain in place after the excavated area is backfilled (WSMS 2009c). In addition, there would be a barrier on the western side of the present location of Lagoons 1 through 3. These barriers would result in localized changes of the groundwater flow on the North Plateau (see Appendix C, Sections C.3.1.1.7 and C.3.1.1.8). The removal of the source area for the North Plateau Groundwater Plume would improve local water quality.

The overall impact of the Phased Decisionmaking Alternative on groundwater flow would depend on the Phase 2 decision. If the Phase 2 decision is removal of remaining waste and contamination, total impacts would be similar to those under the Sitewide Removal Alternative. If the Phase 2 decision for the SDA is continued active management, impacts on groundwater flow caused by its configuration under the No Action Alternative, including the presence of the geomembrane cover, would continue in the vicinity of the SDA (see Section 4.1.4.4). If the Phase 2 decision is in-place closure of remaining waste and contamination, the total effect on groundwater flow would be similar to those under the Sitewide Close-In-Place Alternative, although the impacts would be less extensive because the Main Plant Process Building, North Plateau Groundwater Plume source area, and Lagoons 1 through 3 would have been removed. If the Phase 2 decision for the SDA is continued active management, there would be fewer impacts on groundwater flow because of the absence of a multi-layer cap over the SDA. The impact of the SDA on groundwater flow would be similar to that for the No Action Alternative.

The continued maintenance of some facilities, while decontaminating and decommissioning others, could result in some short-term groundwater quality impacts under Phase 2 of the Phased Decisionmaking Alternative. If the Phase 2 decision is removal of all remaining waste and contamination, long-term groundwater quality would be expected to improve as a result of contamination removal actions during Phase 1 that would continue during Phase 2. If the Phase 2 decision for the SDA is continued active management, long-term groundwater quality would be bounded by that for the No Action Alternative (see Section 4.1.4.4). If the Phase 2 decision is in-place closure of all remaining waste and contamination, groundwater quality impacts are expected to be less extensive than those identified for the Sitewide Close-In-Place Alternative for the remaining Phase 2 in-place closure actions. If the Phase 2 decision for the SDA is continued active management, long-term groundwater quality would be bounded by the No Action Alternative.

4.1.4.4 No Action Alternative

Surface Water Flow and Quality

Because no decommissioning or long-term management actions would take place under the No Action Alternative, surface water flow and quality would not change over the near term, assuming continued monitoring and maintenance activities. Groundwater flow would continue to be affected by the existing barrier walls and geomembrane covers over the NDA and SDA. Contaminated water would be treated prior to permitted discharge of surface streams. Repair and maintenance of facilities would not result in additional impacts to surface water quality.

Section 4.1.10 reports an analysis of the No Action Alternative impacts that could result from the long-term transport, assuming no mitigation, of radiological and hazardous constituents from the WNYNSC WMAs through groundwater to onsite streams (Erdman Brook, Franks Creek, and Buttermilk Creek), with ensuing flow into Cattaraugus Creek. Based on a review of reasonably foreseeable scenarios, transport of contaminants from the WMAs through groundwater is not expected to significantly affect long-term surface water quality (see Section 4.1.10). If unmitigated erosion is assumed to occur, however, there could be long-term impacts to surface water quality such as increased sedimentation.

Floodplains

No decommissioning activities would take place under the No Action Alternative; therefore, no floodplain impacts would occur.

Groundwater Flow and Quality

Implementing the No Action Alternative would not entail new activities that could cause additional groundwater contamination. The Groundwater Recovery System would continue to operate. Engineered barriers installed as part of the Interim End State would be maintained to contain the North Plateau Groundwater Plume while the radionuclides constituting the plume decay. The quality of the groundwater impacted by this plume would thus slowly improve. Otherwise, there would be no reductions in existing rates of transport of surface and subsurface contamination into site groundwater. Groundwater monitoring would continue as part of existing programs.

4.1.5 Air Quality and Noise

Air quality and levels of noise would be affected by decommissioning actions. Indicators of impacts on nonradiological air quality include exceedance of Federal or state ambient air quality standards for criteria air pollutants, hazardous air pollutants, or other toxic pollutants. Indicators for noise are an increase in day or night average sound level at sensitive receptors. A summary of the impacts on air quality and noise under each alternative is presented in **Table 4–7**. None of the alternatives would annually release greenhouse gases in the form of carbon dioxide exceeding 5,700 metric tons (6,300 tons), which represents about 0.00009 percent of the U.S. release in 2005 (EPA 2007d).

Table 4–7 Summary of Air Quality and Noise Impacts

Environmental Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Air Quality	Peak year activity meets ambient standards, except possibly $PM_{2.5}$ for 24-hour standard.	Peak year activity meets ambient standards, except possibly $PM_{2.5}$ and PM_{10} for 24-hour standards.	For Phase 1, peak year activity meets ambient standards, except possibly $PM_{2.5}$ for 24-hour standard. For the entire alternative (Phase 1 and Phase 2), impacts would be bounded by those for the Sitewide Removal and Sitewide Close-In-Place Alternatives. These impacts would bound the sitewide impacts that could result if the Phase 2 decision for the SDA is continued active management.	Peak year activity meets ambient standards, except possibly $PM_{2.5}$ for 24-hour standard.
Noise	Temporary elevated noise levels at nearest residences when equipment activity is near the site boundary.	Temporary elevated noise levels at nearest residences when equipment activity is near the site boundary.	For both Phase 1 and Phase 2, temporary elevated noise levels at nearest residences when equipment activity is near the site boundary. Sitewide noise levels would be reduced for Phase 2 if the Phase 2 decision for the SDA is continued active management.	Negligible increase in noise levels at nearby residences.

$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns, PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns, SDA = State-Licensed Disposal Area.

4.1.5.1 Air Quality – Nonradiological Releases

Closure activities; construction, operations, and demolition of facilities used for closure; and monitoring and maintenance activities would result in emissions of nonradiological criteria and toxic pollutants from construction equipment, trucks, treatment facilities, and employee vehicles. Particulate emissions from wind and equipment disturbance of soil would also occur. Criteria pollutant emissions were compiled for the activities occurring under each alternative to determine total emissions by year of implementation. Air pollutant concentrations were modeled for carbon monoxide, nitrogen dioxide, particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and sulfur dioxide for the year with the highest emissions (see Appendix K of this EIS). Concentrations were modeled at the WNYNSC boundary and along public roads passing through WNYNSC.

Description of Affected Resources—Air pollution refers to the introduction, directly or indirectly, of any substance into the air that could:

- Endanger human health,
- Harm living resources and ecosystems,
- Damage material property, or
- Impair or interfere with the comfortable enjoyment of life and other legitimate uses of the environment.

For the purpose of this EIS, only outdoor air pollutants were addressed. They may be in the form of solid particles, liquid droplets, gases, or a combination of these forms. Generally, they can be categorized as primary pollutants (those emitted directly from identifiable sources) and secondary pollutants (those produced in the air by interaction between two or more primary pollutants or by reaction with normal atmospheric constituents that may be influenced by sunlight). Air pollutants are transported, dispersed, or concentrated by meteorological and topographical conditions. Thus, air quality is affected by air pollutant emission characteristics, meteorology, and topography.

Ambient air quality in a given location can be described by comparing the concentrations of various pollutants in the atmosphere with appropriate standards. Ambient air quality standards have been established by Federal and state agencies, allowing an adequate margin of safety for the protection of public health and welfare from the adverse effects of pollutants in the ambient air. Pollutant concentrations higher than the corresponding standards are considered unhealthy; those below such standards are considered acceptable.

The pollutants of concern are primarily those for which Federal and state ambient air quality standards have been established, including criteria air pollutants, hazardous air pollutants, and other toxic air compounds. Criteria air pollutants are those listed in Title 40 of the *Code of Federal Regulations* (CFR), Part 50 (40 CFR 50), "National Primary and Secondary Ambient Air Quality Standards." Hazardous air pollutants and other toxic compounds are those listed in Title I of the Clean Air Act, as amended (42 United States Code [U.S.C.] 7401 *et seq*.), those regulated by the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61), and those that have been proposed or adopted for regulation by the applicable state or are listed in state guidelines. States may set ambient standards that are more stringent than the National Ambient Air Quality Standards (NAAQS). The more stringent of the Federal or state standards is shown in this document. For the purpose of this EIS, carbon monoxide, nitrogen dioxide, PM_{10}, $PM_{2.5}$, and sulfur dioxide were evaluated because they are the primary pollutants emitted from diesel construction equipment and from earth-moving activities (fugitive dust). Ozone precursors, nitrogen dioxide, and volatile organic compounds were considered or discussed in Appendix K of this EIS. Lead would be emitted in such small quantities under the alternatives that it was not considered in this analysis. Toxic pollutants are emitted from diesel equipment. For the purpose of this EIS, benzene was evaluated as one of the primary toxic pollutants from diesel equipment.

Emissions of airborne radionuclides are regulated by the U.S. Environmental Protection Agency (EPA) under 40 CFR Part 61, Subpart H, "National Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." These emissions and compliance with this standard are discussed in Section 4.1.9 of this chapter. DOE activities on the Project Premises must comply with handling and reporting requirements of the NESHAP for asbestos (40 CFR Part 61, Subpart M).

Areas having air quality that meets the NAAQS for criteria air pollutants are designated as "attainment areas," while areas having air quality that does not meet the NAAQS for such pollutants are designated as "nonattainment areas." Areas may be designated as "unclassified" when sufficient data for attainment-status designation are lacking. Attainment-status designations are assigned by county, metropolitan statistical area, consolidated metropolitan statistical area (or portions thereof), or air quality control regions. Air quality control regions designated by EPA and attainment-status designations are listed in 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purposes."

For locations that are in an attainment area for criteria air pollutants, Prevention of Significant Deterioration (PSD) regulations limit pollutant emissions from new or modified sources and establish allowable increments of pollutant concentrations. Three PSD classifications are specified, with the criteria for classification established in the Clean Air Act. Class I areas include national wilderness areas; memorial parks larger than 2,020 hectares (5,000 acres); national parks larger than 2,430 hectares (6,000 acres); and areas that have been redesignated as Class I. Class II areas are all areas not designated as Class I. No Class III areas have been designated (42 U.S.C. 7472 *et seq.*).

The ROI for air quality encompasses an area surrounding a candidate site that is potentially affected by air pollutant emissions caused by implementation of the alternatives. The air quality impact area normally evaluated is the area in which concentrations of criteria pollutants would increase more than a significant amount in a Class II area (on the basis of averaging period and pollutant: 1 microgram per cubic meter for the annual average for sulfur dioxide, nitrogen dioxide, and PM_{10}; 5 micrograms per cubic meter for the 24-hour average for sulfur dioxide and PM_{10}; 500 micrograms per cubic meter for the 8-hour average for carbon monoxide; 25 micrograms per cubic meter for the 3-hour average for sulfur dioxide; and 2,000 micrograms for the 1-hour average for carbon monoxide [40 CFR 51.165]). Generally, this covers a few kilometers downwind from the source. Further, for sources within 100 kilometers (60 miles) of a Class I area, the air quality impact area evaluated would include the Class I area if the increase in concentration of any air pollutants for which there are PSD increments is greater than 1 microgram per cubic meter (24-hour average). The area of the ROI depends on emission source characteristics, pollutant types, emission rates, and meteorological and topographical conditions. For the purpose of this nonradiological air quality analysis, impacts were evaluated at the WNYNSC boundary and along roads within WNYNSC to which the public has access.

Baseline air quality is typically described in terms of pollutant concentrations modeled for existing sources and background air pollutant concentrations measured near the site. For this EIS, monitoring data are presented for the nearest state air pollutant monitors discussed in Chapter 3, Section 3.7.

Description of Impact Assessment—The impacts of pollutant emissions from construction, operations, and closure activities on air quality were evaluated for each alternative. This assessment included a comparison of pollutant concentrations under each alternative with applicable Federal and state ambient air quality standards. If both Federal and state standards exist for a given pollutant and averaging period, compliance was evaluated using the more stringent standard. Air pollutant emissions data for each alternative were based on conservative engineering analyses (see Appendix K of this EIS). Diesel emissions from trucking shipments are also presented in Appendix K for comparison among the alternatives.

For each alternative, contributions to offsite air pollutant concentrations were modeled on the basis of guidance presented in EPA's "Guideline on Air Quality Models" (40 CFR Part 51, Appendix W). The EPA ISCST3 computer model was selected as an appropriate model. The modeling analysis incorporated conservative assumptions, which tend to overestimate pollutant concentrations as discussed in Appendix K of this EIS. Modeled concentrations for each pollutant and averaging time were compared with the applicable standards. The concentrations presented were the maximum occurring at or beyond the WNYNSC boundary, the highest sixth-high 24-hour concentration for PM_{10}, and the average eighth highest 24-hour concentration for $PM_{2.5}$, which represents the 98^{th} percentile value used to evaluate compliance with the 24-hour $PM_{2.5}$ standard. The highest sixth-high 24-hour concentration for PM_{10} is the value that EPA recommends for evaluating compliance with the 24-hour PM_{10} standard. This value is the highest of the sixth-high values at all the receptors during a 3-year period. For the purpose of this analysis, 5 years of modeling results were used.

Sitewide Removal Alternative

The concentrations appropriate for comparison to ambient standards and guidelines under the Sitewide Removal Alternative for each pollutant and averaging time and the corresponding ambient standards are presented in **Table 4–8**. The highest concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 55 to the north-northwest and west-southwest. The annual concentration would be less than 29 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be less than 39 percent of the standard if a background concentration were added to the modeling results. The concentrations at the WNYNSC boundary for $PM_{2.5}$ for the annual and average eighth highest 24-hour average concentration were identified in year 55 to the north-northwest and west-southwest, respectively. The annual concentration would be less than 2 percent of the standard and less than 75 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be less than 14 percent of the standard and about 110 percent of the standard if a background concentration were added to the modeling results. The primary contributor to these particulate matter concentrations is North Plateau Groundwater Plume exhumation. The annual average emissions of carbon dioxide over the 60-year period would be about 5,700 metric tons (6,300 tons), representing about 0.00009 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below ambient standards and guidelines.

Air pollutant emissions from operation of the three new facilities (Soil Drying Facility, Leachate Treatment Facility, and Container Management Facility) under this alternative would be small and not subject to PSD regulations. Therefore, a PSD increment analysis is not required.

Table 4–8 Nonradiological Air Pollutant Concentrations by Alternative

Criteria Pollutant	*Averaging Period*	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Background (micrograms per cubic meter)* [b]	*Maximum Incremental Concentration (micrograms per cubic meter)* [c]			
				Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [d]	*No Action Alternative*
Carbon monoxide	8 hours 1 hour	10,000 [f] 40,000 [f]	3,500 7,000	304 1,070	223 1,270	141 621	39.4 214
Nitrogen dioxide	Annual	100 [f]	30	0.64	1.49	0.511	0.163
PM_{10}	Annual 24 hours	45 [g] 150 [h]	13 28	1.37 29.7	7.02 262 [e]	0.607 24.5	0.411 16.6
$PM_{2.5}$	Annual 24 hours	15 [h] 35 [h]	11 34	0.23 4.65 [e]	1.1 40.2 [e]	0.119 4.09 [e]	0.0651 2.43
Sulfur dioxide	Annual 24 hours 3 hours	80 [f] 365 [f] 1,300 [f]	7.9 34 94	0.00195 0.109 0.442	0.0042 0.127 0.759	0.00156 0.0974 0.431	0.00041 0.0364 0.203
Benzene	Annual 1 hour	0.13 [i] 1,300 [i]	NR NR	0.00204 1.3	0.00154 1.29	0.0005 0.538	0 0

NR = not reported, PM_n = particulate matter less than or equal to n microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. Other than those for ozone, particulate matter, and lead, and those based on annual averages, the NAAQS are not to be exceeded more than once per year (40 CFR Part 50). The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. The 24-hour PM_{10} standard is met when the expected number of exceedances is 1 or less over a 3-year period. The 24-hour $PM_{2.5}$ standard is met when the 3-year average of the 98^{th} percentile 24-hour averages is less than or equal to the standard. The annual $PM_{2.5}$ standard is met when the 3-year average of the annual mean is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. Values have been converted to micrograms per cubic meter.

[b] Based on ambient monitoring data from Chapter 3, Section 3.7.2.1.

[c] Concentrations were analyzed at locations to which the public has continual access and at the WNYNSC boundary.

[d] Air quality impacts under the entire Phased Decisionmaking Alternative, including Phases 1 and 2, would be expected to be bounded by the impacts under the Sitewide Removal and Sitewide Close-In-Place Alternatives (see discussion in the text).

[e] Standard could be exceeded when background is added to the modeled increment for this alternative.

[f] Federal and New York State standard.

[g] New York State standard.

[h] Federal standard.

[i] New York State air toxic guidance.

The Final Rule for "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (40 CFR Parts 51 and 93) requires a conformity determination for certain-sized projects in nonattainment areas. A conformity determination is not necessary to meet the requirements of the conformity rule for the alternatives considered in this EIS, because WNYNSC is located in an attainment area for all criteria pollutants (DOE 2000).

Sitewide Close-In-Place Alternative

Under the Sitewide Close-In-Place Alternative, the highest concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 6 to the southeast and south-southeast. These concentrations would be attributable primarily to WMA 8 closure and erosion control system replacement and would be about 175 percent of the 24-hour ambient standard. The 24-hour concentration would be about 193 percent of the standard if a background concentration were added to the modeling results. The annual concentration would be less than 45 percent of the standard if a background concentration were added to the modeling results. The concentrations at the WNYNSC boundary or nearest public road for $PM_{2.5}$ for the annual and 24-hour concentrations were identified in year 6 to the southeast and south-southeast. These concentrations would be attributable primarily to WMA 8 closure and erosion control system replacement. The annual concentration would be about 7 percent of the standard and about 81 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be about 115 percent of the standard and about 212 percent of the standard if a background concentration were added to the modeling results. The annual average emissions of carbon dioxide would be about 1,850 metric tons (2,040 tons), representing about 0.00003 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below the ambient standards and guidelines.

Phased Decisionmaking Alternative

Under Phase 1 of the Phased Decisionmaking Alternative, the highest 24-hour concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 15 to the southeast and south-southeast. These concentrations would be attributable primarily to SDA geomembrane replacement. These concentrations would be less than 17 percent of the 24-hour ambient standard. The annual concentration would be less than 28 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be 35 percent of the standard if a background concentration were added to the modeling results. The concentrations at the WNYNSC boundary or nearest public road for $PM_{2.5}$ for the annual and 24-hour concentrations were identified in year 7 to the northwest and west-southwest. These concentrations would be attributable primarily to WMA 10 closure. The annual concentration would be about 1 percent of the standard and about 74 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be about 12 percent of the standard and about 109 percent of the standard if a background concentration were added to the modeling results. The annual average emissions of carbon dioxide over a 30-year period would be about 2,570 metric tons (2,830 tons), representing about 0.00004 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below the ambient standards and guidelines.

Air quality impacts under the entire Phased Decisionmaking Alternative (both Phase 1 and 2) is expected to be bounded by the impacts under the Sitewide Removal and Sitewide Close-In-Place Alternatives. If the Phase 2 decision for the SDA is continued active management, air quality impacts for the entire alternative would be less because there would be fewer decommissioning activities resulting in release of air pollutants. This assessment assumes that the rate at which activities are performed would be similar to that under these alternatives and result in similar emission rates. Some variation of actual emissions during any year would result from variations in the schedule and overlap of activities. Concentrations of air pollutants are expected to be below the ambient standards and guidelines, except for PM_{10} and $PM_{2.5}$.

No Action Alternative

Under the No Action Alternative, the highest concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 15 to the southeast and south-southeast. These concentrations would be attributable primarily to SDA geomembrane replacement. The 24-hour concentration would be less than 12 percent of the 24-hour ambient standard. The 24-hour concentration would be less than 30 percent of the standard if a background concentration were added to the modeling results. The annual concentration would be less than 1 percent of the ambient standard. The annual concentration would be less than 27 percent of the standard if a background concentration were added to the modeling results. The highest concentrations at the WNYNSC boundary or nearest public road for $PM_{2.5}$ for the annual and 24-hour concentration were identified in year 15 to the southeast and south-southeast. The annual concentration would be less than 1 percent of the standard and about 74 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be about 7 percent of the standard and about 104 percent of the standard if a background concentration were added to the modeling results. The annual average emissions of carbon dioxide would be about 73 metric tons (80 tons), representing about 0.000001 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below the ambient standards and guidelines.

4.1.5.2 Radiological Releases

Radiological releases to air and water are addressed in Section 4.1.9.

4.1.5.3 Noise

Noise, or sound, results from the compression and expansion of air or some other medium when an impulse is transmitted through it. Propagation of sound is affected by various factors, including meteorology, topography, and barriers. Noise is undesirable sound that interferes or interacts negatively with the human or natural environment. Noise can disrupt normal activities (e.g., hearing and sleep), damage hearing, or diminish the quality of the environment.

Noise-level measurements used to evaluate the effects of nonimpulsive sound on humans are compensated by an A-weighting scale that accounts for the hearing response characteristics (i.e., frequency) of the human ear. Noise levels are expressed in decibels, or in the case of A-weighted measurements, decibels A-weighted. EPA has developed noise-level guidelines for different land use classifications (EPA 1974). EPA guidelines identify a 24-hour exposure level of 70 decibels, as the maximum level of environmental noise that will prevent any measurable hearing loss over a lifetime. Likewise, maximum levels of 55 decibels outdoors and 45 decibels indoors are identified as preventing activity interference and annoyance.

Noise from construction, operations, and closure of the closure facilities and associated traffic could affect human and animal populations. The ROI for WNYNSC includes the site and surrounding areas, including transportation corridors, where proposed activities might increase noise levels. Transportation corridors most likely to experience increased noise levels are those roads within a few kilometers of the site boundary that carry most of the site's employee and shipping traffic.

No noise-level data representative of site environs were available. The acoustic environment was briefly described in terms of existing noise sources and nearby land uses. (See Chapter 3, Section 3.7.3.)

Impact Assessment

Noise impacts associated with the alternatives may result from construction, operations, and closure activities, including increased traffic. Impacts of proposed activities under each alternative were assessed according to the types of noise sources and the location of the activities relative to the site boundary and noise-sensitive receptors (Table 4–7). Potential noise impacts of traffic were assessed based on the likely increase in traffic volume. Possible impacts on wildlife were evaluated based on the possibility of sudden loud noises occurring during site activities under each alternative.

Construction, operations, and demolition of facilities used for closure would result in some increase in noise levels near the area from construction and demolition equipment and activities. Equipment that is expected to be used includes front-end loaders, bulldozers, graders, compactors, trucks, and lifts. Several pieces of such equipment could operate at one time. Equipment would operate closest to the WNYNSC boundary while removing sediment of the South Reservoir during WMA 12 closure and would be within 801 meters (2,670 feet) of the nearest residence. During activity at the Cesium Prong, equipment would be operated 519 meters (1,730 feet) from the nearest residence; during activities at the North Plateau Groundwater Plume, equipment would be operated 1,182 meters (3,940 feet) from the nearest residence. If five pieces of equipment were operating at the same time (two trucks, grader, dozer, and loader), the noise level at these residences would be about 59, 63, and 56 decibels A-weighted, respectively (WSMS 2009e). This noise would be audible above the background sound levels in the area. Noise from this activity and other activities near the WNYNSC boundary would occur during daytime hours and could be a source of annoyance to nearby residents. Some disturbance of wildlife within WNYNSC could occur as a result of the operation of earth-moving equipment and other equipment. During many of the closure activities, there would be no change in day/night average sound levels and noise impacts on the public outside of WNYNSC, except for noise attributable to construction employee vehicles and trucks hauling materials and waste.

The duration of noise-producing activities would vary under the different alternatives. The Sitewide Removal Alternative would have heavy diesel construction equipment in operation over a period of 60 years. Under the Sitewide Close-In-Place Alternative, heavy diesel construction equipment would be in operation over a period of 7 years, with additional activity at intervals. The Phased Decisionmaking Alternative would have one 8-year period of heavy equipment operation during Phase 1, with occasional additional activity thereafter. During Phase 2, similar heavy diesel construction equipment operation is expected, assuming either removal or in-place closure of all remaining waste contamination. Sitewide noise impacts from either of these activities would bound the sitewide noise impacts that would result if the Phase 2 decision for the SDA is continued active management. This is because there would be less heavy diesel construction equipment operation at the SDA.

Monitoring and maintenance activities and construction activities, such as geomembrane replacement under the No Action Alternative, would result in some increase in noise levels near the activity area, primarily from construction equipment. Several pieces of equipment could operate at one time. Equipment is expected to operate closest to the WNYNSC boundary while in the SDA. This activity would occur about 1,500 meters (5,000 feet) from the nearest residences. If two pieces of equipment were operating simultaneously, the noise level at these residences would be about 43 dBA. This noise would be barely audible above background sound levels in the area. Noise from this activity and other construction-type activities would occur during daytime hours, and, based on the EPA guidelines, is not expected to be a source of annoyance to nearby residents. Some disturbance of wildlife within WNYNSC could occur as a result of equipment operation. During routine monitoring and maintenance, there would be no change in day/night average sound levels and noise impacts on the public outside of WNYNSC as a result of these activities, except for noise attributable to employee vehicles and trucks.

4.1.6 Ecological Resources

Impacts on ecological resources may occur as a result of land disturbance, water use, human activity, or noise resulting from the construction, operations, and removal of facilities associated with the decommissioning or long-term management of WNYNSC. Likely impacts would include habitat loss (including wetlands) and increased mortality of wildlife, as well as indirect impacts such as displacement of wildlife from the affected area. Habitat loss was measured quantitatively in terms of the extent of plant community loss or modification. Indirect impacts were evaluated qualitatively. Impacts on threatened and endangered species during construction of facilities were determined in a manner similar to that for other terrestrial and aquatic resources.

A summary of the impacts under each alternative on ecological resources is presented in **Table 4–9**. Potential measures to mitigate impacts on ecological resources are addressed in Chapter 6, Section 6.5, and throughout this section, as appropriate.

Table 4–9 Summary of Ecological Resources Impacts

Resource	***Sitewide Removal Alternative***	***Sitewide Close-In-Place Alternative***	***Phased Decisionmaking Alternative***	***No Action Alternative***
Terrestrial Resources (Habitat)	Loss of about 16.6 hectares of woodlands and fields as a result of remediation of that portion of the Cesium Prong located outside the disturbed portion of the site.	Minimal impacts as most development would take place on disturbed portions of the site. However, erosion control measures would disturb 10.1 hectares of woodlands and fields.	Minimal impacts under Phase 1, as only developed portions of the site would be impacted. During Phase 2, the loss of terrestrial habitat could range from 10.1 to 16.6 hectares. This range would bound the loss of habitat that could result if the Phase 2 decision for the SDA is continued active management.	No change in terrestrial habitat resources.
Wetlands	Direct impact on 2.8 hectares and potential indirect impacts on other wetland areas.	Direct impact on 4.2 hectares and potential indirect impacts on other wetland areas.	No direct or indirect impacts on site wetland areas under Phase 1. Direct impacts on wetlands under Phase 2 could range from 2.8 hectares to 4.2 hectares. Although fewer wetlands would be disturbed, this range would essentially bound the sitewide direct impact on wetlands if the Phase 2 decision for the SDA is continued active management.	No change in wetland resources.
Aquatic	Direct and indirect impacts on site streams, ponds, lagoons, and reservoirs.	Direct and indirect impacts on site streams and lagoons.	Minimal impacts on aquatic resources during Phase 1. During Phase 2, impacts could range from few additional impacts over Phase 1 to direct and indirect impacts on aquatic resources associated with work in streams and reservoirs. This range would essentially bound the sitewide impacts on aquatic resources if the Phase 2 decision for the SDA is continued active management.	No change in aquatic resources.

Resource	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative	No Action Alternative
Threatened and Endangered Species	No impacts are expected on Federal or state-listed endangered, threatened, or candidate species. Potential direct and indirect impacts on two New York State Natural Heritage Program–ranked species of tiger beetle.	No impacts are expected on Federal or state-listed endangered, threatened, or candidate species. Minimal potential for indirect impacts on two New York State Natural Heritage Program–ranked species of tiger beetle.	No impacts are expected on Federal and state threatened and endangered species during either Phase 1 or 2. During Phase 1, minimal indirect impacts on two New York State Natural Heritage Program–ranked species of tiger beetle. During Phase 2, impacts on the two species of tiger beetle could range from no impact to potential direct and indirect impacts. This range would bound the sitewide impacts on these two species if the Phase 2 decision for the SDA is continued active management.	No impacts (no change to baseline conditions).

SDA = State-Licensed Disposal Area.
Note: To convert hectares to acres, multiply by 2.471.

4.1.6.1 Sitewide Removal Alternative

Under the Sitewide Removal Alternative, a number of new temporary facilities would be built to support decommissioning activities. Decommissioning would also involve the decontamination and removal of all site facilities and the removal or alteration of numerous manmade and natural water bodies. Additionally, the North Plateau Groundwater Plume and Cesium Prong would be remediated by removing contaminated soil to levels allowing for unrestricted use.

Terrestrial Resources

Construction of new temporary facilities and structures would disturb approximately 11.3 hectares (28 acres). However, because all construction would take place within the disturbed portion of the site, there would be no direct loss of habitat. Wildlife in adjacent habitat could be disturbed by noise and increased human presence, which could cause some animals to temporarily move from the area, while others are more tolerant of human activities. Proper maintenance of equipment and restricting workers to the work zone would help minimize this impact.

Impacts on terrestrial resources would also result from demolition, excavation, and land-clearing activities, including those associated with remediation of the North Plateau Groundwater Plume and the Cesium Prong. As most activities are associated with the removal of existing structures in disturbed areas, impacts would be minimal. However, remediation of the Cesium Prong would involve the clearing of about 16.6 hectares (41 acres) of woodlands and fields located outside of the disturbed portion of the site. Following the removal of contaminated soil to levels permitting unrestricted use, disturbed areas would be regraded and revegetated using native species according to a sitewide revegetation plan that would be approved by the State of New York.

Impacts of clearing operations associated with the remediation of the undisturbed portion of the Cesium Prong would include the loss of less-mobile species (e.g., salamanders, toads, frogs, mice, rabbits, snakes, and squirrels), as well as displacement of more-mobile species (e.g., birds and large mammals). Depending on whether the areas to which displaced animals moved were at or below their carrying capacity (i.e., the maximum number of animals of a particular species that the area could support), the ecosystem dynamics could be altered, possibly leading to the loss of the relocated animals. Prior to land-clearing operations, the areas to be disturbed would be surveyed for nests of migratory birds in accordance with the Migratory Bird Treaty Act. For example, to avoid disturbing resident breeding bird populations, many of which are migratory, it might be necessary to undertake clearing operations during the non-breeding season (i.e., August 1 through March 15). In addition to protecting bird populations in general, conducting land clearing activities during the non-breeding season would meet the requirements of the Migratory Bird Treaty Act by protecting adults, their nests, and young. Upon restoration of the site, it would once again be available to wildlife, although the species composition would likely be different.

Wetlands

No wetlands would be affected during construction of temporary facilities, because none are present on the proposed construction sites. However, wetlands would be directly and indirectly impacted by demolition and remediation activities, particularly during remediation of the Cesium Prong. Indirect impacts could include the alteration or destruction of wetlands resulting from sedimentation following earthmoving activities and the removal of contaminated sediments from streams. Stormwater runoff control measures, including erosion and sediment controls, would be installed, inspected, and maintained to prevent indirect impacts. Noise and human presence could also impact wildlife present within wetland areas, with impacts and mitigation measures similar to those addressed earlier for terrestrial species.

Overall, about 2.8 hectares (7.0 acres) of wetlands could be directly affected under this alternative. Direct impacts on wetlands would occur in connection with remediation of the Cesium Prong, where six delineated wetland areas (W31, W37, W38, W40, W44, and W45) totaling 2.1 hectares (5.1 acres) are located in and around WMAs 3, 4, and 5. Removal of the SDA would directly impact three jurisdictional wetlands (W33, W65, and W66) totaling 0.04 hectare (0.1 acre). Removal of the SDA also has the potential to impact the 30.5-meter (100-foot) adjacent area around the New York State Freshwater Wetlands (W10 and W11) that border the SDA to the east and south (see Appendix M, Figure M–6). Any work within the adjacent area would require a permit from the state. Additionally, five other wetland areas (W4 – W8) measuring a total of 0.7 hectare (1.8 acres) would be affected as a result of altered water levels and siltation during closure of the dams and reservoirs in WMA 12. The largest of these wetlands is located at the head end of the North Reservoir, while the other four smaller wetlands are located just downstream from the discharge point from the North Reservoir. Impacts on affected wildlife would be similar to those for terrestrial wildlife discussed previously in this section.

If needed, prior to the disturbance of any jurisdictional wetland, a Section 404 permit would be acquired from the U.S. Army Corps of Engineers, and in the case of a New York State freshwater wetland, a permit would be acquired from the New York State Department of Environmental Conservation (NYSDEC). Additionally, a mitigation plan would be developed that would fully address the compensation mechanism selected (i.e., compensatory mitigation, mitigation bank, or in-lieu fee mitigation) to mitigate wetland impacts (73 FR 19594). Best management practices, including erosion and sediment controls, would be implemented during all remediation work potentially affecting wetlands.

Aquatic Resources

Direct impacts on aquatic resources during construction and operation of new temporary facilities would not occur because no such resources are located within the construction sites. Indirect impacts would be limited because best management practices, including implementation of a soil erosion and sedimentation plan, would be followed.

Manmade aquatic features (i.e., lagoons, ponds, and reservoirs) would be directly impacted by decommissioning activities when lagoons and ponds are excavated and backfilled and dams and reservoirs are demolished and removed. The active lagoons contain wastewater or treated water. Periodically, treated wastewater from Lagoon 3 is discharged to Erdman Brook through an SPDES-permitted discharge. The reservoirs drain into Buttermilk Creek. Fish, amphibians, and reptiles associated with the ponds and reservoirs would be lost during implementation activities. The sunfish population would be particularly affected, because it is the most common species observed in the North Reservoir and the only species of fish seen in the South Reservoir. The dams and reservoirs would be closed in accordance with applicable Federal and state regulations and approvals from EPA, NYSDEC, and the New York State Department of Health. Specific requirements for fish management at the time of closure would be developed as part of the approval process.

Aquatic populations associated with site streams would also be affected during the removal of contaminated sediment in Quarry Creek, Erdman Brook, Franks Creek, Buttermilk Creek from its confluence with Franks Creek downstream to its confluence with Cattaraugus Creek, and the portion of Cattaraugus Creek near its confluence with Buttermilk Creek. This action would result in the direct loss of aquatic species and indirect loss due to downstream sedimentation. Additionally, the removal of vegetation along streambeds would increase stream temperatures, thereby altering ecosystem dynamics. Removal of soil from the 16.6 hectares (41 acres) of the Cesium Prong that are located outside the disturbed portion of the site would directly impact Quarry Creek and several small ponds with the loss of associated aquatic species. Remediation of the Cesium Prong (and North Plateau Groundwater Plume) also has the potential to indirectly affect streams through erosion and sedimentation. Impacts on wildlife associated with ponds and stream channels would also occur as a result of remediation activities. Appropriate erosion controls would be installed and best management practices would be implemented to minimize soil erosion and sedimentation. As with the dams and reservoirs, specific requirements for fish management would be developed as part of the approval process prior to any actions taking place.

Threatened and Endangered Species

No Federal or state threatened, endangered, or candidate species have been found to reside on WNYNSC (see Chapter 3, Section 3.8.4); thus, there would be no impact on any listed species from the Sitewide Removal Alternative. Further, no critical habitat for any such species, nor critical environmental areas for state rare or endangered species are known to exist on WNYNSC; therefore, none would be affected under the Sitewide Removal Alternative.

Remediation work under this alternative would involve removal of sediments in Quarry Creek, Erdman Brook, Franks Creek, Buttermilk Creek from its confluence with Franks Creek downstream to its confluence with Cattaraugus Creek, and the portion of Cattaraugus Creek near its confluence with Buttermilk Creek. These activities could impact the Appalachian tiger beetle (*Cinindela ancocisconensis*) (New York State rank: imperiled) and cobblestone tiger beetle (*Cinindela marginipennis*) (New York State rank: critically imperiled). Although neither species is legally protected, both would be fully considered during the planning and implementation phases should this alternative be selected. Because the Appalachian tiger beetle is present in the vicinity of the confluence of Buttermilk and Cattaraugus Creeks, remediation work is likely to adversely impact local populations of this species. The cobblestone tiger beetle is located downstream from the confluence of these two streams, and although this species would not be directly impacted, careful implementation of the erosion and sediment control plan would be necessary to prevent indirect impacts.

Long-Term Impacts

Implementing the Sitewide Removal Alternative would remove essentially all the contamination and would result in low residual contamination levels that would result in human exposure of less than 25 millirem per year. These low residual contamination levels would not result in long-term ecological consequences for aquatic or terrestrial receptors.

4.1.6.2 Sitewide Close-In-Place Alternative

Similar to the Sitewide Removal Alternative, a number of new temporary facilities would be built to support decommissioning activities, and key site facilities would be closed in place. Site ponds, lagoons, and reservoirs would be taken out of service. No effort would be made to remediate contaminated streambed sediment or soils within the North Plateau Groundwater Plume or Cesium Prong.

Terrestrial Resources

Direct and indirect impacts from the construction of new temporary facilities to support decommissioning, including remediation activities, would be similar to those discussed under the Sitewide Removal Alternative in Section 4.1.6.1; however, the total affected area for these facilities (located in previously disturbed areas) would be 0.8 hectare (2 acres). In addition, 17.8 hectares (44 acres) of previously disturbed land would be affected by the installation and maintenance of engineered barriers and multi-layered caps. Mitigation measures would also be similar to those described under the Sitewide Removal Alternative. As part of this alternative, a number of erosion control measures would be taken, including installation of water control structures and work in and adjacent to Quarry Creek, Franks Creek, and Erdman Brook. These actions would disturb about 10.1 hectares (25 acres) of woodlands and fields, with impacts similar to the other ground-disturbing activities addressed in Section 4.1.6.1.

Decommissioning activities under this alternative would take place throughout WNYNSC, with the exception of WMAs 4, 10, and 11. In general, demolition of facilities would have minimal direct impact on terrestrial resources. Indirect impacts would be possible, however, and could include disturbance and displacement of wildlife due to noise and increased human presence (see Section 4.1.6.1). Both the NDA and SDA would receive robust multi-layer caps under this alternative. These caps would offer little habitat for wildlife, as they would be rock covered. The areas would also be fenced, thus preventing use by larger mammals.

At the conclusion of decommissioning activities, as well as decay of the Cesium Prong, much of the site (see Figure 4–1) would be available for release for unrestricted use. Regrading and revegetation of remediated areas with native species would allow those areas to be used by wildlife.

While the North Plateau Groundwater Plume source area would be closed in an integrated manner with the Main Plant Process Building and other facilities, the radioactive contaminants in the nonsource area would be allowed to decay in place. Similarly, the Cesium Prong would be managed by implementing restrictions on use until in-place decay results in contaminant levels allowing for unrestricted use. Because activities would take place within disturbed areas of WNYNSC, terrestrial resources would not be affected.

Wetlands

Overall, up to 4.2 hectares (10.4 acres) could be directly affected under this alternative.

No wetlands would be affected during construction of new facilities, because none are present on the proposed construction sites. However, construction of erosion control measures under this alternative would directly impact two jurisdictional wetlands (W34 and W39) totaling approximately 0.1 hectare (0.3 acre), while placement of the multi-layer cap over the NDA and SDA would directly impact five jurisdictional wetlands (W10 and W11 [both also New York State Freshwater Wetlands] and W33, W65, and W66) totaling 3.4 hectares (8.4 acres). The actual disturbance to the jurisdictional wetlands would be less than half their total area. Impacts on these wetlands would be similar to those addressed in Appendix M, Section M.3.1.2. Additionally, placement of the multi-layer caps has the potential to cause indirect impacts (sedimentation) on those portions of the New York State wetlands not directly impacted. Placement of the multi-layer caps would impact the 100-foot (30.5-meter) adjacent area around the New York State wetlands. Any work within the state wetlands (and adjacent area) would require a permit from the state, as well as the U.S. Army Corps of Engineers. Mitigation measures such as those addressed in Appendix M, Section M.4.2, and Chapter 6 of this EIS would be implemented to address direct and indirect impacts.

Similar to the Sitewide Removal Alternative, five wetland areas measuring 0.7 hectare (1.8 acres) could be affected during closure activities associated with the dams and reservoirs. Direct and indirect impacts resulting from remediation and closure activities, as well as mitigation requirements, would be similar to those addressed under the Sitewide Removal Alternative. Because the North Plateau Groundwater Plume and Cesium Prong would not involve removal of soils in nonsource areas, there would be no indirect impacts on wetlands in those areas of the site.

Aquatic Resources

Under the Sitewide Close-In-Place Alternative, impacts on aquatic resources generally would be fewer than those under the Sitewide Removal Alternative. Thus, while streambeds and associated aquatic resources would be temporarily disturbed during the installation of erosion control features (see earlier discussion of terrestrial resources in this section), streams would not be remediated through sediment removal. Because soil in nonsource areas of the North Plateau Groundwater Plume and Cesium Prong would not be disturbed under this alternative, there would be no direct or indirect impacts on ponds or streams from this activity. Also, although the reservoirs would be taken out of service, they would not be removed. This would leave intact the aquatic populations of these water bodies.

Threatened and Endangered Species

Similar to the Sitewide Removal Alternative, impacts on Federal or state threatened or endangered species are not expected from any of the actions taken under the Sitewide Close-In-Place Alternative. Although there would be some temporary disturbance to streams during the placement of erosion control structures, implementation of the site soil erosion and sediment control plan would minimize potential indirect impacts on both the Appalachian tiger beetle and cobblestone tiger beetle.

Long-Term Impacts

To understand the potential for local adverse ecological impacts from possible long-term release of radionuclides at the site for the Sitewide Close-In-Place Alternative, a screening-level ecological risk assessment was performed that compared projected concentrations against published DOE Biota Concentration Guides (BCGs), which are concentration limits for radionuclides to protect biota (DOE 2002d). BCGs are based on threshold doses for the protection of ecological receptors of 1 rad per day for aquatic biota, 1 rad per day for plants and terrestrial invertebrates, and 0.1 rad per day for terrestrial animals. These dose limits meet the requirements of DOE Order 5400.5, "Radiation Protection of the Public and Environment" (DOE 1990), and DOE Order 450.1A, "Environmental Protection Program" (DOE 2008c); they equal the dose limits for protection of biota recommended by the National Council on Radiation Protection and Measurements and the International Atomic Energy Agency (DOE 2002d). BCGs are calculated using conservative exposure assumptions and parameter values and are thus "appropriately conservative limiting concentrations of radionuclides in environmental media" (DOE 2002d).

The models used for the long-term performance assessment, which are described in Section 4.1.10 and Appendix H, project radionuclide concentrations in surface water and in sediments as a result of groundwater and surface water transport processes. This screening analysis considered two potential receptor locations: (1) Buttermilk Creek below the confluence of Franks Creek and Buttermilk Creek, and (2) Franks Creek above the point where Quarry Creek enters Franks Creek. The Buttermilk Creek location receives more contamination but with greater dilution. The Buttermilk Creek location is in the center of the site and is exposed to contaminated water discharged to Franks Creek as well as contaminated water that enters Buttermilk Creek upstream from seeps on the western bank. The Franks Creek position receives less contamination but the contamination may have higher concentrations as a result of the lower flow rate of Franks Creek. The Franks Creek receptor location was added for this Final EIS.

The screening analysis compared projected radionuclide concentrations in surface water and sediment in the two locations against DOE BCGs for terrestrial vertebrates and aquatic biota exposed to water and sediment. The projected water concentrations for the Buttermilk Creek location were about 9 percent of the DOE screening-level concentration limits for aquatic biota and about 0.05 percent of the screening-level concentrations for terrestrial vertebrates. The projected sediment concentrations were about 0.02 percent of the DOE screening-level concentration limits for aquatic biota and less than 0.7 percent of the screening-level concentration limits for terrestrial vertebrates.

The projected water concentrations for the Franks Creek location slightly exceeded the DOE screening-level concentration limits for aquatic biota and were about 1 percent of the screening-level concentrations for terrestrial vertebrates. The projected sediment concentrations were about 0.3 percent of the DOE screening-level concentration limits for aquatic biota and about 9 percent of the screening-level concentrations for terrestrial vertebrates.

On the basis of this screening analysis, it is concluded that long-term releases from the Sitewide Close-In-Place Alternative (assuming no unmitigated erosion) would not result in long-term ecological consequences for receptors along Buttermilk Creek and terrestrial receptors along Franks Creek. Aquatic biota exposed to surface water in Franks Creek are unlikely to experience unacceptable risk of long-term adverse effects because BCGs are conservative benchmarks and conservative estimates of maximum strontium-90 concentrations in the North Plateau Groundwater Plume only slightly exceed its BCG.

4.1.6.3 Phased Decisionmaking Alternative

Under Phase 1 of this alternative, some new temporary facilities would be built to support closure activities and some key site facilities would be removed (see Chapter 2, Section 2.4.3.5, and Appendix C, Section C.4, of this EIS). This alternative would initially remove all North Plateau facilities, except for the Waste Tank Farm and many of its supporting facilities, and the CDDL. Site ponds and lagoons would also be taken out of service; however, reservoirs would be maintained. No effort would be made to remediate contaminated streambed sediment or soils within the nonsource area of the North Plateau Groundwater Plume and Cesium Prong. Under Phase 2, actions could range from no removal to complete removal of all remaining site facilities.

Terrestrial Resources

Under Phase 1 of this alternative, direct and indirect impacts from the construction of new temporary facilities to support decommissioning, including remediation activities, would be similar to those discussed in Section 4.1.6.1; however, the total area impacted would be about 0.8 hectare (2 acres) of previously disturbed land. In addition, about 10.5 hectares (26 acres) of previously disturbed land would be affected as part of actual removal of facilities and construction of engineered barriers. Mitigation measures for new temporary facilities would also be similar to those described for the Sitewide Removal Alternative. Because the nonsource area of the North Plateau Groundwater Plume and Cesium Prong would not be remediated under Phase 1 and radioactive contaminants would be allowed to decay in place, there would be no impact on terrestrial resources.

If the Phase 2 decision is removal of remaining waste and contamination, impacts on terrestrial resources would be similar to those for the Sitewide Removal Alternative, as described in Section 4.1.6.1. The major impact would be the loss of 16.6 hectares (41 acres) of terrestrial habitat resulting from remediation of the Cesium Prong. If the Phase 2 decision for the SDA is continued active management, there would ultimately be less terrestrial habitat (6.1 hectares [15 acres]) available for wildlife because the area would not be revegetated. If the Phase 2 decision is in-place closure, impacts would be similar to those for the Sitewide Close-In-Place Alternative described in Section 4.1.6.2. There would be no impacts from remediation of the Cesium Prong; however, 10.1 hectares (25 acres) of terrestrial habitat would be lost from construction of erosion control measures. A Phase 2 decision to continue active management of the SDA would not affect terrestrial resources because, whether the SDA remained covered with a geomembrane cover or was closed in place with a multi-layered cap, it would remain in a non-vegetated state.

Wetlands

During Phase 1 of this alternative, no wetlands would be affected by construction of temporary facilities, because no wetlands are present on the proposed construction sites. Further, remediation and closure activities planned under this alternative would not directly impact wetlands, because none are present in the associated WMAs. However, the removal of existing facilities could lead to indirect impacts on nearby wetlands as described for the Sitewide Removal Alternative. Mitigation requirements would be similar to those discussed for the Sitewide Removal Alternative. Because the nonsource area of the North Plateau Groundwater Plume and the Cesium Prong would not be remediated and radioactive contaminants would be allowed to decay in place, there would be no impacts on wetlands in this area.

If the Phase 2 decision is removal of remaining waste and contamination, impacts on wetlands would be similar to those for the Sitewide Removal Alternative. Thus, direct (2.8 hectares [7.0 acres]) and indirect impacts are possible and would result largely from the remediation of the North Plateau Groundwater Plume and Cesium Prong, and removal of the north and south reservoirs. If the Phase 2 decision is in-place closure, direct (4.2 hectares [10.4 acres]) and indirect impacts on wetlands would be similar to those for the Sitewide Close-In-Place Alternative. In this case, impacts would largely result from the installation of a number of erosion control measures and the placement of multi-layer caps over the NDA and SDA. If the Phase 2 decision for the SDA is continued active management while the remaining waste and contamination at the site is either removed or closed in place, there would be fewer wetlands disturbed (i.e., W10, W11, W33, W65, and W66), because the SDA and the immediately surrounding area would remain in its current condition.

Aquatic Resources

Under Phase 1 of this alternative, the only manmade aquatic features to be directly impacted would be a number of lagoons and the demineralizer sludge ponds which would be exhumed and backfilled. This would have a negligible impact on aquatic resources. The dams and reservoirs in WMA 12 would remain and no action would be taken on contaminated stream sediments. Also, because soil in the nonsource area of the North Plateau Groundwater Plume and Cesium Prong would not be excavated, there would be no direct or indirect impacts on ponds or streams.

If the Phase 2 decision is removal of remaining waste and contamination, direct and indirect impacts on aquatic resources would be similar to those for the Sitewide Removal Alternative. Direct impacts on aquatic resources would primarily be associated with remediation of the nonsource area of the North Plateau Groundwater Plume, remediation of the Cesium Prong, sediment removal in streams, and closure of the reservoirs. If the Phase 2 decision is in-place closure, fewer impacts on aquatic resources would occur because those activities noted earlier would not take place. However, streambeds and associated aquatic resources would be temporarily disturbed during the installation of erosion control features. If the Phase 2 decision for the SDA is continued active management while the remaining waste and contamination is either removed or closed in place, there would be somewhat less potential for erosion and sedimentation, because there would be no new land disturbance within the disposal area.

Threatened and Endangered Species

Impacts on Federal or state threatened or endangered species would not be expected from any of the actions taken under Phase 1 of this alternative. As noted for aquatic resources, soil disturbance, and hence, the potential for stream sedimentation, would be minimized under this alternative because soil in the nonsource area of the North Plateau Groundwater Plume and Cesium Prong would not be excavated. Contaminated stream sediments would not be removed during Phase 1. These factors, plus the implementation of a site soil erosion and sediment control plan, would minimize potential indirect impacts on the Appalachian tiger beetle and cobblestone tiger beetle.

As is the case under Phase 1, Phase 2 of the Phased Decisionmaking Alternative would not be expected to impact any Federal or state threatened or endangered species. However, if Phase 2 activities reflect those of the Sitewide Removal Alternative, impacts from stream remediation activities on the Appalachian tiger beetle and cobblestone tiger beetle would be similar to those addressed in Section 4.1.6.1. If Phase 2 activities are similar to those undertaken under the Sitewide Close-In-Place Alternative, potential impacts on these two species would be similar to those under this alternative but minimized through the implementation of the site erosion and the sediment control plan (see Section 4.1.6.2). If the Phase 2 decision for the SDA is continued active management while other onsite waste and contamination is either removed or closed in place, there would be little change in impacts to threatened or endangered species, although there could be slightly less potential for sedimentation. This could also lessen impacts on the Appalachian tiger beetle and cobblestone tiger beetle.

Long-Term Impacts

Long-term ecological consequences after implementation of Phase 2 of this alternative would depend on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, the low residual contamination would not result in long-term ecological consequences for aquatic or terrestrial receptors (see Section 4.1.6.1). If the Phase 2 decision is to close in place all remaining waste and contamination, long-term ecological consequences would be bounded by the screening analysis performed for the Close-In-Place Alternative (Section 4.1.6.2). Because Phase 1 would remove some site waste and contamination, and the remaining contamination would be isolated, long-term releases would not result in long-term consequences to aquatic or terrestrial receptors. If the Phase 2 decision for the SDA is for continued active management, then long-term consequences to aquatic or terrestrial receptors would be expected to be somewhat larger than those for the Sitewide Removal or Close-In-Place Alternatives; these consequences would be nonetheless bounded by those analyzed for the No Action Alternative (see Section 4.1.6.4).

4.1.6.4 No Action Alternative

Under the No Action Alternative, no decommissioning actions would be taken. It is estimated, however, that, a portion of the site (693 hectares [1,713 acres]) could be released for unrestricted use, while remaining portions would continue to be monitored and maintained as required by Federal and state regulations. There would be no decommissioning impacts on terrestrial resources, wetlands, aquatic resources, or threatened and endangered species under this alternative.

Long-Term Impacts

As described in discussion for the Sitewide Close-In-Place Alternative of this chapter (Section 4.1.6.2), a screening-level ecological risk assessment was performed to understand the potential for local adverse ecological impacts from long-term releases of radionuclides at the site. The screening analysis for the No Action Alternative compared projected radionuclide concentrations within surface water and sediment against DOE BCGs for terrestrial vertebrates and aquatic biota along Buttermilk Creek below the point where

Franks Creek discharges into Buttermilk Creek, and along Franks Creek above the point where Quarry Creek enters Franks Creek. The Franks Creek receptor was added for this Final EIS.

The projected water concentrations for the Buttermilk Creek location exceeded the DOE screening-level concentration limits for aquatic biota by a factor of 2 but did not exceed the screening-level concentrations for terrestrial vertebrates. The projected sediment concentrations were about 0.5 percent of the DOE screening-level concentration limits for aquatic biota and less than 16 percent of the screening-level concentrations for terrestrial vertebrates.

The projected water concentrations for the Franks Creek location exceeded the DOE screening-level concentration limits for aquatic biota by a factor of 12 but did not exceed the screening-level concentrations for terrestrial vertebrates. The projected sediment concentrations were about 3 percent of the DOE screening-level concentration limits for aquatic biota and about 90 percent of the screening-level concentrations for terrestrial vertebrates.

On the basis of this screening analysis, it was concluded that long-term releases from the No Action Alternative (assuming no unmitigated erosion) could result in long-term ecological consequences for aquatic biota.

4.1.7 Cultural Resources

Cultural resources include prehistoric, historic, and traditional cultural properties. Prehistoric resources are physical remains of human activities that predate written records. They generally consist of artifacts that may alone or collectively yield information about the past. Historic resources consist of physical properties that postdate the emergence of written records. In the United States, they are architectural structures or districts, archaeological objects, or archaeological features dating from 1492 and later. Ordinarily, sites less than 50 years old are not considered historic, but exceptions can be made if the sites are of particular importance, such as structures associated with Cold War themes. Traditional cultural properties include sites, areas, and materials that have a cultural significance to American Indians and other ethnic groups. A traditional cultural property is associated with cultural practices or beliefs that are rooted in history and are important in maintaining the continuing cultural identity of the community for religious or heritage-related reasons. Such resources may include geographic features, plants, animals, cemeteries, battlefields, trails, or sacred/ceremonial sites.

Decommissioning activities are not likely to have an impact on prehistoric resources, historic resources, or traditional cultural properties in or near WNYNSC. The analysis of potential impacts on cultural resources under each alternative is summarized in **Table 4–10**.

To determine whether cultural resources were present, previous surveys of facility locations were examined. Potential indirect impacts include those associated with reduced access to a resource site, as well as impacts associated with increased traffic and visitation to sensitive areas. Direct impacts include those resulting from ground-disturbing activities associated with demolition, construction, and operations. Avoidance of identified cultural resources would be a primary goal wherever practical. To avoid loss of cultural resources during construction, cultural resource surveys would be conducted in the area of interest. Although no alternative is expected to affect significant cultural resources, the potential for inadvertent discovery of prehistoric or archaeological resources exists, especially in areas that are not presently disturbed. Consultations to comply with Section 106 of the National Historic Preservation Act were conducted with the New York State Office of Parks, Recreation, and Historic Preservation. Correspondence offering consultation was sent to the Seneca Nation of Indians (see Appendix O of this EIS). There will be ongoing correspondence with the Seneca Nation of Indians to discuss any issues or concerns that arise.

Table 4–10 Cultural Resources Impacts

Resource	***Sitewide Removal Alternative***	***Sitewide Close-In-Place Alternative***	***Phased Decisionmaking Alternative***	***No Action Alternative***
Prehistoric	None expected; lack of existing prehistoric resources on site. This alternative would have a greater potential for impact due to land disturbance and the possibility of unearthing archaeological resources. If prehistoric resources are found, they would most likely be in areas that are not presently developed.	None expected; lack of existing prehistoric resources on site. If prehistoric resources are found, they would most likely be in areas that are not presently developed.	None expected for Phase 1; lack of existing prehistoric resources on site. If Phase 2 involves removal activities, there would be greater potential for land disturbance with the possibility of unearthing archaeological resources. If prehistoric resources are found, they would most likely be in areas that are not presently developed. Continued active management of the SDA would not affect currently undeveloped land.	None expected; lack of existing prehistoric resources on site.
Historic	None expected; no sites of historical significance were identified on site in previous surveys. This alternative would have a greater potential for impacts due to the land disturbance and the possibility of unearthing archaeological resources. If historic resources are found, they would most likely be in areas that are not presently developed.	None expected; no sites of historical significance were identified on site in previous surveys. If historic resources are found, they would most likely be in areas that are not presently developed.	None expected for Phase 1; no sites of historical significance were identified on site in previous surveys. If Phase 2 involves removal activities, there could be greater potential for impacts due to land disturbance and the possibility of unearthing archaeological resources. If historic resources are found, they would most likely be in areas that are not presently developed. Continued active management of the SDA would not affect currently undeveloped land.	None expected; no sites of historical significance were identified on site in previous surveys.
Traditional Cultural Properties	None expected; decommissioning activities would occur in previously disturbed areas or areas lacking traditional cultural properties. There is ongoing consultation with the Seneca Nation of Indians regarding possible impacts. This alternative would have a greater potential for impact due to land disturbance and the possibility of unearthing archaeological resources. If traditional cultural properties are found, they would most likely be in areas that are not presently developed.	None expected; decommissioning activities would occur in previously disturbed areas or areas lacking traditional cultural properties. There is ongoing consultation with the Seneca Nation of Indians regarding possible impacts. If traditional cultural resources are found, they would most likely be in areas that are not presently developed.	None expected for Phase 1; decommissioning activities would occur in previously disturbed areas or areas lacking traditional cultural properties. If Phase 2 involves close-in-place activities, no impacts are expected. If Phase 2 involves removal activities, there could be greater potential for impact due to land disturbance with the possibility of unearthing archaeological resources. If traditional cultural resources are found, they would most likely be in areas that are not presently developed. Continued active management of the SDA would not affect currently undeveloped land. There is ongoing communication with the Seneca Nation of Indians regarding possible impacts.	None expected; no traditional cultural properties were identified on site in previous studies. There is ongoing consultation with the Seneca Nation of Indians regarding possible impacts.

SDA = State-Licensed Disposal Area.

4.1.7.1 Sitewide Removal Alternative

Prehistoric Resources

Under the Sitewide Removal Alternative, all facilities would be removed and the entire site would be available for release for unrestricted use (except for possible operation of the Container Management Facility). About 16.6 hectares (41 acres) of previously undisturbed land would be affected by remediating the Cesium Prong. If prehistoric resources are found, they would most likely be in areas that are not presently developed. No adverse impacts on prehistoric resources are expected because the activities under this alternative would primarily occur in previously disturbed areas (WSMS 2009a). There has only been one prehistoric lithic findspot on WNYNSC, which was considered a stray find (WVNS 1994b) (see Chapter 3, Section 3.9.1). No other cultural material or cultural features were observed during additional shovel test pits. If additional prehistoric resources were uncovered during demolition or construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

Historic Resources

Under this alternative, impacts on potential historic resources associated with natural stream channels would be greatest during removal of trees and vegetation along Erdman Brook to allow access for heavy excavation equipment. About 16.6 hectares (41 acres) of previously undisturbed land would be affected by remediating the Cesium Prong. If historic resources are found, they would most likely be in areas that are not presently developed. The possibility of unearthing previously undetected sites is greater near the banks of streams and rivers, where previous inhabitants tended to establish settlements. Increased human presence and vehicular traffic would also contribute to the disturbance. Of the 10 historic sites and structures identified during cultural resource surveys (see Chapter 3, Section 3.9.2), none has been determined eligible for inclusion in the National Register of Historic Places (SHPO 1995, DOE 2006c). If potential historic resources are found during demolition or construction, additional investigations may be required. Consultation with the State Historic Preservation Officer would be undertaken, as necessary, to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places, and, if appropriate, data and artifact recovery would be conducted. Further mitigation measures would be developed and implemented should such a discovery occur.

Traditional Cultural Properties

Under the Sitewide Removal Alternative, most activities would occur within previously disturbed areas contained within or adjacent to developed areas. About 16.6 hectares (41 acres) of previously undisturbed land would be affected by remediating the Cesium Prong. If traditional cultural properties are found, they would most likely be in areas that are not presently developed. The likelihood that these areas contain cultural materials intact or in their original context is small, as indicated by the results of cultural resources studies (SHPO 1995, DOE 2005a).

Under this alternative, the reservoirs in WMA 12 would be drained slowly and in accordance with applicable Federal and state regulations and approval from NYSDEC, the New York State Department of Health, and EPA. The reservoirs drain into Buttermilk Creek, which flows into Cattaraugus Creek. Cattaraugus Creek, located downstream approximately 24 kilometers (15 miles) from WNYNSC, holds great cultural and economic significance to the Seneca Nation of Indians (Snyder 1993). Because decommissioning activities that could adversely impact Cattaraugus Creek and potential traditional cultural resources would be accomplished in a controlled manner, no impacts are expected (WSMS 2009a). As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any impacts that could result from implementing this alternative.

4.1.7.2 Sitewide Close-In-Place Alternative

Prehistoric Resources

Under this alternative, key facilities would be closed in place. Other areas would be isolated and could remain under license or permit for the foreseeable future. About 10.1 hectares (25 acres) of previously undisturbed land would be affected by installation of erosion control features. If prehistoric resources are found, they would most likely be in areas that are not presently developed. As for the Sitewide Removal Alternative, due to the absence of prehistoric finds in the area, no impacts on prehistoric resources are expected. (The only artifact recovered from surveys of this area is considered to be a "stray find" because it was isolated and not found in association with other prehistoric cultural material or features.) If additional prehistoric resources were uncovered, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

Historic Resources

As noted for the Sitewide Removal Alternative, no historic sites or structures that are eligible for the inclusion in the National Register of Historic Places have been identified during cultural resource surveys at WNYNSC. About 10.1 hectares (25 acres) of previously undisturbed land would be affected by erosion control features. If historic resources are found, they would most likely be in areas that are not presently disturbed. Although the majority of activities under the Sitewide Close-In-Place Alternative would occur within previously disturbed areas contained within or adjacent to developed areas, there is always the potential to unearth or expose cultural material during excavation. If historic resources were found, consultation with the State Historic Preservation Officer would be undertaken, as necessary, to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places, and, if appropriate, data and artifact recovery would be conducted. Further, mitigation measures would be developed and implemented should such a discovery occur.

Traditional Cultural Properties

Under this alternative, most activities would occur within previously disturbed areas contained within or adjacent to developed areas. Approximately 10.1 hectares (25 acres) of previously undisturbed land would be affected by installation of erosion control features. If traditional cultural properties were found, they would most likely be in areas that are not presently developed. Decommissioning activities that could adversely impact Cattaraugus Creek and potential traditional cultural properties would be accomplished in a controlled manner and impacts would be minimal (WSMS 2009b). As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any impacts that could result from implementing this alternative.

4.1.7.3 Phased Decisionmaking Alternative

Prehistoric Resources

Under this alternative, decommissioning would be conducted in two phases. Phase 1 would initiate the decommissioning process for parts of WNYNSC, and Phase 2 would complete the decommissioning or long-term management process for the balance of WNYNSC. No impacts on prehistoric resources are expected. As stated for the previous alternatives, no significant prehistoric finds were discovered during previous surveys, although similar to that under the Sitewide Removal and Sitewide Close-In-Place Alternatives, there would be a greater potential for impact if Phase 2 activities involve disturbances of previously undeveloped land. There would be less disturbance of previously undeveloped land if the sitewide Phase 2 decision was to close the remaining waste and contamination in place than if the sitewide decision was to remove the remaining waste and contamination. Continued active management of the SDA would neither increase or decrease impacts because none of the SDA consists of previously undeveloped land.

If additional prehistoric resources were uncovered during construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

Historic Resources

Under both phases of the Phased Decisionmaking Alternative, impacts on historic resources would be similar to those stated for the Sitewide Removal and Close-In-Place Alternatives. The existing historic sites and structures identified in previous surveys were not determined to have cultural significance, although if historic resources were found, they would be most likely be in areas that are not presently disturbed. There would be less disturbance of previously undeveloped land if the sitewide Phase 2 decision was to close the remaining waste and contamination in place than if the sitewide decision was to remove the remaining waste and contamination. Continued active management of the SDA would neither increase or decrease impacts because none of the SDA consists of previously undeveloped land.

If historic resources were found, consultation with the State Historic Preservation Officer would be undertaken, as necessary, to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places, and, if appropriate, data and artifact recovery would be conducted. Further, mitigation measures would be developed and implemented should such a discovery occur.

Traditional Cultural Properties

It is not expected that either phase of the Phased Decisionmaking Alternative would have any impacts on traditional cultural properties. As for the Sitewide Removal and Close-In-Place Alternatives, historic resources would be most likely found in areas that are not presently disturbed, and most decommissioning activities would occur within previously disturbed areas contained within or adjacent to developed areas. There would be less disturbance of previously undeveloped land if the sitewide Phase 2 decision was to close the remaining waste and contamination in place than if the sitewide decision was to remove the remaining waste and contamination. Continued active management of the SDA would neither increase or decrease impacts because none of the SDA consists of previously undeveloped land.

As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any impacts that could result from implementing this alternative.

4.1.7.4 No Action Alternative

Prehistoric Resources

No actions toward decommissioning would be taken. No impacts on prehistoric resources are expected because no additional disturbances to previously undisturbed areas of the site are planned.

Historic Resources

No impacts on historic resources are expected because no additional disturbances to previously undisturbed areas of the site are planned.

Traditional Cultural Properties

No impacts on traditional cultural properties are expected under this alternative. Mitigation measures would be implemented as needed following the replacement or refurbishment of a structure, system, or component

(WSMS 2009d). As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any impacts that could result from implementing this alternative.

4.1.8 Socioeconomics

Socioeconomic impacts are the result of changes to the demographic, economic, and social conditions of a region. The major measure in this analysis is the change in the number of jobs in the affected region. Jobs are characterized by two types: (1) construction-related jobs, which are transient in nature and short in duration, and thus, less likely to have a longer term socioeconomic impact; and (2) operations-related jobs in support of facility operations, which are required for a longer period of time, and thus, have a greater potential for permanent socioeconomic impacts in the region.

Potential economic impacts include the effects on employment, earnings, and output. Because earnings and output are a derivation of employment, this analysis focuses on employment impacts. **Table 4–11** lists the potential employment impacts estimated under each alternative. To provide a backdrop to realize the scale of the impacts, the average annual employment associated with the implementation of each alternative was compared to the projected regional labor force during the final year of decommissioning activities. Potential social and demographic impacts as a result of changes in employment and economic activity are discussed in this section.

Based on the expected changes in employment levels, the impact on economic conditions currently experienced within the ROI would be small. For the purposes of comparison, as of 2008, there were about 484,000 individuals employed in the two-county ROI (445,000 in Erie County and 39,000 in Cattaraugus County) (NYSDOL 2008b). The largest impact would be associated with implementing the Sitewide Removal Alternative, because this alternative would have a long-lasting, elevated worker requirement that would put the most money into the local economy. No change is expected in regional unemployment rates because the average requirements for additional workers at the site to support closure activities would be a very small percentage of workers in the region, and, more importantly, much of the work would be accomplished over relatively short periods of time by subcontractors hired to accomplish specific demolition or cleanup tasks. The businesses that accomplish these efforts typically work on jobs for set periods of time and then move on to other jobs, so it is not expected that the need for additional workers at the site would result in an influx of workers into the area during implementation of any of the alternatives. In some cases, personnel who may be losing permanent positions as activities are closed on site might transition to cleanup-related activities. There would eventually be a loss of employment at the site as a result of implementing the alternatives, but these losses would be known in advance and planning should allow the community to absorb the relatively small number of workers without unduly stressing existing support programs.

There would be no appreciable impact to the demographic characteristics of the ROI. The in-migration of workers, if any, to support the decommissioning or long-term management operations at WNYNSC under any of the alternatives would be small. Likewise, there would be no appreciable change in the current availability of housing and/or demand for community services within the ROI.

During implementation of the Sitewide Removal, Sitewide Close-In-Place, or Phased Decisionmaking (Phase 1) Alternatives, additional funds would flow into the local economy as a result of increased spending to support decommissioning activities. About $100 million (2008 dollars) of project funding is estimated to be spent annually implementing the decommissioning actions for each of these three alternatives (WSMS 2009e), although a large fraction of these funds would go toward shipping waste off site for alternatives that involve removal, and the full benefit of these funds would not necessarily flow into the local economy.

Table 4–11 Summary of Socioeconomic Impacts

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Decommissioning Action Employment Levels	Greatest potential for socioeconomic impacts due to the longest duration of decommissioning actions (average 250 employees over 60 years). Employment levels would be a small fraction of regional employment, so there would be no discernible impact on socioeconomic infrastructure. Eventual reduction in employment is known and should be manageable.	Moderate potential for socioeconomic impacts over the duration of decommissioning actions (average 320 employees over 7 years). Employment levels would be a small fraction of regional employment, so there would be no discernible impact on socioeconomic infrastructure. Eventual reduction in employment is known and should be manageable.	Moderate potential for socioeconomic impacts over the duration of Phase 1 decommissioning actions (average 230 employees over 8 years). Additional employment could follow from the Phase 2 decision, depending on actions to be taken. If the Phase 2 decision is removal of all remaining waste and contamination, employment levels (in worker years) for this alternative would be similar to those for the Sitewide Removal Alternative; if the SDA Phase 2 decision is continued active management, the overall labor resources required to complete the alternative would decrease by about 25 percent. If the Phase 2 decision is close-in-place, the employment levels (in worker-years) would be equal to or slightly less than those for the Sitewide Close-In-Place Alternative; if the SDA Phase 2 decision is continued active management, the overall labor resources required to complete the alternative would decrease by about 15 percent. Employment levels would be a small fraction of regional employment, so there would be no discernible impact on socioeconomic infrastructure. Eventual reduction in employment is known and should be manageable.	No decommissioning action employment.
Monitoring and Maintenance Employment Levels	About 20 employees assuming onsite storage of orphan waste; none if onsite storage is not necessary.	About 31 employees until the Interim Storage Facility is removed in year 33; 18 employees thereafter.	About 50 employees until the Interim Storage Facility is removed in year 30. Longer-term employment depends on the Phase 2 decision.	About 75 employees, including the effective annual level for routine replacement activities.

SDA = State-Licensed Disposal Area.

4.1.8.1 Sitewide Removal Alternative

An average annual workforce of about 250 would be required throughout the 60-year implementation of this alternative, which would result in the highest number of worker-years of any of the decommissioning alternatives. Resulting indirect employment is expected to average about 270 workers. Peak staffing of approximately 300 is estimated to occur between years 26 and 31. The lowest staffing levels would be required during the last year of the decommissioning actions, when approximately 40 individuals would be needed during the final stages of excavation of the North Plateau Groundwater Plume (WSMS 2009a). Construction employment is estimated to peak at about 140 workers around year 3. The average total employment that could be attributed to implementing this alternative is estimated to be approximately 0.10 percent of the projected regional labor force during the final year of the implementation phase. Assuming no orphan waste has to be managed on site, no long-term monitoring staff would be required because the site would meet all the criteria for unrestricted release. If orphan waste must be managed on site, operations would cost approximately $3.7 million annually (WSMS 2009a) and require a staff of approximately 20 workers.

The level of employment associated with the Sitewide Removal Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Similarly, at the end of the project, the additional land available for release for unrestricted use is not expected to spur development or other growth-inducing factors.

4.1.8.2 Sitewide Close-In-Place Alternative

The average annual staffing requirements during the 7-year decommissioning period would be about 320 workers, which would result in fewer worker-years than that for the Sitewide Removal Alternative. The average indirect employment during decommissioning is estimated at about 340 workers. Peak employment of about 350 workers is estimated to occur around year 2. Construction employment is estimated to peak at about 131 workers around year 7. The average total employment for implementing this alternative would be approximately 0.13 percent of the projected ROI labor force during the final year of decommissioning actions. For purposes of analysis, operation of the Interim Storage Facility is projected to continue until about year 32, and be demolished the following year. After decommissioning of this facility, it is expected that the labor force of 31 employees would be reduced to 18 employees who would perform routine monitoring, maintenance, and systems replacement activities, including replacement of the North Plateau permeable treatment wall about every 20 years (WSMS 2009b).

The level of employment associated with the Sitewide Close-In-Place Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Similarly, at the end of the project, the additional land available for release for unrestricted use is not expected to spur development or other growth-inducing factors.

4.1.8.3 Phased Decisionmaking Alternative

During Phase 1, estimated annual staffing would average approximately 230 workers. The peak requirement of 330 workers would occur approximately in year 3 during construction of the Interim Storage Facility and removal of facilities such as the Main Plant Process Building and Low-Level Waste Treatment Facility area lagoons. The average indirect employment during Phase 1 decommissioning is estimated at about 250 workers. The average total employment due to activities at WNYNSC during Phase 1 is estimated to be 0.09 percent of the projected ROI labor force during the final year of Phase 1 decommissioning activities. Phase 1 decommissioning actions would be completed by year 8, but monitoring and maintenance activities would continue while onsite studies are conducted and the Interim Storage Facility is operational. Employment during this time would be about 50 workers. For purposes of analysis, the Interim Storage Facility was projected to operate until approximately year 30, when it would be demolished (WSMS 2009c). Activities associated with Phase 2 are expected to begin during the end of Phase 1 decommissioning actions or in the early years of the monitoring and maintenance period. If a Phase 2 decision is delayed past the completion of Phase 1 decommissioning activities, there could be a drop in employment until a Phase 2 decision is made.

If the Phase 2 decision is removal of all remaining waste and contamination, employment levels and related socioeconomic impacts for the entire Phased Decisionmaking Alternative would be similar to those described for the Sitewide Removal Alternative. If the decision for the SDA is continued active management, the employee resources necessary to implement removal would decrease due to the reduction in removal activity outweighing the addition of maintenance personnel. The decrease in removal activity would decrease labor requirements by approximately 3,800 worker-years (25 percent). It is estimated that approximately 10 employees would be required for continued active management of the SDA.

If the Phase 2 decision is in-place closure, employment levels for the entire Phased Decisionmaking Alternative would be equal to or slightly less than those described under the Sitewide Close-In-Place Alternative. If the Phase 2 decision for the SDA is continued active management, the employment resources necessary to implement sitewide closure would decrease due to the reduction in removal activity outweighing the addition of maintenance personnel. The decrease in removal activity would decrease the labor requirements by approximately 530 worker-years (15 percent). Again, approximately 10 employees would be required for continued active management of the SDA.

The level of employment associated with the Phased Decisionmaking Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Possible fluctuations in employment between completion of Phase 1 decommissioning activities and the implementation of Phase 2 would not cause a notable impact on unemployment rates in the ROI. At the end of Phase 2, the additional land that may be available for release for unrestricted use would not be expected to spur development or other growth-inducing factors.

4.1.8.4 No Action Alternative

Approximately 75 full-time-equivalent personnel would be required to monitor and maintain WNYNSC. These personnel would include operations personnel who would provide full-time staffing (i.e., 24 hours a day, 7 days a week). Also included would be engineering and maintenance personnel, as well as personnel within the various support organizations, including Quality Assurance, Industrial Hygiene and Safety, Purchasing, Financial, Environmental Affairs, Computer Support, Human Resources, Analytical Labs, and Security, as well as personnel expected to be required about every 20 to 25 years to replace roofs, the SDA and NDA geomembranes, and the permeable treatment wall (WSMS 2009d). The average indirect employment is estimated at about 80 workers. The average annual total employment attributed to the No Action Alternative is estimated to be 0.03 percent or less of the projected ROI labor force.

The level of employment associated with the No Action Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Similarly, the land available for release for unrestricted use is not expected to spur development or other growth-inducing factors.

4.1.9 Human Health and Safety During Decommissioning Activities

Actions to implement decommissioning would result in releases of radioactive materials to the atmosphere and to local surface waters. These releases would result in radiation doses and the risk of latent cancer fatalities (LCFs) to offsite individuals and populations, as well as occupational exposure to site workers. Accidents during decommissioning actions could result in doses to offsite individuals. Because fatal cancer is the most serious effect of environmental and occupational radiation exposures, estimates of cancer fatalities, rather than cancer incidence, are presented in this section. These effects are referred to as "latent" cancer fatalities because the cancer may take many years to develop. The numbers of fatal cancers can be used to compare the risks among the various alternatives.[8] A more-detailed discussion of LCFs is presented in Appendix I, Section I.3, of this EIS. (Note that cancer incidence [latent cancer morbidity] is analyzed in Section 4.1.10 to enable comparison of the projected long-term impacts under the EIS alternatives with the Comprehensive Emergency Response, Compensation, and Liability Act [CERCLA] risk range.)

Section 4.1.9.1 provides incident-free radiological impacts, while Section 4.1.9.2 presents accident-related radiological and chemical impacts. **Table 4–12** presents a comparison of the impacts under normal operations and accidents.

[8] The risk factor of 0.0006 fatal cancers per rem or person-rem (DOE 2002f) was used as the conversion factor for all radiological exposures due to accidents. For incident-free decommissioning operations resulting in radiological exposure, lifetime fatal cancer risk was calculated using radionuclide-specific risk factors.

Table 4–12 Summary of Health and Safety Impacts

Environmental Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Total Public Population Dose	Total public population dose from decommissioning actions over 60 years would be approximately 120 person-rem and 0.0010 person-rem when the Interim Storage Facility is demolished. No public population dose would occur in the region following decommissioning actions, even if orphan waste was stored pending offsite disposal.	Total public population dose from decommissioning actions over 7 years would be approximately 40 person-rem. There would be a small additional dose of 0.00046 person-rem from each periodic North Plateau Groundwater Plume permeable treatment wall replacement, if necessary, and a one-time dose of 0.0010 person-rem when the Interim Storage Facility is demolished (total 0.0015 person-rem if both activities occur in the same year).	Total public population dose from the Phase 1 decommissioning actions over 8 years would be approximately 42 person-rem. There would be a small additional dose of 0.038 person-rem from one-time North Plateau Groundwater Plume permeable treatment wall replacement, if necessary, one-time Interim Storage Facility removal, and annual WMA 3 operations during Phase 1 after decommissioning actions. There would be an additional public population dose for the Phase 2 actions, which have not been defined at this time. Depending on the decision for Phase 2, the total decommissioning dose for both phases would be less than 82 person-rem if the Phase 2 decision is in-place closure and about 120 person-rem if the Phase 2 decision is removal. If the Phase 2 decision for the SDA is continued active management, the total population dose would be bounded by this range.	There would be no decommissioning actions. There would be a recurring annual dose of 0.083 person-rem per year as WNYNSC is monitored and maintained for the foreseeable future. This annual population dose would gradually decrease with time as the inventory decays.
Peak Annual MEI Dose	The peak annual dose to the MEI would be 1.3 millirem, due to releases to the atmosphere during decommissioning actions.	The peak annual dose to the MEI would be 0.16 millirem, due to air releases during decommissioning actions.	The peak annual dose to the MEI would be 2.2 millirem, due to releases to the atmosphere during decommissioning actions. Depending on the decision for Phase 2 (i.e., Sitewide Close-In-Place Alternative or Sitewide Removal Alternative), the peak annual Phase 2 dose would generally be no greater than that for the Sitewide Close-In-Place Alternative or Sitewide Removal Alternative. If the Phase 2 decision for the SDA is continued active management, the peak annual dose would be bounded for some receptors by the No Action Alternative.	The peak annual dose to the MEI would be 0.61 millirem, due to recurring liquid releases as the facilities are being monitored and maintained.
Total Worker Dose	Total worker population dose from decommissioning actions over 60 years is estimated to be approximately 990 person-rem. A recurring worker exposure of about 0.15 person-rem per year would occur following decommissioning actions if orphan waste is stored on site pending offsite disposal.	Total worker population dose from decommissioning actions over 7 years is estimated to be approximately 120 person-rem. A recurring worker exposure of about 0.80 person-rem per year would occur as part of monitoring and maintenance activities.	Total worker population dose from Phase 1 decommissioning actions over 8 years is estimated to be approximately 160 person-rem. There would be additional occupational exposure for Phase 1 actions following decommissioning of 1.7 person-rem per year. The total worker decommissioning dose for Phase 1 and Phase 2 would be 240 person-rem if in-place closure is chosen for Phase 2, and 990 person-rem if removal is chosen for Phase 2. Reduced total worker decommissioning doses would result if the Phase 2 decision for the SDA is continued active management.	There are no decommissioning actions. A recurring worker exposure of approximately 2.0 person-rem per year would occur as part of monitoring and maintenance activities, assuming no orphan waste is stored on site.
Potential Accidents – Relative Risk to the Population and MEI	Highest [a]	Low [a]	Low [a,b]	Lowest [a]

MEI = maximally exposed individual, SDA = State-Licensed Disposal Area.

[a] These terms are meant to show a relative comparison between alternatives of the very small radiological consequences and risks for all short-term accident scenarios for all alternatives.

[b] Depending on the decision for Phase 2 actions, the relative risk could remain low or be as high as that for the Sitewide Removal Alternative. This would be the case whether or not the Phase 2 decision for the SDA is continued active management.

4.1.9.1 Incident-free Radiological Impacts

Population

The Sitewide Removal Alternative, Sitewide Close-In-Place Alternative, and Phase 1 of the Phased Decisionmaking Alternative would each result in controlled releases of radionuclides to the atmosphere and surface streams during decommissioning. While there would be no decommissioning actions under the No Action Alternative, ongoing releases to the atmosphere and surface water would occur.

Controlled releases to air and water during decommissioning actions would result in doses to the surrounding general population. The releases are presented in terms of a peak annual population dose and a total population dose. Peak annual population dose is the largest dose expected for any of the years during decommissioning operations under each alternative; the total population dose is the sum of the annual doses over the periods of decommissioning under each alternative. The population dose for air releases is based on the dose to 1.7 million people in the U.S. and Canada who live within 80 kilometers (50 miles) of WNYNSC. The population dose for liquid releases is based on the dose to the population served by two water treatment systems that are within 80 kilometers (50 miles) of WNYNSC. Liquid releases flow off site via permitted outfalls into Cattaraugus Creek and ultimately into Lake Erie and the Niagara River, where they could enter water treatment plants. These water treatment plants serve 951,000 individuals. The drinking-water dose analysis conservatively assumes no radionuclide removal in the water treatment system. In addition, the potential exists for a population dose from the consumption of fish raised in Lake Erie. Fish yields from northern Lake Erie were used to establish an estimate of the amount of contaminated fish that might be consumed. This dose was added to the population dose for the Lake Erie and Niagara River water users. The GENII [Hanford Environmental Radiation Dosimetry Software System, Generation 11] Version 2 computer model (PNNL 2007) was used to estimate the radiological impacts of incident-free decommissioning operations. Discussion of the model and its application, along with results, is presented in Appendix I, Section I.4, of this EIS.

In addition, there could be long-term groundwater releases and potential unmitigated erosion releases under all of the alternatives, except that those for the Sitewide Removal Alternative would be very small because the potential sources of releases would be removed to levels consistent with applicable regulatory standards. The potential for long-term releases under the Phased Decisionmaking Alternative is not currently quantitatively evaluated, because Phase 2 activities have not been defined. Phase 2 releases would not be expected to be greater than those for the Sitewide Close-In-Place and No Action Alternatives, and in fact would be expected to be less because of the waste and contamination removed during Phase 1. Impacts from long-term releases are addressed in Section 4.1.10.

Table 4–13 summarizes the projected total population dose to the general population and the risk associated with this dose in terms of additional LCFs for each of the alternatives as a result of decommissioning actions. The projected dose to the general population for the decommissioning alternatives ranges from approximately 40 to 120 person-rem. These doses are expected to result in less than 1 (0.012 to 0.027) additional LCF within the affected population. In other words, no additional LCFs are expected in the population as a result of decommissioning actions.

The total decommissioning population dose for Phases 1 and 2 of the Phased Decisionmaking Alternative would depend the Phase 2 decision. Because some removal activities would occur during Phase 1, the total decommissioning population dose would be greater than that for the Sitewide Close-In-Place Alternative if the Phase 2 decision is in place closure of all remaining waste and contamination. The total dose for both phases would be less than 82 person-rem, which is the sum of the population dose for Phase 1 and the Sitewide Close-In-Place Alternative. The dose would be approximately the same as that for the Sitewide Removal

Alternative (120 person-rem) if the Phase 2 decision is to remove all remaining waste and contamination. The total decommissioning dose would be bounded by this range if the Phase 2 decision for SDA is continued active management because no decommissioning of the SDA would take place.

Table 4–13 Total Population Doses and Risk from Decommissioning Actions

Medium	*Sitewide Removal Alternative (over 60 years)*		*Sitewide Close-In-Place Alternative (over 7 years)*		*Phased Decisionmaking Alternative – Phase 1 (over 8 years)* [a]		*No Action Alternative* [b]	
	Dose (person-rem)	*Risk (LCFs)*	*Dose (person-rem)*	*Risk (LCFs)*	*Dose (person-rem)*	*Risk (LCFs)*	*Dose* [c] *(person-rem)*	*Risk* [c] *(LCFs)*
Air Releases [c]	72	0.011	2.3	0.00050	42	0.0056	NA	NA
Liquid Releases [c]	50	0.016	37	0.012	0.051	0.000016	NA	NA
Total	120	0.027	40	0.012	42	0.0056	NA	NA

LCF = latent cancer fatality, NA = not applicable.
[a] Phase 2 doses would be no greater than those for the Sitewide Removal or Sitewide Close-In-Place Alternatives if one of these actions is selected, or if the Phase 2 decision for the State-Licensed Disposal Area is continued active management.
[b] No decommissioning actions occur for the No Action Alternative.
[c] See text for descriptions of the populations addressed in the analyses.
Note: Totals may not add due to rounding.

In addition to total population dose, an estimate of the peak annual dose to the general population from the decommissioning actions for each of the decommissioning alternatives is presented in **Table 4–14**. The peak annual dose represents the highest projected annual dose to members of the general population for a given alternative. It is a function of the rate at which specific decommissioning activities occur. The peak annual dose to the general population would range from 10 to 27 person-rem, depending on the alternative.

Table 4–14 Peak Annual Population Dose from Decommissioning Actions (person-rem per year)

Medium	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative – Phase 1* [a]	*No Action Alternative* [c]
Air Releases [b]	7.9	0.64	14	NA
Liquid Releases [b]	2.5	26	0.009	NA
Total [d]	10	27	14	NA

NA = not applicable.
[a] Phase 2 doses would be no greater than those for the Sitewide Removal or Sitewide Close-In-Place Alternatives if one of these actions is selected.
[b] See text for descriptions of the populations addressed in the analyses.
[c] No decommissioning actions occur for the No Action Alternative.
[d] The listed totals are conservative because the peak year for both air and water releases would need to coincide to obtain the listed total collective doses.
Note: Totals may not add due to rounding.

For Phase 2 of the Phased Decisionmaking Alternative, the peak annual population doses from decommissioning would be bounded by the ranges shown for the Sitewide Removal and Sitewide Close-In-Place Alternatives. The peak annual doses and risks for Phase 2 could be smaller because of the decommissioning actions during Phase 1 that would remove some waste and contamination from the site. If the Phase 2 decision for the SDA is continued active management, peak annual Phase 2 decommissioning doses could be reduced because no decommissioning of the SDA would take place.

After completion of the decommissioning actions under the decommissioning alternatives, there are expected to be minimal atmospheric or water releases and thus, negligible population doses. The exception would be the maintenance actions for as-needed replacement of the permeable treatment wall and the removal of the Interim

Storage Facility for the Sitewide Close-In-Place Alternative and Phase 1 of the Phased Decisionmaking Alternative. The annual population doses due to releases after completion of the decommissioning actions are presented in **Table 4–15**. The doses shown for the Sitewide Close-In-Place and Phased Decisionmaking (Phase 1) Alternatives are peaks that are projected to occur during years when the permeable treatment wall maintenance actions would take place; the doses for the No Action Alternative apply to every year.

Table 4–15 Population Dose Following Completion of Decommissioning Actions (person-rem per year)

Medium	*Sitewide Removal Alternative* [a]	*Sitewide Close-In-Place Alternative* [b]	*Phased Decisionmaking Alternative – Phase 1* [c]	*No Action Alternative* [d]
Air Releases [e]	Negligible	0.0015	0.0015	0.0040
Liquid Releases [e]	Negligible	0.0	0.038	0.079
Total	Negligible	0.0015	0.038	0.083

[a] No releases are expected, even if orphan waste is stored.
[b] Doses are peak doses (about 0.00046 person-rem) coincident with periodic replacement of the permeable treatment wall (about every 20 years, if necessary), plus a one-time dose associated with demolition of the Interim Storage Facility (about 0.0010 person-rem). It is conservatively assumed that both doses occur in the same year.
[c] Air release doses are peak doses coincident with one-time replacement of the permeable treatment wall, and with one-time demolition of the Interim Storage Facility. Liquid release doses are from annual releases from WMA 3 from ongoing operations after completion of Phase 1 decommissioning actions. Annual population doses from the Phased Decisionmaking Alternative during Phase 2 decommissioning actions cannot be analyzed until a decision is made on Phase 2 actions. Phase 2 doses would be no greater than those for the Sitewide Removal or Sitewide Close-In-Place Alternatives if one of these actions is selected. Phase 2 doses could be larger if the Phase 2 decision for the State-Licensed Disposal Area is continued active management, but no greater than those for the No Action Alternative.
[d] Based on releases associated with continued operation of the existing ventilation and wastewater treatment systems. No decommissioning occurs for the No Action Alternative.
[e] See text for descriptions of the populations addressed in the analyses.
Note: Totals may not add due to rounding.

Peak annual population doses following decommissioning for Phase 1 of the Phased Decisionmaking Alternative are projected to be larger than those for the Sitewide Close-In-Place Alternative. The peak dose is projected to occur only once (if at all) during Phase 1 activities, but would occur periodically under the Sitewide Close-In-Place Alternative. Peak annual population doses are larger for Phase 1 because, in addition to those associated with as-needed permeable treatment wall replacement, releases to air and water (and therefore population doses) are conservatively projected from the waste and contamination not removed or closed in place during Phase 1 actions.

For the combined (Phase 1 and 2) Phased Decisionmaking Alternative, a range of annual population doses could result following completion of decommissioning actions depending on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, the annual population dose would be negligible as summarized in Table 4–15. If the Phase 2 decision is in-place closure of all remaining waste and contamination, the annual population dose would be bounded by that for the Sitewide Close-In-Place Alternative. If the Phase 2 decision is continued active management of the SDA, the annual population dose would be bounded by that for the No Action Alternative.

Maximally Exposed Individual

This section analyzes the dose to the maximally exposed individual (MEI) from decommissioning actions. The MEI dose is the largest dose expected for any individual member of the public whether from air emissions or liquid emissions. The releases to the atmosphere and to surface water result in impacts in different locations. For this reason, the following discussion addresses three receptors, any one of whom could be the MEI. One MEI is assumed to be at the site boundary for maximum exposure to air emissions, while other MEIs are located downstream for maximum liquid exposure.

For air releases, because of distance and meteorological conditions, the receptor who would receive the highest dose is located about 1.3 kilometers (0.8 miles) north-northwest of the Main Plant Process Building. It is conservatively assumed that all the food (fruit, vegetables, and meat) consumed by this receptor is raised on or near the receptor's residence. This receptor is also assumed to spend time outside, to be directly exposed to the atmospheric releases. For liquid releases, two receptors are analyzed, either of which could be the MEI, depending on the radionuclides released. The first is a receptor assumed to be along Cattaraugus Creek downstream of the confluence with Buttermilk Creek, which is located about 5.6 kilometers (3.5 miles) downstream of the Main Plant Process Building. It is assumed that this receptor drinks untreated Cattaraugus Creek water and annually consumes approximately 9 kilograms (20 pounds) of fish that is raised in Cattaraugus Creek near its confluence with Buttermilk Creek. The second receptor who could be the MEI for liquid releases would be a receptor on the lower reaches of Cattaraugus Creek, located about 28.2 kilometers (17.5 miles) downstream from the site, who annually consumes 62 kilograms (137 pounds) of locally raised fish, and drinks untreated Cattaraugus Creek water. An individual living on Seneca Nation of Indians land could be such a receptor. A receptor at the site boundary would not be impacted by liquid releases because the closest liquid pathway is Buttermilk Creek, which is not located at the closest site boundary.

The projected doses to the three potential MEI receptors under each of the decommissioning alternatives are presented in **Table 4–16**. These dose calculations are based on the assumption that the MEI remains at the exposure point for the duration of the decommissioning actions. In the case of the Sitewide Removal Alternative, this would be 60 years; for the Sitewide Close-In-Place Alternative, 7 years; and for Phase 1 of the Phased Decisionmaking Alternative, 8 years. Under the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives, the receptor at the nearest site boundary has the largest total dose. The dose would be highest under the Sitewide Removal Alternative: a total dose of 14 millirem to the MEI at the site boundary over the decommissioning time period, which would equate to an increased risk of developing a fatal cancer of 2.9×10^{-6}, or approximately 1 chance in 350,000. The highest dose to the MEI under the Sitewide Close-In-Place Alternative would be 0.58 millirem, with an increased fatal cancer risk of 1.6×10^{-7}, or approximately 1 chance in 6 million. The dose to the MEI for Phase 1 of the Phased Decisionmaking Alternative would be 6.8 millirem, with an increased fatal cancer risk of 1.1×10^{-6}, or approximately 1 chance in 900,000. There is no dose or risk under the No Action Alternative in Table 4–16 because there would be no decommissioning actions under this alternative.

For Phase 2 of the Phased Decisionmaking Alternative, the total doses and risks to the MEI would be between the values shown for the Sitewide Removal and Sitewide Close-In-Place Alternatives. The doses and risks for Phase 2 would be somewhat smaller because of the decommissioning actions during Phase 1 that would remove some of the site waste and contamination. If the Phase 2 decision for the SDA is continued active management, the total dose and risk to the MEI during Phase 2 would be expected to be reduced because no decommissioning would take place for the SDA.

Table 4–17 shows the peak annual dose to the MEI from both air and liquid releases for the alternatives. All of these radiological doses would be in compliance with 40 CFR Part 61, Subpart H, and 40 CFR Part 141. The peak annual dose to the MEI from air emissions is 1.3 millirem under the Sitewide Removal Alternative, 0.16 millirem under the Sitewide Close-In-Place Alternative, 2.2 millirem for Phase 1 of the Phased Decisionmaking Alternative, and 0.29 millirem under the No Action Alternative. This considers releases while decommissioning actions are occurring as well as releases for monitoring and maintenance activities; it also considers releases for the No Action Alternative, which does not involve decommissioning actions.

[9] *Depending on the decision for Phase 2 actions (i.e., removal or in-place closure), the MEI dose and risk for the entire Phased Decisionmaking Alternative would be no greater than those presented for the Sitewide Removal or Sitewide Close-In-Place Alternatives.*

Table 4–16 Total Dose and Risk to the Maximally Exposed Individual from Decommissioning Actions

Receptor	Sitewide Removal Alternative (Over 60 years)		Sitewide Close-In-Place Alternative (Over 7 years)		Phased Decisionmaking Alternative – Phase 1 (Over 8 years) [a]		No Action Alternative [b]	
	Dose (millirem)	Risk (LCF)	Dose (millirem)	Risk (LCF)	Dose (millirem)	Risk (LCF)	Dose [b] (millirem)	Risk [b] (LCF)
Receptor at nearest site boundary (airborne releases)	14	2.9×10^{-6}	0.58	1.6×10^{-7}	6.8	1.1×10^{-6}	NA	NA
Receptor on Cattaraugus Creek near site (liquid and airborne releases)	3.1	5.7×10^{-7}	0.29	8.7×10^{-8}	1.7	2.2×10^{-7}	NA	NA
Receptor on lower reaches of Cattaraugus Creek (liquid and airborne releases)	0.65	2.3×10^{-7}	0.32	1.1×10^{-7}	0.029	3.9×10^{-9}	NA	NA

LCF = latent cancer fatality, NA = not applicable.

[a] Phase 2 doses would be no greater than those under the Sitewide Removal or Sitewide Close-In-Place Alternatives if one of these actions is selected. This would still be the case if the Phase 2 decision for the State-Licensed Disposal Area is continued active management.

[b] No decommissioning actions occur for the No Action Alternative.

Table 4–17 Peak Annual Dose and Risk to Potential Maximally Exposed Individual

Receptor	Sitewide Removal Alternative		Sitewide Close-In-Place Alternative		Phased Decisionmaking Alternative – Phase 1 [a]		No Action Alternative	
	Dose (millirem)	Risk (LCF)	Dose (millirem)	Risk (LCF)	Dose (millirem)	Risk (LCF)	Dose (millirem)	Risk (LCF)
Receptor at nearest site boundary [b]	1.3	2.0×10^{-7}	0.16	4.2×10^{-8}	2.2	3.5×10^{-7}	0.29	9.3×10^{-9}
Receptor on Cattaraugus Creek near site [c]	0.32	4.7×10^{-8}	0.13	3.9×10^{-8}	0.54	7.2×10^{-8}	0.21	5.8×10^{-8}
Receptor on lower reaches of Cattaraugus Creek [c]	0.031	9.7×10^{-9}	0.12	4.0×10^{-8}	9.6×10^{-3}	1.2×10^{-9}	0.61	2.1×10^{-7}

LCF = latent cancer fatality.

[a] Peak Phase 2 doses would be no greater than those under the Sitewide Removal or Sitewide Close-In-Place Alternatives if removal or in-place closure is selected for Phase 2. Peak Phase 2 doses could be bounded for some receptors by the No Action Alternative if the Phase 2 decision for the State-Licensed Disposal Area is continued active management.

[b] Impacts due to airborne releases.

[c] Impacts due to air and liquid releases.

To provide perspective, the maximum peak annual dose to the MEI (2.2 millirem for Phase 1 of the Phased Decisionmaking Alternative) can be compared to the average dose from ubiquitous background and other sources of radiation. The average annual American radiation exposure is currently estimated to be about 620 millirem per year (NCRP 2009) (see Chapter 3, Table 3-16).

For Phase 2 of the Phased Decisionmaking Alternative, the peak annual MEI doses would depend on the decision. If the Phase 2 decision is removal of all remaining waste and contamination, the peak annual MEI doses would be bounded by those listed in Table 4-17 for the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure of all remaining waste and contamination, peak annual MEI doses would be bounded by those listed in this table for the Sitewide Close-In-Place Alternative. If the Phase 2 decision is continued active management of the SDA, peak annual doses could be bounded for some receptors by the No Action Alternative.

Worker

This section presents estimates of the dose to the workers at WNYNSC during decommissioning actions and during the period following completion of decommissioning actions. The occupational doses were estimated as part of the preliminary engineering work under each alternative. The method for estimating occupational exposure is presented in the methodology technical report (WSMS 2009e), and the specific estimates are presented in the technical reports for the various alternatives (WSMS 2009a, 2009b, 2009c, 2009d).

The first row in **Table 4–18** shows the total dose to the worker population from decommissioning actions, while the second row shows the average annual individual worker dose from decommissioning actions. The third row on the table presents the annual worker population dose for activities following completion of the decommissioning actions as well as those from storage of waste, monitoring, maintenance, and as-needed replacement of the SDA geomembrane and North Plateau Groundwater Plume permeable treatment wall. The values in the third row are based on the assumption that no orphan waste remains on site. The fourth row presents the annual worker population dose for all the post-decommissioning actions in the third row, plus the dose from monitoring any orphan waste generated by decommissioning actions.

As shown in Table 4–18, total worker dose for the decommissioning alternatives ranges from approximately 120 person-rem under the Sitewide Close-In-Place Alternative to 990 person-rem under the Sitewide Removal Alternative. These doses would result in less than 1 (about 0.1 to 0.6) additional fatal cancer among the involved worker population. The average annual worker dose would range from 54 millirem under the Sitewide Close-In-Place Alternative to 83 millirem under Phase 1 of the Phased Decisionmaking Alternative. Note that DOE limits dose to a worker to 5 rem per year, but an administrative control level of 500 millirem per year has been established for activities on the Project Premises (10 CFR 835.202, WVNSCO 2006). All workers working in radiation areas would be monitored to ensure their doses are within annual limits.

The Sitewide Removal Alternative has no long-term activities other than potential storage of orphan waste. The Sitewide Close-In-Place Alternative would involve long-term monitoring and maintenance activities, and the incremental exposure from the storage of orphan waste would be very small. The annual worker population monitoring and maintenance dose following completion of the Phase 1 removal actions is greater than that for site maintenance under the Sitewide Close-In-Place Alternative because the facilities would be in a condition similar to the No Action condition and not placed in a low-maintenance configuration.

Total worker doses for the entire Phased Decisionmaking Alternative (Phase 1 and Phase 2) would be about 240 person-rem if the Phase 2 decision is in-place closure, and about 990 person-rem if the Phase 2 decision is removal of remaining waste and contamination. Reduced total worker decommissioning doses would result if the Phase 2 decision for the SDA is continued active management. For Phase 2 actions following decommissioning, the total annual worker population dose would be very low as shown in Table 4–18 if the Phase 2 sitewide decision is removal or in-place closure. The total annual worker population dose could be larger if the Phase 2 decision for the SDA is continued active management, but would be bounded by that for the No Action Alternative.

The range of annual doses to the post-decommissioning monitoring and maintenance worker can be also estimated based on a review of historical data. Site workers performing work similar to the type envisioned for post-decommissioning monitoring and maintenance, plus some higher-exposure work, receive annual doses of 10 millirem per year to 60 millirem per year. When allowances are made for the fact that higher-exposure work would not be included in post-decommissioning monitoring and maintenance, it is estimated that the annual dose to post-decommissioning monitoring and maintenance workers would generally be in the range of 10 to 20 millirem per year.

Table 4–18 Projected Worker Dose and Risk During and After Decommissioning

	Sitewide Removal Alternative		***Sitewide Close-In-Place Alternative***		***Phased Decisionmaking Alternative – Phase 1*** [b]		***No Action Alternative*** [d]	
	Dose	***Risk (LCF)***	***Dose***	***Risk (LCF)***	***Dose***	***Risk (LCF)***	***Dose***	***Risk (LCF)***
Total worker population dose from decommissioning actions (person-rem) [a]	990	0.60	120	0.070	160	0.090	NA	NA
Average individual worker dose from decommissioning actions [a] (millirem per year)	66	0.00004	54	0.000030	83	0.000050	NA	NA
Total annual worker population dose for actions following decommissioning actions—no generated orphan waste monitoring and maintenance (person-rem per year)	0.0	0.0	0.80	0.0005	1.7	0.001	2.0	0.0010
Total annual worker population dose for actions following decommissioning actions—with generated orphan waste monitoring and maintenance (person-rem per year)	0.15	0.000090	0.80 [c]	0.00050	1.7 [c]	0.001	2.1	0.0010

LCF = latent cancer fatality, NA = not applicable.

[a] Based on a total workforce of 250, 320, and 230 persons for the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives, respectively.

[b] Depending on the decision for Phase 2 actions (e.g., removal or close-in-place), the Phase 2 projected worker dose and risk during decommissioning would be no greater than that projected for the Sitewide Removal or Sitewide Close-In-Place Alternatives. If the Phase 2 decision is removal, the total worker population dose for Phase 2 would be about 830 person-rem. If the Phase 2 decision is in-place closure, the total worker population dose for Phase 2 would be about 76 person-rem. Phase 2 doses would be reduced in either case if the Phase 2 decision for the State-Licensed Disposal Area is continued active management.

[c] The contribution to this dose from orphan waste is small relative to that from the other wastes.

[d] The No Action Alternative has no decommissioning actions.

Sources: WSMS 2009a, 2009b, 2009c, 2009d, 2009e.

Table 4–19 presents the estimated worker nonradiological accidents and fatalities that could occur from actions planned for each of the proposed alternatives. These estimates were projected using data from DOE's historical database for worker injuries and fatalities at its facilities (WSMS 2009a, 2009b, 2009c, 2009d, 2009e). These estimates are conservative in that the average WNYNSC injury rates for the period 1999 through 2005 were about half of those obtained from the overall DOE historical database, as discussed in Chapter 3, Section 3.11.4 of this EIS, and smaller than the average injury rates associated with related industries. Using the projected number of hours involved in implementing the alternatives and the historical accident rates, it is estimated that over 60 years, the number of reportable cases would be 556 for the Sitewide Removal Alternative with 267 lost workdays; for the Sitewide Close-In-Place Alternative, over 60 years, there would be 131 reportable cases and 63 lost workdays. Phase 1 of the Phased Decisionmaking Alternative would result in 122 reportable cases and 59 lost workdays, over 30 years. If removal of all remaining waste and contamination was selected for Phase 2, the total number of reportable cases, lost workdays, and worker fatalities for Phase 2 could be as many as that for the Sitewide Removal Alternative; if close-in-place is selected for all remaining waste and contamination, the total numbers for Phase 2 could be as many as that for the Sitewide Close-In-Place Alternative. If the Phase 2 decision for the SDA is continued active management, the total numbers for Phase 2 would be expected to be less than or equal to those for the Sitewide Removal or Sitewide Close-In-Place Alternatives.

Over 60 years, there would be 148 reportable cases and 71 lost workdays for the No Action Alternative. No fatalities from worker accidents are expected under any of the alternatives. These estimates are for work accomplished on site and do not include transportation accidents. Transportation accidents are addressed in Section 4.1.12, Transportation, of this EIS.

Table 4–19 Conventional Worker Injuries and Fatalities for Implementing Each Alternative

				No Action Alternative (over 60 years)
Total Reportable Cases	556	131	122	148
Lost Workday Cases	267	63	59	71
Estimated Fatalities	0.22	0.06	0.05	0.045

[a] To provide a basis of comparison among the alternatives, impacts are presented over a 60-year period for the Sitewide Removal, Sitewide Close-In-Place, and No Action Alternative; and, for purposes of analysis, 30 years for Phase 1 of the Phased Decisionmaking Alternative.

4.1.9.2 Accident Impacts

Radiological Accident Impacts

This section estimates the consequences of significant radiological accidents and radiological accident risk during decommissioning activities under the decommissioning alternatives. The consequences of short-term significant radiological accidents that could occur over minutes to days are presented both in terms of radiation dose and LCFs. LCFs from radiation doses are based on a 50-year latent time period after exposure to a radiation dose. The LCF risks are based on accident-specific probability estimates.

For each alternative, a range of postulated accidents that encompasses a range of annual frequencies and radiological consequences was examined to provide a basis for estimating risk and for understanding the differences in accident risks for the various alternatives.

Radiological accidents were identified by reviewing the description of facilities and operations presented in the engineering reports for each of the alternatives (WSMS 2009a, 2009b, 2009c, 2009d, 2009e), the West Valley Safety Analysis Report (WVNS 2004a), and relevant EISs including the *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* (DOE/EIS-0337F) (DOE 2003e), and the *Final Environmental Impact Statement on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Center (Plutonium Residues EIS)* (DOE/EIS-0277F) (DOE 1998). The *Plutonium Residues EIS* is relevant to this analysis because it analyzes a number of accidents involving buildings or structures with similar contamination and seismic collapse scenarios as the Main Plant Process Building accident scenario analyzed in this EIS.

Accident scenario identification focuses on accidents that would have greater consequences or higher frequencies (i.e., greater than 10^{-6} per year); therefore, attention was focused on buildings or structures that have high radionuclide inventories (the Main Plant Process Building and the Waste Tank Farm), as well as operations that are conducted multiple times (the filling and handling of waste packages) or that would have limited or no features that would mitigate the effects of an accident (outdoor waste package handling operations). Radionuclide inventories in other facilities and in soil being removed are at a much lower concentration or activity level, and accidents involving them would be bounded by potential accidents involving the aforementioned structures and components.

After the spectrum of accidents was identified, release fractions and accident frequency were estimated. The previously noted safety analysis reports and EISs provided a basis for estimating accident frequency. The radiological impacts of accident releases were calculated using the MACCS2 computer code (Sandia 1997), which estimates radiological doses and health effects from accidental releases to the atmosphere. A further description of the accident identification and analysis methodology is presented in Appendix I, Section I.5.

A total of 15 individual accident scenarios were analyzed, including a scenario involving the Main Plant Process Building, a scenario involving the Waste Tank Farm, 11 scenarios involving radioactive waste packages, a scenario involving the NDA, and a scenario involving the SDA. The accident scenarios for the Main Plant Process Building and the Waste Tank Farm are assumed to be initiated by a seismically induced structural failure. The radioactive waste package accident scenarios encompassed all the different types of waste packages and initiators such as a drop, puncture, or fire. The NDA and SDA accident scenarios involve exhumation and plume release initiated by a fire. A detailed discussion of the different accident scenarios is presented in Appendix I, Section I.5.

This EIS does not present a quantitative analysis of accident consequences and risks to workers because there is no adequate method for calculating meaningful consequences at or near the location where the accident occurs. The results are dependent on details of worker location and actions immediately following the accident and parameters that have a very large uncertainty and vary significantly over time. The risk to these workers would be due to both radiological and nonradiological effects. For example, in a fire, the involved workers could be exposed to both airborne radioactive material and the smoke and heat of the fire. Similarly, in an earthquake, involved workers could be exposed to both airborne radioactive material and could be injured or killed by the collapse of a structure before they could be evacuated.

The consequences and annual risks for the dominant accident scenarios associated with each alternative are presented in **Table 4–20**. For each alternative, the largest consequence estimate to the general population and the MEI, as well as the dominant annual risk contributor, are in **bold**. It should be noted that for the Phased Decisionmaking Alternative, only Phase 1 accident consequences and risks have been analyzed. Accident consequences and risks for Phase 2 of this alternative could be larger, depending on the decision about further actions, but they would be no greater than those for the Sitewide Removal Alternative. This would be the case whether or not the Phase 2 decision for the SDA is continued active management.

To put the doses from these accidents in perspective, the largest dose to the MEI of 0.68 rem from the Greater-Than-Class C drum puncture scenario is below any dose for which any health effects could occur in an individual, and much lower than the allowable annual worker dose. The maximum MEI latent cancer risk of 0.000037 from the Greater-Than-Class C drum puncture accident scenario means there would be about 1 chance in 27,000 of an LCF to the MEI for the most severe accident. For comparison and assuming one such accident over the lifetime of a worker, the latest National Cancer Institute statistics (NCI 2008) indicate that the chance of a fatal latent cancer in all Americans over their lifetime is about 0.22, or slightly greater than one chance in five.

For perspective the maximum accident population dose of 3.4 person-rem may be compared to the annual average population dose from ubiquitous background and other sources of radiation (NCRP 2009) of 1.1 million person-rem that would be received by the 1.7 million residents within an 80-kilometer (50-mile) radius of WNYNSC. Another perspective on the population dose from this postulated bounding accident is that the risk to the average individual in the general population in terms of developing an LCF from a 3.4-person-rem population dose is 1.3×10^{-9}, or 1 chance in 770 million.

Table 4–20 Dominant (Bounding) Accident Annual Risk and Consequences During Decommissioning

Bounding Accident	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative – Phase 1* [e]	*No Action Alternative*
Main Plant Process Building Collapse (frequency = 0.0001 per year)				
Population dose	0.68 person-rem	0.68 person-rem	0.68 person-rem	**0.68 person-rem**
MEI dose [a]	0.046 rem	0.046 rem	0.046 rem	**0.046 rem**
Population annual risk	4.1×10^{-8}	4.1×10^{-8}	4.1×10^{-8}	**4.1×10^{-8}**
MEI annual risk [a]	2.7×10^{-9}	2.7×10^{-9}	2.7×10^{-9}	**2.7×10^{-9}**
Radioactive Waste Package Handling Accidents				
Greater-Than-Class C Drum Puncture [d] *(frequency = 0.09 per year)*				
Population dose	1.9 person-rem	Not applicable	Not applicable	Not applicable
MEI dose [b]	**0.68 rem**			
Population annual risk	**0.00010**			
MEI annual risk [b]	**0.000037**			
Transuranic (remote-handled) Drum Puncture [d] *(frequency = 0.09 per year; 0.01 per year; 0.1 per year)* [f]				
Population dose	0.27 person-rem	0.27 person-rem	0.27 person-rem	Not applicable
MEI dose [b]	0.029 rem	0.029 rem	0.029 rem	
Population annual risk	1.5×10^{-5}	**1.6×10^{-6}**	**1.6×10^{-5}**	
MEI annual risk [b]	1.6×10^{-6}	1.8×10^{-7}	1.7×10^{-6}	
High-Integrity Container Fire (frequency = 0.0001 per year)				
Population dose	**3.4 person-rem**	**3.4 person-rem**	**3.4 person-rem**	Not applicable
MEI dose [b]	0.053 rem	**0.053 rem**	**0.053 rem**	
Population annual risk	2.0×10^{-7}	2.0×10^{-7}	2.0×10^{-7}	
MEI annual risk [b]	3.2×10^{-9}	3.2×10^{-9}	3.2×10^{-9}	
High-Integrity Container Puncture [d] *(frequency = 0.09 per year; 0.01 per year; 0.1 per year)* [f]				
Population dose	0.12 person-rem	0.12 person-rem	0.12 person-rem	Not applicable
MEI dose [b]	0.033 rem	0.033 rem	0.033 rem	
Population annual risk	6.5×10^{-6}	7.3×10^{-7}	7.2×10^{-6}	
MEI annual risk [b]	1.8×10^{-6}	**2.0×10^{-7}**	**2.0×10^{-6}**	
Class B/C Box Puncture [d] *(frequency = 0.09 per year; 0.01 per year; 0.1 per year)* [f]				
Population dose	0.12 person-rem	0.12 person-rem	0.12 person-rem	Not applicable
MEI dose [b]	0.028 rem	0.028 rem	0.028 rem	
Population annual risk	6.5×10^{-6}	7.3×10^{-7}	7.2×10^{-6}	
MEI annual risk [b]	1.5×10^{-6}	1.6×10^{-7}	1.7×10^{-6}	
Class A Box Puncture [d] *(frequency = 0.09 per year; 0.01 per year; 0.1 per year; 0.005 per year)* [f]				
Population dose	0.00038 person-rem	0.00038 person-rem	0.00038 person-rem	0.00038 person-rem
MEI dose [b]	0.000091 rem	0.000091 rem	0.000091 rem	0.000091 rem
Population annual risk	2.0×10^{-8}	2.3×10^{-9}	2.3×10^{-8}	1.1×10^{-9}
MEI annual risk [b]	5.0×10^{-9}	5.5×10^{-10}	5.5×10^{-9}	2.7×10^{-10}
Radioactive Waste Exhumation Accident				
SDA Exhumation Fire (frequency = 0.0001 per year)				
Population dose	0.078 person-rem	Not applicable	Not applicable	Not applicable
MEI dose [c]	0.0034 rem			
Population annual risk	4.7×10^{-9}			
MEI annual risk [c]	2.0×10^{-10}			

MEI = maximally exposed individual, SDA = State-Licensed Disposal Area.
[a] Located 244 meters (800 feet) from the accident.
[b] Located 183 meters (600 feet) from the accident.
[c] Located 2,500 meters (8,200 feet) from the accident.
[d] This accident scenario assumes human error while handling the package, which results in an object penetrating the confinement wall of the package and a release of radioisotopes to the environment.
[e] Phase 2 doses would be no greater than those for the Sitewide Removal or Sitewide Close-In-Place Alternatives if one of these actions is selected. This would still be the case if the Phase 2 decision for the State-Licensed Disposal Area is continued active management.
[f] The listed three frequencies are for accidents associated with the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives, respectively.
Note: Not applicable indicates that the specific type of radioactive waste package is not used for the alternative.

In considering the overall risk from accidents for an alternative, it is necessary to consider the duration of the various operations in the decommissioning process. In addition, in the case of radioactive waste package handling accidents, the total number of packages and annual handling rate must be considered. **Table 4–21** is a summary of the estimated number of years that each type of operation would occur under each alternative and the respective number of radioactive waste packages handled. This table only presents values for Phase 1 of the Phased Decisionmaking Alternative. Phase 2 could result in additional radioactive waste package handling up to that analyzed for the Sitewide Removal Alternative, depending on the Phase 2 decision.

Table 4–21 Duration for Major Accident Scenarios

	Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Years before initiating Main Plant Process Building removal or stabilization	5	1	1	No removal or stabilization
Years before Waste Tank Farm removal or stabilization	20	2	No removal or [b] stabilization	No removal or stabilization
Years of radioactive waste package handling during decommissioning actions	60	7	8	0 [a]
Number of radioactive waste packages handled	256,564	3,904	35,069 [b]	4,294 every 20 years [a]
Annual radioactive waste package handling rate	4,276	558	4,384 [b]	215 [a]

[a] Average over 20-year time intervals to account for periodic waste disposal, along with annual expected waste disposal volumes, and assumes drums for Class A waste and the low-specific-activity container for low-specific-activity waste. This alternative does not involve preparation for decommissioning.

[b] The status of the Waste Tank Farm and numbers/ratio of radioactive waste packages may change for Phase 2, depending on Phase 2 decision.

Sources: WSMS 2009a, 2009b, 2009c, 2009d.

The combination of the annual risk estimate for various accident types and the activity duration estimates supports the development of an overall relative risk estimate for the EIS alternatives for accidents that would involve short-term releases of radionuclides to the atmosphere. This overall relative risk is presented in **Table 4–22**. The terms used in this table (highest, low, and lowest) are intended to convey a relative qualitative assessment of the accident risk among the alternatives. The absolute magnitude of accident consequences and risks for all alternatives is estimated to be very small and is not expected to present a significant health risk to the general population.

Table 4–22 Relative Accident Population and Maximally Exposed Individual Annual Risk Comparison Rating Between Alternatives

Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Highest [a]	Low [a]	Low [a, b]	Lowest [a]

[a] These terms are meant to show a relative comparison between alternatives of the very small radiological consequences and risks for all short-term accident scenarios for all alternatives.

[b] Depending on the Phase 2 decision, the relative risk could remain low or be as high as that for the Sitewide Removal Alternative. This would be the case whether or not the Phase 2 decision for the State-Licensed Disposal Area is continued active management.

The Sitewide Removal Alternative has the greatest potential for a short-term accident with the highest consequences and is expected to have the highest overall short-term accident risk because it has the greatest number and duration of higher radioactivity content waste removal, packaging, and handling operations, and because the actions would take place over a longer period of time.[10]

The most significant short-term accident scenarios for the Sitewide Close-In-Place, Phased Decisionmaking (Phase 1),[10] and No Action Alternatives have lower projected consequences than the Sitewide Removal Alternative accident scenarios. The overall accident risk for these alternatives is estimated to be less than the overall accident risk for the Sitewide Removal Alternative. The overall accident risk for Phase 1 of the Phased Decisionmaking Alternative is slightly higher than the risk for the Sitewide Close-In-Place and No Action Alternatives as a result of the additional activity related to the Main Plant Process Building removal and the greater number of annual radioactive waste handling operations.

The most serious accident for the No Action Alternative, in terms of population dose, is the same as that for the Sitewide Close-In-Place and Phased Decisionmaking (Phase 1) Alternatives,[10] but the overall risk from accidents involving short-term releases to the atmosphere for this alternative is estimated to be lower than the risk for the other two alternatives. The No Action Alternative does, however, have a higher risk of groundwater contamination over the long term as a result of degradation of the Main Plant Process Building and Waste Tank Farm because these facilities are not remediated under this alternative. It should also be noted that there are no plans for removal of the high-level radioactive waste tanks in Phase 1 of the Phased Decisionmaking Alternative.

Toxic Chemical Accident Impacts

The basic method for toxic chemical accident analysis is comparable to that used for radioactive material accident analysis. The methodology and more-detailed results are presented in Appendix I, Section I.5.8, of this EIS.

The operations that would be conducted under the various alternatives do not involve the use of toxic chemicals as process chemicals; therefore, no processing accidents involving hazardous chemicals were analyzed.

Inventories of Resource Conservation and Recovery Act (RCRA) hazardous materials have been estimated within the Waste Tank Farm, the Main Plant Process Building, the NDA, and the SDA (WSMS 2005a, 2005b, 2005c; SAIC 2005a, 2005b). These inventories exist within equipment and individual components such as switches, lamps, and shielded windows, and are not concentrated in one tank or physical location. Their physical and chemical forms are not consistent with serious accident consequences because the inventory is limited, generally solid, and dispersed. In the event of an accident involving a high-level radioactive waste tank, Main Plant Process Building, or the NDA or SDA, the largest risks would be associated with the radioactive materials, as discussed earlier in this section. Any risk from toxic chemicals present in these areas would be a fraction of the radiological risk. Based on the type, form, and distribution of toxic chemicals at WNYNSC, no credible toxic chemical accidents affecting worker or public health are expected to occur.

4.1.10 Long-term Human Health

This section summarizes the long-term human health consequences under the four EIS alternatives. The estimate of consequences under the Sitewide Removal Alternative is based on knowledge of the residual contamination standard that would be applied to the removal actions. The estimates of consequences under the Sitewide Close-In-Place and No Action Alternatives are based on models designed to reflect what are

[10] *The Phase 2 decision for the Phased Decisionmaking Alternative may change the relative risk of this alternative.*

considered to be the major physical processes controlling the movement of contaminants through the environment. Radiological dose and cancer risk are the measures of consequence used in this analysis for radionuclides, cancer risk for carcinogenic hazardous materials, and Hazard Quotients for non-carcinogenic hazardous materials. The risk results are also compared with the CERCLA risk range: according to EPA the appropriate measure of impact for this comparison is risk of cancer (EPA 1989).

The dose and risk depend upon contaminant release rate, contaminant movement through the environment, and the location and timing of human actions that would result in human exposure to radionuclides and hazardous chemicals. Predictions of human behavior are not considered to be reliable and so a spectrum of scenarios that cover a range of hypothetical human actions was defined and evaluated. The scenarios evaluated include an optimistic bound, for which it was assumed that institutional controls were effective in keeping surface engineered features (e.g., roofs, engineered covers) maintained and in preventing human intrusion onto the site. The scenarios also include a more-pessimistic case where it was assumed that institutional controls are lost after 100 years and remain that way, allowing hypothetical individuals to access the site and undertake a variety of activities at a variety of locations. The scenarios also include an unmitigated erosion case that would result in consequences only after an extended period of time following loss of institutional controls.

No specific analysis was conducted for the long-term human health consequences for the Phased Decisionmaking Alternative. The long-term impacts of this alternative depend on the Phase 2 decision for the Waste Tank Farm, the NDA, and the SDA. If a removal decision is made for all these facilities, the consequences would be comparable to those estimated for the Sitewide Removal Alternative. If an in-place closure decision is made for all these facilities, the consequences would be comparable to those estimated for the Sitewide Close-In-Place Alternative. If the Phase 2 decision for the SDA is continued active management, the consequences for some exposure scenarios and receptors would be bounded by those for the No Action Alternative.

4.1.10.1 Summary of Long-term Performance Assessment

Changes to the Long-Term Performance Assessment for this Final EIS

The near-field hydrologic flow model and the erosion model were revised for the Final EIS. The lateral extent of the North Plateau near-field hydrologic flow model was extended to include the entirety of the thick-bedded unit and slack-water sequence and the specification of stratigraphy was revised to reflect the current understanding of the structure of the slack-water sequence. Additional details on the revised structural interpretation and its implications on near-field flow are discussed in Appendix E, Section E.4. The increased North Plateau flow rate resulted in higher short-term and lower long-term doses for postulated users of North Plateau groundwater. Other changes for the Final EIS that influenced the predicted doses for exposure scenarios were changes in the Waste Tank Farm inventory to reflect planned DOE decontamination actions, changes in estimated flow tube width, and a correction in radionuclide decay chain data for the direct intrusion analysis. For groundwater release scenarios, most peak annual dose estimates for specific source areas changed by less than a factor of two. The peak annual dose to an intruder who uses North Plateau groundwater decreased compared to the Revised Draft EIS because more of the plume inventory is projected to move off site before the intrusion is postulated. The revised dose estimates resulting from the revised near-field flow model are presented in Sections 4.1.10.3.1 and 4.1.10.3.2.

The basic approach of using a site-calibrated landscape evolution model was retained for the Final EIS. The CHILD model was recalibrated using probabilistic (Monte-Carlo) techniques to identify five sets of parameters that allow the model to predict a topography comparable to current conditions at a rate consistent with known Buttermilk Creek downcutting rates. These five sets of calibration parameters were used to project future topography for an unmitigated erosion scenario. The calibrated model predicted gully advance rates that decreased with time. Projected gully advance rate was greater when the analysis assumed a climate that is wetter than current conditions. The faster gully advance rate was used for the revised erosion dose analysis. Overall, the estimated doses for individuals who ingested contamination released by erosion decreased for the Final EIS as a result of the using a gully with a decreasing advance rate. The dose estimates resulting from the revised erosion analysis are presented in Section 4.1.10.3.3.

Table 4–23 presents a summary of the long-term human health consequences under the Sitewide Removal, Sitewide Close-In-Place, and No Action Alternatives expressed in terms of radiological dose. The table is limited to the presentation of dose information because the analysis showed that the peak risk to all hypothetical receptors is from radiological constituents rather than chemically hazardous constituents. The term "hypothetical receptors" is used because none of the doses and risks calculated in Section 4.1.10 represent impacts to real individuals; the receptors are assumed to be in locations and pursue activities that would result in upper-bound assessments of dose and risk. Results are presented for three cases—institutional controls remain in effect, loss of institutional controls after 100 years without erosion, and loss of institutional control after 100 years with unmitigated erosion.

The top section of Table 4–23 compares doses to populations and individual receptors assumed to use untreated water obtained from Lake Erie or the Niagara River; the second section compares doses to postulated receptors assumed to farm alongside and use untreated water from Cattaraugus Creek downstream of WNYNSC; and the third section compares doses to a spectrum of postulated receptors assumed to access WNYNSC after institutional controls are lost. The Lake Erie and Niagara River water user populations and individual receptors were assumed to consume and garden with untreated river or lake water, and to consume fish from the lake. The Cattaraugus Creek receptors were assumed to consume water and fish and irrigate farms with untreated water obtained either directly downstream of WNYNSC or on the lower reaches of the creek. The receptor at the latter location was assumed to consume larger quantities of fish than other receptors, and could be a member of the Seneca Nation of Indians. The onsite receptors were assumed to undertake activities such as hiking and recreation, housing or well construction, onsite farming, or well-water use in contaminated areas, or to use untreated water from Buttermilk Creek for consumption or farming.

The results show the importance of institutional controls in keeping potential receptors away from direct contact with contaminated media (soil and water). The results also show that either institutional controls or engineered barriers can protect receptors along Buttermilk Creek and offsite.

Details of the long-term human health consequences are presented in the balance of this section. More-detailed information is presented in various appendices.

- Appendix H contains information on the details of the analysis and analytical results. The appendix contains sensitivity analyses and a discussion on why the deterministic analysis is considered to be conservative.

- It also contains a more-detailed identification of receptors and has figures that show the locations of receptors:

  - Figure H–2 shows the locations of the offsite receptors.
  - Figure H–3 shows the locations of the receptors chosen for erosion modeling of the Low-Level Waste Treatment Facility, NDA, and SDA, and of the wells used in contaminated groundwater scenarios.

- Appendix E contains a description of the groundwater models (three-dimensional and one-dimensional) used in the Long-term Performance Assessment.

- Appendices F and G present a description of the unmitigated erosion models used in the Long-term Performance Assessment.

Appendix G presents a description of how the various onsite and offsite scenarios were modeled, and specifically how human health impacts were calculated.

Table 4–23 Summary of Long-Term Human Health Consequences

Cases	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Postulated Offsite Receptors – Lake Erie/Niagara River Water Users			
Institutional controls remain in effect	There would be a negligible dose	There would be a peak annual dose of about 0.2 millirem per year to a resident farmer using untreated water for drinking and irrigation and consuming fish raised in Lake Erie (Table 4–29, footnote d). The total population dose accumulated over 10,000 years by Lake Erie/Niagara River water users would be approximately 34,000 person-rem (Table 4–30). [a]	There would be a peak annual dose of about 0.2 millirem per year to a resident farmer using untreated water for drinking and irrigation and consuming fish raised in Lake Erie (Table 4–29, footnote d). The total population dose accumulated over 10,000 years by Lake Erie/Niagara River water users would be approximately 35,000 person-rem (Table 4–30). [a]
Loss of institutional controls after 100 years, without erosion	Same; no discernable effect due to loss of institutional controls	There would be a peak annual dose of about 0.2 millirem per year to a resident farmer using untreated water for drinking and irrigation and consuming fish raised in Lake Erie (Table 4–38, footnote d). The total population dose accumulated over 10,000 years by Lake Erie/Niagara River water users would be approximately 34,000 person-rem (Table 4–39). [a]	There would be a peak annual dose of about 0.6 millirem per year to a resident farmer using untreated water for drinking and irrigation and consuming fish raised in Lake Erie (Table 4–38, footnote e). The total population dose accumulated over 10,000 years by Lake Erie/Niagara River water users would be about 120,000 person-rem (Table 4–39). [a]
Loss of institutional controls after 100 years, with unmitigated erosion	Same; no discernable effect due to loss of institutional controls	There would be a peak annual dose of about 0.4 millirem per year to a resident farmer using untreated water for drinking and irrigation and consuming fish raised in Lake Erie Table 4–44. [a] The total population dose accumulated over 10,000 years by Lake Erie/Niagara River water users would be about 1 million person-rem (Table 4–45). [a]	There would be a peak annual dose of about 2.7 millirem per year to a resident farmer using untreated water for drinking and irrigation and consuming fish raised in Lake Erie (Table 4–44, footnote a). The total population dose accumulated over 10,000 years by Lake Erie/Niagara River water users would be about 1.4 million person-rem (Table 4–45). [a]
Postulated Cattaraugus Creek and Seneca Nation of Indians Receptors			
Institutional controls remain in effect	There would be a negligible dose	There would be peak annual doses of less than 0.7 millirem per year to a resident farmer using untreated Cattaraugus Creek water for drinking and irrigation and consuming fish raised in Cattaraugus Creek either just outside the site boundary or at the Seneca Nation of Indians reservation (Tables 4–24 and H–56).	There would be peak annual doses of less than 0.7 millirem per year to a resident farmer using untreated Cattaraugus Creek water for drinking and irrigation and consuming fish raised in Cattaraugus Creek either just outside the site boundary or at the Seneca Nation of Indians reservation (Tables 4–24 and H–56).
Loss of institutional controls after 100 years, without erosion	Same; no discernable effect due to loss of institutional controls	There would be peak annual doses of less than 0.7 millirem per year to a resident farmer using untreated Cattaraugus Creek water for drinking and irrigation and consuming fish raised in Cattaraugus Creek either just outside the site boundary or at the Seneca Nation of Indians reservation (Tables 4–35 and H–56).	There would be peak annual doses of 2-3 millirem per year to a resident farmer using untreated Cattaraugus Creek water for drinking and irrigation and consuming fish raised in Cattaraugus Creek either just outside the site boundary or at the Seneca Nation of Indians reservation(Tables 4–35 and H–56).

Cases	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	No Action Alternative
Loss of institutional controls after 100 years, with unmitigated erosion	Same; no discernable effect due to loss of institutional controls	There would be peak annual doses of less than about 4 millirem per year to a resident farmer using untreated Cattaraugus Creek water for drinking and irrigation and consuming fish raised in Cattaraugus Creek either just outside the site boundary or at the Seneca Nation of Indians reservation (Tables 4–42 and 4–43).	There would be peak annual doses of 15 to 34 millirem per year to a resident farmer using untreated Cattaraugus Creek water for drinking and irrigation and consuming fish raised in Cattaraugus Creek either just outside the site boundary or at the Seneca Nation of Indians reservation (Tables 4–42 and 4–43).
Postulated Onsite Receptors (Intruders)			
Institutional controls remain in effect	Situation not assumed for Sitewide Removal Alternative	No consequences because receptors are not allowed on site.	No consequences because receptors are not allowed on site.
Loss of institutional controls after 100 years, without erosion	Peak annual dose less than 25 millirem	There could be peak annual doses of less than 2 millirem per year to workers who drill a well downgradient from facilities without a protective cap, or build a home over waste without a protective cap. Protective caps over the Main Plant Process Building, Waste Tank Farm, and burial areas are assumed to prevent well drillers from drilling into those facilities (Table 4–32). There could be peak annual doses of less than about 7 millirem per year to a resident farmer with a garden containing contaminated soil. Protective caps over the Main Plant Process Building, Waste Tank Farm, and burial areas are assumed to prevent construction of a garden (Table 4–33).	There could be peak annual doses of a few to tens of rem per year to workers who drill a well downgradient from facilities, none of which have protective caps, or build a home over waste without a protective cap (Table 4–32). There could be peak annual doses of less than 1 millirem per year to approximately 200 rem per year to a resident farmer with a garden containing contaminated soil over a facility, none of which have protective caps (Table 4–33).
		There could be a peak annual dose of less than 1 millirem per year to about 160 millirem per year to a resident farmer using untreated contaminated groundwater for drinking and irrigation obtained downgradient from a protective cap. The low-hydraulic conductivity of the South Plateau is assumed to preclude this scenario from occurring there (Table 4–34).	There could be peak annual doses of less than a few millirem per year to about 400 rem per year to a resident farmer using untreated contaminated groundwater for drinking and irrigation. There are no protective caps. The low-hydraulic conductivity of the South Plateau precludes this scenario from occurring there (Table 4–34).
		There could be a peak annual dose of about 4 millirem per year to a resident farmer on Buttermilk Creek (Table 4–31).	There could be a peak annual dose of about 14 millirem per year to a resident farmer on Buttermilk Creek (Table 4–31).
Loss of institutional controls after 100 years, with unmitigated erosion	Peak annual dose less than 25 millirem	There could be a peak annual dose of about 70 millirem per year to an onsite resident/recreational hiker (Table 4–40). There could be a peak annual dose of about 16 millirem per year to a resident farmer on Buttermilk Creek (Table 4–41).	There could be a peak annual dose of about 130 millirem per year to an onsite resident/recreational hiker (Table 4–40). There could be a peak annual dose of about 115 millirem per year to a resident farmer on Buttermilk Creek (Table 4–41).

[a] For perspective, the 565,000 Lake Erie water users would receive an average population dose of 350,000 person-rem each year from ubiquitous background and other sources of radiation (see Chapter 3, Table 3-16) not associated with the Western New York Nuclear Service Center.

4.1.10.2 Sitewide Removal Alternative

The Sitewide Removal Alternative is addressed separately because it would entail decontamination of the entire WNYNSC, so that it would be available for release for unrestricted use. This means that the radiation dose to any reasonably foreseeable onsite receptor would be less than 25 millirem per year.[11] The residual contamination is not known with enough precision to warrant an offsite dose analysis, but it is recognized that offsite dose consequences would be substantially below those for the Sitewide Close-In-Place or No Action Alternatives.

Radioactive Contamination

Under this alternative, any remaining residual radiological contamination would be below the unrestricted use dose criteria of 10 CFR 20.1402. To demonstrate that decommissioning is adequate would require analysis of a number of representative, reasonably conservative scenarios to ensure that none of the range of potential human activities on WNYNSC would lead to the accumulation of individual radiation doses exceeding the unrestricted use dose criteria. One possible way of achieving this would be to use the analysis of the scenarios to estimate derived concentration guideline limits (DCGLs) that could be used as decommissioning targets in various parts of the site. Examples of screening DCGLs for soil screening contamination levels, published by the NRC, are provided in Appendix H, Table H–18. In practice, official DCGLs would be developed through the Decommissioning Plan process.

Hazardous Chemical Contamination

Under this alternative, facilities and areas having hazardous chemical contamination would be removed in compliance with the criteria for clean closure. The criteria could include NYSDEC TAGM-4046, *Determination of Soil Cleanup Objectives and Cleanup Levels* (NYSDEC 1994); NYSDEC Division of Water, Technical and Operational Guidance Series 1.1.1, *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent, Limitations* (NYSDEC 1998b); or other agency-approved cleanup objectives that are protective of human health and the environment (e.g., risk-based action levels).

4.1.10.3 Alternatives with Waste On Site

The remainder of this analysis addresses the impacts that are expected to result from implementing the Sitewide Close-In-Place and No Action Alternatives.[12] These two alternatives would leave some amount of hazardous and radioactive material on site. The analysis addresses the impacts caused by releases to the local groundwater that then discharges to onsite streams (Franks Creek and Buttermilk Creek) to a spectrum of individual and population receptors located outside the current WNYNSC boundary. It also addresses the effects of radionuclide releases on individual receptors and the local population, and the effect of both radionuclide and hazardous chemical releases on the two closest individual receptors.

The information is presented in two sections. The first section (Section 4.1.10.3.1) addresses impacts given continuation of institutional controls. These impacts incorporate the effects of institutional controls that

---

[11] *The dose to an individual coming into direct contact with the residual contamination would be less than 25 millirem per year. Any receptor coming into contact with residual contamination that has migrated from its original location (the more likely scenario) would receive a much lower dose.*

[12] *There is no long-term performance assessment for the Phased Decisionmaking Alternative, because the long-term impact depends on the final condition, which is yet to be defined. There is a qualitative discussion of the impacts of the Phased Decisionmaking Alternative in Appendix H, Section H.2.3, of this EIS, and in Section 4.1.10.4 of this chapter. For most exposure scenarios and receptors, long-term impacts would be bounded by those for the Sitewide Removal and Sitewide Close-In-Place Alternatives. Long-term impacts for some exposure scenarios and receptors would be bounded by those for the No Action Alternative*

prevent access to the WMAs and maintain engineered features such as erosion control structures and engineered caps. The information is also used to estimate total risk to offsite receptors from both radionuclides and hazardous chemicals; in the latter case, for comparison to CERCLA risk criteria.

The second section (Section 4.1.10.3.2) addresses impacts assuming loss of institutional controls.[13] This section analyzes potential impacts for two general situations. The first is loss of institutional controls after 100 years so that intruders are allowed to enter WNYNSC and various WMAs. Doses are assessed for intruders assumed to occupy the Buttermilk Creek area (Section 4.1.10.3.2.1) or the North and South Plateaus (Section 4.1.10.3.2.2) and for offsite receptors (Section 4.1.10.3.2.3). Second, Section 4.1.10.3.3 addresses impacts on offsite receptors assuming that unmitigated erosion occurs. The analytical results presented here are from deterministic analyses that are considered to be generally conservative.[14] More details on both the deterministic and sensitivity/uncertainty analyses are presented in Appendix H of this EIS.

4.1.10.3.1 Indefinite Continuation of Institutional Controls

This section presents long-term radiological dose and radiological and hazardous chemical risks to offsite receptors for the Sitewide Close-In-Place and No Action Alternatives. All of the impacts discussed in this section are the result of groundwater flow through WMAs and the discharge of contaminated groundwater to either Franks Creek or Buttermilk Creek, and hence to Cattaraugus Creek. The section is organized by receptor, beginning with the nearest offsite receptor and progressing to the farthest.[15] The receptors are:

- Cattaraugus Creek – downstream of the confluence with Franks Creek (Cattaraugus Creek receptor);
- Cattaraugus Creek – Seneca Nation of Indians, Cattaraugus Reservation (Seneca Nation of Indians receptor); and
- Lake Erie/Niagara River water users – water intake systems at Sturgeon Point on Lake Erie and in the Niagara River downstream of Cattaraugus Creek.

The NYSERDA View Indicates….

The Final EIS Analysis of Contaminant Transport by Groundwater Needs Improvement. In particular, the View states that there is no compelling argument for using the simplified one-dimensional flow and transport model for purposes of calculating long-term dose rather than the three-dimensional model presented in Appendix E.

DOE's Response….

The one-dimensional model was used for contaminant transport analysis in this EIS because testing showed that the one-dimension model predictions of strontium-90 concentrations at various locations in the North Plateau Groundwater Plume centerline are comparable to the three-dimensional model (STOMP) prediction, and those predictions are similar to field observations. In addition, the one-dimensional model has a much shorter run time than the STOMP model when analyzing site-specific contaminant transport and is easier to integrate with both the release models and the dose consequence models. The use of the one-dimensional model also introduces an element of conservatism because it does not take credit for lateral dispersion of contaminants which would lower the plume centerline concentrations.

The basic approach to hydrologic modeling used for the Revised Draft EIS was retained for the Final EIS. The discussion of the regional hydrologic model was expanded for the Final EIS to clarify particular issues raised in comments on Appendix E of the Revised Draft EIS. The hydrologic parameters used in the one-dimensional transport analysis are drawn from three-dimensional hydrologic analysis discussed in Section E.4; the rationale for the use of the one-dimensional model is discussed in Appendix E, Section E.4.1.1 of the Final EIS.

It is DOE's opinion that using the three-dimensional hydrologic model for flow and transport to calculate long-term dose would significantly increase the time required to perform the analysis without providing a significantly more accurate answer. As discussed in Chapter 4, Section 4.3.5, there are many parameters that contribute to uncertainty in the long-term dose estimate and the groundwater transport model is not considered to be a major source of uncertainty.

---

[13] *In the long-term performance assessment, the institutional controls are assumed to be lost after 100 years.*
[14] *The major reasons that contribute to the assessment that estimates of dose are conservative are listed in Section 4.3.5 of this chapter and are further discussed in Appendix H, Section H.2.2.1.*
[15] *Receptors are described in detail in Appendix D, Section D.3.1.3, of this EIS.*

Cattaraugus Creek Receptor

The Cattaraugus Creek receptor is a postulated offsite receptor who is close to the site boundary and experiences the impact of liquid release from all portions of the site. This receptor is conservatively assumed to drink untreated water from Cattaraugus Creek, eat fish from the creek, and irrigate a garden with untreated water from the creek.

A resident farmer is an example of a Cattaraugus Creek receptor. There are several such receptors in this analysis. In general, the resident farmer scenario is based on contact with contamination in surface soil and involves a set of activities including living in a home, maintaining a garden, and harvesting fish. The scenario may be initiated by irrigation with contaminated surface water. For both radionuclides and hazardous chemicals, maintenance of a home and garden involves inhalation of fugitive dust, and consumption of crops and animal products. For radionuclides, an additional pathway, exposure to external radiation, is also evaluated.

Radiological Risk

Table 4–24 presents the peak annual total effective dose equivalent (TEDE) from each of the major WMAs within WNYNSC, and the timing of that peak. The years to peak exposure were measured from a starting date of 2020, the anticipated date for completion of decommissioning activities under the Sitewide Close-In-Place Alternative.[16] The last row of Table 4–24 shows the magnitude and timing of the peak dose when release for all facilities are considered. This was developed from an analysis of the dose to the Cattaraugus Creek receptor for each year following completion of decommissioning actions.

Table 4–24 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Cattaraugus Creek Receptor (year of peak exposure in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	0.019 (200)	0 [b]
Vitrification Facility – WMA 1	0.000037 (1,000)	0 [b]
Low-Level Waste Treatment Facility – WMA 2	0.00026 (100)	0.015 (100)
Waste Tank Farm – WMA 3	0.0019 (300)	0 [b]
NDA – WMA 7 [c]	0.010 (8,700)	0.010 (8,700)
SDA – WMA 8 [c]	0.23 (37,300)	0.23 (37,300)
North Plateau Groundwater Plume [c]	0.51 (34)	0.51 (34)
Total	0.51 (34)	0.51 (34)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that proactive maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational indefinitely. The doses from these units would be minimal as long as institutional controls ensure that these engineered systems function as originally designed to prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

[16] *In Table 4–24 and other tables and figures, the years until total peak dose or risk do not coincide with the years until peak individual WMA doses because the total peak is not a simple sum of individual peaks.*

The North Plateau Groundwater Plume contributes the largest peak annual TEDE, 0.51 millirem per year at 34 years. There is also a long-term peak of 0.23 millirem per year at approximately year 37,000 caused by the SDA. The dominant radionuclide and pathway at 34 years are strontium-90 in drinking water and at 37,000 years are uranium-234 in fish.

Figure 4–3 presents the annual dose as a function of time to a Cattaraugus Creek receptor for the Sitewide Close-In-Place Alternative. The North Plateau Groundwater Plume peak at 34 years does not appear on this plot because, on the time scale presented on the x-axis, it essentially coincides with the y-axis. Figure 4–3 shows the SDA peak at approximately 37,000 years and a subsidiary SDA peak at about 1,000 years. **Figure 4–4** provides a similar plot for the No Action Alternative.

The peak annual dose under both the No Action Alternative and the Sitewide Close-In-Place Alternative is 0.51 millirem per year. For perspective, the average individual radiation dose in the United States from ubiquitous background and other sources of radiation is about 620 millirem per year, of which about 230 millirem is due to radon (NCRP 2009).

A complementary measure is the peak lifetime risk (excess risk of morbidity, or risk of contracting cancer, both fatal and nonfatal) to the Cattaraugus Creek receptor arising from radiological discharges. This risk was calculated assuming a lifetime exposure at the peak dose rate.[17] **Table 4–25** shows how this risk varies from different WMAs and what it is for the entire WNYNSC under each alternative. Because the doses from which the latent cancer morbidity risk was calculated differ little between the alternatives, neither do the risks.

Table 4–25 presents results consistent with those presented in Table 4–24. It shows that the radiological risk would be dominated by the release from the North Plateau Groundwater Plume for both the Sitewide Close-In-Place Alternative and for the No Action Alternative. It also shows that the lifetime cancer risk would be within the CERCLA risk range of 1×10^{-6} to 1×10^{-4}.

Hazardous Chemical Risk

Estimates of the risk to the Cattaraugus Creek receptor from hazardous chemicals in the NDA, SDA, the Main Plant Process Building, and the Waste Tank Farm have also been prepared. Three measures were used: lifetime cancer risk, Hazard Index, and comparison to maximum contaminant levels (MCLs) for drinking water. Tables 4–26 through 4–28 summarize this information for the WMAs having the dominant lifetime hazardous chemical risk. These estimates of lifetime cancer risk, Hazard Index, and comparison to MCLs are based on current inventory estimates. A list of the hazardous chemicals used to develop these estimates is provided in Appendix I, Table I–28, of this EIS. An explanation of how the estimates were calculated is provided in Appendix H of this EIS.

Table 4–26 shows that the lifetime cancer risk from hazardous chemicals would be very small for both alternatives, and would be dominated by the SDA. For WMA 7 and 8, the peak hazardous chemical risks are essentially the same for both alternatives.

Comparing the radiological risk information in Table 4–25 with the chemical risk information in Table 4–26, it can be seen that the lifetime cancer risk to the Cattaraugus Creek receptor would be dominated by radionuclides rather than hazardous chemicals. The peak radiological risk is on the order of 500 times greater than the peak chemical risk. The chemical risk is below the CERCLA risk range of 1×10^{-6} to 1×10^{-4}.

---

[17] Note also that the risk was not calculated by the simple method of taking the peak lifetime TEDE and multiplying by 6×10^{-4} LCF per person-rem. The risks were calculated by summing the risks for individual radionuclides using data from Federal Guidance Report 13 (EPA 1999b).

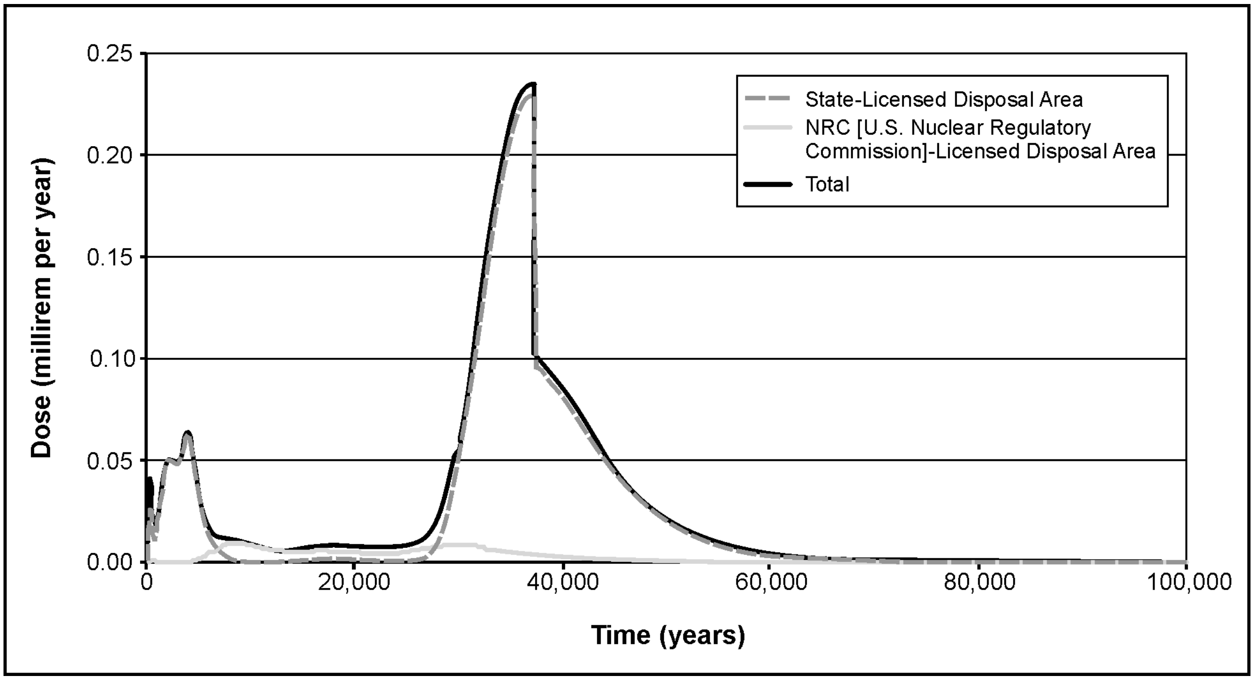


Figure 4–3 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor with the Sitewide Close-In-Place Alternative and Indefinite Continuation of Institutional Controls

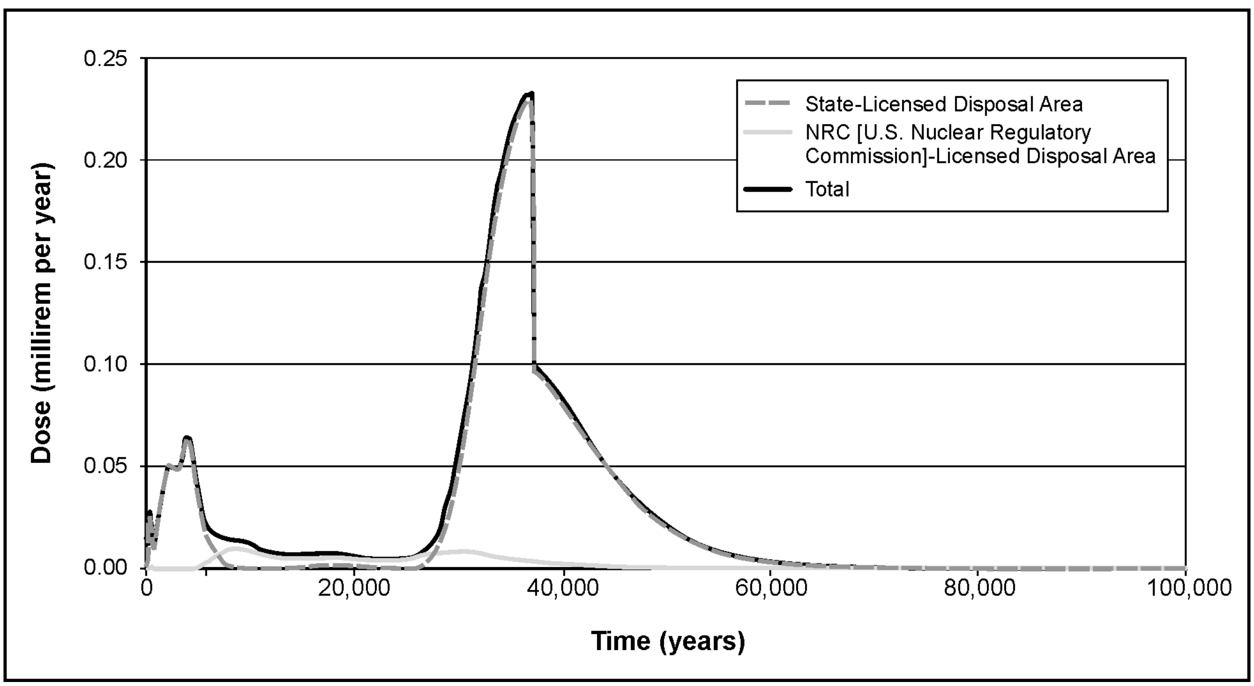


Figure 4–4 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor with the No Action Alternative and Indefinite Continuation of Institutional Controls

Table 4–25 Peak Lifetime Radiological Risk (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	4.2×10^{-7} (200)	0 [b]
Vitrification Facility – WMA 1	3.12×10^{-10} (300)	0 [b]
Low-Level Waste Treatment Facility – WMA 2	6.45×10^{-9} (100)	3.3×10^{-7} (100)
Waste Tank Farm – WMA 3	7.84×10^{-8} (300)	0 [b]
NDA – WMA 7 [c]	2.61×10^{-7} (8,600)	2.61×10^{-7} (8,600)
SDA – WMA 8 [c]	2.89×10^{-6} (37,300)	2.89×10^{-6} (37,300)
North Plateau Groundwater Plume [c]	1.10×10^{-5} (34)	1.10×10^{-5} (34)
Total	1.10×10^{-5} (34)	1.10×10^{-5} (34)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that proactive maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational indefinitely. The doses from these units would be minimal as long as institutional controls ensure that these engineered systems function as originally designed to prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

Table 4–26 Peak Lifetime Risk from Hazardous Chemicals (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	1.4×10^{-9} (5,000)	0 [b]
Vitrification Facility – WMA 1	1.3×10^{-10} (11,700)	0 [b]
Waste Tank Farm – WMA 3	1.1×10^{-10} (8,900)	0 [b]
NDA – WMA 7 [c]	1.4×10^{-9} (85,900)	1.4×10^{-9} (85,900)
SDA – WMA 8 [c]	2.1×10^{-8} (100)	2.1×10^{-8} (100)
Total	2.1×10^{-8} (100)	2.1×10^{-8} (100)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggests it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals. There is no hazardous chemical inventory available for the Construction and Demolition Debris Landfill in WMA 4.

[b] It is assumed that proactive maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational indefinitely. The doses from these units would be minimal as long as institutional controls ensure that these engineered systems function as originally designed to prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

The comparison of lifetime cancer risk from radionuclides and chemicals for the Cattaraugus Creek receptor under the Sitewide Close-In-Place Alternative is shown on **Figure 4–5**. This figure again demonstrates that the greatest risk would be from radionuclides. The radionuclide risk peaks at about 40,000 years and then declines until it becomes approximately equal to the hazardous chemical risk after 80,000 years. The chemical risk increases from about 40,000 years onward as a result of the release of arsenic, which travels very slowly through the groundwater beneath the site. This general pattern is similar for the No Action Alternative and for the other receptors discussed later in this section.

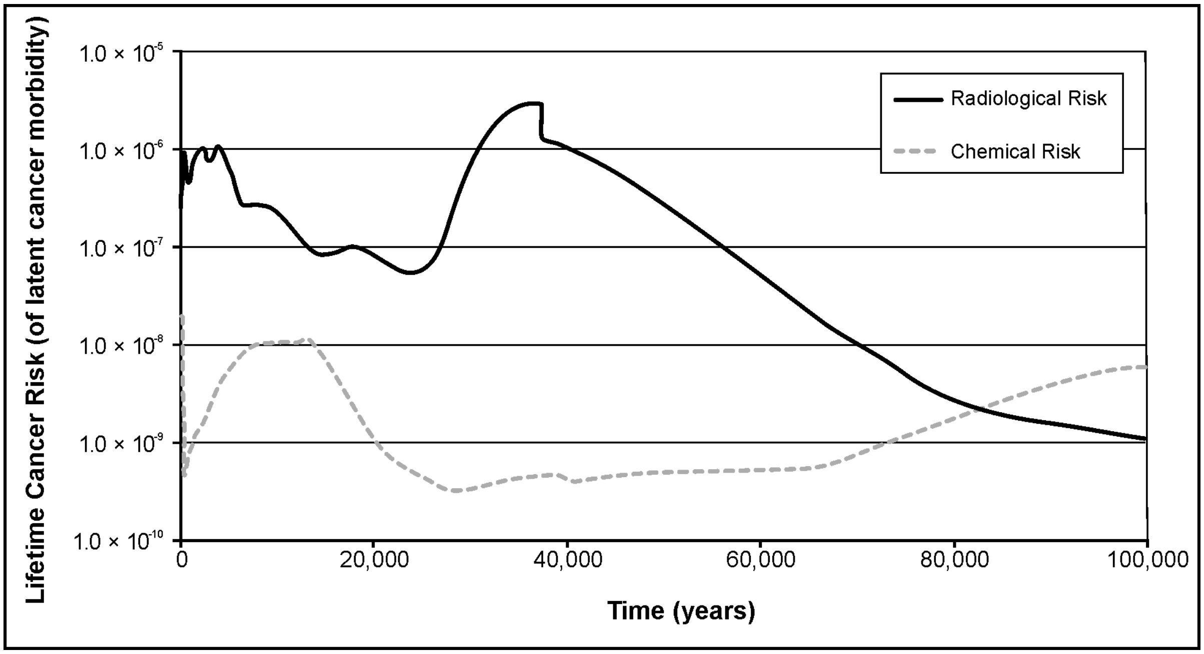


Figure 4–5 Lifetime Latent Cancer Morbidity Risk from Radionuclides and Hazardous Chemicals for the Cattaraugus Creek Receptor with the Sitewide Close-In-Place Alternative and Indefinite Continuation of Institutional Controls

Another measure of chemical risk that is appropriate for noncarcinogenic chemicals is the Hazard Index for an individual receptor.[18] If the Hazard Index is greater than 1, the situation is considered to be hazardous for the receptor. **Table 4–27** presents the Hazard Index peaks for the Cattaraugus Creek receptor. As can be seen, the Hazard Index peaks are much less than 1 for both alternatives.

There are some hazardous chemicals for which there is no carcinogenic slope factor or reference dose, but they are recognized as hazardous materials, and MCLs have been issued under the Clean Water Act. A primary example that is relevant to WNYNSC is lead. When the inventory for a known hazardous material could be estimated, but there was no slope factor or reference dose for the material, an analysis was conducted to determine the maximum concentration of the hazardous material in the year of peak risk and the year of peak Hazard Index. **Table 4–28** shows the results of this analysis. This ratio of peak concentration to MCL would always be less than 1, and for most elements, it would be far less than 1 (less than 0.001).

[18] *The Hazard Index is defined as the sum of the Hazard Quotients for substances that affect the same target organ or organ system. The Hazard Quotient for a specific chemical is the ratio of the exposure to the hazardous chemical (e.g., amount ingested over a given period) to a reference value regarded as corresponding to a threshold of toxicity, or a threshold at which some recognizable health impact would appear. If the Hazard Quotient for an individual chemical or the Hazard Index for a group of chemicals exceeds unity, the chemical(s) may produce an adverse effect, but normally this will require a Hazard Index or Quotient of several times unity. A Hazard Index or Quotient of less than unity indicates that no adverse effects are expected over the period of exposure.*

Table 4–27 Peak Chemical Hazard Index for the Cattaraugus Creek Receptor (year of peak Hazard Index in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	5.8×10^{-5} (3,400)	0 [b]
Vitrification Facility – WMA 1	5.3×10^{-6} (15,100)	0 [b]
Waste Tank Farm – WMA 3	7.1×10^{-5} (9,900)	0 [b]
NDA – WMA 7 [c]	1.5×10^{-5} (30,100)	1.5×10^{-5} (30,100)
SDA – WMA 8 [c]	3.4×10^{-3} (3,900)	3.4×10^{-3} (3,900)
Total	3.5×10^{-3} (3,900)	3.4×10^{-3} (3,900)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggests it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals. There is no hazardous chemical inventory available for the Construction and Demolition Debris Landfill in WMA 4.

[b] It is assumed that proactive maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational indefinitely. The doses from these units would be minimal as long as institutional controls ensure that these engineered systems function as originally designed to prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

Table 4–28 Chemicals with Largest Fraction of Maximum Concentration Levels in Cattaraugus Creek at Year of Peak Risk and Year of Peak Hazard Index – Indefinite Continuation of Institutional Controls [a]

Waste Management Areas [b]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Year of Peak Risk in Parentheses		
Main Plant Process Building – WMA 1	1.07×10^{-4} (8,500) Pb [d]	0 [c]
Vitrification Facility – WMA 1	1.89×10^{-7} (40,500) Pb [d]	0 [c]
Waste Tank Farm – WMA 3	7.25×10^{-7} (9,000) Tl [e]	0 [c]
NDA – WMA 7 [j]	1.3×10^{-6} (86,700) As [f]	1.3×10^{-6} (89,200) As
SDA – WMA 8 [j]	1.07×10^{-4} (100) Benzene [g]	1.07×10^{-4} (100) Benzene
Year of Peak Hazard Index in Parentheses		
Main Plant Process Building – WMA 1	9.47×10^{-5} (3,400) Pb [d]	0 [c]
Vitrification Facility – WMA 1	1.50×10^{-7} (26,000) Sb [h]	0 [c]
Waste Tank Farm – WMA 3	8.78×10^{-7} (12,400) Sb [h]	0 [c]
NDA – WMA 7 [j]	3.4×10^{-5} (30,200) Usol [i]	3.4×10^{-5} (30,200) Usol
SDA – WMA 8 [j]	9.03×10^{-3} (4,700) Usol [i]	9.03×10^{-3} (4,700) Usol

MCL = maximum contaminant level, NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] Presented as fraction of the applicable MCL per years until peak exposure per chemical.

[b] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggests it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals. There is no hazardous chemical inventory available for the Construction and Demolition Debris Landfill in WMA 4.

[c] It is assumed that maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational indefinitely. The health impacts of hazardous chemicals released from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[d] Pb = lead, MCL (Action Level) = 0.015 milligrams per liter. There is no published MCL for lead, so the Action Level is used instead.

[e] Tl = thallium, MCL = 0.002 milligrams per liter.

[f] As = arsenic, MCL = 0.01 milligrams per liter.

[g] Benzene, MCL = 0.005 milligrams per liter.

[h] Sb = antimony, MCL = 0.006 milligrams per liter.

[i] Usol = soluble uranium, MCL = 0.03 milligrams per liter.

[j] NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

Seneca Nation of Indians Receptor

The postulated Seneca Nation of Indians receptor activities are similar to those of the Cattaraugus Creek receptor, but involve the consumption of a larger amount of fish (62 kilograms as opposed to 9 kilograms per year – see Appendix H, Table H–17) raised in the lower reaches of Cattaraugus Creek or in Lake Erie near the point where Cattaraugus Creek discharges into the lake. Because of bioaccumulation of radionuclides in fish at this location, the dose to this receptor is greater than that for the Cattaraugus Creek receptor. Detailed results are presented in Appendix H, Section H.2.2.2.2. The following is a summary of results for the Seneca Nation of Indians receptor under both the Sitewide Close-In-Place Alternative and the No Action Alternative:

- The North Plateau Groundwater Plume causes a short-term peak annual TEDE at 34 years. The peak lifetime radiological risk is about a factor of 1.3 higher for the Seneca Nation of Indians receptor than it is for the Cattaraugus Creek receptor. The dominant radionuclide is strontium-90 via drinking water. The risks associated with this peak would be within the CERCLA lifetime cancer risk range of 1×10^{-6} to 1×10^{-4} for both alternatives.

- The long-term peak annual TEDE due to groundwater releases:
  - Would be less than 1 millirem per year under both alternatives;
  - Would be higher than that for the Cattaraugus Creek receptor under both alternatives, due to the aforementioned consumption of fish; the peak annual TEDE for the Seneca Nation of Indians receptor is approximately 2.4 times higher than that for the Cattaraugus Creek receptor under both the Sitewide Close-In-Place and No Action Alternatives;
  - Would occur at approximately the same time as that for the Cattaraugus Creek receptor; and
  - Would be dominated by releases from the SDA under both the Sitewide Close-In-Place and No Action Alternatives.

- The long-term peak lifetime radiological risk due to groundwater releases:
  - Would be dominated by releases from the NDA and SDA under both the Sitewide Close-In-Place and No Action Alternatives;
  - Would be within the CERCLA risk range of 1×10^{-6} to 1×10^{-4} under the Sitewide Close-In-Place Alternative and for the No Action Alternative; and
  - Would bear much the same relationship to the Cattaraugus Creek peak lifetime radiological risk as does the peak TEDE to the Cattaraugus Creek peak TEDE (in this case, a factor of 2.8 higher).

- The dominant radionuclide would be uranium-234 via the fish consumption pathway.

The hazardous chemical risk and Hazard Index were calculated for the Seneca Nation of Indians receptor in the same manner as they were for the Cattaraugus Creek receptor. Similar to that of the Cattaraugus Creek receptor, the hazardous chemical lifetime cancer risk would be a small fraction of the risk resulting from the estimated release of radionuclides under the same alternative, and the Hazard Index is small. Likewise, the calculated MCL fractions for each chemical are all less than unity.

Lake Erie/Niagara River Water Users

In addition to the Cattaraugus Creek and Seneca Nation of Indians receptors, peak annual and time-integrated population dose estimates have been prepared. These are summarized in **Tables 4–29** and **4–30**, respectively. Lake Erie water users consume untreated water taken from Sturgeon Point while Niagara River water users consume untreated water from several structures in the eastern channel of the Niagara River.[19] They are also assumed to eat fish from Lake Erie, and (conservatively) to all be residential farmers.

Under the Sitewide Close-In-Place and the No Action Alternatives, the predicted peak population dose is about 95 person-rem. Most of the population dose shown in Table 4–29 would be received by receptors using water from the Sturgeon Point intake, which would see higher radionuclide concentrations than the intake structures on the Niagara River. No credit is taken for dilution in the flow between the mouth of Cattaraugus Creek and the Sturgeon Point intake structure. Complete mixing in the flow of the Niagara River is assumed for water intake points in the Niagara River. The estimated annual radiation dose from ubiquitous background and other sources of radiation (NCRP 2009) accumulated by the Sturgeon Point (Lake Erie) water users alone (565,000 people) would be approximately 350,000 person-rem.[20]

Table 4–30 presents the time-integrated population dose over periods of 1,000 and 10,000 years. For perspective, under both alternatives, the total population dose accumulated over 10,000 years (approximately 34,000 to 35,000 person-rem) would be less than the background dose that would be accumulated in 1 year by Lake Erie (Sturgeon Point) water users alone (350,000 person-rem).

Table 4–29 Peak Annual Total Effective Population Dose Equivalent (person-rem per year) for the Lake Erie/Niagara River Water Users (year of peak dose in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	1.0 (200)	0 [b]
Vitrification Facility – WMA 1	0.0030 (1,000)	0 [b]
Low-Level Waste Treatment Facility – WMA 2	0.038 (100)	2.7 (100)
Waste Tank Farm – WMA 3	0.41 (300)	0 [b]
NDA – WMA 7 [c]	1.2 (30,100)	1.2 (30,100)
SDA – WMA 8 [c]	18 (37,300)	18 (37,300)
North Plateau Groundwater Plume [c]	95 (34)	95 (34)
Total	95 [d] (34)	95 [d] (34)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that proactive maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational indefinitely. The doses from these units would be minimal as long as institutional controls ensure that these engineered systems function as originally designed to prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

[d] Almost all of these 95 person-rem per year would be accumulated by the 565,000 Lake Erie (Sturgeon Point) water users. This corresponds to a peak annual individual dose of approximately 0.2 millirem per year.

[19] There are an estimated 565,000 Lake Erie (Sturgeon Point) water users and 390,000 Niagara River water users.

[20] The background radiation dose accumulated by the Sturgeon Point group of postulated water users is appropriate for comparison with the 95 person-rem listed in Table 4–29 because virtually all of this dose is accumulated by that group.

Table 4–30 Time-integrated Total Effective Population Dose Equivalent for Lake Erie/Niagara River Water Users in Person-rem Over 1,000 and 10,000 years – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Integration Over 1,000 Years		
Main Plant Process Building – WMA 1	590	0 [b]
Vitrification Facility – WMA 1	2	0 [b]
Low-Level Waste Treatment Facility – WMA 2	13	340
Waste Tank Farm – WMA 3	130	0 [b]
NDA – WMA 7 [c]	150	150
SDA – WMA 8 [c]	710	710
North Plateau Groundwater Plume [c]	2,400	2,400
Total	4,000	3,600
Integration Over 10,000 Years		
Main Plant Process Building – WMA 1	940	0 [b]
Vitrification Facility – WMA 1	5	0 [b]
Low-Level Waste Treatment Facility – WMA 2	50	1,500
Waste Tank Farm – WMA 3	260	0 [b]
NDA – WMA 7 [c]	2,200	2,200
SDA – WMA 8 [c]	28,000	28,000
North Plateau Groundwater Plume [c]	2,500	2,500
Total	34,000	35,000

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials

[b] It is assumed that proactive maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs, etc.) operational indefinitely. The doses from these units would be minimal as long as institutional controls ensure that these engineered systems function as originally designed prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

Note: Totals may not add due to rounding.

Conclusions Given Continuation of Institutional Controls

For alternatives where waste would remain on site, the overall assessment is that the dose and risk are small for both alternatives. The risk is dominated by the radiological hazards. The peak annual dose to offsite receptors is less than 25 millirem per year when considering all WMAs, regardless of the alternative.[21] For both the Sitewide Close-In-Place Alternative and the No Action Alternative, the radiological hazard in the short term is dominated by the North Plateau Groundwater Plume. In the longer term it is dominated by the SDA.

4.1.10.3.2 Conditions Assuming Loss of Institutional Control – Groundwater-Driven Releases

A loss of institutional controls is assumed to take place after 100 years. In the case of the No Action Alternative, loss of institutional controls means that all maintenance activities cease and, in particular, no effort is made to keep radionuclides confined within the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm. Conservatively, failure of containment of these facilities is assumed to take place immediately upon loss of institutional controls. For the Sitewide Close-In-Place Alternative, however, it is

[21] *Compliance with decommissioning dose criteria is discussed in Appendix L of this EIS.*

expected that cessation of maintenance and other activities has little effect on the rate of release of radionuclides from areas that dominate dose in this case, such as the SDA, NDA, and North Plateau Groundwater Plume. Finally, for both alternatives, loss of institutional controls means that intruders could enter the site.

The scenarios considered in this section are: (1) loss of institutional controls leading to intruders along Buttermilk Creek; (2) loss of institutional controls leading to intruders on or adjacent to the North and South Plateaus; (3) loss of institutional controls on offsite receptors. All of these analyses focus on the impacts of radionuclides being released and coming in contact with human receptors. For radiological health impacts, the discussion is confined to dose impacts only (except for offsite receptors), because there are dose standards for situations following loss of institutional controls, but not risk standards.

4.1.10.3.2.1 Loss of Institutional Controls Leading to Intruders on Buttermilk Creek

Table 4–31 presents the predicted peak annual TEDE for the Buttermilk Creek resident farmer for each alternative, assuming failure of the active controls that would detect and mitigate releases from the Main Plant Process Building, the Waste Tank Farm, and the North Plateau Groundwater Plume after 100 years. See Appendix H, Figure H–2, of this EIS for the location of this receptor.

All of the projected doses for the Sitewide Close-In-Place Alternative would be less than 5 millirem per year. The No Action Alternative would result in the highest peak annual dose to this receptor (14 millirem per year), dominated by the Waste Tank Farm (11 millirem per year). If the loss of institutional controls were to occur earlier (i.e., prior to year 100), the dose would be higher because radionuclides from facilities such as the Waste Tank Farm could then migrate toward receptors and reach them sooner with less radioactive decay having taken place. For the Sitewide Close-In-Place Alternative, the North Plateau Groundwater Plume, followed by the SDA are the largest contributors to the long-term dose, while for the No Action Alternative, the Waste Tank Farm would dominate.

The NYSERDA View Indicates….

The Final EIS assumptions for the performance of engineered barriers such as caps, slurry walls, reducing grout, and other engineered materials intended to keep contamination physically and chemically bound in place have not been substantiated and may be overly optimistic. Additional analysis and verification are required for the performance of the engineered barriers that are used in the Final EIS site closure alternatives.

DOE's Response….

The National Academies' Committee to Assess the Performance of Engineered Barriers has reviewed the available data to support the estimate of long-term barrier performance and has noted the generally acceptable performance to date. This Committee also noted that extrapolations of long-term performance from existing data will have high uncertainties until field data are accumulated for longer periods of time. NYSERDA's call for additional references to support assumptions about barrier performance does not recognize that there are serious limitations on the availability of data as noted by the Committee. Appendix H, Section H.2.2.1, includes references for the assumptions about engineered barrier properties wherever possible. In many cases, the properties of the degraded materials are similar to those of the surrounding natural material.

NYSERDA's statement that the EIS does not analyze the consequences of erosion on North Plateau barriers is incorrect. The analysis presented in Appendix H, Section H.3.4, shows peak annual doses following erosion damage of the slurry wall around the Waste Tank Farm and Main Plant Process Building.

NYSERDA's statement that the Final EIS assumes that engineered barrier properties would remain unchanged for 100,000 years is misleading. As stated in Section H.2.2.1, the analysis assumes immediate barrier degradation which continues for the entire assessment period. The long-term performance assessment assumes degraded barrier properties until the year of peak dose or peak risk is identified. Most of the peak doses occur before 10,000 years. Some of the dose peaks for the burial areas are in the range of 30,000 to 40,000 years. The only peaks that approach 100,000 years are for chemical risks from the burial areas. The analytical period used when determining compliance with NRC's License Termination Rule is 1,000 years as noted in Appendix D, Section D.3.1.

Table 4–31 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Buttermilk Creek Resident Farmer (year of peak dose in parentheses) – Loss of Institutional Controls after 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	0.14 (200)	2 (200)
Vitrification Facility – WMA 1	0.00028 (1,000)	0.79 (200)
Low-Level Waste Treatment Facility – WMA 2	0.0020 (100)	0.12 (100)
Waste Tank Farm – WMA 3	0.014 (300)	11 (200)
NDA – WMA 7 [b]	0.076 (8,700)	0.076 (8,700)
SDA – WMA 8 [b]	1.7 (37,300)	1.7 (37,300)
North Plateau Groundwater Plume [b, c]	3.9 (34)	3.9 (34)
Total	3.9 (34)	14 (200)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

[c] The peak arising from the North Plateau Groundwater Plume at 34 years will have already passed by the time institutional controls fail. In practice, no one would be allowed to farm on Buttermilk Creek at that time, so the 34-year dose is conservative.

4.1.10.3.2.2 Loss of Institutional Controls Leading to Intruders in the North and South Plateaus

This section presents the estimated doses to a spectrum of intruders who enter WNYNSC in the event of loss of institutional controls designed to limit site access. These scenarios are considered to be conservative and useful for understanding the potential magnitude of impacts if intruders come onto the North or South Plateaus. The specific intruders evaluated were: (1) a direct intruder worker, (2) a resident farmer who has waste material directly deposited in his garden as a result of well drilling or home construction, and (3) a resident farmer who uses contaminated groundwater. Direct intruders are assumed to be located immediately above the waste in each WMA, while contaminated groundwater is assumed to come from wells that are located approximately 150 meters (490 feet) downgradient from the edge of the waste (see Appendix H, Figure H–3, of this EIS). Additional information on these exposure scenarios is provided in Appendix D of this EIS. For the purposes of analysis of the No Action Alternative, the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm are assumed to have lost their structural integrity and collapsed at the time of loss of institutional controls after exactly 100 years.

Intruder Worker

Two worker scenarios were considered: a well driller and a home construction worker. For the well driller, exposure pathways include inadvertent ingestion of contaminated soil, inhalation of contaminated dust, and direct exposure to contaminated water in a cuttings pond. For home construction, exposure pathways include inadvertent ingestion of contaminated soil, inhalation of contaminated dust, and exposure to external radiation from the walls of an excavation for the foundation of a home. However, the home construction scenario is not considered credible when there is a thick-engineered cap (e.g., the South Plateau burial grounds under the Sitewide Close-In-Place Alternative).

The results of this analysis are summarized in **Table 4–32**, with the results presented for the scenario with the highest TEDE.

Table 4–32 Estimated Peak Total Effective Dose Equivalent in Millirem Per Year to Intruder Worker (well driller or home construction worker) – Intrusion After 100 Years

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	Not applicable	3,910 [a, b]
Vitrification Facility – WMA 1	Not applicable	28,000 [a, b]
Low-Level Waste Treatment Facility – WMA 2	1.0 [c]	45,000 [a, b]
Waste Tank Farm – WMA 3	Not applicable	133 [c]
NDA – WMA 7	Not applicable	19,000 [a]
SDA – WMA 8	Not applicable	3,110 [a, b]
North Plateau Groundwater Plume	0.0000011 [b]	0.0000011 [b]
Cesium Prong – On site	1.9 [b]	1.9 [b]

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] The doses for the No Action Alternative are very high because, in this scenario, the well driller or home construction worker intrudes directly into volumes that contain high inventories of radionuclides. In the corresponding Sitewide Close-In-Place scenarios, the concentrated inventories have been covered by a cap that is thick enough to preclude a home construction worker from reaching the remaining inventories.

[b] Peak impact due to home construction scenarios.

[c] Peak impact due to well-drilling scenarios.

Under the Sitewide Close-In-Place Alternative, none of the predicted doses would exceed 2 millirem per year. However, the No Action Alternative peak annual doses could be substantial—up to 45,000 millirem per year—with the highest potential dose being from the Low-Level Waste Treatment Facility in the home construction scenario.

This analysis shows the importance of the thick, multi-layered engineered barrier in limiting the extent of direct intrusion into the waste, thereby limiting the dose from the disposal areas under the Sitewide Close-In-Place Alternative.

Resident Farmer with Waste Material in His Garden

Table 4–33 presents the doses to the resident farmer as a result of direct contact with contamination that would be brought to the surface and placed in a garden following a well drilling or home construction scenario.

Resident Farmer Using Contaminated Groundwater

Table 4–34 presents the doses to the resident farmer whose contact with the waste would be through an indirect pathway—the use of contaminated water. The receptors for the North Plateau facilities (Main Plant Process Building, Low-Level Waste Treatment Facility, Waste Tank Farm, and North Plateau Groundwater Plume) have wells in the sand and gravel layer on the North Plateau. The scenario is inapplicable for the NDA and SDA receptor because of the low hydraulic conductivity of the unweathered Lavery till and the unsaturated conditions in the Kent recessional sequence.

The results for the No Action Alternative in both Tables 4–33 and 4–34 clearly show that serious consequences are possible should institutional control over facilities like the Main Plant Process Building or the Waste Tank Farm be lost.

Table 4–33 Estimated Peak Annual Total Effective Dose Equivalent in Millirem Per Year to a Resident Farmer with a Garden Containing Contaminated Soil from Well Drilling or House Construction – Intrusion After 100 Years

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	Not applicable	19,900 [a, c]
Vitrification Facility – WMA 1	Not applicable	235,000 [a, c]
Low-Level Waste Treatment Facility – WMA 2	7.0 [b, d]	65,400 [a, c,]
Waste Tank Farm – WMA 3	Not applicable	2,080 [a, c]
NDA – WMA 7	Not applicable	61,500 [a, d]
SDA – WMA 8	Not applicable	2,150 [a, c]
North Plateau Groundwater Plume	0 [d]	0 [d]
Cesium Prong – On site	4.4 [c]	4.4 [c]

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] The doses for the No Action Alternative are very high because, in this scenario, the well driller or home construction worker intrudes directly into volumes that contain high inventories of radionuclides. In the corresponding Sitewide Close-In-Place scenarios, the concentrated inventories have been covered by a cap that is thick enough to preclude a home construction worker from reaching the remaining inventories.

[b] In the case of the Low-Level Waste Treatment Facility, it is possible for the well driller to penetrate soil contaminated with radioactive waste and spread radioactive material over a farmer's garden. However, the amount of material brought to the surface by a well driller is much less than that spread around during home construction.

[c] Peak impact due to home construction scenarios.

[d] Peak impact due to well-drilling scenarios. The predicted dose to the well drillers from the North Plateau Groundwater Plume is close to zero due to the cap.

Table 4–34 Estimated Peak Annual Total Effective Dose Equivalent in Millirem Per Year to a Resident Farmer Using Contaminated Groundwater – Intrusion After 100 Years

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	162	28,387 [a]
Vitrification Facility – WMA 1	1.9	101,000 [a]
Low-Level Waste Treatment Facility – WMA 2	31.6	1,448 [a]
Waste Tank Farm – WMA 3	157	397,988 [a]
NDA – WMA 7	Not applicable	Not applicable
SDA – WMA 8	Not applicable	Not applicable
North Plateau Groundwater Plume [b]	72	72
Cesium Prong – On site	4.4	4.4

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] The doses for the No Action Alternative are very high because, in this scenario, the well intrudes directly into volumes that contain high inventories of radionuclides. In the Sitewide Close-In-Place scenario the caps over the SDA, NDA, process building and vitrification facility prevent direct intrusion into the waste and the slurry wall and cap limit flow of water through the waste.

[b] North Plateau Groundwater Plume interstitial velocity calculated from STOMP model outputs was the same under Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

The time series of dose for the North Plateau Groundwater Plume under the Sitewide Close-In-Place Alternative is presented on **Figure 4–6** for receptors at 150 and 300 meters from the source of the plume. The figure illustrates the sensitivity of the dose to the time at which the intrusion occurs, and to where the intruder places his farm. The peak dose from the North Plateau Groundwater Plume for the Sitewide Close-In-Place Alternative is received by the receptor at 300 meters at about 30 years. The distance of 150 meters (490 feet) is in the vicinity of the peak concentration of the North Plateau Groundwater Plume at the first year of the period of analysis for both the No Action and Sitewide Close-In-Place Alternatives, and just outside of the downgradient slurry wall for the Sitewide Close-In-Place Alternative. The distance of 300 meters (980 feet) is located just upgradient of the North Plateau drainage ditch, the first location of discharge of the plume to the surface. Under each alternative, the predicted peak onsite concentration would occur during the period of institutional controls when a receptor could not access the contaminated groundwater. As time proceeds, the radionuclide concentration in the plume decreases at locations near the source and increases and then decreases at locations further removed from the source. This behavior explains the occurrence of peak dose at a location removed from the original source for an analysis time of 100 years.

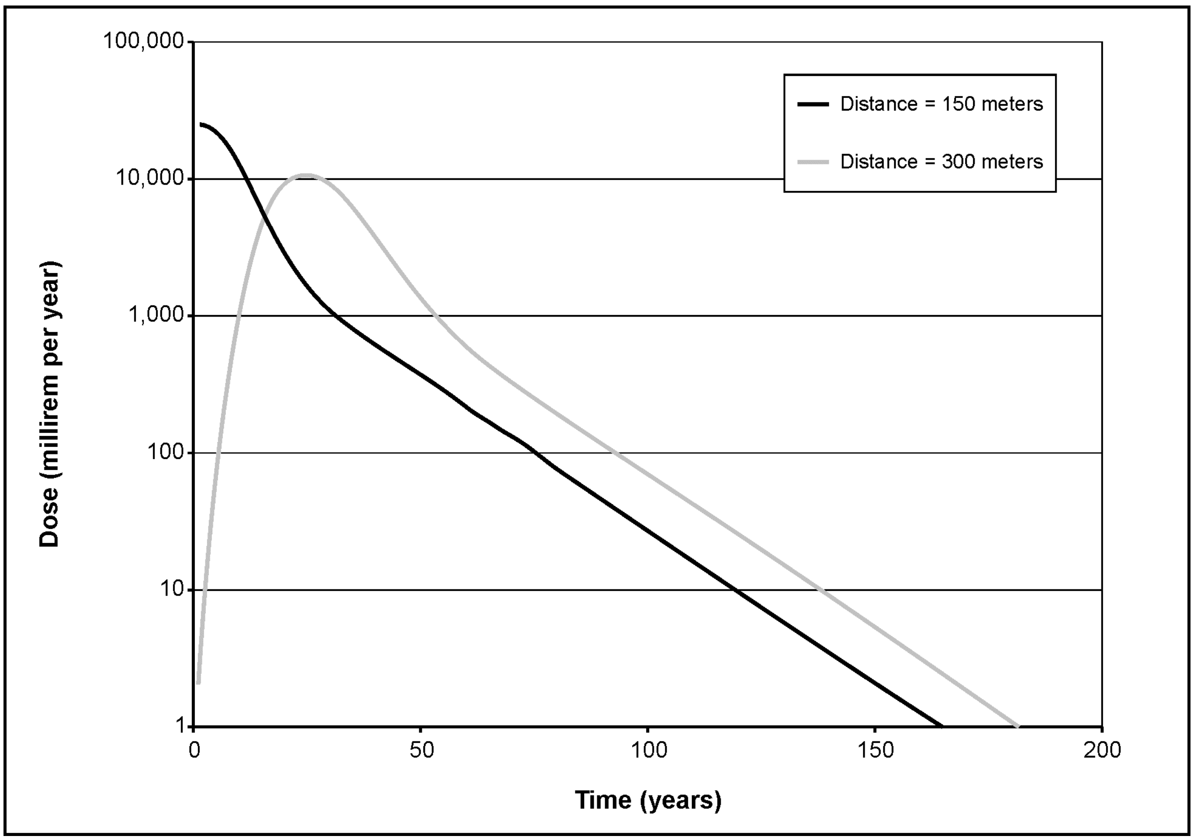


Figure 4–6 Time Series of Dose for Onsite Receptors for North Plateau Groundwater Plume Under the Sitewide Close-In-Place Alternative – Time Measured from Completion of Decommissioning

Dose from Multiple Sources

The previous discussion presented information on the dose to various receptors from individual WMAs. There is the potential for receptors to come in contact with contamination from multiple areas and therefore receive higher doses than would be received from a single WMA. The highest doses are to home construction intruders under the No Action Alternative (Table 4–32), a resident farmer with contamination from home construction under the No Action Alternative (Table 4–33), and a resident farmer using contaminated groundwater for either the Sitewide Close-In-Place Alternative or the No Action Alternative (Table 4–34).

The greatest potential for a dose from multiple sources under the No Action Alternative would be the combination of a garden contaminated with material from home construction and irrigated with contaminated groundwater. These combinations could result in peak doses approaching 200,000 to 500,000 millirem per year, with the higher value occurring if the well is located near the Waste Tank Farm.

4.1.10.3.2.3 Effect of Loss of Institutional Controls on Offsite Receptors

This section is parallel to Section 4.1.10.3.1, which presented the results of the long-term performance assessment for offsite receptors assuming indefinite continuation of institutional controls. However, this section reexamines the analysis for the offsite receptors assuming that institutional controls would be lost after 100 years (i.e., site maintenance activities would cease). In particular, it is assumed that there would be no more efforts to contain radionuclides and hazardous chemicals within WMAs on the North and South Plateaus. Conservatively, these are assumed to fail as soon as institutional controls fail. This section reexamines the analysis for the offsite receptors. Section 4.1.10.3.2.4 considers a scenario where institutional controls are assumed to be lost and unmitigated erosion occurs.

The principal effect of allowing releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm is to considerably increase predicted doses and risks under the No Action Alternative. However, the predicted doses and risks under the Sitewide Close-In-Place Alternative are barely changed because the engineered features that would be put in place around and above (for example) the NDA and SDA would be little affected by the cessation of maintenance. Therefore, the discussion in Section 4.1.10.3.2.3 focuses on the No Action Alternative. Tabular results for the Sitewide Close-In-Place Alternative are included for comparison.

Cattaraugus Creek Receptor

As described previously, the Cattaraugus Creek receptor is a postulated offsite receptor who is closest to the site boundary and receives the impact of liquid release from all portions of the site. This receptor is conservatively assumed to drink untreated water from Cattaraugus Creek, eat fish from the creek, and irrigate a garden with untreated water from the creek.

Figure 4–7 presents the annual TEDE as a function of time to the Cattaraugus Creek receptor for the No Action Alternative. See Figure 4–4 for the comparable plot for the No Action Alternative with indefinite continuation of institutional controls. The North Plateau Groundwater Plume peak at 34 years does not appear on this figure because, on the time-scale presented in the x-axis, it essentially coincides with the y-axis.

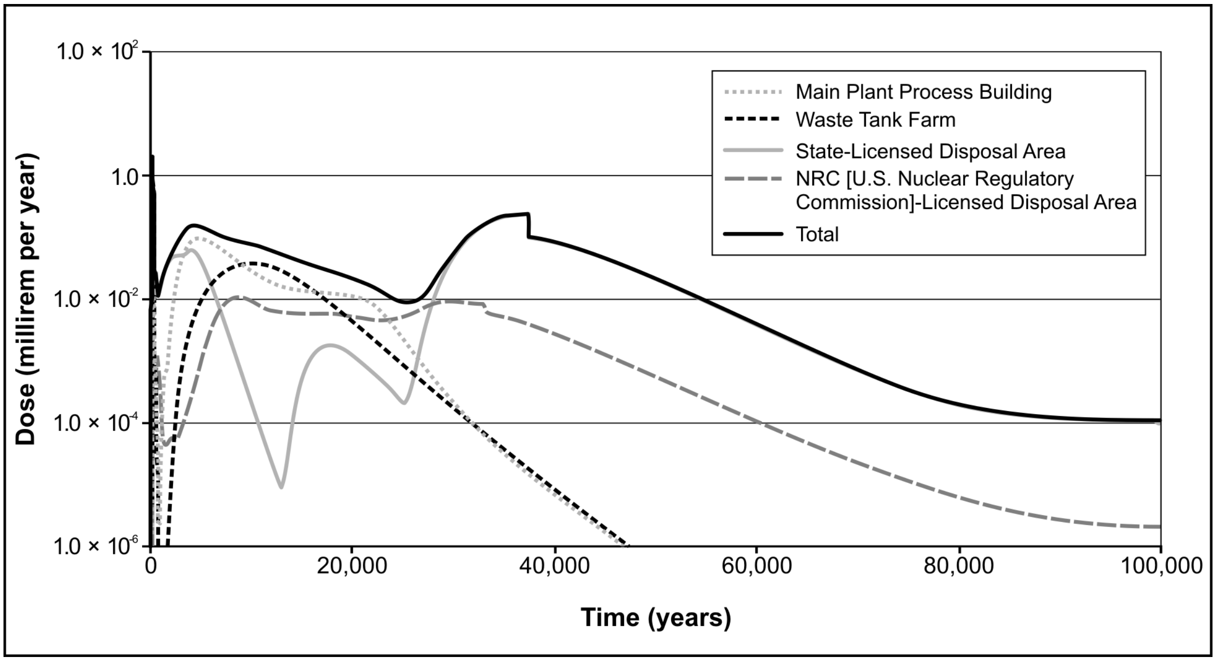


Figure 4–7 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor Under the No Action Alternative with Loss of Institutional Controls After 100 Years

The figure shows a number of peaks that correspond to the arrival of "pulses" of radionuclides from different areas on the site. This is further clarified by **Table 4–35**, which, for each alternative, displays the WMA, the predicted peak annual TEDE arising from radionuclides leaching from the WMA, and the predicted years until peak annual TEDE.

Table 4–35 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Cattaraugus Creek Receptor (year of peak exposure in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	0.019 (200)	0.26 (200)
Vitrification Facility – WMA 1	0.000037 (1,000)	0.10 (200) [b]
Low-Level Waste Treatment Facility – WMA 2	0.00026 (100)	0.015 (100)
Waste Tank Farm – WMA 3	0.0019 (300)	1.5 (200)
NDA – WMA 7 [c]	0.010 (8,700)	0.010 (8,700)
SDA – WMA 8 [c]	0.23 (37,300)	0.23 (37,300)
North Plateau Groundwater Plume [c]	0.51 (34)	0.51 (34)
Total	0.51 (34)	1.9 (200)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational for 100 years, after which they would fail completely.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

The results presented in Table 4–35 show that the total peak annual dose to the Cattaraugus Creek receptor due to groundwater releases would be less than 2 millirem per year under both alternatives. However, whereas in Table 4–24 the predicted total doses for the two alternatives were about the same, the long-term peak for the No Action Alternative is now about 4 times larger. For the No Action Alternative, the peak annual dose would be dominated by the Waste Tank Farm and occur at approximately 200 years. The dominant radionuclide from the Waste Tank Farm with the No Action Alternative is strontium-90 in drinking water. The doses for the Sitewide Close-In-Place Alternative with loss of institutional controls are much the same as they were for indefinite continuation of institutional controls, reflecting the conservative nature of the assumptions made with respect to the degradation of barriers in the latter case. This is because the movement of contaminants under the Sitewide Close-In-Place Alternative is not controlled by features that are sensitive to the presence or absence of institutional controls.

Table 4–36 shows the peak risk of latent cancer morbidity for the Cattaraugus Creek receptor arising from radiological discharges. It also shows how this risk varies from different WMAs and what it is for contributions from the entire site for each alternative. As expected, this table closely parallels the dose table, Table 4–35. Releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm under the No Action Alternative result in a projected lifetime risk of cancer fatality of 4.1×10^{-5} per year, which is about a factor of 4 greater than the risk for the Sitewide Close-In-Place Alternative. Both of these values lies within the CERCLA risk range of 1×10^{-6} to 1×10^{-4}.

Table 4–36 Peak Lifetime Radiological Risk (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	4.2×10^{-7} (200)	5.62×10^{-6} (200)
Vitrification Facility – WMA 1	3.12×10^{-10} (300)	2.28×10^{-6} (200) [b]
Low-Level Waste Treatment Facility – WMA 2	6.45×10^{-9} (100)	3.38×10^{-7} (100)
Waste Tank Farm – WMA 3	7.84×10^{-8} (300)	3.24×10^{-5} (200)
NDA – WMA 7 [c]	2.61×10^{-7} (8,600)	2.61×10^{-7} (8,600)
SDA – WMA 8 [c]	2.89×10^{-6} (37,300)	2.89×10^{-6} (37,300)
North Plateau Groundwater Plume [c]	1.10×10^{-5} (34)	1.10×10^{-5} (34)
Total	1.10×10^{-5} (34)	4.06×10^{-5} (200)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational for 100 years, after which they would fail completely.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

Table 4–37 shows the peak lifetime cancer risk from chemical exposure broken down by WMA. In contrast to radiological doses, the additional releases from the Main Plant Process Building and Waste Tank Farm that occur in the case of the No Action Alternative do not cause a large increase in risk. This is because, when analyzing only chemicals, inventories of hazardous chemicals are much larger and more mobile in the NDA and SDA than in the buildings and tanks.[22] As was the case for indefinite continuation of institutional controls, the chemical risks are a small fraction of the radiological risks, except for times approaching 100,000 years.

Detailed calculations also confirm that, for loss of institutional controls after 100 years, the Hazard Index and the fraction of MCL both remain much less than unity.

Table 4–37 Peak Lifetime Risk from Hazardous Chemicals (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	1.4×10^{-9} (5,000)	3.0×10^{-9} (4,000) [b]
Vitrification Facility – WMA 1	1.3×10^{-10} (11,700)	3.6×10^{-9} (1,100) [b]
Waste Tank Farm – WMA 3	1.1×10^{-10} (8,900)	1.3×10^{-9} (2,300) [b]
NDA – WMA 7 [c]	1.4×10^{-9} (85,900)	1.4×10^{-9} (85,900)
SDA – WMA 8 [c]	2.1×10^{-8} (100)	2.1×10^{-8} (100)
Total	2.1×10^{-8} (100)	2.1×10^{-8} (100)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggest it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals.

[b] It is assumed that maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational for 100 years, after which they would fail completely.

[c] NDA and SDA interstitial velocity calculated from STOMP model outputs were the same for the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

Seneca Nation of Indians Receptor

As described above for the case where institutional controls remain in place, the timing of the peak annual dose to the Seneca Nation of Indians receptor for the case when institutional controls fail after 100 years is similar to that for the Cattaraugus Creek receptor, but the Seneca Nation of Indians receptor dose is larger because the Seneca Nation of Indians receptor is postulated to consume a larger amount of fish (62 kilograms per year) raised in the lower reaches of Cattaraugus Creek or in Lake Erie near the point where Cattaraugus Creek discharges into the lake. Detailed results are presented in Appendix H, Section H.2.2.3.3 (Tables H–56 through H–59). The following is a summary of those results for the Seneca Nation of Indians receptor in the case of the No Action Alternative.

- The long-term peak annual total effective dose due to groundwater releases:
  - Would be less than 3 millirem per year;
  - Would be slightly higher than that of the Cattaraugus Creek receptor (about a factor of 1.3);
  - Would occur at approximately the same time as for the Cattaraugus Creek receptor; and
  - Would be dominated by the Waste Tank Farm.

[22] *Note that, in general, organic chemicals experience less retardation than radionuclides. The controlling constituent of the SDA impact is more strongly retarded than that of the NDA impact, which is why the NDA peak occurs much earlier than the SDA peak. Note also that degradation of organic compounds is not addressed.*

- The peak lifetime radiological risk of latent cancer morbidity due to groundwater releases:
  - Would be dominated by the Waste Tank Farm;
  - Would lie within the CERCLA risk range of 1×10^{-6} to 1×10^{-4}; and
  - Would bear much the same relationship to the Cattaraugus Creek peak lifetime radiological risk as does the peak TEDE to the Cattaraugus Creek peak TEDE (i.e., somewhat higher).
- The dominant radionuclide would be strontium-90 via fish (as opposed to strontium-90 via drinking water for the Cattaraugus Creek receptor).
- The latent cancer morbidity risk from hazardous chemicals would be very much smaller than that from radioactive materials except approaching 100,000 years. The Hazard Indices and fractions of MCL remain much less than unity.
- As with the Cattaraugus Creek receptor, the dose to the Seneca Nation of Indians receptor under the Sitewide Close-In-Place Alternative with loss of institutional controls after 100 years is similar to that for indefinite continuation of institutional controls because the movement of contamination under the Sitewide Close-In-Place Alternative is not controlled by features that are sensitive to the presence or loss of institutional controls.

Lake Erie/Niagara River Water Users

Table 4–38 presents the peak annual population TEDE for Lake Erie/Niagara River water users. **Table 4–39** presents the population TEDE integrated over 1,000 and 10,000 years.

Table 4–38 Peak Annual Total Effective Population Dose Equivalent in Person-Rem per Year for Lake Erie/Niagara River Water Users (year of peak dose in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	***Sitewide Close-In-Place Alternative***	***No Action Alternative***
Main Plant Process Building – WMA 1	1.0 (200)	36 (200) [b]
Vitrification Facility – WMA 1	0.0030 (1,000)	20 (200) [b]
Low-Level Waste Treatment Facility – WMA 2	0.038 (100)	2.7 (100)
Waste Tank Farm – WMA 3	0.41 (300)	287 (200) [b]
NDA – WMA 7 [c]	1.2 (30,100)	1.2 (30,100)
SDA – WMA 8 [c]	18 (37,300)	18 (37,300)
North Plateau Groundwater Plume [c]	95 (34)	95 (34)
Total	95 (34) [d]	344 (200) [e]

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational for 100 years, after which they would fail completely. The doses from these units would be minimal as long as these engineered systems function as originally designed.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

[d] This total dose of 95 person-rem per year would be primarily accumulated by the 565,000 Lake Erie (Sturgeon Point) water users, giving a peak annual individual TEDE of approximately 0.2 millirem per year.

[e] This total dose of 344 person-rem per year would be primarily accumulated by the 565,000 Lake Erie (Sturgeon Point) water users, giving a peak annual individual TEDE of approximately 0.6 millirem per year.

Table 4–39 Time-integrated Total Effective Population Dose Equivalent for Lake Erie/Niagara River Water Users in Person-Rem Over 1,000 and 10,000 Years – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Integration over 1,000 years		
Main Plant Process Building – WMA 1	590	3,800 [b]
Vitrification Facility – WMA 1	2	2,000 [b]
Low-Level Waste Treatment Facility – WMA 2	13	340
Waste Tank Farm – WMA 3	130	31,000 [b]
NDA – WMA 7 [c]	150	150
SDA – WMA 8 [c]	710	710
North Plateau Groundwater Plume [c]	2,400	2,400
Total	4,000	40,000
Integration over 10,000 years		
Main Plant Process Building – WMA 1	940	41,000
Vitrification Facility – WMA 1	5	2,500 [b]
Low-Level Waste Treatment Facility – WMA 2	50	1,500
Waste Tank Farm – WMA 3	260	42,000
NDA – WMA 7 [c]	2,200	2,200
SDA – WMA 8 [c]	28,000	28,000
North Plateau Groundwater Plume [c]	2,500	2,500
Total	34,000	120,000

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA, while the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that maintenance actions would keep engineered systems (geomembrane covers, drying systems, roofs) operational for 100 years, after which they would fail completely.

[c] North Plateau Groundwater Plume, NDA, and SDA interstitial velocities calculated from STOMP model outputs were the same under the Sitewide Close-In-Place and No Action Alternatives; therefore, peaks are the same for both alternatives.

Note: Totals may not add due to rounding.

As described previously, most of the population dose shown in Table 4–38 would be received by receptors using water from the Sturgeon Point intake, which would see higher radionuclide concentrations than the intake structures on the Niagara River. The peak annual dose is about 95 person-rem under the Sitewide Close-In-Place Alternative and approximately 344 person-rem under the No Action Alternative. For perspective, the estimated annual background radiation dose for Lake Erie water users (565,000 receptors) would be approximately 350,000 person-rem.

Table 4–39 presents the time-integrated population dose over periods of 1,000 and 10,000 years. For the Sitewide Close-In-Place Alternative and the No Action Alternative, the total population dose accumulated over 10,000 years (34,000 person-rem and 120,000 person-rem, respectively) would be smaller than the background dose that would be accumulated in 1 year by Sturgeon Point (Lake Erie) water users alone (350,000 person-rem).

4.1.10.3.3 Conditions Assuming Loss of Institutional Control – Erosion-Driven Releases

The NYSERDA View Indicates….

The Final EIS Analysis of Soil Erosion is Not Scientifically Defensible and Should Not be Used for Long-term Decisionmaking. The erosion analysis in the Final EIS is not scientifically defensible because in NYSERDA's opinion, many of the modeling results are inconsistent with what is observed at WNYNSC today and do not explicitly predict the location and magnitude of stream meandering, gully erosion, and other physical changes in the landscape.

DOE's Response….

The erosion analysis is scientifically defensible. This analysis has been conducted by acknowledged experts in this technical specialty using landscape evolution models, a theoretical approach consistent with methods currently available to the scientific community, and all available site-specific data. Although DOE was of the opinion that the erosion modeling performed for the Revised Draft EIS met NEPA and SEQR requirements and could be used to make long-term decisions for WNYNSC, between the Revised Draft and Final EIS, DOE made changes to its modeling effort and analysis in response to NYSERDA's comments. The original analytical approach together with the acknowledgement and discussion of the uncertainty in the analysis meets the requirements of NEPA and SEQR.

- *NYSERDA's statement that the soil erosion analysis in this EIS is "not scientifically defensible and should not be used for long-term decisionmaking" appears to be a comment on the state of landscape evolution science in general. NYSERDA's statements about the state of the science of landscape evolution modeling, including the statement that such models necessarily represent nature in a very abstract, simplistic way, recognize the current state of the science for erosion analysis. In addition, neither NYSERDA nor its expert panel identified any specific analytical improvements that could be implemented for the analysis in this EIS.*

  For the Final EIS, and in response to concerns raised in the NYSERDA View for the Revised Draft EIS, the CHILD erosion model was recalibrated using Monte-Carlo (probabilistic) methods and more detailed calibration criteria. Five sets of calibration parameters produced topography predictions close to observed conditions. These five sets of calibration parameters were then used to develop topography predictions over 10,000 years for the unmitigated erosion scenario.

- *NYSERDA's statements that the results from short-term erosion predictions reported in Appendix F provide little useful information with regard to erosion rates at WVDP misses the purpose of presenting this information in Appendix F. As stated in Section F.3.2, this information from previous studies is presented to provide perspective on the reasonableness of the CHILD results. Predictions from the calibrated CHILD model are relied upon to obtain insight into long-term erosion at the West Valley site.*

- *NYSERDA's statement that "With the exception of one modeling scenario, the simulation results show no gully erosion of the South Plateau over the next 10,000 years" is incorrect. While some South Plateau erosion predictions show limited erosion, other cases show erosion that includes gully advance. These results are briefly discussed in Sections F.3.1.6.7 and F.3.1.6.9, which discuss the CHILD erosion predictions for the No Action and Close-In-Place Alternatives, respectively. These sections discuss the erosion predictions including gully advance that were developed by CHILD using various calibration cases.*

  The unmitigated erosion analysis predicts gully advancement on both the North and South Plateaus. The dose estimates for the unmitigated erosion scenario were developed using the more rapid gully advance rate predicted by the calibrated CHILD model (NPTwet Case for the Sitewide Close-In-Place Alternative), and assumes the gully advances into areas determined to be vulnerable to gully formation. These conservative assumptions were used in recognition of the uncertainty about the precise location and advance rate of gullies. The CHILD predictions do not support gully penetration into the area of the Main Plant Process Building or Waste Tank Farm within 10,000 years. Appendix F and Chapter 4, Section 4.1.10.3.3 have been revised to present the updated results and discuss the updated methodology. In addition, Section 2.3 of the Comment Response Document includes a summary level discussion of the erosion analysis.

- *NYSERDA's statement that the predictions are "wholly inconsistent with what is being observed at these locations today" is inconsistent with DOE's interpretation of the projections. Section F.3.1.6.10 discusses both consistencies and inconsistencies between the CHILD predictions and present day patterns.*

- *DOE recognizes that the NYSERDA staff considers the 10,000-year predictions to be unrealistic and overly optimistic, but there does not appear to be any technical basis for this opinion because NYSERDA has not performed an independent long-term erosion analysis.*

Erosion is recognized as a site phenomenon, and so a conservative scenario of unmitigated erosion is analyzed to estimate the dose to various receptors. For the purposes of this analysis, unmitigated erosion is defined to mean that credit is not taken for the presence of erosion control structures or performance monitoring and maintenance of any kind. Predictions of unmitigated erosion for thousands of years into the future were developed with the help of a landscape evolution model that was calibrated to reproduce both historical erosion rates and current topography, starting from the topography estimated to exist after the last glacial recession. The development of the unmitigated erosion estimate is discussed in Appendix F of this EIS. The chosen erosion scenario for the landscape evolution model corresponds to a case in which the site becomes partly forested and partly grassland.

The modeling described in this section considers unmitigated erosion for the Low-Level Waste Treatment Facility on the North Plateau and the SDA and NDA on the South Plateau only. The landscape evolution model predicts very little erosion in the region of the Main Plant Process Building, Vitrification Facility, and Waste Tank Farm, and also predicts that the only places where any serious erosion is expected in the foreseeable future would be in the vicinities of the Low-Level Waste Treatment Facility, SDA, or NDA. The analysis was based on the size and configuration of a large gully predicted to develop at the north end of the North Plateau under conditions of elevated precipitation and reduced infiltration (see Appendix F, Section F.3.1.6.4). A more-complete description of this gully is presented in Appendix H, Section H.2.2.

A spectrum of erosion-related receptors was examined: (a) three residents,[23] one on the west bank of Erdman Brook south of the Low-Level Waste Treatment Facility, one on the east bank of Franks Creek opposite the SDA, and one on the west bank of Erdman Brook opposite the NDA, each of whom would be exposed to direct radiation from the eroded opposite bank and would spend some time hiking about the site; (b) a resident farmer along Buttermilk Creek; and (c) the same offsite receptors as those evaluated for the case of continuation of institutional controls—Cattaraugus Creek, Seneca Nation of Indians, and Lake Erie/Niagara River water users.

Low-Level Waste Treatment Facility/NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area/State-Licensed Disposal Area Resident/Recreational Hiker

Table 4–40 presents the peak annual TEDE for the resident/recreational hiker for the Low-Level Waste Treatment Facility, NDA, and SDA if unmitigated erosion was allowed to take place. The table also shows the year of peak annual dose. The assumptions governing the behavior and exposure of the recreational hiker are given in Appendix H, Table H–5, of this EIS. Exposure modes for a hiker include inadvertent ingestion of soil, inhalation of fugitive dust, and exposure to direct radiation. However, this receptor does not ingest radionuclides through food and water pathways.

The projected results are quite similar for the Sitewide Close-In-Place and the No Action Alternatives. Because of conservative assumptions in the unmitigated erosion model, the engineered cap only slightly reduces the rate of erosion for the Sitewide Close-In-Place Alternative. No credit is taken for stream erosion controls for the erosion resistance of the rock along the side of the engineered cap. Additional detail on the unmitigated erosion release model is provided in Appendix G of this EIS.

[23] *The onsite resident differs from the onsite resident farmer in that the former has no garden and does not drink contaminated water. See Appendix H, Figure H–3, of this EIS, for the locations of these three receptors.*

Table 4–40 Peak Annual Total Effective Dose Equivalent in Millirem Per Year to a Resident/Recreational Hiker on the Low-Level Waste Treatment Facility, NDA, and SDA (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	34 (200)	70 (160)
SDA – WMA 8	29 (190)	40 (160)
Low-Level Waste Treatment Facility – WMA 2	11 (180)	28 (140)
Total	68 (200)	129 (160)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

Buttermilk Creek Resident Farmer

Table 4–41 presents the peak annual TEDE from the eroded Low-Level Waste Treatment Facility, NDA, and SDA for the Buttermilk Creek resident farmer for the unmitigated erosion scenario. See Appendix H, Section H.1.3.1, for a discussion of the location of the Buttermilk Creek resident farmer. The table also shows the year of peak annual dose. For comparison, the predicted annual TEDEs for the case of loss of institutional controls without unmitigated erosion are 3.9 millirem per year under the Sitewide Close-In-Place Alternative and 14 millirem per year under the No Action Alternative (see Table 4–31).

Table 4–41 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Buttermilk Creek Resident Farmer (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	12 (490)	84 (200)
SDA – WMA 8	5 (420)	26 (160)
Low-Level Waste Treatment Facility – WMA 2	6 (200)	12 (170)
Total	16 (860)	115 (200)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

Cattaraugus Creek Receptor

Table 4-42 presents the peak annual TEDE from the Low-Level Waste Treatment Facility, NDA, and SDA for the Cattaraugus Creek resident farmer for the unmitigated erosion scenario.

The doses to the Cattaraugus Creek receptor, if unmitigated erosion were allowed to progress at WNYNSC, show a similar pattern to that seen for the Buttermilk Creek intruder, but the doses would be generally lower by a factor of about eight.

For comparison, the peak annual TEDE to the Cattaraugus Creek receptor for the case of loss of institutional controls without unmitigated erosion is 0.51 millirem per year under the Sitewide Close-In-Place Alternative and 1.9 millirem per year under the No Action Alternative (see Table 4–35).

Table 4–42 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Cattaraugus Creek Receptor (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	1.5 (490)	11 (200)
SDA – WMA 8	0.68 (420)	3.4 (160)
Low-Level Waste Treatment Facility – WMA 2	0.74 (200)	1.6 (170)
Total	2.1 (860)	15 (200)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

An illustration of how the peak annual dose to the Cattaraugus Creek receptor would vary as a function of time for the Sitewide Close-In-Place Alternative is presented on **Figure 4–8**. The variations for the No Action Alternative are almost identical. The variations for the Buttermilk Creek farmer (provided earlier) and the Seneca Nation of Indians receptor (in this section) have the same shape, although the peaks are not of the same magnitude. The plot cuts off at about 3,000 years because the peak annual dose occurs prior to 100 years and rates of erosion decrease with time.

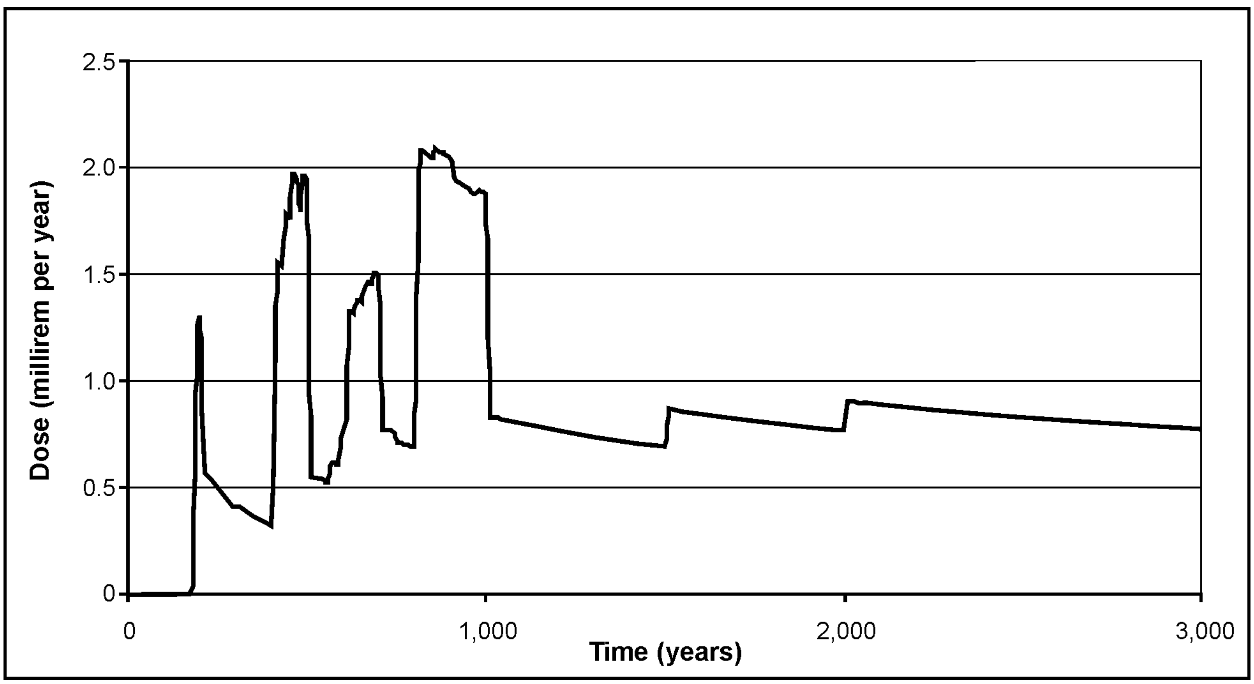


Figure 4–8 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor as a Function of Time with the Sitewide Close-In-Place Alternative and Unmitigated Erosion

Seneca Nation of Indians Receptor

As described previously, a Seneca Nation of Indian receptor is postulated to use Cattaraugus Creek near Gowanda for drinking water and to consume large quantities of fish raised in these waters. The peak annual dose for this receptor is presented in **Table 4–43**.

The timing of the dose peaks for the Seneca Nation of Indians receptor, in the event of unmitigated erosion at WNYNSC, show a similar pattern to that seen for the Cattaraugus Creek receptor, but the numerical values of the dose peaks would be higher by a factor of about two as a result of the higher assumed level of fish consumption.

Table 4–43 Peak Annual Total Effective Dose Equivalent in Millirem Per Year to the Seneca Nation of Indians Receptor (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	4 (490)	26 (200)
SDA – WMA 8	1 (420)	7 (160)
Low-Level Waste Treatment Facility – WMA 2	2 (200)	3 (170)
Total	4 (490)	34 (200)

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, WMA = Waste Management Area.

For comparison, the peak annual TEDE to the Seneca Nation of Indians receptor for the case of loss of institutional controls without unmitigated erosion is 0.68 millirem per year for the Sitewide Close-In-Place Alternative and 2.5 millirem per year for the No Action Alternative, see Appendix H, Table H–56.

Lake Erie/Niagara River Water Users

Peak annual and time-integrated population dose estimates have been prepared for the unmitigated erosion release scenario. These are summarized in **Tables 4–44** and **4–45**, respectively.

As described previously, most of this population dose would be received by the estimated 565,000 receptors postulated to use water from the Sturgeon Point intake on Lake Erie. Using an average annual dose rate from ubiquitous background and other sources of radiation of 620 millirem per year (NCRP 2009), the annual background population dose for these receptors would be approximately 350,000 person-rem. This estimated dose provides perspective to peak annual population doses that were estimated for the Sitewide Close-In-Place Alternative (240 person-rem per year) and the No Action Alternative (1,500 person-rem per year).

Table 4–44 Peak Annual Total Effective Dose Equivalent Population Dose in Person-rem Per Year to the Lake Erie/Niagara River Water Users (year of peak exposure in parentheses) – Unmitigated Erosion

	Sitewide Close-In-Place Alternative	*No Action Alternative*
Unmitigated Erosion	240 (860) [a, b]	1,500 (200) [a, b]

[a] These population doses would be mostly accumulated by the 565,000 Lake Erie (Sturgeon Point) water users, corresponding to peak annual individual TEDEs of about 0.4 millirem (Sitewide Close-In-Place Alternative) and 2.7 millirem per year (No Action Alternative).
[b] For comparison, the peak population dose without unmitigated erosion would be 95 and 344 person-rem per year for the Sitewide Close-In-Place and No Action Alternatives, respectively (see Table 4–38).

Table 4–45 Time-integrated Total Effective Population Effective Dose Equivalent in Person-rem to the Lake Erie/Niagara River Water Users – Unmitigated Erosion

	Sitewide Close-In-Place Alternative	*No Action Alternative*
Integration over 1,000 years	170,000 [a]	450,000 [b]
Integration over 10,000 years	1,000,000 [a]	1,400,000 [b]

[a] For comparison, the time-integrated doses without unmitigated erosion would be approximately 4,000 and approximately 34,000 person-rem, respectively (see Table 4–39).
[b] For comparison, the time-integrated doses without unmitigated erosion would be approximately 40,000 and approximately 120,000 person-rem (see Table 4–39).

Additional perspective is provided by the cumulative population dose at 1,000 and 10,000 years. The background population dose accumulated by Sturgeon Point (Lake Erie) water users alone under the No Action Alternative would be approximately 200 million person-rem over 1,000 years, and 2 billion person-rem over

10,000 years. As shown in Table 4–45, the additional population doses accumulated from WNYNSC would be relatively small.

Conclusions for Loss of Institutional Controls Leading to Unmitigated Erosion

The results for uncontrolled erosion of the SDA, NDA and Low-Level Waste Treatment Facility for the Sitewide Close-In-Place Alternative show TEDEs of up to about 68 millirem per year for the resident hiker, 16 millirem per year for the Buttermilk Creek resident farmer, 2 millirem per year for the Cattaraugus Creek receptor, and 4 millirem per year for the Seneca Nation of Indians receptor. For the two offsite receptors, these represent an increase by a factor of about four over the case without unmitigated erosion. The corresponding results for the No Action Alternative are 129, 115, 15, and 34 millirem per year, respectively – higher than those for the Sitewide Close-In-Place Alternative, as expected. Those for the two offsite receptors are higher than those for the case of no erosion by a factor of about eight.

Integrated Groundwater/Erosion Model

In the foregoing analysis, groundwater releases and erosion releases (i.e., particulate matter washed into rivers and streams) are modeled separately. At the present time, integrated models of groundwater and erosional releases are beyond the state-of-the art. This question is addressed in sensitivity studies in Appendix H, Section H.3. However, dose impacts on offsite receptors are about 4-6 times greater in the unmitigated erosion scenarios than they are in the groundwater release scenarios for the Sitewide Close-In-Place Alternative, but the erosion peaks occur much later. In this case, one would not expect much difference in the results of an integrated model. For the No Action Alternative, the dose to offsite receptors ranges from about 8 to 14 times that for the groundwater release scenarios and the peaks occur in comparable time frames, but from different waste management areas. In this particular case, one might expect an integrated model to predict doses that are additive of the two individual results.

4.1.10.4 Some Observations on the Phased Decisionmaking Alternative

As previously discussed, it is not possible to do a long-term performance assessment for the Phased Decisionmaking Alternative, because the ultimate disposition of various areas of the site is not known. For most exposure scenarios and receptors, however, long-term impacts would be bounded by those for the Sitewide Removal and Sitewide Close-In-Place Alternatives. Long-term impacts for some exposure scenarios and receptors would be bounded by those for the No Action Alternative if the Phase 2 decision for the SDA is continued active management.

Some general observations are possible.

Main Plant Process Building and Vitrification Facility – Waste Management Area 1

The plume source volume for the Main Plant Process Building and the Vitrification Facility would be completely removed. These actions most closely resemble those expected for these facilities under the Sitewide Removal Alternative. Therefore, residual contamination from these two structures would contribute negligibly to potential health impacts under any final disposition of the site.

Low-Level Waste Treatment Facility and Lagoons – Waste Management Area 2

All facilities in WMA 2 would be removed during Phase 1 except the permeable treatment wall, which may be replaced. The removal actions would reduce the inventory of radioactive materials and hazardous chemicals and residual contamination in this area, with the exception of that in the North Plateau Groundwater Plume (discussed below), would contribute negligibly to potential health impacts under any final disposition of the site.

Waste Tank Farm – Waste Management Area 3

The underground tanks of the Waste Tank Farm would be isolated with residual contamination in a dry form at the start of Phase 2 decommissioning and this configuration is expected to be maintained during the Phase 2 actions. Releases are not reasonably foreseeable in the near term and longer term consequences from the Waste Tank Farm would depend on the Phase 2 decision for the WMA. If the Waste Tank Farm is closed in place the long-term impacts would be the same as those for the Waste Tank Farm for the Sitewide Close-In-Place Alternative. If the Waste Tank Farm is removed, the long-term impacts would be small and consistent with those for the Sitewide Removal Alternative.

NDA – Waste Management Area 7

During Phase 1, the NDA would continue as at present, under monitoring and/or active management. For the immediate future, contamination would slowly migrate from this area consistent with the No Action Alternative, but there would be no offsite consequences in the near term. Over the longer term, consequences would depend on the Phase 2 decision. If the NDA is closed in place, the long-term impacts for the NDA would be the same as those for the Sitewide Close-In-Place Alternative. If the NDA is removed, the long-term impacts would be small and consistent with those for the Sitewide Removal Alternative.

SDA – Waste Management Area 8

During Phase 1, the SDA would continue as at present, under monitoring and/or active management. For the immediate future, contamination would slowly migrate from this area consistent with the No Action Alternative, but there would be no offsite impacts in the short term. Over the longer term, impacts would depend on the Phase 2 decision. If the decision for the SDA is in-place closure, long-term impacts for the SDA would be consistent with those for the Sitewide Close-In-Place Alternative. If the decision for the SDA is removal, long-term impacts for the SDA would be small and consistent with those for the Sitewide Removal Alternative. If the decision for SDA is continued active management, long-term impacts for the SDA would be bounded for some exposure scenarios and receptors by those for the No Action Alternative.

North Plateau Groundwater Plume

The source area of the North Plateau Groundwater Plume would be removed as in the Sitewide Removal Alternative. Migration of the non-source area of the North Plateau Groundwater Plume would result in a peak in the annual dose to offsite receptors around the year 2045. The dose would be on the order of 0.5 millirem per year for Cattaraugus Creek receptors and less than 0.2 millirem per year to Lake Erie/Niagara River water users (see the results for the Sitewide Close-In-Place and No Action Alternatives). These peak annual doses would not be increased by Phase 2 actions.

Conclusion – Phased Decisionmaking Alternative

Phase 1 removal actions for the Main Plant Process Building, Vitrification Facility, and Low-Level Waste Treatment Facility Area lagoons would result in minimal long-term impacts from residual waste and contamination in these areas. Impacts of the North Plateau Groundwater Plume would peak around the year 2045 and are not sensitive to the Phase 2 decision. Long-term impacts for the Waste Tank Farm, the NDA, and the SDA would depend on the Phase 2 decision. Long-term impacts for the Waste Tank Farm and the NDA are expected to be bounded by the results already calculated for the Sitewide Removal and Sitewide Close-In-Place Alternatives. Long term impacts for the SDA are expected to be bounded by results already calculated for the Sitewide Removal, Sitewide Close-In-Place, and No Action Alternatives.

4.1.11 Waste Management

Depending on the alternative, construction, operations, and decommissioning of facilities would generate several types of waste including nonhazardous, hazardous, low-level radioactive, mixed low-level radioactive, and transuranic waste. Definitions for the various waste types are provided in the text box in Chapter 2, Section 2.1, of this EIS.

Waste management impacts were assessed by comparing the projected waste volumes generated under each alternative to current waste management practices and to the volumes of waste being managed from ongoing activities at WNYNSC. Ongoing activities include waste treatment, storage, and disposal as evaluated in the *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* (DOE/EIS-0337F) (DOE 2003e) and Supplement Analysis (DOE/EIS-0337-SA-01) (DOE 2006b); disposal of 36 surplus facilities as evaluated in the *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project*, (DOE/EA-1552) (DOE 2006c); and completion of certain actions described in Chapter 2, Section 2.3.1, of this EIS, representing the starting point for this EIS. **Table 4–46** presents a summary of the waste management impacts for the EIS alternatives.

As described in Chapter 2 of this EIS, under the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives, new facilities would be constructed to manage some of the waste. The environmental impacts of construction, operations, and deactivation of these new waste management facilities are evaluated in the applicable sections of this chapter.

4.1.11.1 Waste Volumes

Large volumes of waste, much of it radioactive, are expected to be generated and processed for disposal during decommissioning of WNYNSC.

Table 4–47 compares the packaged waste volumes generated by the four EIS alternatives. The table is divided into two sections. The upper section of the table shows the volumes of wastes that would need to be processed and disposed of under the DOE/Commercial Disposal Option (DOE low-level radioactive waste is disposed of at DOE disposal facilities while commercial low-level radioactive waste is disposed of at commercial disposal facilities). The lower section of the table shows the volumes of wastes that would need to be processed and disposed of under the Commercial Disposal Option (all low-level radioactive waste is disposed of at commercial facilities). Note that the packaged volumes vary because of the different packaging required to meet the waste acceptance criteria of the waste disposal facilities. For example, DOE wastes that would be equivalent to Class B and C wastes under NRC regulations that would be disposed of at DOE disposal facilities are assumed to be packaged in B-25 boxes or 208-liter (55-gallon) drums, whereas commercial facilities are assumed to require packaging in high integrity containers (HICs).

Table 4–48 compares the packaged waste volumes generated by the activities performed under the three decommissioning alternatives for site monitoring and maintenance or long-term stewardship. These wastes are presented on an annual basis to allow comparison with each other and the No Action Alternative.

4.1.11.2 Management Options

There are a variety of disposal options available for the different types of wastes to be processed under the alternatives. Different disposal options may be available (i.e., whether the waste in question comes from an area that is a DOE responsibility or one that is a NYSERDA responsibility). **Table 4–49** presents these options by waste type.

Table 4–46 Summary of Waste Management Impacts

Activity	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative* [f]
Packaged Decommissioning Waste (cubic meters)				
Nonhazardous	140,000	15,000	33,000	NA
Hazardous	15	3	2	NA
LLW [a]	1,500,000	9,900	180,000	NA
GTCC [a]	4,200	0	0	NA
TRU [a]	1,000	35	710	NA
MLLW	570	410	41	NA
Total	1,600,000	26,000	210,000	NA
Impacts	Nonhazardous waste, Class A low-level radioactive waste (including low-specific-activity waste), and Greater-Than-Class C waste exceed the volumes being managed from ongoing activities.[b] Nonhazardous waste is common demolition debris that would have no adverse impact on commercial disposal facility capacity. Much of the low-level radioactive waste is low-specific-activity waste that would have no adverse impact on DOE or commercial disposal facility capacity.	All waste volumes would be less than the volumes being managed from ongoing activities.[c]	Nonhazardous waste and Class A low-level radioactive waste generated during Phase 1 (including low specific activity waste) would exceed the volumes being managed from ongoing activities.[b] Nonhazardous waste is common demolition debris that would have no adverse impact on commercial disposal facility capacity. Much of the low-level radioactive waste is low-specific-activity waste that would have no adverse impact on DOE or commercial disposal facility capacity. If the Phase 2 decision is removal of all remaining waste and contamination, the total waste volume generated under the entire Phased Decisionmaking Alternative would be similar to that generated under the Sitewide Removal Alternative. Approximately 30 percent of the Class A/LSA low-level radioactive waste and most of the mixed low-level radioactive, Class B and C low-level radioactive, and Greater-Than-Class C waste would not be generated if the Phase 2 decision for the SDA is continued active management. If the Phase 2 decision is in-place closure, the waste volume generated under the entire Phased Decisionmaking Alternative would be the sum of the Phase 1 waste volume plus about 30 percent of the waste volume generated under the Sitewide Close-In-Place Alternative. The waste volume would be slightly less if the Phase 2 decision for the SDA is continued active management.	Not applicable.
Packaged Waste from Site Monitoring and Maintenance or Long-term Stewardship (cubic meters per year) [e]				
Nonhazardous	0	0	6	32
Hazardous	0	0	< 1	1
GTCC	0	0	0	0
TRU	0	0	0	0
LLW	0	110	140	450
MLLW	0	0	0	< 1
Total	0	110	150	480

Activity	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase 1)	No Action Alternative [f]
Impacts	Not applicable	Annual waste volumes would be less than those under the No Action Alternative (continuing current activities) and therefore would have little impact on the waste management infrastructure.	Annual long-term waste generation rates for Phase 2 would be almost double the Phase 1 monitoring and maintenance rates if the remaining facilities are closed in place, and would be zero if Phase 2 results in the removal of the remaining waste and contamination. If the Phase 2 decision for the SDA is continued active management and the Phase 2 decision for the remainder of the site is in-place closure, there would be small quantities of wastes generated annually from ongoing monitoring and maintenance of the SDA and long-term stewardship of the remaining affected portions of the site. If the Phase 2 decision for the SDA is continued active management and the Phase 2 decision for the remainder of the site is removal, there would be small quantities of wastes annually generated from ongoing monitoring and maintenance of the SDA but no waste from long-term stewardship for the remainder of the site. Annual waste volumes would be less than those under the No Action Alternative (continuing current activities) and therefore would have little impact on the waste management infrastructure.	Annual waste volumes would be similar to those currently generated by these activities and therefore would have little impact on the waste management infrastructure.
Orphan Waste Management (cubic meters per year)				
LLW	3.2 [c]	< 3.2 [c]	≤ 3.2 [c, d]	0
Impacts	Until the issues related to disposal of commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, and non-defense transuranic waste are resolved, these wastes would be stored in the Container Management Facility. High-level radioactive waste would be stored in the Interim Storage Facility until disposition decisions are made and implemented.	Until the issues related to disposal of commercial Class B and C low-level radioactive waste and non-defense transuranic waste are resolved, these wastes would be stored in Lag Storage Area 4. High-level radioactive waste would be stored in the Interim Storage Facility until disposition decisions are made and implemented.	Until the issues related to disposal of non-defense transuranic waste are resolved, this waste would be stored in Lag Storage Area 4. High-level radioactive waste would be stored in the Interim Storage Facility until disposition decisions are made and implemented.	High-level radioactive waste would continue to be stored in the Main Plant Process Building until disposition decisions are made and implemented.

Activity	***Sitewide Removal Alternative***	***Sitewide Close-In-Place Alternative***	***Phased Decisionmaking Alternative (Phase 1)***	***No Action Alternative*** [f]

GTCC = Greater-Than-Class C waste, LLW = low-level radioactive waste, LSA = low-specific-activity, MLLW = mixed low-level radioactive waste, NA = not applicable, SDA = State-Licensed Disposal Area, TRU = transuranic waste, WVDP = West Valley Demonstration Project.

[a] Pre-WVDP Class B and C low-level radioactive waste, Greater-Than-Class C low-level radioactive waste, and non-defense transuranic waste do not have a clear disposal path and may need to be stored on site until a disposal location is available.

[b] Quantities indicated are the maximum quantities of packaged waste projected in the technical reports (WSMS 2009a, 2009b, 2009c, 2009d). Values are rounded to two significant figures.

[c] This annual volume is generated only if orphan waste is stored on site.

[d] Annual volumes are dependent on the Phase 2 decision, but would be less than or equal to those listed for the Sitewide Removal Alternative.

[e] Wastes from long-term stewardship would not be generated under Sitewide Removal Alternative, although some waste could be annually generated as part of temporary operation of an orphan waste storage facility. Long-term stewardship wastes would be generated under the Sitewide Close-In-Place Alternative. Monitoring and maintenance waste would be generated as part of Phase 1 of the Phased Decisionmaking Alternative and the No Action Alternative. Wastes from long-term stewardship may be generated following completion of Phase 2 of the Phased Decisionmaking Alternative if the decision for Phase 2 is in-place closure. Wastes from monitoring and maintenance may be generated following completion of Phase 2 if the Phase 2 decision for the SDA is continued active management.

[f] Decommissioning does not occur for the No Action Alternative.

Note: Quantities indicated are the maximum quantities of packaged waste projected in the technical reports. Values are rounded to two significant figures. Totals may not add due to rounding. To convert cubic meters to cubic feet, multiply by 35.314.

Source: Summarized from Tables 4–47 and 4–48 of this chapter.

Table 4–47 Comparison of Estimated Packaged Waste Volumes for Decommissioning Activities (cubic meters)

Waste Type (Disposal Location)	*Sitewide Removal Alternative* [a]	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [a, b]	*No Action Alternative* [c]
Assuming the DOE/Commercial Disposal Option				
Nonhazardous construction/demolition debris (commercial)	140,000	15,000	33,000	NA
Hazardous (commercial)	15	3	2	NA
Low-level radioactive				
DOE Low-specific-activity (DOE)	300,000	5,300	160,000	NA
DOE Class A – equivalent (DOE)	34,000	3,000	19,000	NA
DOE Class B – equivalent (DOE)	140	3	99	NA
DOE Class C – equivalent (DOE)	1,300	42	1,100	NA
Low-specific-activity/Class A [d] (commercial)	1,100,000	1,500	25	NA
Class B/C [e, f] (commercial)	4,900	23	0	NA
Greater-Than-Class C [f] (uncertain)	4,200	0	0	NA
Transuranic [f] (uncertain)	1,000	35	710	NA
Mixed low-level radioactive (commercial)	570	410	41	NA
Total	1,600,000	26,000	210,000	NA
Assuming the Commercial Disposal Option				
Nonhazardous construction/demolition debris (commercial)	140,000	15,000	33,000	NA
Hazardous (commercial)	15	3	2	NA
Low-level radioactive				
Low-specific-activity (commercial)	1,300,000	5,900	160,000	NA
Class A (commercial)	120,000	3,900	20,000	NA
Class B (commercial)	2,600	3	110	NA
Class C (commercial)	3,900	65	1,200	NA
Greater-Than-Class C [f] (uncertain)	4,200	0	0	NA
Transuranic [f] (uncertain)	1,000	35	710	NA
Mixed low-level radioactive (commercial)	570	410	41	NA
Total	1,600,000	26,000	210,000	NA

NA = not applicable.

[a] If the waste incidental to reprocessing process is not applied to the high-level radioactive waste storage tanks and waste residuals in the tanks, under the Sitewide Removal Alternative approximately 500 cubic meters (18,000 cubic feet) of waste would be added to the inventory of high-level radioactive waste already stored on site, and the amount of low-level radioactive waste and transuranic waste shown in this table would be reduced by about 210 cubic meters (7,500 cubic feet) and 280 cubic meters (10,000 cubic feet), respectively. For Phase 1 of the Phased Decisionmaking Alternative, approximately 51 cubic meters (1,800 cubic feet) of waste would be added to the inventory of high-level radioactive waste, and the amount of low-level radioactive waste and transuranic waste would be reduced by about 32 cubic meters (1,100 cubic feet) and 19 cubic meters (670 cubic feet), respectively.

[b] If Phase 2 of the Phased Decisionmaking Alternative results in removal of all remaining waste and contamination, the total decommissioning waste volumes generated under the entire Phased Decisionmaking Alternative (Phases 1 and 2) are expected to be very similar to those generated under the Sitewide Removal Alternative. Much less waste would be generated if

the Phase 2 decision for the State-Licensed Disposal Area (SDA) is continued active management. If Phase 2 of the Phased Decisionmaking Alternative results in in-place closure of all remaining waste and contamination, the decommissioning waste volumes generated under the entire Phased Decisionmaking Alternative (Phases 1 and 2) are expected to be similar to the sum generated by adding the Phase 1 waste volumes to approximately 30 percent of the waste volumes generated under the Sitewide Close-In-Place Alternative (WVES 2008). Comparable waste volumes would be generated if the Phase 2 decision for the SDA is continued active management.

[c] Decommissioning does not occur for the No Action Alternative.

[d] Represents pre-West Valley Demonstration Project low-specific-activity and Class A waste planned for disposal at a commercial disposal facility.

[e] Represents pre-West Valley Demonstration Project Class B and C waste planned for disposal at a commercial disposal facility.

[f] Pre-West Valley Demonstration Project Class B and C low-level radioactive waste, Greater-Than-Class C waste, and non-defense transuranic waste do not have a clear disposal path and may need to be stored on site until a disposal location is identified.

Note: Quantities indicated are the maximum quantities of packaged waste projected in the technical reports (WSMS 2009a, 2009b, 2009c, 2009d). Values are rounded to two significant figures. Totals may not add due to rounding. To convert cubic meters to cubic feet, multiply by 35.314.

Sources: WSMS 2009a, 2009b, 20098c, 2009d, 2009e.

Table 4–48 Comparison of Estimated Annual Packaged Waste Volumes for Site Monitoring and Maintenance or Long-term Stewardship Activities (cubic meters per year) [a]

Waste Type	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1) [b]*	*No Action Alternative*
Disposal Using Commercial and DOE Facilities				
Nonhazardous construction/demolition debris	0	0	6	32
Hazardous	0	0	< 1	1
Low-level radioactive				
Low-specific-activity	0	100	74	110
Class A	0 [d]	6 [d]	71 [d]	340
Mixed low-level radioactive [c]	0	0	0	< 1
Total	0 [d]	110	150	480

[a] Wastes from long-term stewardship would not be generated for the Sitewide Removal Alternative, although wastes could be generated during operation of an orphan waste storage facility. Long-term stewardship wastes would be generated for the Sitewide Close-In-Place Alternative. Site monitoring and maintenance wastes would be generated as part of Phase 1 of the Phased Decisionmaking Alternative and the No Action Alternative. Wastes from long-term stewardship may be generated following completion of Phase 2 of the Phased Decisionmaking Alternative if the decision for Phase 2 is in-place closure. Wastes from monitoring and maintenance may be generated following completion of Phase 2 if the Phase 2 decision for the State-Licensed Disposal Area (SDA) is continued active management.
[b] Annual volumes are dependent on the Phase 2 decision. Annual long-term stewardship waste generation rates for Phase 2 would be almost double the Phase 1 monitoring and maintenance rates if remaining facilities are closed in place, and would be zero if Phase 2 results in removal of the remaining waste and contamination (WVES 2008). Continued active management of the SDA would result in annual monitoring and maintenance wastes.
[c] Represents mixed low-level radioactive waste planned for treatment and disposal at a commercial disposal facility.
[d] Storage of orphan waste is projected to annually generate up to 3.2 cubic meters of Class A low-level radioactive waste.
Note: Values are rounded to two significant figures. Totals may not add due to rounding. To convert cubic meters to cubic feet, multiply by 35.314.
Sources: WSMS 2009a, 2009b, 2009c, 2009d, 2009e.

Table 4–49 Waste Disposal Options

Waste Type	*Disposal Option(s)*
Nonhazardous construction/demolition debris	Permitted commercial construction/demolition debris landfill.
Hazardous	Permitted commercial hazardous waste treatment and/or disposal facility.
Low-level radioactive (low-specific-activity/ Class A/B/C)	Under the DOE/Commercial Disposal Option, DOE low-level radioactive waste would be disposed of at DOE facilities, while commercial low-level radioactive waste would be disposed of at commercial facilities. Under the Commercial Disposal Option, all low-level radioactive waste would be disposed of at commercial facilities.
Greater-Than-Class C	No disposal facility currently available.[a]
Transuranic	No disposal facility currently identified for non-defense transuranic waste.[b]
Mixed low-level radioactive	Permitted commercial mixed low-level radioactive waste disposal facility, such as EnergySolutions in Clive, Utah.
High-level radioactive	No disposal facility currently available. [c]

[a] All Greater-Than-Class C waste generated as part of any EIS alternative would be safely stored until an appropriate offsite disposal facility is available. DOE proposes to identify a disposal facility for Greater-Than-Class C and potential non-defense transuranic waste based on the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (GTCC EIS)* (DOE/EIS-0375). As announced in the July 23, 2007, Notice of Intent, the *GTCC EIS* will evaluate several DOE sites and generic locations for the disposal of Greater-Than-Class C waste and similar DOE waste (72 FR 40135).
[b] All non-defense transuranic waste generated as part of any EIS alternative would be safely stored until DOE has determined that all statutory and regulatory requirements regarding offsite disposal have been met, subject to further NEPA review as appropriate.
[c] Vitrified high-level radioactive waste would be stored on site until disposition decisions are made and implemented.
Sources: Modified from WSMS 2009e.

Any nonhazardous solid waste generated during decommissioning and/or site monitoring and maintenance or long-term stewardship activities would be packaged and transported in conformance with standard industrial practices. Solid waste, such as uncontaminated metal items that can be recycled, would be sent off site for that purpose. The remaining debris derived from demolition of uncontaminated structures would be packaged in roll-off containers for transport to an offsite permitted commercial or municipal disposal facility in accordance with applicable regulations (WSMS 2009e). Trash, such as waste paper generated by routine office work, is not included in the nonhazardous waste estimates (WSMS 2009a).

Hazardous waste would be packaged in U.S. Department of Transportation (DOT)-approved containers in a manner appropriate to the specific waste type, and shipped off site to permitted commercial recycling, treatment, and disposal facilities. (Treatment would be performed before disposal to meet RCRA land-disposal restriction standards.) The hazardous waste would be accumulated for less than 90 days. Therefore, long-term hazardous waste storage facilities would not be required.

Low-level radioactive waste (e.g., contaminated personal protective equipment, tools, filters, rubble, debris, soil, and sediment) would be generated during decommissioning and/or site monitoring and maintenance or long-term stewardship activities. Low-level radioactive waste would be packaged in Sealand containers, lift liners, 208-liter (55-gallons) drums, B-25 boxes, HICs, or similar containers, depending on the waste classification (WSMS 2009a, 2009e). Low-level radioactive waste is typically not treated, or only minimally treated (e.g., drying and compaction), before being sent directly to disposal. Therefore, long-term storage facilities would not be required for most low-level radioactive waste. Class B and C low-level radioactive waste may pose an exception as described later in this section.

In May 2000, the State of South Carolina passed an act forming the Atlantic Interstate Low-Level Radioactive Waste Compact (Atlantic Compact), which includes the States of South Carolina, New Jersey, and Connecticut, under the Low-Level Radioactive Waste Policy Act. As of June 2008, the Atlantic Compact does not accept waste for disposal at the Barnwell, South Carolina, disposal facility from locations outside the Atlantic Compact. The Barnwell facility was the only disposal facility recently available to WNYNSC for the disposal of Class B or C commercial wastes. Therefore, under alternatives that generate commercial Class B or C wastes, onsite storage would be needed until an offsite disposal location is available.

Low-level radioactive wastes buried in the NDA and SDA that exceed the Class C criteria of 10 CFR Part 61 are assumed to be Greater-Than-Class C wastes, which are generally not acceptable for near-surface disposal.[24] Only the Sitewide Removal Alternative (or the Phased Decisionmaking Alternative if the Phase 2 decision results in removal of remaining contaminants) has the potential to generate Greater-Than-Class C waste. Under the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240), the Federal Government is responsible for disposal of Greater-Than-Class C waste in a facility licensed by the NRC. However, no such Greater-Than-Class C disposal facility exists at this time. An *Environmental Impact Statement for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste (GTCC EIS)* (DOE/EIS-0375) that evaluates alternatives for developing a Greater-Than-Class C waste disposal facility is being prepared (72 FR 40135). Therefore, under the Sitewide Removal Alternative, onsite storage would be needed until an offsite disposal location is available.

The *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement (WIPP SEIS)* (DOE/EIS-0026-S-2) analyzed the receipt and disposal of 1,890 cubic meters (66,744 cubic feet) of transuranic waste from the West Valley Demonstration Project (WVDP) (DOE 1997b). The 1,000 cubic meters (35,000 cubic feet) of packaged transuranic waste under the maximum alternative (Sitewide Removal Alternative), when added to the 2,100 cubic meters (74,000 cubic feet) of transuranic waste being managed from ongoing activities at WNYNSC, would exceed the capacity analyzed for WVDP in the *WIPP SEIS*.

[24] *Pursuant to 10 CFR 61.7, there may be some instances where Greater-Than-Class C waste would be acceptable for near-surface disposal; these instances would be evaluated on a case-by-case basis.*

Under all alternatives, transuranic waste generated during decommissioning and/or site monitoring and maintenance or long-term stewardship would be safely stored on site until DOE has determined that all statutory and regulatory requirements regarding disposal have been met, subject to appropriate NEPA review.

Decommissioning and/or site monitoring and maintenance or long-term stewardship activities would also generate mixed Class A low-level radioactive waste (e.g., contaminated equipment, filters, sludge, soils, and sediment). Mixed low-level radioactive wastes generated during decommissioning would be sent to a commercial disposal facility such as EnergySolutions in Clive, Utah, for treatment and disposal. Mixed low-level radioactive waste would be treated to meet RCRA land disposal restriction treatment standards prior to disposal. This mixed low-level radioactive waste would be packaged and transported in a manner consistent with its chemical or radiological characteristics, as described in 49 CFR Part 173.

The existing high-level radioactive waste canisters would be stored on site until disposition decisions are made and implemented. No high-level radioactive waste would be generated by decommissioning and/or site monitoring and maintenance or long-term stewardship of WNYNSC, except where the waste incidental to reprocessing process outlined in DOE Manual 435.1-1 (DOE 1999a) is not applied in classifying remedial waste as low-level radioactive waste and transuranic waste. Therefore, two waste disposal options (waste incidental to reprocessing and high-level radioactive waste) were evaluated for the high-level radioactive waste tanks in WMA 3. The waste incidental to reprocessing option assumes the wastes associated with Tanks 8D-1, 8D-2, and 8D-4 would be managed as low-level radioactive waste and transuranic waste. However, future characterization may require some of this waste to be managed as mixed low-level radioactive waste. The quantities of waste associated with this approach are included in Table 4–47. If it is determined that the waste incidental to reprocessing process cannot be applied (i.e., the wastes associated with these tanks cannot be managed as low-level radioactive waste and transuranic waste), the high-level radioactive waste option assumes Tanks 8D-1, 8D-2, and 8D-4 would need to be managed as high-level radioactive waste.

If the high-level radioactive waste option becomes necessary, a maximum of approximately 500 cubic meters (18,000 cubic feet) of high-level radioactive waste would be added to the inventory of high-level radioactive waste already stored on site, and the amount of low-level radioactive waste and transuranic waste shown in Table 4–47 for the Sitewide Removal Alternative would be reduced by about 210 cubic meters (7,500 cubic feet) and 280 cubic meters (10,000 cubic feet), respectively.

Under the alternatives analyzed in this EIS, varying amounts of waste would be processed and shipped off site for disposal. For example, under the Sitewide Removal Alternative, all waste would be processed and shipped off site for disposal. Under the other alternatives, lesser quantities of waste would be processed and disposed of off site, meaning that more of the waste would remain on site.

There are uncertainties surrounding the options available for offsite disposal of commercial Class B and C low-level radioactive waste, transuranic waste, and Greater-Than-Class C waste generated under these alternatives. Because of these uncertainties, both offsite disposal and onsite storage of these wastes were analyzed. If onsite storage is needed, it would be accomplished using the new Container Management Facility or existing Lag Storage Area 4.

4.1.11.3 Impacts of the Alternatives

This section describes the waste management impacts specific to each EIS alternative.

Table 4–50 shows the new waste management facilities that would be constructed under each of the alternatives. Upon completion of the actions to be taken in these facilities, they would be demolished and disposed of off site. For additional information on the actions that would be taking place in these facilities, refer to Appendix C of this EIS and the appropriate technical report (WSMS 2009a, 2009b, 2009c, 2009d).

Table 4–50 New Waste Management Facilities Associated with West Valley Demonstration Project Alternatives

Waste Management Facility	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [a]	*No Action Alternative*
Interim Storage Facility for high-level radioactive waste canisters	X	X	X	
Waste Tank Farm Waste Processing Facility	X			
Soil Drying Facility	X			
Leachate Treatment Facility	X	X		
Container Management Facility	X			

[a] Additional actions, including the construction of additional waste management facilities, could be taken in the future under Phase 2 of this alternative.

Sources: WSMS 2009a, 2009b, 2009c, 2009d.

Sitewide Removal Alternative

As shown in Tables 4–46 through 4–48, the Sitewide Removal Alternative would generate the largest volume of waste (approximately 1.6 million cubic meters [56 million cubic feet]) from decommissioning, but zero waste from long-term stewardship. Nonhazardous waste, Class A low-level radioactive waste (including low-specific-activity waste), and Greater-Than-Class C waste would exceed the volumes being managed from ongoing activities at WNYNSC as presented in Chapter 3, Table 3–20. Nonhazardous waste is common demolition debris that is expected to have no adverse impact on the capacity of commercial disposal facilities. Much of the Class A low-level radioactive waste is low-specific-activity waste that is expected to have no adverse impact on the capacity of DOE or commercial disposal facilities. Until the issues related to disposal of commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, and non-defense transuranic waste are resolved, these wastes would be safely stored in the new Container Management Facility. An additional 3.2 cubic meters (110 cubic feet) of Class A low-level radioactive waste would be generated annually during maintenance and surveillance of this orphan waste. High-level radioactive waste would be safely stored in the new Interim Storage Facility until disposition decisions are made and implemented.

New waste management facilities that would be constructed to support decommissioning of WNYNSC would include:

- An Interim Storage Facility for high-level radioactive waste canisters (see Appendix C, Section C.4.1, of this EIS),
- A Waste Tank Farm Waste Processing Facility to support exhumation of the high-level radioactive waste tanks (see Appendix C, Section C.4.2, of this EIS),
- A Soil Drying Facility to process soils contaminated by the North Plateau Groundwater Plume (see Appendix C, Section C.4.3, of this EIS),
- A Container Management Facility to process wastes exhumed from the NDA and SDA and to store orphan waste (see Appendix C, Section C.4.4, of this EIS),
- A Leachate Treatment Facility to process contaminated water from the NDA and SDA (see Appendix C, Section C.4.5, of this EIS), and
- Environmental enclosures and confinement structures to support removal of buried wastes and contaminated soils from the NDA and SDA (see Appendix C, Section C.4.6 and related subsections of, this EIS).

Upon completion of operations in these facilities, the facilities would be demolished and disposed of off site. The waste volumes reported for this alternative reflect demolition of these facilities. Additional information on the activities that would take place in these facilities is presented in Appendix C of this EIS and the Sitewide Removal Alternative technical report (WSMS 2009a).

Sitewide Close-In-Place Alternative

As shown in Tables 4–46 through 4–48, the Sitewide Close-In-Place Alternative would generate the third largest volume of waste (approximately 26,000 cubic meters [920,000 cubic feet]) from decommissioning, and approximately 110 cubic meters (3,900 cubic feet) per year from long-term stewardship activities. All waste volumes would be less than the volumes being managed from ongoing activities at WNYNSC (see Chapter 3, Table 3–20), and therefore should have minimal impacts on the waste management infrastructure. Until the issues related to disposal of commercial Class B and C low-level radioactive waste and non-defense transuranic waste are resolved, these wastes would be safely stored in Lag Storage Area 4. Less than 3.2 cubic meters (110 cubic feet) of Class A low-level radioactive waste would be generated annually during maintenance and surveillance of this orphan waste. High-level radioactive waste would be safely stored in the Interim Storage Facility until disposition decisions are made and implemented.

Under the Sitewide Close-In-Place Alternative, the high-level radioactive waste tanks and vaults, below-grade portions of the Main Plant Process Building, NDA, SDA, Construction and Demolition Debris Landfill, and Scrap Material Landfill would be stabilized and closed in place. New waste management facilities that would be constructed to support closure and decommissioning of the site would include:

- An Interim Storage Facility for high-level radioactive waste canisters (see Appendix C, Section C.4.1, of this EIS), and
- A Leachate Treatment Facility to process contaminated water from the NDA and SDA (see Appendix C, Section C.4.5, of this EIS).

Upon completion of the actions to be taken at the Interim Storage Facility and Leachate Treatment Facility, these facilities would be demolished and disposed of off site. The waste volumes reported for this alternative reflect demolition of these facilities. Additional information on the activities that would be taking place in these facilities is presented in Appendix C of this EIS and the Sitewide Close-In-Place Alternative Technical Report (WSMS 2009b).

Phased Decisionmaking Alternative

As shown in Tables 4–46 through 4–48, Phase 1 of the Phased Decisionmaking Alternative would generate the second largest volume of waste (approximately 210,000 cubic meters [7.5 million cubic feet]) from decommissioning, and approximately 150 cubic meters (5,300 cubic feet) per year from site monitoring and maintenance activities. Nonhazardous waste and Class A low-level radioactive waste (including low-specific-activity waste) would exceed the volumes being managed from ongoing activities at WNYNSC as presented in Chapter 3, Table 3–20. The nonhazardous waste is common demolition debris that is expected to have no adverse impact on commercial disposal facility capacity. Much of the DOE Class A–equivalent low-level radioactive waste is low-specific-activity waste that is expected to have no adverse impact on DOE or commercial disposal facility capacity. Until the issues related to disposal of non-defense transuranic waste are resolved, these wastes would be safely stored in Lag Storage Area 4. Less than or equal to 3.2 cubic meters (110 cubic feet) of Class A low-level radioactive waste would be generated annually during maintenance and surveillance of this orphan waste. High-level radioactive waste would be safely stored in the new Interim Storage Facility until disposition decisions are made and implemented.

New waste management facilities constructed to support decommissioning would include an Interim Storage Facility for high-level radioactive waste canisters (see Appendix C, Section C.4.1, of this EIS). Upon completion of the actions to be taken at the Interim Storage Facility, it would be demolished and disposed of off site. The waste volumes reported for this alternative reflect demolition of this facility. Additional information on the activities that would take place in this facility is presented in Appendix C of this EIS and the Phased Decisionmaking Alternative Technical Report (WSMS 2009c).

The Phase 2 decision would be deferred until additional studies are completed. This decision may result in the removal of additional facilities and waste, or the closure of some facilities. If the Phase 2 decision is removal of all remaining waste and contamination, decommissioning waste volumes generated for the entire Phased Decisionmaking Alternative (Phases 1 and 2) would be similar to those for the Sitewide Removal Alternative (see Table 4–47). If the Phase 2 decision is in-place closure of all remaining waste and contamination, the waste volumes generated for the entire Phased Decisionmaking Alternative (Phases 1 and 2) would be the sum of the Phase 1 waste volume plus about 30 percent of the waste volume generated under the Sitewide Close-In-Place Alternative (see Table 4–47). Annual long-term stewardship waste generation rates for Phase 2 would be almost double the Phase 1 monitoring and maintenance rates if remaining facilities are closed in place (WVES 2008), and would be zero if Phase 2 results in the removal of the remaining waste and contamination.

If the Phase 2 decision is continued active management of the SDA and in-place closure of the remaining waste and contamination, the quantities of wastes from decommissioning would be slightly lower than those indicated in the previous paragraph. If the Phase 2 decision is continued active management of the SDA and removal of the remaining waste and contamination, there would be less waste from decommissioning than that for the Sitewide Removal Alternative (i.e., approximately 30 percent less Class A/low-specific-activity low-level radioactive waste and almost no mixed low-level radioactive, Class B and C low-level radioactive, and no Greater-Than-Class C waste).

Following decommissioning, if the Phase 2 decision for the SDA is continued active management and the decision for the remaining waste and contamination is in-place closure, small quantities of waste would be generated annually from ongoing monitoring and maintenance of the SDA and long-term stewardship of the remainder of the site. If the Phase 2 decision for the SDA is continued active management and the decision for the remaining waste and contamination is removal, small quantities of waste would be generated annually from ongoing monitoring and maintenance of the SDA. No additional waste would be generated from the remainder of the site.

No Action Alternative

As shown in Tables 4–46 through 4–48, the No Action Alternative would generate no waste from decommissioning, and the largest volume of waste (approximately 480 cubic meters [17,000 cubic feet] per year) from site monitoring and maintenance activities. All waste volumes would be less than the volumes being managed from ongoing activities at WNYNSC (see Chapter 3, Table 3–20), and therefore should have minimal impact on the waste management infrastructure. High-level radioactive waste canisters would continue to be safely stored in the Main Plant Process Building until disposition decisions are made and implemented.

Under the No Action Alternative, no new waste management facilities would be constructed. Additional information on the activities that would take place under this alternative is presented in Appendix C of this EIS and the No Action Alternative Technical Report (WSMS 2009d).

4.1.12 Transportation

Both radiological and nonradiological impacts would result from the shipment of radioactive waste from WNYNSC to offsite disposal sites. Radiological impacts are those associated with the effects from low levels of radiation emitted during incident-free transportation and from the accidental release of radioactive materials, and are expressed as additional LCFs. Nonradiological impacts are independent of the nature of the cargo being transported, and are expressed as fatal traffic accidents when there is no release of radioactive material. Increases in traffic density are discussed in Section 4.1.2, while increases in nonradiological pollutants from traffic emissions are discussed in Section 4.1.5.

A summary of the transportation impacts of each alternative is presented in **Table 4–51**.

Table 4–51 Summary of Transportation Impacts

Environmental Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Incident-Free Radiological Impacts	Largest number of truck or rail shipments of radioactive waste and highest population dose. However, it is unlikely that radioactive waste transportation would cause an additional LCF.	Third largest number of truck or rail shipments of radioactive waste and population dose. It is unlikely that radioactive waste transportation would cause an additional LCF.	Second largest number of truck or rail shipments of radioactive waste and population dose from Phase 1. It is unlikely that radioactive waste transportation would cause an additional LCF. If the Phase 2 decision is removal of all remaining waste and contamination, total risks from both phases would be similar to those for the Sitewide Removal Alternative. Risks would be reduced by 40 percent if the Phase 2 decision for the SDA is continued active management. If the Phase 2 decision is in-place closure, total risks from both phases would be about 5 percent greater than those from Phase 1 alone. Risks would be slightly less if the Phase 2 decision for the SDA is continued active management.	Smallest number of truck or rail shipments of radioactive waste and population dose over a 20-year period. It is unlikely that radioactive waste transportation would cause an additional LCF.
Radiological Impacts from Accidents	Maximum radiological dose-risk to population estimated to be 2.7 person-rem, or 0.0016 LCFs.	Maximum radiological dose-risk to population estimated to be 0.00093 person-rem, or 5.6 × 10-7 LCFs.	Maximum radiological dose-risk to population estimated to be 0.53 person-rem, or 0.00032 LCFs. If the Phase 2 decision is removal of all remaining waste and contamination, total dose-risks from both phases would be similar to those for the Sitewide Removal Alternative. Risks would be reduced by 40 percent if the Phase 2 decision for the SDA is continued active management. If the Phase 2 decision is in-place closure, total dose-risks from both phases would be about 2 percent greater than those from Phase 1 alone. Risks would be slightly less if the Phase 2 decision for the SDA is continued active management.	Maximum radiological dose-risk to population estimated to be 0.00070 person-rem, or 4.3 × 10-7 LCFs.
Nonradiological Impacts–Traffic Fatalities	Up to 15 fatalities for radioactive waste shipments by rail and less than 1 fatality for nonradioactive shipments during decommissioning.	No fatalities for radioactive waste shipments and 1(1.2) fatalities for nonradioactive shipments during decommissioning.	Up to 2 (1.8) fatalities for radioactive waste shipments (rail) and no fatalities for nonradioactive shipments during Phase 1 of decommissioning. If the Phase 2 decision is removal of all remaining waste and contamination, total risks from both phases would be essentially equivalent to those for the Sitewide Removal Alternative. Risks would be reduced by about 30 percent if the Phase 2 decision for the SDA is continued active management. If the Phase 2 decision is in-place closure, total risks from both phases would be higher than those from Phase 1 alone. Risks would be less if the Phase 2 decision for the SDA is continued active management.	No fatalities for radioactive waste shipments (rail) and no fatalities for nonradioactive shipments over a 20-year period.

LCF = latent cancer fatality, SDA = State-Licensed Disposal Area.

4.1.12.1 Methodology and Assumptions

Shipping packages containing radioactive materials emit low levels of radiation; the amount of radiation depends on the kind and amount of transported materials. DOT regulations require that shipping packages containing radioactive materials have sufficient radiation shielding to limit the radiation to 10 millirem per hour at a distance of 2 meters (6.6 feet) from the transporter. For incident-free transportation, the potential human health impacts of the radiation field surrounding the transportation packages were estimated for transportation workers and the general population along the route (off-traffic, or off-link), as well as people sharing the route (in traffic or on-link), at rest areas, and at other stops along the route. The RADTRAN 5 computer program (Neuhauser and Kanipe 2003) was used to estimate the impacts on transportation workers and populations, as well as the impacts on an MEI (e.g., a person stuck in traffic, a gas station attendant, an inspector) who could be a worker or a member of the public.

The NYSERDA View Indicates….

Current Methods for Assessing Nonradiological Risk from Transportation Have Limitations and are Likely to Overestimate Fatalities. Nonradiological fatalities from waste transportation rail accidents appear to be over-estimated because the analysis in the Final EIS uses railcar-kilometers to assess the number of expected accident fatalities.

DOE's Response….

The only acceptable reference for railcar accident data reports in units of railcar-kilometers. While DOE acknowledges this data may result in an overestimate of potential nonradiological fatalities due to accidents, there is no other accepted method for this analysis at this time. DOE has made other changes in the transportation analysis for this Final EIS, however, which have reduced the conservatism in the analysis: state-specific accident and fatality rate data have replaced the national mean accident and fatality rates, and the possibility of under-reporting of truck accident and fatality data has been accounted for by using published correction factors. Because a consistent methodology and set of assumptions were applied to each alternative; a meaningful comparison between the alternatives can be made. In its View for this Final EIS, NYSERDA acknowledges that calculating fatalities based on train-kilometers is not at this time defensible, and accepts that, although likely to be overestimated, the rail fatality rates presented in the Final EIS are adequate for decisionmaking.

Transportation accidents involving radioactive materials present both nonradiological and radiological risks to workers and the public. Nonradiological impacts of transportation accidents include traffic accident fatalities. Radioactive material would be released during transportation accidents only when the package carrying the material is subjected to forces that exceed the package design standard. Only a severe fire and/or a powerful collision, both events of extremely low probability, could lead to a transportation package of the type used to transport radioactive material being damaged to the extent that there could be a release of radioactivity to the environment with significant consequences.

The impact of a specific radiological accident is expressed in terms of probabilistic risk (i.e., dose-risk), which is defined as the accident probability (i.e., accident frequency) multiplied by the accident consequences (dose). The overall risk is obtained by summing the individual risks from all reasonably conceivable accidents. The analysis of accident risks takes into account a spectrum of accident severities ranging from high-probability accidents of low severity (e.g., fender bender) to hypothetical high-severity accidents that have a low probability of occurrence. In addition to calculating the radiological risks that would result from all reasonably conceivable accidents during transportation of radioactive wastes, this EIS assesses the highest consequences of a maximum reasonably foreseeable accident with a radioactive release frequency greater than 1×10^{-7} (1 chance in 10 million) per year in an urban or suburban population area along the route. The latter consequences were determined for atmospheric conditions that could prevail during accidents. This latter analysis used the RISKIND computer program to estimate doses to individuals and populations (Yuan et al. 1995).

Incident-free radiological health impacts are expressed in terms of additional LCFs. Radiological accident health impacts are also expressed as additional LCFs, and nonradiological accident risk as additional immediate (traffic) fatalities. LCFs associated with radiological exposure were estimated by multiplying the occupational (worker) and public dose by a dose conversion factor of 0.0006 LCFs per rem or person-rem of exposure (DOE 2002a). The health impacts associated with the shipment of radioactive wastes were calculated assuming that all wastes would be transported using either truck or rail transport.

In determining transportation risks, per-shipment risk factors were calculated for incident-free and accident conditions using the RADTRAN 5 computer program (Neuhauser and Kanipe 2003) in conjunction with the Transportation Routing Analysis Geographic Information System (TRAGIS) computer program (Johnson and Michelhaugh 2003) to choose transportation routes in accordance with DOT regulations. The TRAGIS program provides population density estimates along the routes based on the 2000 U.S. census for determining population radiological risk factors. For incident-free operations, the affected population includes individuals living within 800 meters (0.5 miles) of each side of the road or rail line. For accident conditions, the affected population includes individuals living within 80 kilometers (50 miles) of the accident, and the MEI is assumed to be a receptor located 100 meters (330 feet) directly downwind from the accident. Additional details on the analysis approach and on modeling and parameter selections are provided in Appendix J of this EIS.

Two options for disposing of low-level radioactive waste were evaluated in this EIS:

- *DOE/Commercial Disposal Option* – DOE low-level radioactive waste would be disposed of at DOE disposal facilities. Commercial low-level radioactive waste would be disposed of at commercial disposal facilities.

- *Commercial Disposal Option* – All low-level radioactive waste would be disposed of at commercial disposal facilities.

For both options, all waste would be disposed of in accordance with current waste acceptance criteria and appropriate permits/licenses. Transportation impacts for each of these options were estimated with the following assumptions:

- Construction debris and hazardous wastes would be transported to local commercial disposal sites estimated to be located about 160 kilometers (100 miles) from the site.

- Radioactive DOE Class A and low-specific-activity low-level radioactive wastes would be transported to the Nevada Test Site (NTS) (DOE/Commercial Disposal Option) or to a commercial disposal facility such as EnergySolutions (Commercial Disposal Option).

- DOE Class B and C low-level radioactive wastes could be transported either to NTS under the DOE/Commercial Disposal Option or to a commercial disposal facility under the Commercial Disposal Option. Commercial Class B and C low-level radioactive wastes can only be transported to a commercial disposal facility. Because there are no commercial disposal facilities that currently accept Class B and C low-level radioactive waste from New York State, this transportation analysis assumes:

  - For the DOE/Commercial Disposal Option, commercial Class B and C low-level radioactive waste would be transported to a proxy commercial disposal facility located either in the western or eastern United States; DOE Class B and C low-level radioactive waste would be transported to NTS.

  - For the Commercial Disposal Option, DOE and commercial Class B and C low-level radioactive wastes would be both transported to a proxy commercial disposal facility located either in the western or eastern United States.

- The route characteristics for the western and eastern proxy commercial disposal facilities are similar to those for transporting wastes to the Hanford Site in Washington State and to the Barnwell disposal facility in South Carolina, respectively.[25]

- Mixed low-level radioactive wastes, after treatment, would be transported under either option to a commercial disposal facility such as EnergySolutions.

- The impacts of transporting WVDP transuranic waste to the Waste Isolation Pilot Plant (WIPP) were included for purposes of analysis, although DOE is not currently approved to ship WVDP transuranic waste to WIPP, and there is currently no identified disposal facility for non-defense transuranic waste.[27]

- To compare impacts among the alternatives, this transportation analysis uses the Nevada Test Site as a representative site for disposal of Greater-Than-Class C waste.[27] There is currently no disposal facility for Greater-Than-Class C waste; the *GTCC EIS*, in preparation, evaluates alternatives for developing a Greater-Than-Class C disposal facility.

Waste materials to be shipped off site for disposal were classified into three broad disposal groupings: construction and demolition debris, hazardous wastes, and radioactive wastes. Low-level radioactive wastes were classified in accordance with Federal regulations governing land disposal of radioactive waste (10 CFR Part 61), and transportation of low-specific-activity waste. The volumes of the different waste types that are expected to be generated under each alternative during WNYNSC decommissioning are given in Section 4.1.11.

4.1.12.2 Summary of Transportation Impacts

Table 4–52 provides the estimated number of waste shipments by truck under each alternative by waste type. A shipment is defined as the amount of waste transported on a single truck or a single railcar. For each waste type, each railcar would contain twice the amount of waste transported by a single truck. Multiple waste railcars (i.e., two or more railcars) could be used to reduce the number of rail shipments. However, because the rail accident and fatalities data are calculated per railcar-kilometer, the transportation analysis presented here is based on one waste railcar per rail shipment. While it may be possible to reduce the number of rail shipments by using multiple railcars, there would be a proportional increase in the transportation risks per transport in terms of the radioactive waste present, accident frequency, and nonradiological transport accident fatalities. There are other options that could be considered, including shipments of waste using a combination of rail and trucks for disposal.[28] This EIS did not calculate all potential options. The results presented using either all truck shipments or all rail shipments would provide a range of risks that would encompass all potential options.

[25] *The risks presented in this section are based on assumed transport of commercial Class B and C low-level radioactive waste to a western U.S. commercial disposal facility . The risks for transport of this waste to an eastern U.S. commercial disposal facility are presented in Table J-8 of Appendix J.*
[26] *DOE also analyzed the impacts associated with transporting commercial Class B and C low-level radioactive waste to the Barnwell Disposal Facility in South Carolina. See Appendix J, Table J–8.*
[27] *All Greater-Than-Class C waste generated as part of any EIS alternative would be safely stored until an appropriate offsite disposal facility is available. DOE proposes to identify a disposal facility for Greater-Than-Class C and potential non-defense transuranic waste based on the* Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement *(DOE/EIS-0375). As announced in the July 23, 2007, Notice of Intent, the GTCC EIS will evaluate several DOE sites and generic locations for the disposal of Greater-Than-Class C waste and similar DOE waste (72 FR 40135).*
[28] *Shipments involving a combination of rail and truck for a specific shipment would involve workers who would transfer waste containers from railcars to trucks (or visa versa) at an intermodal station. Based on a study of total risk to workers and population from truck-only transportation and a combination of truck-rail transportation (PNNL 1999), it is estimated that the total dose to workers and public for a combination of rail and truck shipment would be less than those that could occur if the entire transportation occurred by truck.*

Table 4–52 Estimated Number of Truck Shipments Under Each Alternative

Waste Types	Assumed Disposal Location	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase 1)	No Action Alternative [i]
DOE/Commercial Disposal Option					
Low Specific Activity	NTS/EnergySolutions [j]	92,263	831	10,799	151
Class A [a]	NTS/EnergySolutions [j]	8,212	288	1,473	470
Class A [b]	NTS/EnergySolutions [j]	46	5	29	1
Class B and C [c]	NTS/Commercial [j]	924	0	80	0
Class C-RH [d]	NTS/Commercial [j]	124	34	20	0
Mixed LLW	Energy Solutions	40	28	3	1
GTCC [e]	NTS	2,357	0	0	0
Transuranic [f]	WIPP	477	17	335	0
Hazardous [g]	Local	2	1	1	2
Other [h]	Local	8,881	1,003	2,155	43
Commercial Disposal Option					
Waste Types	***Assumed Disposal Location***	***Sitewide Removal Alternative***	***Sitewide Close-In-Place Alternative***	***Phased Decisionmaking Alternative (Phase 1)***	***No Action Alternative [i]***
Low Specific Activity	EnergySolutions	92,263	830	10,799	151
Class A [a]	EnergySolutions	8,211	287	1,473	470
Class A [b]	EnergySolutions	46	5	28	1
Class B and C [c]	Commercial	1,075	0	224	0
Class C-RH [d]	Commercial	124	33	20	0
Mixed LLW	EnergySolutions	40	28	3	1
GTCC [e]	NTS	2,357	0	0	0
Transuranic [f]	WIPP	477	17	335	0
Hazardous [g]	Local	2	1	1	2
Other [h]	Local	8,881	1,003	2,155	43

GTCC = Greater-Than-Class C waste, LLW = low-level radioactive waste, NTS = Nevada Test Site, RH = remote-handled, WIPP = Waste Isolation Pilot Plant.

[a] Class A low-level radioactive waste transported in Type A B-25 boxes.
[b] Class A low-level radioactive waste transported in 208-liter (55-gallon) drums.
[c] Class B and Class C contact-handled wastes are packaged in either high-integrity containers for transport to an eastern or western U.S. site (for purposes of analysis only), or Type A B-25 boxes for transport to NTS.
[d] Class C remote-handled wastes packaged in drums or high-integrity containers and transported in Type B casks. Class B wastes packaged in drums are also transported in Type B casks.
[e] For purposes of analysis only, it was assumed that Greater-Than-Class C waste would be shipped to NTS. Several DOE sites and generic commercial locations are being evaluated in the *GTCC EIS* as potential disposal locations.
[f] For purposes of analysis only, it is assumed that transuranic waste would be shipped to WIPP.
[g] Hazardous waste would be disposed of at landfills within 160 kilometers (100 miles) of WNYNSC.
[h] This includes construction/demolition debris or other wastes that go to local landfills within about 160 kilometers (100 miles) of WNYNSC.
[i] Under the No Action Alternative, waste is generated both annually and periodically (about every 20 years). Here, for the purposes of comparisons to other alternatives, waste shipments are given for monitoring and maintenance activities over a 20-year period. The waste shipment quantities under this alternative would continue to be generated every 20 years.
[j] DOE waste would go to the Nevada Test Site or EnergySolutions, or another appropriate commercial facility. Commercial waste would only go to EnergySolutions or other appropriate commercial facility because commercial wastes cannot be disposed of at DOE facilities.

Note: The values given in this table are for truck shipments. Rail shipments are assumed to be one-half of the number of truck shipments.

Table 4–53 summarizes the transportation impacts by disposal option under each alternative. The accident impacts presented in this table are those that would result from all reasonably conceivable impacts during transport of radioactive wastes. Impacts from accidents having the highest consequences of a maximally foreseeable accident are presented in Appendix J, Table J–11.

Table 4–53 Risks of Transporting Radioactive Waste Under Each Alternative [a]

LLW Disposal Option	Transport Mode	Number of Shipments	One-way Kilometers Traveled (million)	Incident-Free: Crew Dose (person-rem)	Incident-Free: Crew Risk [c]	Incident-Free: Population Dose (person-rem)	Incident-Free: Population Risk [c]	Accident: Radiological Risk [b]	Accident: Non-radiological Risk [c]
Sitewide Removal Alternative									
DOE/ Commercial	Truck	104,443	356.8	2,070	1.2	370	0.22	1.2×10^{-3}	9.7
	Rail	52,224	190.5	65.4	0.039	94.3	0.057	5.4×10^{-4}	15
Commercial	Truck	104,593	342.1	2,200	1.3	352	0.21	1.6×10^{-3}	10
	Rail	52,299	180.5	64.7	0.039	94.3	0.057	6.8×10^{-4}	15
Sitewide Close-In-Place Alternative									
DOE/ Commercial	Truck	1,203	4.3	48.6	0.029	11.0	0.0066	4.2×10^{-7}	0.10
	Rail	604	2.3	1.9	0.0012	2.8	0.0017	1.5×10^{-7}	0.17
Commercial	Truck	1,200	3.9	45.1	0.027	9.9	0.0060	5.6×10^{-7}	0.12
	Rail	602	2.1	1.4	0.00085	2.6	0.0016	2.0×10^{-7}	0.17
Phased Decisionmaking Alternative (Phase 1)									
DOE/ Commercial	Truck	12,739	49.6	273	0.16	71.5	0.043	9.2×10^{-6}	1.0
	Rail	6,371	27.3	10.9	0.0065	16.3	0.0098	3.4×10^{-6}	1.8
Commercial	Truck	12,882	42.0	397	0.24	58.1	0.035	3.2×10^{-4}	1.3
	Rail	6,442	22.1	10.8	0.0065	16.1	0.0097	1.4×10^{-4}	1.8
No Action Alternative [d]									
DOE/ Commercial	Truck	623	2.4	37.8	0.023	11.8	0.0071	2.4×10^{-7}	0.050
	Rail	313	1.4	1.7	0.0010	2.6	0.0016	1.0×10^{-7}	0.090
Commercial	Truck	623	2.0	31.3	0.019	9.8	0.0059	4.3×10^{-7}	0.060
	Rail	313	1.1	1.4	0.00082	2.6	0.0016	1.3×10^{-7}	0.090

LLW = low-level radioactivity waste.

[a] For purposes of analysis only, Greater-Than-Class C and transuranic wastes are assumed to be transported to the Nevada Test Site and Waste Isolation Pilot Plant, respectively. All Greater-Than-Class C waste generated as part of any EIS alternative would be safely stored until an appropriate offsite disposal facility is available. DOE proposes to identify a disposal facility for Greater-Than-Class C and potential non-defense transuranic waste based on the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (GTCC EIS)* (DOE/EIS-0375). As announced in the July 23, 2007, Notice of Intent, the *GTCC EIS* will evaluate several DOE sites and generic locations for the disposal of Greater-Than-Class C waste and similar DOE waste (72 FR 40135).

[b] The transportation risks presented in this table are based on use of a western U.S. commercial disposal facility for Commercial Class B and C low-level radioactive waste. The risk results for the use of an eastern U.S. commercial disposal facility are presented in Table J–8 of Appendix J.

[c] Risk is expressed in terms of LCFs, except for nonradiological risk where it refers to the number of traffic accident fatalities.

[d] Under the No Action Alternative, for the purpose of comparison to other alternatives, transportation impacts are provided for monitoring and maintenance activities over a 20-year period. The waste quantities under this alternative would continue to be generated every 20 years.

Note: To convert kilometers to miles, multiply by 0.62137.

DOE and NYSERDA could choose to use a combination of rail and truck transport during the execution of any of the decommissioning alternatives. If that turns out to be the case, the cumulative dose to the general population is expected to be between the lowest projected dose of about 2.5 person-rem, which is associated with all train transport for the DOE/Commercial Disposal Option under the Sitewide Close-In-Place

Alternative, and the highest projected dose of about 370 person-rem associated with all truck transport for the DOE/Commercial Disposal Option under the Sitewide Removal Alternative. The additional LCFs that are expected from such exposures to the general population range from 0.0015 to 0.22 LCFs, thus, it is expected that there would be no additional LCFs in the population under any of the alternatives. Similarly, the lowest cumulative dose to the crew would be under the Sitewide Close-In-Place Alternative using all train transport (1.4 person-rem), while the highest cumulative dose would be under the Sitewide Removal Alternative using all truck transport (about 2,200 person-rem). The additional LCFs that are expected from exposures to the transportation crews would range from 0.00085 to 1.3; however, it should be noted that the maximum annual dose to a transportation worker would be 100 millirem per year, unless the individual is a trained radiation worker, for which doses would be administratively limited to an annual dose of 2 rem (DOE 1999b). Because a dose of 2 rem corresponds to an LCF risk of about 0.0012 LCFs, an individual transportation worker would not be expected to develop a lifetime latent fatal cancer from exposures during these activities. In addition, there is no scenario where a combination of train and truck transport is expected to result in a higher dose to the general population or the transportation crews than the truck-only options.

4.1.12.3 Sitewide Removal Alternative

Under this alternative, DOE and NYSERDA would transport about 1.6 million cubic meters (2.1 million cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal to offsite locations over approximately 60 years. As indicated in Table 4–53, a very large number of shipments (about 104,600 truck shipments) of radioactive waste would be made under this alternative. Under the Commercial Disposal Option, all Class-C-or-lower low-level radioactive waste would be shipped to commercial disposal facilities. Under the DOE/Commercial Disposal Option, the Class-C-or-lower low-level radioactive waste for which New York State is responsible would still be transported to commercial disposal facilities. For purposes of analysis only, shipments of transuranic waste to WIPP and Greater-Than-Class C waste to the Nevada Test Site are included under both disposal options. If rail transport were used, the total number of shipments (about 52,300 shipments) would be about one-half of those made under truck transport. The total projected one-way distance traveled on public roads or rail lines transporting radioactive waste to the various disposal locations under this alternative would range from 342 to 357 million kilometers (213 to 222 million miles) for trucks, and from 181 to 191 million kilometers (112 to 118 million miles) for trains.

Following the assumed 60-year decommissioning period, there would be no offsite shipments of waste except for shipments of low-level radioactive waste that may be generated as part of onsite management of orphan waste (see Table 4–46).

Impacts of Incident-Free Transportation

Under this alternative, the highest level of health impacts on transportation workers (e.g., truck crew) would occur under the Commercial Disposal Option using all truck shipments, and the highest impacts on the general population would occur under the DOE/Commercial Disposal Option using all truck shipments (see Table 4–53). Truck shipments result in higher crew doses. The impacts are proportional to the distance traveled and the assumed western commercial site (Hanford Site characteristics) is the farthest distance from WNYNSC and would be the major contributor to crew doses. In addition, for the general population, the shipments to NTS expose a larger number of public along the transportation routes.

Crew—The cumulative dose to crew members during the transportation of waste by truck would range from 2,070 to 2,200 person-rem, resulting in 1 (1.2 to 1.3) additional LCF. However, it should be noted that the maximum annual dose to a transportation worker would be 100 millirem per year, unless the individual is a trained radiation worker, who would be subject to administrative procedures that would limit the annual dose to 2 rem (DOE 1999b). The potential for a trained radiation worker to develop a fatal latent cancer from the maximum annual exposure is 0.0012 LCFs. Therefore, an individual transportation worker would not be expected to develop a lifetime latent fatal cancer from exposure during these activities. If train transport were used, the cumulative dose to crew members during the transportation of waste under this alternative would be about 65 person-rem, resulting in less than 1 (0.039) additional LCF. Rail transport would expose the crew to much lower doses, due to the greater shielding and distance between the crew and the waste being transported, and the smaller number of shipments required.

Public—The cumulative dose to the general population during the transportation of waste by truck would range from 352 to 370 person-rem, resulting in less than 1 (0.21 to 0.22) additional LCF. If train transport were used, the cumulative dose to the general population would be about 94 person-rem, resulting in less than 1 (0.057) additional LCF. Rail transport would lead to lower doses to the general population, due to the smaller number of shipments and lower exposure to people in the vicinity of stations where the reclassification and inspections would take place. Almost half of the doses to the general population from truck transport would be from doses at rest areas, gas stations, and stops along the route.

If a combination of rail and truck transport were used during the execution of this alternative, the cumulative dose to the general population is expected to be between the lowest projected dose of 94 person-rem associated with train transport, and the highest projected dose of 370 person-rem, associated with all truck transport. There is no scenario where a combination of train and truck transport is expected to result in a higher dose to the general population than the truck-only option.

Impacts of Accidents During Transportation

As described previously, two sets of analyses were performed for the evaluation of radiological transportation accident impacts: impacts of maximum reasonably foreseeable accidents (accidents with radioactive release probabilities greater than 1×10^{-7} [1 chance in 10 million] per year), and impacts of all conceivable accidents (total transportation accidents).

For waste shipped under the Sitewide Removal Alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve contact-handled Class B/C waste in an HIC with no shielded cask (see Appendix J, Table J–11). These waste shipments are expected to occur over about 44 years (the number of years when Class B/C wastes would be generated). The probabilities of a truck or rail accident involving this type of waste shipment are slightly different. Transportation accident probabilities were calculated for all route segments (i.e., rural, suburban, and urban), and maximum consequences were determined for those route segments with a likelihood of release frequency exceeding 1-in-10 million per year. The maximum reasonably foreseeable probability of a truck accident involving this waste type would be 1.3×10^{-7} per year in an urban area, while the maximum probability for a rail accident would be 4.2×10^{-7} per year in an urban area, or approximately 1 chance in a million each year for both truck and rail transport. The consequences of the truck and rail transport accident in terms of population dose would be about 590 and 1,190 person-rem, respectively. Such exposures could respectively result in up to 1 (0.36 to 0.71) additional LCF among the exposed population. The difference in the general population doses between truck and rail accidents is due to the possibility of the rail accident occurring in an urban area with twice the waste inventory of the truck. Trains travel longer distances in urban areas than trucks. (Truck shipments would tend to bypass such areas to the maximum extent possible.) The maximum dose from a rail accident to an MEI, located at a distance of 100 meters (330 feet) and exposed to the accident plume for 2 hours, would be about 0.30 rem, with a risk of 0.00018 LCFs.

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose risk to the general population of 2.7 person-rem over the life of expected shipments, resulting in less than 1 (0.0016) LCF for all truck transport under the Commercial Disposal Option, and a maximum nonradiological accident risk of 15 fatalities for all rail transport under the DOE/Commercial Disposal Option (see Table 4–53).

Impacts of Construction and Operational Material and Hazardous Waste Transport

The impacts of transporting construction/demolition debris, construction and erosion control materials (i.e., concrete, gravel/sand/soil, asphalt, steel, piping, fabric), and hazardous wastes were also evaluated. The estimated transportation impacts under this alternative would be 57.8 million kilometers (35.9 million miles) traveled, 20 (19.9) traffic accidents, and less than 1 (0.7) traffic accident fatality over the entire duration of implementation of the Sitewide Removal Alternative.

4.1.12.4 Sitewide Close-In-Place Alternative

Under this alternative, over 60 years DOE and NYSERDA would transport about 0.032 million cubic meters (0.042 million cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal at offsite locations. About 59 percent of waste would be generated during the 7 years of the decommissioning activities.

As indicated in Table 4–53, about 1,200 truck shipments of radioactive materials would be made under this alternative. Similar to the Sitewide Removal Alternative, under the DOE/Commercial Disposal Option, the Class-C-or-lower low-level radioactive waste for which New York State is responsible would be transported to commercial disposal facilities; and, under the Commercial Disposal Option, all Class-C-or-lower low-level radioactive waste would be shipped to commercial disposal facilities. Transuranic waste shipments to WIPP are included under both options for purposes of analysis. No shipments of Greater-Than-Class C waste would be needed under this alternative. If train transport was used, the total number of shipments (up to 600 shipments) would be about one-half of those made under truck-only transport. The total projected distance traveled on public roads or rail lines transporting radioactive waste to its disposal location under this alternative would range from 3.9 to 4.3 million kilometers (2.4 to 2.7 million miles) for truck transport, and from 2.1 to 2.3 million kilometers (1.3 to 1.4 million miles) for train transport.

During the long-term stewardship period, it is projected that approximately 110 cubic meters (3,900 cubic feet) of low-level radioactive waste would be annually generated. Small quantities of low-level radioactive waste may be also generated annually as part of orphan waste management operations (see Table 4-46). Generation of this waste would result in a small number of annual offsite waste shipments.

Impacts of Incident-Free Transportation

Under this alternative, the highest level of health impacts on transportation workers would occur for all truck shipments under the Commercial Disposal Option, and the highest level of impacts on the general population would occur for all truck shipments under the DOE/Commercial Disposal Option (see Table 4–53). Under this alternative, a very limited amount of Class B/C waste would be generated. As discussed under the Sitewide Removal Alternative, truck shipments would result in higher crew doses. The impacts are proportional to the distance traveled, and NTS is the farthest distance from WNYNSC of the disposal facilities. In addition, the transports to NTS would expose a larger general population along the transportation routes.

Crew—Under this alternative, the cumulative dose to crew members during the transportation of waste by truck would range from about 45 to 49 person-rem, resulting in less than 1 (0.027 to 0.029) additional LCF. If train transport was used, the cumulative dose to crew members during the transportation of radioactive waste under this alternative would range from about 1.4 to 1.9 person-rem, resulting in less than 1 (0.00085 to 0.0012) additional LCF.

Public—Under this alternative, the cumulative dose to the general population during transport of radioactive waste by truck would be about 11 person-rem, resulting in less than 1 (0.0066) additional LCF. If train transport was used, the cumulative dose to the general public during the transportation of waste under this alternative would be about 2.8 person-rem, resulting in less than 1 (0.0017) additional LCF.

As discussed under the Sitewide Removal Alternative, if DOE and NYSERDA choose to use a combination of rail and truck transport during the execution of this alternative, the cumulative dose to the general population is expected to be between the lowest projected dose of 2.6 person-rem, associated with train transport, and the highest projected dose of about 11 person-rem, associated with all-truck transport. There is no scenario where a combination of train and truck transport is expected to result in a higher dose to the general population than the all-truck option.

Impacts of Accidents During Transportation

For waste shipped under this alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve Class A waste transported in Type A boxes (see Appendix J, Table J–11). These waste transports are expected to occur over a period of 7 years. The maximum reasonably foreseeable probability of a truck accident involving this waste type would be 8.7×10^{-7} per year in a suburban area, while the maximum probability for a rail accident would be 6.5×10^{-8} per year in a suburban area, or approximately 1 chance in a million each year for truck transport and 1 chance in 15 million each year for rail transport. The consequences for the truck and rail transport accident in terms of population dose would be 0.020 and 0.054 person-rem, respectively. Such an exposure could result in less than 1 (0.000012 to 0.000032) excess LCF among the exposed population. The large difference in the general population doses between truck and rail accidents is due to the possibility of the rail accident occurring with twice the waste inventory of the truck. The maximum dose from a rail accident to an MEI, located at a distance of 100 meters (330 feet) and exposed to the accident plume for 2 hours, would be 0.000072 rem, with a risk of 4.3×10^{-8} LCFs.

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose-risk to the general population of 0.00093 person-rem over the life of expected transportation shipments, resulting in less than 1 (5.6×10^{-7}) LCF for truck transport under the Commercial Disposal Option, and a maximum nonradiological accident risk of less than 1 (0.17) fatality for rail transport under the DOE/Commercial Disposal Option (see Table 4–53).

Impacts of Construction and Operational Material and Hazardous Waste Transportation

The impacts of transporting construction/demolition debris, construction and erosion control materials (i.e., concrete, gravel/sand/soil, asphalt, steel, piping, fabric, etc.), and hazardous wastes were also evaluated. The estimated transportation impacts under this alternative would be 95.2 million kilometers (59.2 million miles) traveled, 33 (32.8) accidents, and 1 (1.2) fatality over the duration.

4.1.12.5 Phased Decisionmaking Alternative

Assuming a 30-year Phase 1 period for purposes of analysis, DOE and NYSERDA would transport about 0.21 million cubic meters (0.28 million cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal at offsite locations under Phase 1 of this alternative. Almost all of these wastes would be generated and transported over a period of 8 years.

As indicated in Table 4–53, about 12,880 truck shipments of radioactive materials would be made under Phase 1 of this alternative. No Greater-Than-Class C wastes would be generated. Similar to the Sitewide

Removal Alternative, the Class-C-or-lower low-level radioactive waste for which New York State is responsible would be transported to commercial disposal facilities; and, under the Commercial Disposal Option, all DOE Class-C-or-lower low-level radioactive waste would also be transported to commercial disposal facilities. If train transport was used, the total number of shipments (about 6,440 shipments) would be about one-half of those made under truck-only transport. The total projected distance traveled on public roads or rail transporting waste to its disposal location under this alternative would range from about 42 to 50 million kilometers (26 to 31 million miles) for truck transport, and from about 22 to 27 million kilometers (13.7 to 16.8 million miles) for train transport.

Transportation impacts for the entire Phased Decisionmaking Alternative would depend on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, total radiological transportation risks under incident-free and accident conditions for both phases of this alternative would be essentially equal to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management of the SDA and removal of the waste and contamination for the remainder of the site, total radiological transportation risks (for both phases) would be about 40 percent less than those for the Sitewide Removal Alternative. This is because continued active management of the SDA would reduce waste shipments by approximately 30 percent for Class A low-level radioactive waste (including low-specific-activity waste), 13 percent for mixed low-level radioactive waste, about 50 percent for Class B and C low-level radioactive waste, and about 50 percent for Greater-Than-Class C waste. If the Phase 2 decision is in-place closure of all remaining waste and contamination, total incident-free transportation risks for both phases would be about 5 percent greater than those for Phase 1 alone. The total accident dose risks would be about 2 percent greater than those for Phase 1 alone. This is because there would be only a small amount of radioactive waste generated from removal of the current geomembrane cover and construction of an engineered SDA cap. If the Phase 2 decision is continued active management of the SDA and in-place closure of the remainder of the site, total transportation risks would be essentially equivalent to those for Phase 1 alone, because no radioactive waste would be generated from removal of the existing geomembrane cover and construction of an engineered SDA cap.

Nonradiological health (traffic fatality) risks for the entire Phased Decisionmaking Alternative would follow a similar pattern. If the Phase 2 decision is removal of all remaining waste and contamination, total traffic fatality risks from both phases would be essentially equivalent to those for the Sitewide Removal Alternative. If the Phase 2 decision is continued active management of the SDA and removal of the waste and contamination in the remainder of the site, total traffic fatality risks would be about 30 percent less than those for the Sitewide Removal Alternative. This is principally because waste would not be removed from the SDA nor transported to offsite disposal facilities. If the Phase 2 decision is in-place closure of all remaining waste and contamination, total traffic fatality risks from both phases would be higher than those for Phase 1 alone. This is principally because of deliveries of construction and erosion control materials. If the Phase 2 decision is continued active management of the SDA and in-place closure of the remainder of the site, total traffic fatality risks would be less because there would be no deliveries of the construction and erosion control materials required to build the engineered SDA cap.

Following completion of Phase 2 activities, there could be offsite shipments of waste from WNYNSC depending on the Phase 2 decision. If the Phase 2 decision is removal of all remaining waste and contamination, there would be only a small number of offsite shipments of waste during the long-term stewardship period. These would be shipments of low-level radioactive waste that may be generated as part of onsite management of orphan waste (see Table 4–46). If the Phase 2 decision is continued active management of the SDA and removal of waste and contamination in the remainder of the site, there would be a larger annual number of shipments of waste offsite. These annual shipments would be bounded by those for the No Action Alternative. If the Phase 2 decision is in-place closure of all remaining waste and contamination, there would be a small number of annual shipments of low-level radioactive waste offsite associated with long-term stewardship activities (see Section 4.1.12.4). If the Phase 2 decision is continued active management of the SDA and in-place closure of the remainder of the site, there would be annual offsite shipments of waste from management of the SDA and from stewardship of the remainder of the site. Impacts of Incident-Free Transportation

Under Phase 1 of this alternative, the highest level of health impacts on transportation workers and the general population would be from activities similar to those explained under the Sitewide Removal Alternative.

Crew—Under this alternative, the cumulative dose to crew members during the transport of waste by truck would range from about 273 to 397 person-rem, resulting in less than 1 (0.16 to 0.24) additional LCF. If train transport was used, the cumulative dose to crew members during the transport of radioactive waste under this alternative would be about 11 person-rem, resulting in less than 1 (about 0.0065) additional LCF.

Public—Under this alternative, the cumulative dose to the general population during the transport of waste by truck would range from about 58 to 72 person-rem, resulting in less than 1 (0.035 to 0.043) additional LCF. If train transport was used, the cumulative dose to the general public during the transportation of waste under this alternative would be about 16 person-rem, resulting in less than 1 (about 0.0098) additional LCF.

As discussed for the Sitewide Removal Alternative, DOE and NYSERDA could choose to use a combination of rail and truck transport during the execution of this alternative. In that case, the cumulative dose to the general population is expected to be between the lowest projected dose of about 16 person-rem associated with all-train transport and the highest projected dose of about 72 person-rem associated with all-truck transport. There is no scenario where a combination of train and truck transport is expected to result in a higher dose to the general population than the truck-only option.

Impacts of Accidents During Transportation

For waste shipped under Phase 1 of this alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve Class B/C waste in a Type A B-25 box for the DOE/Commercial Disposal Option, and Class B/C waste in an HIC for the Commercial Disposal Option (see Appendix J, Table J–11).

For the DOE/Commercial Disposal Option, the probability of this accident would be a maximum of about 1.3×10^{-7} and 1.4×10^{-8} per year for truck and rail transport in a suburban area, respectively. In such an accident, the dose to the general population would be 6.1 and 16 person-rem, respectively, leading to less than 1 (0.0037 and 0.0098, respectively) additional LCF for truck and rail transport. Note that the difference between these two doses is proportional to the amount of waste transported by rail and truck. The maximum dose to an MEI from this accident would be 0.022 rem, with a risk of developing a latent fatal cancer of 0.000013.

For the Commercial Disposal Option, the probability of this accident would be about 1.4×10^{-7} and 4.6×10^{-7} per year for truck and rail transport in an urban area, respectively. Given such an accident, the consequences for the general population would be about 590 to 1,190 person-rem, respectively, leading to up to 1 additional LCF for truck and rail transport (0.36 and 0.71, respectively). The difference between these two doses is proportional to the amount of waste transported by rail and truck. The maximum dose to an MEI from a rail accident would be about 0.30 rem with a corresponding risk of developing a latent fatal cancer of 0.00018 LCFs.

The differences in consequences between the accidents involving an HIC and those involving Type A B-25 boxes are driven by the container structural materials (i.e., a poly-hydrocarbon polymer in an HIC versus structural steel for the Type A box). Accidents involving an HIC would lead to a higher airborne release and greater consequences.

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose-risk to the general population of 0.53 person-rem over the life of the projected transportation shipments, resulting in less than 1 (0.00032) LCF for truck transport under the Commercial Disposal Option, and a maximum nonradiological accident risk of about 2 (1.8) fatalities for rail transport under the DOE/Commercial Disposal Option (see Table 4–53).

Impacts of Construction and Operational Material and Hazardous Waste Transportation

The impacts of transporting construction/demolition debris, construction and erosion control materials (i.e., concrete, gravel/sand/soil, asphalt, steel, piping, fabric), and hazardous wastes were also evaluated for Phase 1. The transportation impacts under this alternative would be 8.2 million kilometers (5.1 million miles) traveled, 3 (2.8) accidents, and less than 1 (0.10) fatality over the duration.

4.1.12.6 No Action Alternative

Under the No Action Alternative, a minimal amount of waste would be generated annually compared to the other alternatives. Additional wastes would also be generated through periodic maintenance of facility roofs and NDA/SDA geomembrane replacement activities every 20 to 25 years. Thus, for the purposes of analysis and comparisons of waste volumes and transport needs, the impact was evaluated for a 20-year operational period. During each 20-year period, DOE and NYSERDA would transport about 9,700 cubic meters (12,700 cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal at offsite locations.

Under this alternative, no Class B/C, transuranic, or Greater-Than-Class C wastes would be generated. As indicated in Table 4–53, an average of about 620 truck shipments of radioactive materials would be made under this alternative over a 20-year period. If train transport was used, the total number of shipments would be about one-half of those made under truck-only transport. The total projected distance traveled on public roads or rail transporting radioactive waste would range from 2.0 to 2.4 million kilometers (1.25 to 1.5 million miles) for truck transport, and from 1.1 to 1.4 million kilometers (0.68 to 0.87 million miles) for train transport.

Impacts of Incident-free Transportation

The highest level of health impacts on transportation workers and the general population from all transportation activities would occur under the DOE/Commercial Disposal Option (see Table 4–53). As stated under the Sitewide Removal Alternative, this is because the impacts are proportional to distance traveled, and NTS is the farthest distance from WNYNSC of the analyzed transport options.

Crew—Under this alternative, the cumulative dose to crew members during the transportation of waste by truck would range from about 31 to 38 person-rem, resulting in less than 1 (0.019 to 0.023) additional LCF. If train transport was used, the cumulative dose to crew members during the transport of radioactive waste under this alternative would range from 1.4 to 1.7 person-rem, resulting in less than 1 (0.00082 to 0.0010) additional LCF.

Public—Under this alternative, the expected cumulative dose to the general population during the transport of waste by truck would range from about 10 to 12 person-rem, resulting in less than 1 (0.006 to 0.007) additional LCF. If train transport was used, the cumulative dose to the general public during the transport of waste under this alternative would be about 2.6 person-rem, resulting in less than 1 (up to 0.0016) additional LCF.

As discussed for the Sitewide Removal Alternative, if DOE and NYSERDA choose to use a combination of rail and truck transport during the execution of this alternative, the cumulative dose to the general population is expected to be between the lowest projected dose of about 2.6 person-rem, associated with all-train transport, and the highest projected dose of 12 person-rem, associated with all-truck transport. There is no scenario where a combination of train and truck transport is expected to result in a higher dose to the general population than the truck-only option.

Impacts of Accidents During Transportation

For the wastes transported under this alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve Class A waste in a B-25 box for both disposal options (see Appendix J, Table J–11). The probabilities of a truck or rail accident involving this type of waste shipment are slightly different. The probability of a truck accident with maximum consequence involving this waste type would be 5.8×10^{-7} per year, while the probability for a rail accident would be 4.3×10^{-8} per year. The consequences of the maximum foreseeable accidents under this alternative would be similar to those presented under the Sitewide Close-In-Place Alternative (see Section 4.1.12.4).

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose-risk to the general population of about 0.00072 person-rem over 20 years, resulting in 4.3×10^{-7} LCFs for truck transport in the Commercial Disposal Option, and a maximum nonradiological accident risk of less than 1 (0.09) fatality for rail transport in the DOE/Commercial Disposal Option (see Table 4–53).

Impacts of Construction and Operational Material and Hazardous Waste Transportation

This alternative would require minimal transport of materials for monitoring and maintenance operations. The impacts of transporting clean debris and hazardous wastes to local landfills were evaluated. The estimated transportation impacts under this alternative would be 0.014 million kilometers (0.009 million miles) traveled, less than 1 (0.005) accident, and less than 1 (0.0002) fatality over 20 years.

4.1.13 Environmental Justice

Environmental justice addresses the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations that could result from implementation of the alternatives in this EIS. In assessing the impacts, the following definitions were used:

- *Minority individuals*: Individuals who identify themselves as members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, two or more races, or some other race.
- *Minority populations:* Minority populations are identified where either: (1) the minority population of the affected area exceeds 50 percent of the area's general population, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.
- *Low-income population:* Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the U.S. Census Bureau's Current Population Reports, Series P60, on *Poverty in the United States* (Census 2000). Canadian low-income populations were identified from low-income measures from Statistics Canada (Giles 2004).

Consistent with the impact analysis for the public and occupational health and safety, the affected populations are defined as those minority and low-income populations that reside within an 80-kilometer (50-mile) radius centered on WNYNSC. Low-income populations and minority populations residing within this radius are identified in Chapter 3, Section 3.12, of this EIS.

Adverse health effects are measured in terms of risks and rates of exposure that could result in LCFs, as well as other fatal or nonfatal adverse impacts on human health. Disproportionately high and adverse human health effects would occur if the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. The minority and low-income populations are subsets of the general public residing around the site, and all are exposed to the same hazards generated by various operations at the site. Therefore, estimates for environmental justice impacts were determined using either the human health risks results or similar methods provided in this chapter.

4.1.13.1 Decommissioning Period Impacts

No disproportionately high and adverse environmental impacts on minority and low-income populations would occur during the decommissioning period under any of the alternatives for this EIS. This conclusion is a result of investigations in this EIS that determined there would be no significant impacts on human health or ecological, cultural, paleontological, socioeconomic, or other resource areas described in this chapter.

As discussed in Section 4.1.9.1, radiological and hazardous chemical risks to the public resulting from decommissioning actions would be small. These actions at WNYNSC are not expected to cause fatalities among the general population, including minority and low-income populations living within the potentially affected area. An analysis was performed of a high fish-consumption lifestyle for individuals on the lower reaches of Cattaraugus Creek. Such an individual could be a member of the Seneca Nation of Indians. This analysis showed that the projected doses from normal operations under any of the decommissioning alternatives would not be expected to adversely impact this individual during the decommissioning actions.

Even lower doses are projected for the post-decommissioning time period for the decommissioning alternatives, as indicated in Section 4.1.9.1.

Annual radiological risks to the offsite population that could result from facility accidents discussed in Section 4.1.9.2 were estimated to be less than 1 LCF under all decommissioning alternatives over the decommissioning action time periods. These risks are not expected to disproportionately impact minority or low-income populations. The general population surrounding the site is not made up of a disproportionate number of minority or low-income individuals, as discussed in Chapter 3, Section 3.12, of this EIS.

4.1.13.2 Long-term Impacts

Section 4-4 of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," directs that Federal agencies, "whenever practical and appropriate, shall collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence" and "shall communicate to the public the risks of those consumption patterns."

In the analysis of long-term impacts, which is discussed in Section 4.1.10 and in Appendix H, one of the scenarios is a Seneca Nation of Indians receptor who is postulated to annually consume 62 kilograms (137 pounds) of fish that was raised in the lower reaches of Cattaraugus Creek or in Lake Erie near the point where Cattaraugus Creek discharges into the lake. This scenario is conservative due to the large amount of fish in the diet, the assumption that the fish was raised in the area, and the assumption that Cattaraugus Creek water is used for drinking and irrigation. Nevertheless, based on a review of reasonably foreseeable scenarios, the peak annual total effective dose to a Seneca Nation of Indians receptor was estimated to be approximately

0.7 millirem under the Sitewide Close-In-Place Alternative and range up to about 3 millirem for the No Action Alternative. The projected doses to the Seneca Nation of Indians receptor would not be expected to adversely impact this individual, and there would be no disproportionately high and adverse impacts. If unmitigated erosion was assumed to occur, however, the annual dose to the Seneca Nation of Indians receptor could rise to 34 millirem for the No Action Alternative, although this dose would still be smaller than DOE's limit for protection of the public of 100 millirem in a year (DOE 1990). This dose would bound the option where the SDA would remain under continued active management and the remainder of the affected areas of the site were removed or closed in place. Under such a scenario there would still be little cause for environmental justice concerns.

4.2 Cost-Benefit Considerations

The various decommissioning actions involve the investment of money and worker and public exposure in the interest of reducing future worker and public exposures. This section presents the costs for the various alternatives in present value terms to facilitate direct comparison of different expenditures patterns for the alternatives. The section also presents information on the worker and public doses that are estimated to occur during decommissioning actions and during a 1,000-year period of follow-up monitoring and maintenance or long-term stewardship for each decommissioning alternative (see Section 4.2.2). Using the No Action Alternative as a baseline, this information was used to estimate the incremental cost-effectiveness of each decommissioning alternative, expressed in terms of present value cost per avoided person-rem. A summary of the cost-benefit comparative assessment is provided in **Table 4–54**.

Cost-benefit analysis is not typically included in a DOE EIS but is included in an NRC EIS. The cost-benefit analysis presented in this EIS is intended to increase the utility of the document to NRC. The analysis was performed for all alternatives assuming real discount rates ranging from 1 to 5 percent. The analysis considers a range of unit disposal costs for Greater-Than-Class C waste—i.e., $2,300 per cubic foot to $21,000 per cubic foot (WSMS 2009e). The values presented in Table 4–54 are based on long-term performance assessment results that reflect the assumption of continued institutional controls.

All decommissioning alternatives have an incremental cost for avoided population dose (expressed in person-rem) that is much greater than the $2,000 per person-rem which is both the NRC general and decommissioning-specific standard. All decommissioning alternatives appear to meet NRC's decommissioning ALARA requirement.

Table 4–54 Cost-Benefit Comparative Assessment [a]

Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative [b]*	*No Action Alternative*
The Sitewide Removal Alternative would transfer essentially the entire site radionuclide inventory to other disposal sites. The incremental cost-effectiveness is estimated to range from about $430,000 to $1,300,000 per avoided person-rem.	The Sitewide Close-In-Place Alternative would keep most of the site radionuclide inventory out of the site's accessible environment. The incremental cost-effectiveness is estimated to range from about $210,000 to $950,000 per avoided person-rem.	The cost-effectiveness of this alternative would depend primarily on the Phase 2 decision. If the Phase 2 decision is timely removal of the remaining waste and contamination, the incremental cost-effectiveness is estimated to range from about $230,000 to $1,300,000 per avoided person-rem. If the Phase 2 decision is timely in-place closure for the remaining waste and contamination, the incremental cost-effectiveness is estimated to range from about $450,000 to $760,000 per avoided person-rem.	The No Action Alternative serves as a baseline for assessing the incremental cost-effectiveness of the decommissioning alternatives.

[a] The analysis was performed for all alternatives assuming real discount rates ranging from 1 to 5 percent, and unit Greater-Than-Class C waste disposal costs ranging from $2,300 to $21,000 per cubic foot (WSMS 2009e). The values in this table are based on calculations that assume continued institutional controls.

[b] The analysis for the Phased Decisionmaking Alternative assumes the Phase 2 decision is either all removal or all in-place closure for the Waste Tank Farm, NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, and State-Licensed Disposal Area.

4.2.1 Cost

The NYSERDA View Indicates….

The Final EIS Approach for Exhumation may be Overly Conservative. NYSERDA believes that the approach identified in the Final EIS for exhuming the disposal areas and the Waste Tank Farm should be reassessed to determine whether less conservative, but still protective, methods of exhumation could be identified that would significantly reduce the cost of exhumation.

DOE's Response….

The pre-conceptual engineering approach to implementing the Sitewide Removal Alternative was reviewed, and revisions were made to the design of modular environmental enclosures used for exhuming waste from the SDA and estimates of the contamination levels for some of the soil removed from the burial areas. These changes resulted in small reductions in the estimated cost of removing these facilities.

DOE recognizes that fabric structures have been used to provide containment for exhumation of buried material with chemical and alpha-contamination. In particular, DOE notes the use of multiple, moderate-sized enclosures that utilize an industrial fabric skin over a prefabricated steel structure to support waste retrieval operations. The Accelerated Retrieval Project at DOE's Idaho National Laboratory has used these structures to enclose areas of about one-half acre to support the exhumation of waste that includes plutonium contamination and volatile organic compounds. These structures are designed to minimize the spread of contamination and provide protection from the environment. The first structure supported Accelerated Retrieval Project 1, which lasted about 3 years.

DOE is not aware of any successful use of fabric-covered structures for the exhumation of NDA- and SDA-type waste in which there are major gamma radiation sources that require increased worker protection from this penetrating radiation. DOE also notes that its design standards call for the facilities that handle higher activity material to be able to withstand natural phenomena including snow loads, high winds, and wind-driven missiles.

DOE has used fabric structures at WNYNSC to protect materials, including packaged waste, from the environment. The fabric cover of LSA 3 was torn and removed by a wind storm in 1996 and a framed structure with a fabric cover used for equipment storage collapsed from a snow load in 2003.

While DOE recognizes the potential for the use of fabric-covered structures to reduce the initial cost of exhumation projects, there are other issues that must be considered in the design of structures used to support the exhumation of waste with the potential for high dose rates. At the present time, DOE considers it prudent to develop preliminary exhumation designs and costs estimates based on the use of solid-walled structures. DOE will continue to monitor the development of remote exhumation technologies applicable to nuclear waste. If decommissioning actions involves removal actions, the detailed design effort will review the existing technology and select a design approach that is protective of worker and public safety and involves the efficient use of public funds.

A summary of the costs needed to complete the decommissioning actions, as well as the annual post-decommissioning monitoring and maintenance or long-term stewardship cost for each alternative, is presented in **Table 4–55** (WSMS 2009a, 2009b, 2009c, 2009d). This information is presented in the first two rows of Table 4–55 in 2008 dollars. The table shows the high initial cost and absence of post-decommissioning cost for the Sitewide Removal Alternative, and the annual monitoring and maintenance cost and absence of initial cost for the No Action Alternative. Two estimates are presented for the decommissioning cost for the Sitewide Removal Alternative to reflect uncertainty in Greater-Than-Class C waste disposal cost. The higher estimate is associated with a higher unit Greater-Than-Class C waste disposal cost and the lower estimate is associated with a lower unit Greater-Than-Class C waste disposal cost. The table also shows the costs for the Sitewide Close-In-Place Alternative, which would incur initial decommissioning costs for 7 years followed by annual long-term stewardship costs.

Two cost estimates are presented in the first row of Table 4–55 for the Phased Decisionmaking Alternative. The first cost estimate is based on the assumption that Phase 2 involves removing the remaining waste and contamination (Waste Tank Farm, NDA, and SDA) while the second cost estimate is based on the assumption that the remaining waste and contamination is closed in place. The range for the Phase 2 removal option reflects uncertainty in Greater-Than-Class C waste disposal cost.

As noted, the cost estimates presented in the first two rows of the table are based on engineering studies intended to identify the actions necessary to complete decommissioning and to conduct post-decommissioning monitoring and maintenance or long-term stewardship. It does not include an estimate of funds for responding to potential catastrophic events. There are limited bases for developing cost estimates for responding to catastrophic events. Furthermore, if such estimates were developed, weighted according to probability of occurring and discounted (see following text), it is estimated that the additional cost would represent a small addition to the existing estimates. In addition, all alternatives would include this future cost risk and it would be difficult to establish a meaningful, discriminating difference in this cost for the alternatives.

Table 4–55 Costs for Environmental Impact Statement Alternatives

Cost Element	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Cost to complete decommissioning actions (billions of 2008 dollars)	9.3 – 6.5 [a]	1.0	9.4 – 6.6 (Removal) [a, b] 1.7 (Close-In-Place) [b]	0
Effective annual costs for monitoring and maintenance or long-term stewardship (millions of 2008 dollars per year)	0	4.7	0 (Removal) [c] 4.7 (Close-In-Place) [c]	12.6
Present value (billions of 2008 dollars) assuming 1, 3, and 5 percent real discount rates and 1,000 years of monitoring and maintenance or long-term stewardship for the Sitewide Close-In-Place, Phased Decisionmaking, and No Action Alternatives	7.0 – 4.9 (1%) [a] 4.4 – 3.1 (3%) [a] 3.1 – 2.1 (5%) [a]	1.4 (1%) 1.1 (3%) 0.9 (5%)	6.9 – 4.2 (1%, Removal) 1.8 (1%, Close-In-Place) 4.2 – 2.1 (3%, Removal) 1.2 –1.3 (3%, Close-In-Place) 2.8 – 1.3 (5%, Removal) 0.9 – 1.41 (5%, Close-In-Place)	1.3 (1%) 0.4 (3%) 0.3 (5%)

[a] The higher cost estimate includes $3.1 billion for disposal of Greater-Than-Class C waste (unit disposal cost of $21,000 per cubic foot) while the lower cost estimate includes $0.34 billion for disposal of Greater-Than-Class C waste (unit disposal cost of $2,300 per cubic foot) (WSMS 2009e).
[b] The listed costs include a cost of $1.2 billion for Phase 1 of the Phased Decisionmaking Alternative.
[c] These are annual costs after completion of Phase 2 decommissioning actions.

The dollar expenditure patterns vary among the alternatives, based on the timing and duration of the decommissioning actions. For example, the Sitewide Removal Alternative decommissioning actions extend for 60 years, after which there would be no need for long-term stewardship (although there may be a need for temporary orphan waste storage). This is reflected in the pattern of costs, with high costs for 60 years, followed by no additional costs. In contrast, under the No Action Alternative, the site would be maintained indefinitely at the starting point of this EIS. Thus, for the No Action Alternative there would be no initial decommissioning expenditures, but there would be annual monitoring and maintenance costs that would continue indefinitely. One way of comparing these costs is to express them in terms of present value which reflects a statement about how much money in today's dollars would be necessary to make all future payments. Making this conversion requires one to make estimates of how the cost would escalate over time as well as the interest that could be accrued on funds prior to their expenditure. The difference between these rates (nominal interest rate – expected inflation rate) is termed the *real discount rate*.[29] NRC guidance suggests that a lower range of discount rates can be considered when there are intergenerational

[29] *OMB Circular A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (http://www.whitehouse.gov/omb/circulars/index.html)*

consequences.[30] To investigate the sensitivity of the results to real discount rate, three real discount rates (1, 3 and 5 percent) were used in a simplified present value analysis that considers costs through 1,000 years. The results of this analysis are presented in the last row of Table 4–55. The No Action Alternative has the least expensive present value range, the Sitewide Removal Alternative has the most expensive present value range, and the Sitewide Close-In-Place Alternative has an intermediate present value range. The Phased Decisionmaking Alternative present value range is approximately equal to that for the Sitewide Removal Alternative if the Phase 2 decision is removal and it is slightly higher than the Sitewide Close-In-Place Alternative if the Phase 2 decision is in-place closure. The range of discounted costs for the Phased Decisionmaking Alternative includes analysis of the effect of the Phase 2 decision made both 10 years and 30 years after issuance of the Phase 1 Record of Decision.

4.2.2 Population Dose

To compare the cost-effectiveness of the decommissioning alternatives for reducing population exposure, it is necessary to compare the time-integrated population dose for each of the alternatives, including the No Action Alternative, which serves as the baseline for the cost-effectiveness analysis.

There are two major components to the worker and public population doses for each alternative. The first is the population dose that would be incurred in carrying out the decommissioning actions (removing or isolating site waste and contamination, and shipping waste off site). The second is the time-integrated long-term population dose resulting from the postulated long-term environmental release of any waste and contamination that remains on site. The integration period is 1,000 years, a timeframe that was selected to be consistent with the analytical timeframe used in NRC's license termination assessments. The estimate of the first component is the dose to workers and populations presented in Section 4.1.9 and Section 4.1.12. The transportation dose estimates are those for rail transportation. This mode of transport results in smaller doses than those for truck transport, thus resulting in a higher estimate of avoided person-rem for the Sitewide Removal Alternative. The estimate of the second component of worker and public population doses is based on the estimated worker dose from monitoring and maintenance activities as presented in Section 4.1.9 and the time-integrated population dose to Lake Erie/Niagara River water user receptors presented in Section 4.1.10. This analysis uses two values for the time-integrated Lake Erie/Niagara River water user receptor population dose. The first value assumes continuance of institutional controls (Table 4–30) while the second value is for assumed loss of institutional controls after 100 years (Table 4–39). This analysis does not consider the time-integrated population dose for the unmitigated erosion scenario because this scenario is considered to be very unlikely.

The population dose components and the total population dose for each of the alternatives are presented in **Table 4–56** and drawn from information provided in Sections 4.1.9, 4.1.10, and 4.1.12. The doses for the Sitewide Removal and Sitewide Close-In-Place Alternatives are given in the first two columns. The 1,000-year population dose due to assumed long-term release of contamination from the site is conservative because it does not take credit for the performance of the permeable treatment wall intended to treat the leading edge of the North Plateau Groundwater Plume. Doses for the Phased Decisionmaking Alternative are given in the third column. For this alternative, two values are given. The first value assumes the Phase 2 decision is removal of the remaining waste and contamination. The second value assumes the Phase 2 decision is in-place closure of the remaining waste and contamination (again, no credit is taken for the performance of the permeable treatment wall). The last column of the table is the information for the No Action Alternative. The total population dose for the No Action Alternative has a range. The lower value is based on the assumption that institutional controls remain in place. The higher value is based on the assumption that institutional controls fail after 100 years. The No Action Alternative serves as the baseline for the cost-effectiveness analysis presented in Section 4.2.3.

[30] *Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission, NUREG/BR-0058, Revision 4, September 2004.*

Table 4–56 Population Dose for Each Alternative

Population Dose Element	Alternative			
	Sitewide Removal	*Sitewide Close-In-Place*	*Phased Decisionmaking*	*No Action*
Dose to site and transportation workers during decommissioning actions (person-rem)	1,100	120	1,000 (Removal) 240 (Close-In-Place)	0
Dose to the offsite population and to the population along transportation routes incurred during decommissioning actions (person-rem)	220	40	200 (Removal) 100 (Close-In-Place)	0
1,000 years of worker dose from monitoring and maintenance activities (person-rem)	0	800	0 (Removal) 800 (Close-In-Place)	2,000
1,000 years of dose to the offsite population from contaminant migration from the site (person-rem), assuming continuance of institutional controls	0 [a]	4,000	0 (Removal) 3,400 (Close-In-Place)	3,600
1,000 years of dose to the offsite population from contaminant migration from the site (person-rem), assuming loss of institutional controls after 100 years	0 [a]	4,000	0 (Removal) 3,400 (Close-In-Place)	40,000 [b]
1,000 years of dose to the offsite population from site monitoring and maintenance activities (person-rem)	0	2	0 (Removal) 2 (Close-In-Place)	80
Total population dose through 1,000 years (person-rem) [c]	1,300	5,000	1,300 (Removal) 4,500 (Close-In-Place)	5,700 – 42,000

[a] The population dose would be a small number; however, for this analysis, the dose is conservatively assumed to be zero.
[b] This population dose assumes failure of the Waste Tank Farm after 100 years. This assumption conservatively increases the estimated dose reduction for the decommissioning alternatives.
[c] The total population dose includes the dose incurred during the decommissioning actions and also during 1,000 years of follow-up monitoring and maintenance.
Note: Individual values as well as totals are rounded. Totals may not add exactly due to this rounding.

4.2.3 Cost-Effectiveness

The information given in the previous sections was used to estimate the total incremental population dose reduction to both workers and the public as a result of implementing each decommissioning alternative, the incremental cost to achieve this population dose reduction, and the incremental cost-effectiveness of the population dose reduction for each decommissioning alternative.

With the following simplifying and conservative assumptions, the analysis applies the principles identified in NRC guidance for conducting as low as is reasonably achievable (ALARA) analyses as presented in Appendix N of NUREG-1757, Volume 2, Revision 1 (NRC 2006):

- The cost estimate does not include a cost equivalence for worker and public fatalities during decommissioning activities and waste and material transportation. NRC guidance identifies a cost equivalence of $3 million per fatality (NRC 2006). If such a cost-equivalence for fatalities was considered, it would increase the effective cost for all alternatives, particularly the Sitewide Removal Alternative, and thereby increase the cost per avoided person-rem for all alternatives.

- Future radiation doses are not discounted. Discounting future radiation doses would decrease the magnitude of the future dose. This would reduce the estimate of the benefit (the avoided population dose), and would thereby increase the cost per avoided person-rem. The increase would be greatest for the Sitewide Removal Alternative which achieves a long-term avoided population dose at the price of a short-term population dose associated with decommissioning.

- The analysis does not consider the population dose that would occur over the short and long term at the disposal facilities to which waste from WNYNSC could be sent. If those population dose consequences were included in the analysis, they would add to the population dose associated with alternatives involving offsite waste disposal, thereby reducing the benefit (the avoided population dose) for these alternatives. The effect would be to increase the incremental cost per avoided person-rem for alternatives that involve offsite disposal of waste.

The analysis uses two estimates of avoided population dose: one based on the assumption that institutional controls remain in place and one based on the assumption that institutional controls are lost after 100 years. Use of the population dose that assumes continuance of institutional controls is considered to be consistent with the spirit of NEPA and SEQR which call for analysis of reasonably foreseeable consequences as well as consistent with the spirit of the NRC guidance which calls for as little bias as possible in ALARA analysis.

The results are given in **Table 4–57**. The first row in the table shows the estimated population dose reduction due to decommissioning. There is a range presented for each alternative. For the Sitewide Removal and Sitewide Close-In-Place Alternatives, the lower value is based on the assumption that institutional controls remain in place (data from Table 4–30), while the higher value is based on the assumption that institutional controls are lost after 100 years (data from Table 4–39). For the Phased Decisionmaking Alternative, two ranges are presented. The first range assumes the Phase 2 decision is removal for the Waste Tank Farm, NDA, and SDA, while the second range assumed the Phase 2 decision is in-place closure. The lower value in each range is based on the assumption that institutional controls remain in place, and the higher value is based on the assumption that institutional controls are lost after 100 years. The population dose reduction for the Sitewide Close-In-Place Alternative and the case where the Phase 2 decision for the Phased Decisionmaking Alternative is in-place closure do not take credit for the performance of the permeable treatment wall as discussed earlier.

The next three rows present the incremental cost necessary to implement an alternative using the differences between the present value for implementing the alternative and the present value for the No Action Alternative. Each of the rows presents the incremental cost based on a different discount rate as noted in Table 4–55. A range of costs is presented for the Sitewide Removal Alternative and for the Phase Decisionmaking Alternative where it is assumed that the Phase 2 decision is removal. The range is the result of different assumptions about the unit Greater-Than-Class C waste disposal cost as discussed for Table 4–55.

The last two rows of Table 4–57 present ranges of incremental cost-effectiveness for population dose reduction. The second-to-last row assumes perpetual continuance of institutional controls, while the last row assumes institutional controls are lost after 100 years. The range reflects the effect of the cost range presented in the three previous rows and the effect of the assumption about the presence or absence of institutional controls. For the Sitewide Removal Alternative, the lower cost-effectiveness value is associated with the higher real discount rate (5 percent) and the lower unit Greater-Than-Class C waste disposal cost. For the Sitewide Close-In-Place Alternative, the lower cost-effectiveness value is associated with the lower real discount rate. For the Phased Decisionmaking Alternative assuming Phase 2 is removal, the lower cost-effectiveness value is associated with the higher real discount rate, the lower unit Greater-Than-Class C disposal cost, and the assumption that Phase 2 actions are initiated 30 years after the Record of Decision documenting selection of the Phased Decisionmaking Alternative. Assuming Phase 2 is close-in-place, the lower cost-effectiveness value is associated with the lower real discount rate and the assumption that Phase 2 actions are initiated 30 years after issuance of the Phase 1 Record of Decision.

Table 4–57 Population Dose Reduction, Incremental Cost, and Cost-effectiveness for Each Action Alternative

Population Dose Element	Alternative			
	Sitewide Removal	Sitewide Close-In-Place	Phased Decisionmaking [b]	No Action
Total population dose reduction due to decommissioning actions (person-rem) [a]	4,400 – 41,000	700 – 37,000	4,400 – 41,000 1,100 – 38,000	The No Action Alternative is the baseline
Incremental cost to achieve the dose reduction (billions of present value dollars at 1 percent real discount rate)	3.6 – 5.7 [c]	0.2	2.9 – 5.6 [c] 0.5 – 0.6	The No Action Alternative is the baseline
Incremental cost to achieve the dose reduction (billions of present value dollars at 3 percent real discount rate)	2.6 – 4.0 [c]	0.6	1.6 – 3.8 [c] 0.7 – 0.9	The No Action Alternative is the baseline
Incremental cost to achieve the dose reduction (billions of present value dollars at 5 percent real discount rate)	1.9 – 2.8 [c]	0.7	1.0 – 2.6 [c] 0.7 – 0.9	The No Action Alternative is the baseline
Incremental cost-effectiveness, $ (present value) per avoided person-rem considering dose savings assuming continuance of institutional controls	430,000 – 1,300,000	210,000 – 950,000	230,000 – 1,300,000 450,000 – 760,000	The No Action Alternative is the baseline
Incremental cost-effectiveness $ (present value) per avoided person-rem considering dose savings assuming loss of institutional controls after 100 years	46,000 – 140,000	4,000 – 18,000	25,000 – 110,000 14,000 – 20,000	The No Action Alternative is the baseline

[a] The dose reduction for each alternative is the difference between the total alternative dose that is incurred during both the period of decommissioning actions and, if applicable, a 1,000-year period of subsequent monitoring and maintenance (refer to the last row of Table 4–56) and the total No Action Alternative dose.

[b] The first range assumes that Phase 2 would be removal of remaining waste and contamination; the second range number assumes in-place closure of remaining waste and contamination.

[c] The minimum value reflects a unit Greater-Than-Class C waste disposal cost of $2,300 per cubic foot; the maximum value reflects a unit Greater-Than-Class C waste disposal cost of $21,000 per cubic foot (WSMS 2009e).

Assuming institutional controls continue indefinitely, the Sitewide Close-In-Place Alternative has the lowest range of incremental cost-effectiveness, although portions of the ranges of incremental cost-effectiveness overlap for all action alternatives. Assuming institutional controls fail after 100 years, the Sitewide Close-In-Place Alternative has the lowest incremental cost-effectiveness range among the action alternatives.

The last two rows show that all of the decommissioning alternatives would cost much more than $2,000 per avoided person-rem and therefore appear to meet NRC's decommissioning ALARA requirement. In addition, ALARA considerations would not be expected to be a significant factor for discriminating among the decommissioning alternatives.

4.3 Incomplete and Unavailable Information

The NYSERDA View Indicates….

The Uncertainties in the Final EIS Long-Term Performance Analyses are not Adequately Presented or Discussed. The EIS does not address uncertainty in a manner that provides decisionmakers with information on the critical contributors to uncertainty or the importance of uncertainty in site cleanup decisions. In particular, NYSERDA concludes that a more comprehensive and transparent analysis and presentation of uncertainty is needed to support long-term decisionmaking for WNYNSC cleanup.

DOE's Response….

DOE fully recognizes the inherent and unavoidable uncertainty in long-term performance assessment. In Section 4.3.5, uncertainty in the estimates of environmental consequences for the various alternatives is acknowledged and incomplete or unavailable information that contributes to the uncertainty in the environmental consequence estimates is identified consistent with CEQ NEPA Regulations (Sec. 1502.22, Incomplete or unavailable information).

Recognizing the uncertainty, DOE has taken several actions to more fully inform decisionmakers. Where informative and useful upper and lower bounds can be established, DOE has developed and presented bounding analyses. The primary example of this is the bounding analysis for the reliability of institutional controls that maintain engineered barriers and limit access to the site. The long-term performance assessment addresses this uncertainty by analyzing scenarios in which institutional controls remain in effect (Section 4.1.10.3.1), institutional controls are lost (Section 4.1.10.3.2), and the special case in which the loss of institutional controls continues for hundreds of years and leads to unmitigated erosion (Section 4.1.10.3.3).

In instances where such bounding analysis is not possible or practical, moderately conservative values were used for parameters in the deterministic long-term performance assessment. The use of moderately conservative values for many of the individual parameters (e.g., lower distribution coefficients (K_d) and higher hydraulic conductivities) and the use of conservative conceptual models (e.g., no radionuclide removal in stream channels or from water treatment) produces overall consequence estimates that are considered to be conservative but still useful when trying to understand the consequences from specific source areas and for specific alternatives. Also, the models of physical processes such as hydrologic transport and erosion are based on theoretical approaches that are generally accepted by the scientific community as required by NEPA. The discussion of the conservatism in the various elements of the long-term performance assessment in Section H.2.2.1 has been expanded to more clearly articulate the conservatism in the overall dose estimates presented in this Final EIS.

DOE recognizes that several parts of the NYSERDA View call for comprehensive uncertainty analysis for the long-term performance assessment and acknowledges the value of such information it if were available. However, the development of probabilistic uncertainty analysis for the long-term dose estimates is not practical for this EIS. In particular, it is not possible at this time to provide defensible quantification of the uncertainty in parameters related to the nature and timing of future human actions that are important parameters in the quantification of future human health impacts.

Incomplete and unavailable information can introduce uncertainty into the consequence analyses presented in this chapter. This section discusses the nature of incomplete and unavailable information for those resource areas having the greatest impact, as identified at the beginning of this chapter. The resource areas and the sections of Chapter 4 where they are discussed are:

- Worker exposure (Section 4.1.9)
- Transportation (Section 4.1.12)
- Waste management (Section 4.1.11)

- Public health and safety during decommissioning actions (Section 4.1.9)
- Human health impacts resulting from long-term release and transport (Section 4.1.10)

The nature of the incomplete or unavailable information for each of these areas and the manner in which the environmental analysis dealt with this data limitation is discussed in the balance of this section. Consistent with the requirements of 40 CFR 1502.22, "Incomplete or Unavailable Information," the discussion includes: (1) information that is incomplete or unavailable, (2) relevance of the information to adverse impacts, (3) summary of existing credible scientific evidence to support evaluation, and (4) evaluation of impacts.

4.3.1 Worker Exposure

Of all EIS alternatives, worker exposure, would be greatest for the Sitewide Removal Alternative because workers would be involved in removing, packaging, and handling all onsite waste.

The exposure to workers carrying out decommissioning actions would depend on the extent and duration of worker exposure to radiation sources, primarily gamma sources. Information that is incomplete or unavailable at this time includes: (1) precise knowledge of the distribution of radionuclides in the waste, particularly the gamma emitters; (2) design details for the facilities that would be used for waste handling and processing; and (3) knowledge of how workers would be assigned during decommissioning actions.

Further characterization of the radionuclide distributions would only become available during the physical characterization effort prior to, or as part of, decommissioning. Further understanding of facility design or operator assignment would occur following the development of detailed designs and detailed operating plans, actions that would occur only for the selected EIS alternative.

Estimates of occupational exposure were developed using labor category-specific exposure rates and resource estimates for each of the labor categories. The category-specific exposure rates were established using historical WVDP occupational exposure information contained in DOE's Radiation Exposure Monitoring System to develop exposure rates specific to 11 labor categories. These exposure rates were used in conjunction with specific labor hour estimates to develop total occupational exposure estimates for the various decommissioning actions. The development of these exposure rates and labor estimates is discussed in a supporting technical report (WSMS 2009e).

The occupational exposure estimates are presented in Section 4.1.9, with the results summarized in Table 4–18. The table shows the total occupational exposure to complete a decommissioning alternative as well as the annual occupational exposure that would occur during any monitoring and maintenance period. A more-detailed breakdown of the estimates is contained in the technical report for each alternative (WSMS 2009a, 2009b, 2009c, 2009d).

The occupational exposure estimates are considered to be conservative because of the conservatism in the development of the labor category–specific exposure rates and the fact that no credit is taken for the decay of the gamma emitters that would be the largest contributors to worker dose (cesium-137 and cobalt-60). Active management controls would assure that occupational dose standards for individual workers are met.

4.3.2 Transportation

Of all EIS alternatives, transportation workers and public exposure during transportation would be greatest for the Sitewide Removal Alternative because all onsite waste would be removed, handled, and transported to offsite disposal locations.

The consequences of radioactive waste transportation depend on the extent and duration of worker and public exposure to radiation sources (i.e., waste) being transported during the decommissioning activities and the number and type of shipments that are related to the number of transportation accidents. Information that is incomplete or unavailable at this time for this consequence analysis includes: (1) precise knowledge of the distributions of radionuclides in the packaged waste, particularly the gamma emitters; (2) radiation dose from the waste package shipment arrays; (3) the transportation routes; and (4) the method of waste shipment (truck, rail, or a combination).

Further characterization of the radionuclide distributions would only become available during the physical characterization effort prior to, or as part of, waste packaging prior to shipment. Estimates of exposure to workers and the general public from incident-free transportation, as well as the consequences of accidents, were developed using methods, codes, and databases commonly used for transportation impact analysis. Assumptions about waste package inventory were conservative and resulted in conservative dose estimates. The radionuclide inventory assumed for each type of waste is the maximum radionuclide concentration that could be present from decontamination, demolition, or decommissioning of buried wastes in the NDA, SDA, or Waste Tank Farm. The subsequent surface dose rate for each type of waste was estimated using inventories of potential gamma emitters, with no credit taken for decay beyond September 2000.

The dose rates from arrays would be known more precisely when the packages are arranged for shipment. Also, details about shipment mode and route would be defined as part of implementing the selected alternative.

Uncertainty about disposal locations for low-level radioactive waste was addressed by considering two different waste disposal strategies (DOE-plus-commercial and commercial-only) and both eastern and western U.S. low-level radioactive waste disposal sites. Uncertainty about transportation method was addressed by considering both truck and rail shipments.

The doses and risks associated with waste transportation are presented in Section 4.1.12, with the results summarized in Table 4–53. A more-detailed breakdown of the estimates is presented in Appendix J of this EIS. The dose and risk estimates are considered to be conservative because no credit is taken for the decay of the gamma emitters (i.e., cesium-137 and cobalt-60) that are expected to control the incident-free dose estimates over the period of waste shipment for each alternative. The dose estimates are considered reasonable, however, because radiological inventory and external reduction estimates are made for each type of waste depending on its specific radiological characteristics.

4.3.3 Waste Management

Of all EIS alternatives, waste management consequences would be greatest for the Sitewide Removal Alternative because all waste would be removed, packaged, handled, and ultimately shipped offsite.

The consequences of radioactive waste management depend on the volume and characteristics of the waste that would be generated under each alternative and the actions that would be taken to manage the waste: storage or disposal. Information that is incomplete or unavailable at this time for this consequence analysis includes: (1) the volumes and characteristics of waste that would be generated under each alternative; and (2) the availability of disposal capacity for all waste, particularly commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, transuranic waste, and any high-level radioactive waste.

Estimates of waste volumes by category were developed in the technical reports for each alternative (WSMS 2009a, 2009b, 2009c, 2009d). The estimates are considered to be generally conservative from both the volume and waste category viewpoints. More-precise characterization of waste volumes and waste characteristics (e.g., categories) would become available as the waste is generated. Uncertainty about the availability of offsite waste disposal locations for Class B and C low-level radioactive waste, Greater-Than-

Class C waste, or non-defense transuranic waste was addressed by analyzing the transportation impacts of shipment of the waste to distant hypothetical disposal facilities. The EIS also analyzes the annual consequences of onsite storage of Class B and C low-level radioactive waste, Greater-Than-Class C waste, and non-defense transuranic waste for the Sitewide Removal Alternative in the event it is not possible to immediately ship this waste offsite as part of decommissioning actions.

The consequences of waste management are discussed in Section 4.1.11, with the results summarized in Tables 4–46 through 4–48.

4.3.4 Public Health and Safety During Decommissioning Actions

Of all EIS alternatives, public exposure during decommissioning is greatest for the Sitewide Removal Alternative because removing, packaging, and handling all onsite waste would result in the largest cumulative environmental release from decommissioning actions.

The dose and risk consequences for the public from decommissioning actions depend on the release of radionuclides to the local atmosphere and surface waters and the potential accidents that might occur during decommissioning operations and release radionuclides to the atmosphere or local surface waters. Information that is incomplete or unavailable at this time for this consequence analysis includes: (1) more precise information on radionuclides that would be released, and (2) the location and actions of future nearby critical receptors.

Further characterization of the radionuclides would only become available as the decommissioning actions are conducted. Information about accident details (how much is released, what form, where, meteorological or hydrologic conditions) would only become available if an accident were to occur.

Estimates of public exposure and subsequent risk for normal operations were developed using a standard code (GENII Version 2) for estimating doses from atmospheric and liquid releases. Estimates of public exposure and subsequent risk for potential accidents were also developed using a standard code for that type of analysis (MACCS2). Both codes and the methodologies are discussed in Appendix I of this EIS. Estimates of discharges to the atmosphere and surface water were developed in the technical reports for each alternative (WSMS 2009a, 2009b, 2009c, 2009d).

Public exposure and risk estimates are presented in Section 4.1.9, with the results summarized in Tables 4–12 through 4–22. The public exposure and risk estimates are considered to be conservative because of the conservatism in the development of the normal operations release estimate as well as the accident release estimate. A conservative element of the airborne release dose analysis is the neglect of radioactive decay. Many of the radioisotopes (tritium, cobalt-60, strontium-90, and cesium-137) have half-lives that are comparable to or shorter than the decommissioning action timeframe and would therefore decay to an appreciable extent. The analysis also conservatively assumes the individuals and populations breathe contaminated air all the time and that all the food consumed by the individuals and populations was exposed to contaminated air and water. The downstream population estimates are also conservative because no credit is taken for radionuclide removal as part of water treatment systems, and it was assumed that in addition to direct water consumption, the water would be used to irrigate a local garden. An additional conservative factor for downstream receptors is the assumption of contaminated fish consumption where there is immediate accumulation of radionuclides in the fish to levels that are consistent with long-term bioaccumulation factors. Public accident risk estimates include conservative assumptions regarding emergency response actions, radiological source terms, and meteorology.

4.3.5 Human Health Impacts Resulting from Long-term Release and Transport

The estimates of long-term doses and risk to individuals (see Section 4.1.10) result from a complex series of calculations that involve estimates of initial hazardous and radiological material inventory and form, estimates of rates for moving these constituents from their original location through the environment taking into account interactions between the various components of the environment (e.g., water, sediment, vegetation, and fish), and finally, estimates of human use of, or interaction with, the contaminated environment.

The major elements of incomplete or unavailable pieces of information that are used in these calculations are:

- Characterization of the amount, chemical form, and physical distribution of hazardous materials (radionuclides and toxic chemicals) in the various locations including contaminated soil and sediment, buried waste, buildings, and underground tanks. The analysis for the No Action Alternative assumes the material remains in its present form, while the analysis for the Sitewide Close-In-Place Alternative assumes modification of the waste form due to the addition of material such as grout.

- Characterization of engineered barriers and their performance over long periods of time. Engineered barriers considered in the analysis include grout that is intended to reduce the mobility of hazardous constituents, hydraulic barriers intended to reduce the flow of water to and from areas containing hazardous constituents, absorptive barriers (possibly part of hydraulic barriers) intended to reduce the hydrologic transport of hazardous constituents, and intrusion barriers intended to limit human intrusion into specific areas such as those containing high concentrations of hazardous materials.

- Knowledge of present site hydrology and how this could be modified by the engineering that would be conducted for each alternative.

- Knowledge of changes in climate, whether natural or human induced.

- Knowledge of present and long-term groundwater chemistry.

- Knowledge of the hydrologic release rates of hazardous materials from the various locations (release rates that could be influenced by water chemistry changes that could occur over time and by engineered barriers).

- Knowledge of erosion mechanisms and rates across various portions of the site, both of which can change with time and be influenced by human actions.

- Knowledge of the long-term erosion-driven release rates of hazardous materials that are a function of waste properties, waste-covering soil and rock properties, and climate.

- Knowledge of the form of hazardous constituents that are released to surface streams and how these constituents would interact with the surface water environment through processes such as adsorption or deposition.

- Knowledge of how plants and animals would come in contact with contaminated environmental media and would bioconcentrate hazardous constituents.

- Knowledge of timing and location of future human activities, including construction of wells in contaminated aquifers, the treatment and use of water from such wells, the consumption of foods (plants and animals) that have come in contact with contaminated media, and the construction and use of homes and gardens in contaminated settings.

Even though there is incomplete information, there is a substantial body of knowledge regarding these factors, which provides a basis for developing informative, comparative estimates of long-term consequences. The remainder of this section discusses how this incomplete or unavailable information is accounted for in the analyses.

Long-term dose estimates were developed using integrated site-specific release, transport, and consequence codes that build on:

- Available information on hazardous material inventory and form.
- Available site geologic and hydrologic information that was used to develop a sitewide three-dimensional hydrologic model.
- Available long-term site-specific erosion information that was used to calibrate two state-of-the-art landscape evolution models as a basis for the unmitigated erosion analysis.

The integrated models are considered to be consistent with theoretical approaches commonly accepted by the scientific community involved in environmental impact assessment. The results are presented in Section 4.1.10 with more detailed information presented in Appendix H. Additional details about the hydrologic and erosion modeling that support the long-term performance assessment are presented in Appendices E and F, respectively.

The integrated models are expected to provide conservative predictions for the receptors analyzed for several reasons. The models:

- Assume a moderate degree of degradation of hydraulic barriers (one order of magnitude for clay layers and two orders of magnitude for drainage layers), thereby increasing the rate of waste removal by hydrologic processes
- Assume conservative (low end of the spectrum) partitioning coefficients for materials for which there is no site-specific information, thereby increasing the rate of waste removal by hydrologic processes
- Take no credit for loss of hazardous material by adsorption or deposition processes after it enters surface streams, thereby increasing the concentration of hazardous materials in downstream waters
- Assume high bioaccumulation factors with no uptake rate limits, as well as different fish consumption rates for specific receptor locations, thereby increasing the concentration of hazardous materials in vegetation, animals, and fish
- Assume no water treatment that would reduce the concentration of hazardous material in drinking or irrigation water, thereby increasing the concentration of hazardous materials in water used for drinking or irrigation
- Assume no dilution of Cattaraugus Creek flow from the point of discharge into Lake Erie until it is mixed with the flow in the east channel of the Niagara River, thereby increasing the concentration of hazardous materials in the Niagara River

Appendix H, Section H.2.2.1, includes a more detailed discussion of the basis for considering the long-term dose consequence estimates to be conservative.

The uncertainty about future human actions is accommodated in the analysis by considering two bounding cases: one where institutional controls are assumed to be fully effective in maintaining engineered barriers and limiting access to the site, and one where institutional controls are assumed to be permanently lost and intruders are able to enter the site. For both cases, a range of potential future human receptors are analyzed; all of which are expected to be on the conservative end of the spectrum with respect to location and behavior. Specific details of implementation of the dose calculation that contribute to the conservative dose calculation include:

- Multiple pathways whenever it appears possible (e.g., house construction in contaminated soil, home garden in the contaminated soil, and well in the contaminated aquifer with the untreated water used for drinking and gardening)
- Use of high-end estimates for utilization rates (ingestion rates for drinking water and fish)
- Longer (conservative) exposure times for hunters and hikers

For this EIS, no credit is taken for any actions that could be taken to restore institutional controls, once assumed to be lost,[31] or mitigate the calculated impacts. This assumption is especially significant for exposure scenarios such as the unmitigated erosion scenario where the erosional processes are assumed to continue unchecked for potentially hundreds of years before offsite release of contamination through this scenario. Thereafter, the scenario is assumed to continue until the onsite contamination affected through propagation of the scenario is all released to the environment (another lengthy process). These assumptions are considered unlikely given the expected continuance of regulatory and public health institutions, Federal and state regulations such as those for monitoring public water supplies, and the ability to detect radionuclides in water and other environmental media.

The uncertainty about future climate is accommodated through sensitivity analysis and more conservative erosion predictions. Appendix H, Section H.3.1, of the EIS discusses the sensitivity of groundwater flow to changes in annual precipitation. The revised erosion prediction used in the Final EIS for the unmitigated erosion dose analysis is based on the assumption that storms occur more frequently than is currently estimated. This would include more frequent occurrence of storms like the one that occurred in the region on August 8-10, 2009. The use of this elevated precipitation associated with a higher erosion rate in the human health assessments is discussed in Appendix H, Section H.2.2.1.

4.4 Intentional Destructive Acts

The environmental impacts of intentional destructive acts (IDAs), also known as intentional malevolent acts or terrorist incidents, were analyzed at WNYNSC under each of the alternatives. The vulnerability of the site to IDAs is different under each of the decommissioning alternatives and the No Action Alternative. Two measures of IDA vulnerability are considered in this analysis: maximum potential IDA scenario consequences and overall vulnerability.

The results of the assessment are summarized in **Table 4–58**. The IDA having the maximum potential consequence, the energetic release of contamination from the high-level radioactive waste tanks in WMA 3, is the same for all the alternatives because the tanks exist for some period of time under all the alternatives. The assessment of overall vulnerability of the alternatives to IDAs considers waste handling and movements that are part of the alternative and affect the vulnerability of the material over time. (Overall vulnerability is a qualitative metric for the quantity of radioactive material at risk for a postulated IDA scenario coupled with the relative time period that this material would remain susceptible to an IDA at WNYNSC.) The results of the overall vulnerability assessment on a relative scale are shown in the last row of Table 4–58.

[31] Note that institutional controls are required at all radioactive and nonradioactive disposal facilities licensed or permitted under NRC, DOE, or EPA requirements.

Table 4–58 Impacts of Intentional Destructive Acts

	Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [a]	*No Action Alternative*
Maximum potential consequences on site	Dispersal of high-level radioactive waste tank inventory	Dispersal of high-level radioactive waste tank inventory	Dispersal of high-level radioactive waste tank inventory	Dispersal of high-level radioactive waste tank inventory
Maximum potential consequences during transportation	Dispersal of fuel and hardware drum and Greater-Than-Class C drum inventory	Dispersal of Greater-Than-Class C drum inventory	Dispersal of Greater-Than-Class C drum inventory	Dispersal of Class A box inventory
Overall vulnerability	High	Medium	Medium	Highest

[a] This assessment is based only on the consideration of Phase 1 decommissioning actions. The overall vulnerability could be higher after Phase 2 decommissioning actions are defined.

The potential impacts of IDAs are estimated by identifying and evaluating potential scenarios. The scenarios could involve larger release quantities or greater dispersion than those estimated for accidents in Section 4.1.9. Quantitative analysis of the IDA scenarios is presented in Appendix N of this EIS. Additional information on methodology and discussion of results is also presented in Appendix N.

The likelihood of these events and consequences may be mitigated by measures to: (1) reduce the probability of occurrence; (2) provide timely response to emergency situations; and (3) facilitate long-term recovery through long-term response actions including monitoring, remediation, and support for affected communities and their environment.

4.5 Cumulative Impacts

Council on Environmental Quality regulations define cumulative impacts as effects on the environment that result from implementing the Proposed Action or any of the alternatives when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR 1508.7). Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource irrespective of the proponent (EPA 1999a).

Cumulative impacts can result from individually minor but collectively significant actions taken over a period of time. Cumulative impacts can also result from spatial (geographic) and/or temporal (time) crowding of environmental disturbances (i.e., concurrent human activities and the resulting impacts on the environment are additive if there is insufficient time for the environment to recover).

The analysis of cumulative impacts for this EIS has shown that generally most other actions in the region do not add in a cumulative manner to those resulting from the decommissioning actions. The only exceptions are:

- The reasonably foreseeable activities at WNYNSC (shipment of existing waste inventories, removal of unnecessary facilities) will be largely completed before decommissioning starts, but there is the potential for some additional consequences. (See Section 4.5.2.)
- If constructed, the U.S. Route 219 freeway would reduce traffic on local U.S. Route 219 (a positive impact) but would disturb land, would change land use, could negatively impact ecological resources through habitat fragmentation, and would have local impacts on water quality as a result of construction and road surface runoff. The construction of the freeway would result in a noticeable addition to local employment. (See Section 4.5.3.)

- The construction of wind-powered electrical generation towers would disturb land, change land use, impact visual resources, and negatively impact wildlife (birds and bats). The construction and operation of these facilities would result in a noticeable addition to local employment. (See Section 4.5.3.)

The approach used to identify and estimate cumulative impacts for this *Decommissioning and/or Long-Term Stewardship EIS* was to:

- Review literature and contact individuals and organizations to identify recent and reasonably foreseeable actions at WNYNSC and in the region;
- Review available environmental documentation to understand the impacts of the actions identified at WNYNSC and in the region; and
- Describe the cumulative impacts of applicable activities.

Cumulative impacts were assessed by combining the potential effects of EIS alternative activities with the effects of other past, present, and reasonably foreseeable actions in the ROI. Some of these actions would occur at different times and locations, and may not be truly additive (cumulative). For example, the set of actions that impact air quality occur at different times and different locations across the ROI, and, therefore, it is unlikely that the impacts would be completely additive.

4.5.1 Past and Present Actions at the Western New York Nuclear Service Center

The impacts of past actions at WNYNSC have resulted in the affected environment, which is described in Chapter 3 of this EIS. The most important impact of past actions, which include spent reactor fuel storage, spent reactor fuel reprocessing, high-level radioactive waste vitrification, treatment and disposal of waste, and some decontamination and facility removal, is the presence of the facilities and residual contamination that are the scope of this EIS.

4.5.2 Reasonably Foreseeable Actions at the Western New York Nuclear Service Center

Reasonably foreseeable onsite actions at WNYNSC included in the cumulative impact analysis of this EIS are ongoing waste management, decontamination, and facility removal activities.

Waste treatment, storage, and disposal activities were evaluated in the *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (WVDP Waste Management EIS)* (DOE 2003e) and the *West Valley Demonstration Project Waste Management Environmental Impact Statement, Supplement Analysis, Revised Final*, prepared in 2006 (DOE 2006b). The *WVDP Waste Management EIS* was prepared to determine how DOE should disposition the operations and decontamination wastes that are in storage or will be generated over a 10-year period. In the Record of Decision for the *WVDP Waste Management EIS* (70 FR 35073), DOE decided to partially implement Alternative A: offsite shipment of high-level radioactive waste, low-level radioactive waste, mixed low-level radioactive waste, and transuranic waste for disposal. Consistent with the *Waste Management Programmatic EIS High-Level Waste* Record of Decision (64 FR 46661), DOE will safely store canisters of vitrified high-level radioactive waste at WNYNSC until disposition decisions are made and implemented. DOE is deferring a decision on the disposal of WVDP transuranic waste, pending a decision supported by the *GTCC EIS*, currently in preparation, which will address disposal of Greater-Than-Class C and non-defense transuranic waste. DOE will ship low-level radioactive waste and mixed low-level radioactive waste off site for disposal. DOE did not evaluate hazardous and nonhazardous waste management in the *WVDP Waste Management EIS*.

The disposal of 36 surplus facilities no longer needed to support WVDP activities was evaluated in the *Final Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the*

West Valley Demonstration Project (DOE 2006c). This environmental assessment examined the environmental impacts of decontaminating, dismantling, removing, and disposing of these facilities.

Most of these actions are expected to be completed prior to the start of decommissioning actions. Only moderately small volumes of waste, some of which is orphan waste, are likely to remain on site. The impacts of managing this waste would add to the impacts of managing decommissioning waste.

The reasonably foreseeable onsite actions at WNYNSC that are included in the cumulative impact analysis of this EIS are summarized in **Table 4–59**. Future actions that are speculative or not well defined were not analyzed, including the future use of WNYNSC.

Table 4–59 Reasonably Foreseeable Onsite Actions at the Western New York Nuclear Service Center

Activity	*Description*
Waste treatment, storage, and disposal	Low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, and high-level radioactive waste currently stored at WNYNSC would be packaged for shipment off site for treatment and disposal (DOE 2003e, 2006b) (70 FR 35073).
Dispose of 36 surplus facilities	Thirty-six facilities that are no longer needed (some lightly contaminated) are being decontaminated, dismantled, removed, and disposed of over a 4-year period (DOE 2006c).
Completion of EIS starting point actions	The major actions that are part of achieving the EIS starting point identified in Chapter 2 are: (1) installation of a geomembrane cover over the NDA, (2) installation of a permeable treatment wall on the leading edge of the North Plateau Groundwater Plume, (3) installation of the Waste Tank Farm tank and vault drying system, and (4) decontamination of the Main Plant Process Building so that it is demolition ready.

NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, WNYNSC = Western New York Nuclear Service Center.

4.5.3 Other Reasonably Foreseeable Actions in the Region

Regional actions that could contribute to cumulative effects could include future state or local development initiatives, new industrial or commercial ventures, new utility or infrastructure construction and operations, new waste treatment and disposal facilities, and new residential development. Data were collected from the Village of Springville and Town of Ellicottville; the counties of Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Niagara, and Wyoming in New York; and the counties of McKean, Potter, and Warren in Pennsylvania regarding anticipated future activities that could contribute to cumulative impacts. The Village of Springville (Kaleta 2008); Allegany, Livingston, and Niagara Counties in New York (Ferrero 2008, Fisk 2008, Risky 2008); and McKean, Potter, and Warren Counties in Pennsylvania (Dietrich 2008, Glotz 2008, Lunden 2008) did not identify any major future actions that are expected to contribute to cumulative impacts at WNYNSC. Activities identified in the region surrounding WNYNSC include:

- Continued fast-paced development in the northern and mid-county region of Erie County, New York (Opalka 2008), approximately 28 kilometers (17 miles) north of WNYNSC.
- Redevelopment of Lake Erie waterfront areas in the cities of Buffalo and Lackawanna, New York (Opalka 2008), approximately 38 kilometers (24 miles) north of WNYNSC.
- Erie County Water Authority service extensions in southern Erie County (Opalka 2008).
- Residential development around the two ski resorts in the towns of Ellicottville and Mansfield, Cattaraugus County, New York (Isaacson 2008, Horowitz 2008), approximately 17 kilometers (11 miles) south of WNYNSC.

- Conversion of the Laidlaw Power Plant in Ellicottville, Cattaraugus County, New York, from natural gas to clean wood chips. The facility would process approximately 63,503 metric tons (70,000 tons) of clean wood waste per year and annually generate 50 million kilowatt-hours of electricity (Isaacson 2008), approximately 16 kilometers (10 miles) south of WNYNSC.

- Electrical generation project at the Chautauqua County Landfill (Moore 2008), approximately 58 kilometers (36 miles) southwest of WNYNSC.

- Proposed wind farm developments in Allegany, Chautauqua, Erie, Genesee, and Wyoming Counties (E&E 2006; Noble Allegany Windpark, LLC 2008; Noble Wethersfield Windpark, LLC 2007; Opalka 2008; Town of Alabama 2008; Town of Arkwright 2009; Town of Perry 2009), between 26 kilometers (16 miles) and 72 kilometers (45 miles) from WNYNSC.

Because of the distance from WNYNSC and the localized environmental effects of these actions, they are not expected to interact with WNYNSC activities to produce cumulative impacts.

Additional information about future activities that could contribute to cumulative impacts was collected from the U.S. Forest Service, U.S. Department of Defense, EPA, U.S. Army Corps of Engineers, NYSDEC, and New York State Department of Transportation. Portions of the Allegheny National Forest in McKean and Warren Counties, Pennsylvania, are within 80 kilometers (50 miles) of WNYNSC. A number of activities were identified that are expected to occur within the Allegheny National Forest during the period of analysis for this EIS. These include land management; vegetation management (including fuels management and overstory removal); watershed management (including management of wildlife, fish, and rare plants); road, recreation, heritage, and scenery management; minerals management (including construction and operation of oil and gas wells and pipelines); and forest products management (USFS 2008). Because these activities are farther than 48 kilometers (30 miles) from WNYNSC, are largely the continuation of ongoing activities in the Allegheny National Forest, and produce only localized environmental effects, they are not expected to interact with WNYNSC activities to produce cumulative impacts.

In May 2005, the U.S. Department of Defense announced its latest round of base realignment and closures (AFIS 2005, DoD 2005). Base realignment and closure can impact areas around military facilities by changing direct and indirect employment and through other activities that produce environmental impacts. The Navy Recruiting District Headquarters in Buffalo, New York, is the only military facility in the WNYNSC ROI that would be affected. Closure of this facility is expected to result in the loss of 53 jobs (37 direct and 16 indirect) in the region (DoD 2005). Because this facility is over 48 kilometers (30 miles) from the WNYNSC boundary, no cumulative impacts are expected.

The EPA National Priorities List (also known as Superfund sites) was reviewed to determine whether these sites could contribute to cumulative impacts at WNYNSC (EPA 2007a, 2007b). Nine active National Priorities List sites are located within 80 kilometers (50 miles) of WNYNSC. The closest National Priorities List site is the Peter Cooper site near Gowanda, New York, approximately 19 kilometers (12 miles) west of WNYNSC. The State of New York also actively pursues cleanup of contaminated sites through the State Superfund, Environmental Restoration, Brownfield Cleanup, and Voluntary Cleanup Programs (NYSDEC 2006c, 2008d). There are over 300 State of New York sites in counties within 80 kilometers (50 miles) of WNYNSC. Of these, 24 sites are located in Cattaraugus County, and 143 sites in Erie County. Most of the sites in Erie County are located in the Buffalo metropolitan area. The three State of New York sites closest to WNYNSC are:

- Machias Gravel Pit site near Machias, New York, in Cattaraugus County, approximately 10 kilometers (6 miles) southeast of WNYNSC;

- CID Landfill, Inc., site near Sardinia, New York, in Cattaraugus County, approximately 14 kilometers (8.7 miles) northeast of WNYNSC; and
- Signore, Inc. site in Ellicottville, New York, in Cattaraugus County, approximately 16 kilometers (9.9 miles) south of WNYNSC.

In addition to being at some distance from WNYNSC, most of these EPA Superfund and State of New York sites are well into the control and cleanup process, and, therefore, are not expected to contribute to cumulative impacts.

Seven sites in the ROI have been, or are being, remediated under the Formerly Utilized Sites Remedial Action Program (USACE 2008a, 2008b). This program was initiated in 1974 to identify, investigate, and clean up or control sites that were part of the nation's early atomic energy and weapons programs. Because these seven sites are not an imminent hazard to persons living near them, are located between 56 and 80 kilometers (35 and 50 miles) north-northwest of WNYNSC, and most are well into the control and cleanup process, they are not expected to contribute to cumulative impacts at WNYNSC.

NYSDEC leases oil and gas development rights on state lands. All parcels offered for lease in 2006 are outside the 80-kilometer (50-mile) radius of WNYNSC (NYSDEC 2006b), and, therefore, are not expected to add to cumulative impacts.

There are plans for six wind projects that could be constructed in the next few years within 80 kilometers (50 miles) of WNYNSC (AWEA 2007, Horizon 2008, Noble 2008). These projects are:

- Dairy Hills Wind Farm in Wyoming County (Town of Perry 2009), approximately 63 kilometers (40 miles) northeast of WNYNSC;
- Arkwright Wind Farm in Chautauqua County (Town of Arkwright 2009), approximately 46 kilometers (29 miles) west of WNYNSC;
- Alabama Ledge Wind Farm in Genesee County (Town of Alabama 2008), approximately 75 kilometers (45 miles) north of WNYNSC;
- Allegany Wind Park in Allegany County (Noble Allegany Windpark, LLC, 2008), approximately 26 kilometers (16 miles) east of WNYNSC;
- Bliss Wind Park in Wyoming County (E&E 2006), approximately 27 kilometers (17 miles) northeast of WNYNSC; and
- Wethersfield Wind Park in Wyoming County (Noble Wethersfield Windpark, LLC, 2007), approximately 54 kilometers (34 miles) northeast of WNYNSC.

These projects would involve the construction of 375 wind turbines generating a total of 634 megawatts of electricity. The projects would disturb land (708 hectares [1,749 acres] for all the projects) and result in visual impacts (375 turbines, each approximately 120 meters [400 feet] tall, and each with three 90-meter [290-foot] rotating blades). In addition, there are a number of cell phone towers in proximity to WNYNSC, most along the U.S. Route 219 corridor (MOBILEDIA 2007). Cellular phone towers are generally 15 to 61 meters (50 to 200 feet) high (FCC 2006) and are often visible from some distance. Wind turbines and cell phone towers are considered in the cumulative impact analysis.

Information on transportation projects was collected to determine if major projects could impact the region around WNYNSC. A number of transportation projects are ongoing or planned (EFLHD 2008; NYSDOT 2008a). Most of these are relatively minor maintenance, upgrade, and resurfacing projects; and some are more substantial improvement, reconstruction, and rehabilitation projects. Only the proposed U.S. Route 219 Springville to Salamanca freeway (USDOT and NYSDOT 2003b) would involve the disturbance of substantial areas of land near WNYNSC. The nearest portion of the proposed new U.S. Route 219 freeway lies approximately 1.5 kilometers (0.93 miles) from the western boundary of WNYNSC. This project is considered in the cumulative impact analysis.

On August 18, 2009, the Federal Highway Administration (FHWA) issued a notice to advise the public that a Supplemental Environmental Impact Statement (SEIS) will be prepared for the U.S. Route 219 Springville to Salamanca freeway project (74 FR 41781). The SEIS will address the segment of U.S. Route 219 between the Town of Ashford and Interstate 86 near the City of Salamanca, in Cattaraugus County, New York. The New York State Department of Transportation and FHWA concluded that an SEIS for this portion of the project was required due to a significant increase in the area of identified wetlands in the project corridor, and observed changes in traffic growth rates for some segments of existing U.S. Route 219 that may influence the safety and operational characteristics of the alternatives previously identified in the freeway project EIS (USDOT and NYSDOT 2003b). These issues will be evaluated through the development of an SEIS.

4.5.4 Results of the Cumulative Impact Analysis

The following resource areas have the potential for cumulative impacts: land use and visual resources, site infrastructure (i.e., electricity, natural gas, and water use), geology and soils, water resources, air quality and noise, ecological resources, cultural resources, socioeconomics, public health and safety, occupational health and safety, waste management, transportation, and environmental justice. The level of detail provided for each resource area is dependent on the extent of the potential cumulative impact. Many resource areas did not require a detailed analysis because of minimal or localized impacts from WNYNSC operations and an assessment that, cumulatively, there would be no appreciable impacts to these resource areas.

4.5.5 Land Use and Visual Resources

Land Use – The reasonably foreseeable actions and the decommissioning alternatives at WNYNSC would largely occur within the disturbed portion of the site. Only remediation of the Cesium Prong and implementation of erosion control measures would occur outside the disturbed area.

If constructed, the new U.S. Route 219 freeway would not disturb land on WNYNSC, but would disturb 98.2 hectares (243 acres) of agricultural land, 46.5 hectares (115 acres) of urban land, 16.4 hectares (40.5 acres) of water and wetlands, 306 hectares (755 acres) of forest, and 74.5 hectares (184 acres) of old fields, for a total of 541 hectares (1,337 acres). The freeway would also require the relocation of 63 residences (35 houses and 28 mobile homes) and 1 business, and would affect 19 major farm operations. In addition, it was estimated that future development of land around the freeway interchanges could consume another 191.8 hectares (474 acres) (USDOT and NYSDOT 2003b). As described in Section 4.5.3, the 6 wind farms could disturb 714 hectares (1,765 acres) of land in the ROI.

Continued development in the ROI is likely to convert additional forested and agricultural land to residential, commercial, industrial, and infrastructure uses. As described in county planning documents, development would be centered on the towns and cities in the ROI, particularly the Buffalo Metropolitan Area (Cattaraugus 2001, 2006e; Erie-Niagara 2006).

Therefore, the potential changes to land use under WNYNSC decommissioning alternatives would be a very small portion of the potential changes expected in the region and would not be expected to exacerbate cumulative impacts to land use.

Visual Resources – Implementation of WNYNSC decommissioning alternatives could result in an increase in construction and demolition activities as new buildings are built and old buildings demolished. This new construction would not change the current VRM Class IV rating of the disturbed portion of the site. Under some alternatives, contaminated facilities, soil, and groundwater would be removed. Most of these activities would take place within the disturbed portion of WNYNSC and would have minimal further negative visual impact. However, remediation of areas of the Cesium Prong and implementation of erosion control measures located outside the disturbed area, while temporary, would be visible from nearby public vantage points, NY Route 240, or higher elevations. Upon completion of restoration activities, these areas would be graded and reseeded to stabilize exposed soils. At this stage, these areas would no longer appear industrial and would become more consistent with a higher VRM rating (VRM Class II or III), where the natural landscape would play a more prominent role.

Cumulative visual impacts such as diminished viewsheds and increases in artificial light from residential, industrial, and commercial development on previously undeveloped land could occur. A total of 44 sensitive viewpoints for the proposed new U.S. Route 219 freeway were identified based on the potential for visual impact. Visual ratings for the proposed new freeway range between negligible and severe. Many of the sensitive viewpoints rated as strong are grouped near settlements where freeway improvements may include structures, interchanges, or major cut/fill slopes, and where high landscape quality now exists. The proposed new freeway would be visible only from a small northern portion of WNYNSC along Buttermilk Creek and therefore should not substantially contribute to cumulative impacts to visual resources at WNYNSC (USDOT and NYSDOT 2003b).

The construction of the 6 wind energy projects in the ROI could result in the operation of 375 wind turbines. These 120-meter (400-foot) tall structures with 90-meter (290-foot) rotating blades would be visible from some distance. Studies performed to assess the environmental impacts of operation of the wind farms typically analyze visual resource impacts within an 8-kilometer (5-mile) radius of the wind turbines. Beyond this distance, these studies assume that natural conditions of atmospheric and linear perspective significantly mitigate most visual impacts (Town of Arkwright 2009). None of the proposed wind farms is within 8 kilometers (5 miles) of the WNYNSC boundary.

There are a number of cellular phone towers in proximity to WNYNSC, most along the U.S. Route 219 corridor (MOBILEDIA 2007). Cellular phone tower construction is likely to continue in the ROI as cellular phone providers upgrade and fill in gaps in their service areas. Cellular phone towers are generally 15 to 61 meters (50 to 200 feet) high (FCC 2006) and are often visible from some distance. New towers could contribute to cumulative visual impacts in the region near WNYNSC.

Although the decommissioning activities evaluated in this EIS could produce short-term adverse impacts on the visual environment that could add to cumulative impacts, over the long-term, decommissioning would have beneficial effects by reducing the presence of visually intrusive manmade structures at WNYNSC. The visual impact changes associated with WNYNSC decommissioning alternatives would be a very small portion of the potential changes expected in the region from other projects.

4.5.6 Site Infrastructure

For any of the alternatives, the demand for site utilities (e.g., electricity, fuel, and water) during decommissioning would not be additive to the reasonably foreseeable actions at WNYNSC because most of the reasonably foreseeable actions would occur prior to decommissioning. Therefore, there would be no cumulative impacts on the site utility infrastructure.

The projected traffic on the main roads around WNYNSC (NY Route 240 and U.S. Route 219) would be within the capacity of these roads, even for Sitewide Close-In-Place Alternative activities, which would produce the greatest traffic increases. Most of the reasonably foreseeable actions at WNYNSC would occur prior to the decommissioning actions, and therefore would not add to the local traffic impacts.

If constructed, the U.S. Route 219 freeway project will link the existing U.S. Route 219 expressway near Springville to the Southern Tier Expressway, and will provide continuous freeway access with reduced travel time and increased safety from the Buffalo Metropolitan Area to many of the communities on the Southern Tier. The new road will divert most of the truck traffic and long-distance vehicle trips that currently use U.S. Route 219 and is estimated to reduce traffic on the existing road by 2,770 vehicle trips per day near Ashford. As part of proposed construction of the U.S. Route 219 freeway, three minor roads near Ashford will be dead-ended: Neff Road, Rock Springs Road, and Scoby Hill Road. Traffic on the proposed new freeway is estimated at 18,090 vehicle trips per day near Ashford (USDOT and NYSDOT 2003b, WIVB 2008). Therefore, traffic impacts of decommissioning activities at WNYNSC would be overshadowed by the impacts of construction and operation of the proposed new freeway, and would not contribute substantially to cumulative impacts in the region.

4.5.7 Geology and Soils

Construction of new facilities and engineered barriers for WNYNSC decommissioning would require use of geologic materials such as gravel, sand, clay, and soil. The geologic materials required for the reasonably foreseeable actions at WNYNSC (approximately 425 cubic meters [556 cubic yards]) are essentially negligible compared to the materials required for reasonably foreseeable decommissioning actions (up to 2,200,000 cubic meters [2,900,000 cubic yards] for the Sitewide Close-In-Place Alternative). Therefore, there would be no cumulative impacts from the use of geologic materials at WNYNSC.

4.5.8 Water Resources

Surface Water – Implementation of decommissioning activities would result in minor short-term impacts on water quality from permitted discharge of treated water. Most treated water discharge from reasonably foreseeable actions at WNYNSC would occur prior to decommissioning activities. Decommissioning activities at WNYNSC would not substantially contribute to adverse cumulative impacts to surface water resources, and would generally produce long-term beneficial results after decommissioning.

The Peter Cooper National Priorities List site is approximately 19 kilometers (12 miles) west of WNYNSC on Cattaraugus Creek. Landfill wastes from this former glue and industrial adhesives manufacturing facility contain elevated levels of chromium, arsenic, zinc, and some organic compounds. In some areas, contaminated leachate is seeping into Cattaraugus Creek (EPA 2006b). Current surface water discharges from WNYNSC to Cattaraugus Creek are very small, and future releases under the decommissioning alternatives are also expected to be very small. These releases would not be expected to have cumulative impacts with the Peter Cooper site. Although releases under the unmitigated erosion scenario are larger, the maximum impacts from the unmitigated erosion scenario would occur in the future after remediation at the Peter Cooper site is scheduled to be completed.

If constructed, the new U.S. Route 219 freeway will traverse 45 perennial and 83 intermittent streams. The proposed new freeway will bridge all of the major creeks, and will result in minimal disturbance to the creek bottoms. All the smaller tributaries will be culverted, which will lead to considerable disturbance to the tributary bottoms. Temporary sedimentation impacts will occur as a result of the construction of culverts, resulting in increased downstream turbidity and increased instream siltation. Erosion control structures (i.e., silt fencing and hay bales) will be used during construction to minimize instream sedimentation. Additionally, adjacent banks will be revegetated or lined with rip-rap to minimize additional sedimentation during operation of the freeway. These actions will result in temporary impacts on water resources that will subside once construction activities are complete. All bridges and culverts for the proposed new U.S. Route 219 freeway will be designed to minimize impacts on floodplains (USDOT and NYSDOT 2003b).

Pollutants from highway use and maintenance, as well as air pollutants from other sources, will accumulate on highway surfaces. These pollutants are carried from the highway surface to adjacent waters by runoff from rainfall and melting snow and ice. Based on current deicing procedures, some localized impacts on surface waters adjacent to the proposed new freeway are likely to occur due to increased chloride concentrations in runoff. The projected lead and zinc concentrations for these drainage basins are projected to be below EPA's acute criteria for the protection of aquatic life.

Stormwater management facilities will be incorporated in the design of the proposed new U.S. Route 219 freeway to mitigate impacts on surface waters resulting from peak flow, first flush, and pollutant loading. Potential impacts on surface water quality due to the introduction of pollutants such as chloride and copper will be mitigated by controlling the runoff from the highway surface and directing the flow to water bodies less susceptible to degradation. For example, redirecting the runoff into streams having higher rates of flow will result in the contaminants being more diluted and less likely to impact the overall water quality of the stream. In addition, grass-covered swales and drainage ways incorporated into the final design of the highway will be used to reduce total suspended solids. If constructed, the freeway will increase the amount of impervious surface area in the drainage basins crossed by only 0.08 percent (USDOT and NYSDOT 2003b).

Overall, surface water impacts of decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

Groundwater – The decommissioning actions would generally improve groundwater quality for the most accessible groundwater source in the disturbed area, the North Plateau Groundwater Plume. The other reasonably foreseeable actions at WNYNSC would not impact groundwater quality.

The U.S. Route 219 freeway project potentially could impact both the quantity and quality of the groundwater near the proposed new freeway. Groundwater quantity impacts evaluated include changes in discharges to wetlands and the water table due to cut-and-fill operations and the addition of impervious road surfaces. Quantity impacts are expected to have a minimal regional effect on the supply of groundwater within the project area, and therefore, are not likely to add to the cumulative effects of decommissioning activities at WNYNSC (USDOT and NYSDOT 2003b).

Groundwater quality impacts evaluated for the proposed new U.S. Route 219 freeway include those due to deicing salt, increased vehicular pollutants, and construction activities. The primary concerns for impacts on groundwater quality arise from the use of road deicing salts and vehicular pollutants such as copper, lead, and zinc. Impacts on groundwater quality, though small, may be long term. Estimates show that even with the chloride added to the environment by maintenance of the proposed new freeway, groundwater concentrations would not exceed 250 milligrams per liter, the maximum allowable chloride concentration in drinking water set by NYSDEC. Calculations also indicate that no adverse impacts on groundwater from vehicular pollutants, including copper, lead, and zinc, are expected (USDOT and NYSDOT 2003b). Therefore, cumulative groundwater impacts with decommissioning activities at WNYNSC are unlikely.

Overall, groundwater impacts from decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

4.5.9 Air Quality and Noise

Air Quality – Decommissioning actions would result in temporary, small, and localized impacts on air quality. Air quality standards for carbon monoxide, nitrogen oxides, and sulfur oxides would not be exceeded at the WNYNSC boundary or along public roadways. Emission of fugitive dust could result in exceedance of particulate matter standards. The impacts on air quality from reasonably foreseeable activities at WNYNSC would be less than those from decommissioning actions and would occur earlier in time; hence, they would not be additive.

Annual emissions of greenhouse gases in the form of carbon dioxide were estimated for each alternative and compared to the total U.S. emissions of carbon dioxide in 2005 (EPA 2007d). These emissions ranged from 73 metric tons (80 tons) per year under the No Action Alternative to 5,700 metric tons (6,300 tons) per year under the Sitewide Removal Alternative, representing from 0.000001 percent under the No Action Alternative to 0.00009 percent under the Sitewide Removal Alternative, of U.S. emissions in 2005. These emissions would make a small incremental contribution to cumulative impacts on global climate change.

The proposed new U.S. Route 219 freeway is included in the Transportation Improvement Program, which was found to conform to the State Implementation Plan. Therefore, the project will not interfere with the area's progress toward achieving the air quality goals of the State Implementation Plan (USDOT and NYSDOT 2003b).

As described in Section 4.5.3, the EPA National Priorities List sites (EPA 2007a, 2007b) and the State of New York cleanup sites (NYSDEC 2006c, 2008d) are distant to WNYNSC, and most of these sites are well into the control and cleanup process. Therefore, toxic pollutant emissions from these sites are not expected to substantially contribute to cumulative toxic air pollutant concentrations near WNYNSC. Cumulative impacts of radiological air pollutants are discussed in Section 4.5.13.

Overall, air quality impacts of decommissioning activities at WNYNSC would be small, and would not contribute substantially to cumulative impacts in the region, except possibly for particulate matter.

Noise – Decommissioning activities for the three decommissioning alternatives would result in some increase in noise levels from construction and demolition equipment. If multiple pieces of equipment were operating at the same time, the noise levels at the nearest residences are expected to be audible above background sound levels in the area. Truck or rail traffic traveling to and from the area as part of decommissioning activities would also contribute to noise impacts.

Noise from these and other activities near the WNYNSC boundary would occur during daytime hours and could be a source of annoyance to nearby residents. During many of the closure activities, there would be no change in day/night average sound levels and noise impacts on the public outside of WNYNSC, except for noise attributable to construction employee vehicles and trucks hauling materials and waste.

Most reasonably foreseeable activities at WNYNSC would occur before decommissioning, would have lower noise levels (DOE 2006c), and would not contribute to cumulative noise impacts.

Short-term noise increases are expected due to construction of the proposed new U.S. Route 219 freeway. However, with construction activities likely taking place only during the day, the increased noise will likely not be perceived as severe. Mitigation measures such as source control, site control, time and activity constraints, and community awareness can be incorporated to reduce construction noise impacts (USDOT and NYSDOT 2003b).

Compared to existing conditions, noise levels due to traffic on the proposed new U.S. Route 219 freeway are expected to be greater in areas adjacent to the proposed new freeway. It is estimated that 573 properties would be impacted by noise from the proposed new freeway. A reduction in noise levels is expected adjacent to the existing U.S. Route 219 due to the expected diversion of traffic to the proposed new freeway (USDOT and NYSDOT 2003b).

Overall, noise impacts from decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

4.5.10 Ecological Resources

Construction, operations, and demolition actions that are part of the decommissioning alternatives would occur primarily in previously disturbed areas and would result in localized short-term disruptions. Impacts of decommissioning actions would be minimized by controlling the timing of the actions as well as the extent of the area disturbed at any one time.

Reasonably foreseeable actions at WNYNSC would occur primarily within the disturbed area. Because these actions would be conducted in the disturbed area, they would have minimal impact on ecological resources.

If constructed, the new U.S. Route 219 freeway would contribute to habitat fragmentation, a process whereby a large continuous area of habitat is both reduced in area and divided into two or more fragments. Even though roads can occupy only a small fraction of the land area, they contribute to fragmentation by dividing previously larger habitats into two or more smaller ones. The influence of habitat fragmentation can extend far beyond the immediate road boundaries. When completed, the proposed new freeway will have disturbed 541 hectares (1,337 acres) of land along its 45-kilometer (28-mile) length. Based on the desire to avoid urban centers and significant agricultural parcels, approximately 306 hectares (756 acres) of forest communities will be disturbed by the proposed new freeway. Although some relatively mature forest stands will be impacted by the project, for the most part, the forest stands to be traversed are already disturbed and fragmented.

If the U.S. Route 219 freeway is constructed, the creation of the freeway corridor through existing ecological communities will result in increased road kill. A number of options to minimize the frequency of road kill to various wildlife species will be considered during the final design phase of the project in consultation with wildlife resource agencies. A variety of wildlife crossings, including enlarged culverts, additional culverted crossings, modified span-type bridges, and enlarged medians, will be considered to maximize opportunities for safe wildlife crossings, to allow for greater connectivity of habitat, and to potentially reduce the risks of collisions with wildlife attempting to cross roadways (USDOT and NYSDOT 2003b). Projections of changes in animal mortality from vehicle collisions were not provided in the final EIS for the proposed U.S. Route 219 freeway.

Completion of the six wind energy projects planned for the ROI would result in the loss of birds and bats from the rotating blades of the turbine. Studies have indicated an average mortality rate for the United States of 2.3 birds and 3.4 bats per turbine per year (NWCC 2004). Projection of these rates to the 375 turbines planned for the ROI would result in the loss of approximately 860 birds and 1,300 bats each year. Studies conducted at wind farms in the eastern United States have indicated that bird and bat mortality may be locally higher. Bird mortality may be 2 to 4 times higher locally, and bat mortality up to 10 times higher (Arnette et al. 2006, Fielder et al. 2007, Jain et al. 2007).

Decommissioning activities at WNYNSC would directly impact a maximum of 2.8 hectares (7.0 acres) of wetlands under the Sitewide Removal Alternative (see Section 4.1.6). Indirect impacts on other wetlands could occur due to sedimentation resulting from erosion of disturbed soils upslope from wetlands. Prior to the disturbance of any jurisdictional wetland, a Section 404 permit would be acquired from the U.S. Army Corps of Engineers. In the case of disturbance to a New York State Freshwater Wetland, a permit would be acquired from NYSDEC. Additionally, a mitigation plan would be developed with mitigation options ranging from the re-establishment of those areas impacted to the creation of new wetlands, either on or off site. Best management practices, including erosion and sediment controls, would be implemented during all remediation work to prevent indirect impacts.

If the U.S. Route 219 freeway is constructed, a total of 13.0 hectares (32.1 acres) of jurisdictional wetlands (the majority of which are small, isolated, low-quality emergent wetlands) will be lost. Twenty-eight wetlands totaling 4.4 hectares (10.8 acres) will be impacted within the Cattaraugus Creek drainage basin. Additional wetlands will be created at a 2 to 1 ratio to mitigate these impacts (USDOT and NYSDOT 2003b).

Measurable impacts on plant and animal populations on or off site are not expected as a result of the incremental increase in exposure to radionuclides or chemicals that would result from the decommissioning alternatives analyzed in this EIS. Additional deposition resulting from the alternatives analyzed in this EIS would not lead to levels of contaminants that would exceed the range of concentrations historically reported in the annual site environmental surveillance reports.

Overall, ecological impacts from decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region. The other activities in the region, particularly the proposed construction of the U.S. Route 219 freeway and the construction of wind turbines, would have much greater impact on the ecosystem as a result of habitat fragmentation, road kill, and bird/bat fatalities from turbine blades.

4.5.11 Cultural Resources

The majority of decommissioning activities on WNYNSC would occur within previously disturbed areas contained within or adjacent to developed areas. The likelihood that these areas contain cultural materials intact or in their original context is small. Standard measures to avoid or minimize the impacts on cultural materials discovered during site development are in place. Further, cultural resource surveys would be performed prior to construction or surface disturbance in previously undisturbed areas, and appropriate standard measures, such as avoidance or scientific documentation and Tribal consultation, would be implemented if resources are found.

If constructed, the U.S. Route 219 freeway will adversely affect a total of 12 properties eligible for listing on the National Register of Historic Places (USDOT and NYSDOT 2003b). Activities at WNYNSC are at some distance from these 12 properties and would not contribute to cumulative impacts.

Overall, cultural resources impacts from decommissioning activities at WNYNSC would be very small and localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

4.5.12 Socioeconomics

Employment – Direct employment at WNYNSC in support of decommissioning actions could reach 350 persons in the peak year of activities. Current employment would be reduced as ongoing waste management and decontamination, demolition, and removal activities are completed. Therefore, employment for existing site activities is not likely to be additive to the activities evaluated under the decommissioning alternatives for this EIS. Future employment for decommissioning activities could act to temporarily reduce the adverse effects of a reduction in baseline employment.

If constructed, the U.S. Route 219 freeway is estimated to result in 4,700 onsite temporary jobs; 11,800 indirect temporary jobs; and 8,700 induced temporary jobs in the ROI (USDOT and NYSDOT 2003b).

This would overshadow the 300 to 350 direct jobs estimated for peak years for the decommissioning alternatives considered in this EIS.

Overall, regional socioeconomic impacts from decommissioning activities at WNYNSC would be very small, of less significance than construction of the proposed U.S. Route 219 freeway, and would not contribute substantially to cumulative impacts.

4.5.13 Public Health and Safety

The peak annual dose to individual members of the public and to the general population from decommissioning actions would be relatively small, as discussed in Section 4.1.9. The activities, and therefore, the doses and health effects from reasonably foreseeable activities at WNYNSC, including waste storage and disposal (DOE 2003e, 2006b) and decontamination, demolition, and removal of lightly contaminated buildings (DOE 2006c), would be essentially complete before decommissioning activities would be initiated. Therefore, annual doses and health effects for existing site activities; waste storage and disposal; and decontamination, demolition, and removal of lightly contaminated buildings are not additive to the annual dose and health effects for the decommissioning alternatives evaluated in this EIS.

Public exposure to hazardous chemicals is not projected for any of the decommissioning alternatives or for reasonably foreseeable activities at WNYNSC.

None of the other activities identified as occurring in the ROI is likely to add to the radiological exposure or be a source of chemical exposure for individuals and populations surrounding WNYNSC. Therefore, cumulative impacts are not expected.

4.5.14 Occupational Health and Safety

As discussed in Section 4.1.9, the annual average dose to the decommissioning worker would be less than 100 millirem per year, regardless of the EIS alternative selected. Reasonably foreseeable activities at WNYNSC, including waste storage and disposal (DOE 2006b) and decontamination, demolition, and removal of lightly contaminated buildings (DOE 2006c), would have been essentially completed before decommissioning is initiated. Therefore, the annual occupational exposures from these activities are not additive to the annual occupational exposure from the decommissioning alternatives. The ongoing storage of existing orphan waste would result in an estimated 0.15 person-rem per year, which would be a small addition to the annual occupational exposure for the decommissioning actions.

None of the other activities identified as occurring in the ROI would add to the occupational exposure for WNYNSC workers. Therefore, cumulative impacts are not expected.

4.5.15 Waste Management

Waste management requirements, including waste handling, transportation, and disposal, could increase substantially for WNYNSC decommissioning. Waste management volumes would range up to a maximum of about 1.6 million cubic meters (56 million cubic feet) for the Sitewide Removal Alternative.

The disposition of waste generated by reasonably foreseeable activities at WNYNSC would be largely complete prior to the start of decommissioning activities. As noted in Chapter 3, Table 3–20, this waste is projected to include about 26,000 cubic meters (920,000 cubic feet) of nonhazardous construction/demolition debris; 2,000 cubic meters (71,000 cubic feet) of hazardous waste; 25,000 cubic meters (880,000 cubic feet) of low-level radioactive waste; 750 cubic meters (26,000 cubic feet) of mixed low-level radioactive waste; and 275 high-level radioactive waste canisters. In addition, 960 cubic meters (34,000 cubic feet) of contact-handled transuranic waste and 1,200 cubic meters (41,000 cubic feet) of remote-handled transuranic waste are projected through the end of fiscal year 2011, totaling about 2,100 cubic meters (76,000 cubic feet) of waste. This estimate is updated over the transuranic waste estimates listed in Table 3–20.

The estimated 2,100 cubic meters (75,000 cubic feet) of transuranic waste currently does not have a disposal path and is expected to be stored on site at the start of decommissioning. An insignificant quantity of additional transuranic waste would be generated if the Sitewide Close-In-Place Alternative is selected, but up to 1,000 cubic meters (35,000 cubic feet) could be generated if the Sitewide Removal Alternative or the Phased Decisionmaking Alternative is selected. The 275 high-level radioactive waste canisters currently do not have a disposition path and would have to be stored on site. Implementing the Sitewide Removal Alternative would generate 4,200 cubic meters (150,000 cubic feet) of Greater-Than-Class C waste that also does not have a current disposal path. Management of this orphan waste would produce 3.2 cubic meters (113 cubic feet) per year of additional waste (Chamberlain 2008). [32]

Other activities in the region will not add to impacts on the WNYNSC waste management infrastructure.

4.5.16 Transportation

The collective dose, cumulative health effects, and traffic fatalities from approximately 130 years of radioactive material and waste transport across the United States are estimated in **Table 4–60**. The period of time from the start of DOE nuclear materials operations in the 1940s to the end of the period of analysis for the Sitewide Removal Alternative in 2070 is approximately 130 years. The total collective worker dose from all types of shipments (general transportation, historical DOE shipments, reasonably foreseeable actions, and EIS alternatives) was estimated to be up to 380,530 person-rem, which would result in 228 LCFs among the affected transportation workers. The total collective dose to the general public was estimated to be up to 249,600 person-rem, which would result in 210 excess LCFs among the affected general population. The total estimated traffic fatalities associated with accidents involving radioactive material and waste transports would be 122 to 138. The majority of the collective doses for workers and the general population are associated with the general transportation of radioactive material. These activities include shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level radioactive waste to commercial disposal facilities. The majority of the traffic fatalities are due to the general transportation of radioactive materials (28 fatalities) and reasonably foreseeable actions (94 fatalities).

Table 4–60 shows that the impacts of alternatives evaluated in this EIS are small compared with the overall transportation impacts associated with radioactive materials and waste shipments across the United States. The alternatives addressed in this EIS would result in the potential for 1 worker cancer death (LCF), no public cancer deaths (LCFs), and 16 traffic fatalities, and therefore would not contribute substantially to cumulative impacts. For perspective, it may be noted that several million traffic fatalities from all causes are expected nationwide during the period from 1943 to 2047 (DOE 2004b).

Freeway facilities with controlled access have much lower accident rates than either two-lane or four-lane highways with free access. Traffic safety will be improved both for users of the new U.S. Route 219 freeway, if constructed, and for local traffic on existing U.S. Route 219, where traffic volumes will be lower. Overall public safety will be improved by providing facilities best suited for all traffic types, local roads for local

---

[32] *If the waste incidental to reprocessing process is not applied to the high-level radioactive waste tanks and waste residuals in the tanks, for the Sitewide Removal Alternative approximately 500 cubic meters (18,000 cubic feet) would be added to the inventory of high-level radioactive waste already stored on site, and the amount of low-level radioactive waste and transuranic waste would be reduced by about 210 cubic meters (7,500 cubic feet) and 280 cubic meters (10,000 cubic feet), respectively. For Phase 1 of the Phased Decisionmaking Alternative, approximately 51 cubic meters (1,800 cubic feet) would be added to the inventory of high-level radioactive wastes, and the amount of low-level radioactive waste and transuranic waste would be reduced by about 21 cubic meters (1,100 cubic feet) and 19 cubic meters (670 cubic feet), respectively.*

traffic, and high-speed freeways for heavy trucks and long-distance travelers, avoiding the natural conflicts when these traffic types mix (USDOT and NYSDOT 2003b). Therefore, adverse cumulative traffic fatalities with WNYNSC decommissioning activities are unlikely.

Table 4–60 Cumulative Impacts from Transportation of Radioactive Materials

Activity		Worker: Dose (person-rem)	Worker: LCF Risk	General Population: Dose (person-rem)	General Population: LCFs	Traffic Fatalities [a]
Past, Present, and Reasonably Foreseeable Future Actions						
General transportation, 1943 to 2073 (DOE 2008a)		350,000	210	300,000	180	28
Historical DOE shipments (from 1943) (DOE 2008a)		330	0.20	230	0.14	NR
Reasonably foreseeable actions (DOE 2008a)		28,000	16.8	49,000	29.4	94
Subtotal Other Actions		378,330	227	349,230	210	122
Decommissioning and/or Long-Term Stewardship EIS Alternatives [b]	Sitewide Removal	2,200	1.3	370	0.22	16
	Sitewide Close-In-Place	45	0.027	10	0.0061	0.019
	Phased Decisionmaking (Phase 1)	400	0.24	72	0.043	2.1
	No Action	38	0.023	12	0.0071	0.10
Total [c]		378,368 to 380,530	227 to 228	349,240 to 349,600	210	122 to 138

LCF = latent cancer fatality, NR = not reported.
[a] Traffic fatalities associated with transporting radioactive materials and waste.
[b] Maximum transportation impact indicators from this chapter. The values were rounded where applicable.
[c] Total is a range that includes the minimum and maximum values from the alternatives addressed in this EIS. Total may not equal the sum of the contributions due to rounding.
Note: LCFs were calculated using a conversion of 0.0006 LCFs per person-rem (DOE 2002a).

4.5.17 Environmental Justice

As shown in Section 4.1.13, decommissioning activities at WNYNSC would not result in disproportionately high and adverse impacts on minority and low-income populations. The reasonably foreseeable actions at WNYNSC are not expected to have impacts on minority and low-income populations. Therefore, there would be essentially no cumulative environmental justice impacts.

4.6 Resource Commitments

This section describes the unavoidable adverse environmental impacts that could result from the implementation of the EIS alternatives, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources. Unavoidable adverse environmental impacts are impacts that would occur after implementation of all feasible mitigation measures. The relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity addresses issues associated with the condition and maintenance of existing environmental resources used to support the EIS alternatives and the utility of these resources after their use. Resources that would be irreversibly and irretrievably committed are those that cannot be recovered or recycled and those that are consumed or reduced to unrecoverable forms.

4.6.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are impacts that would occur after implementation of all feasible mitigation measures, including those incorporated into the design elements of EIS alternatives. Implementing the alternatives considered in this EIS would result in unavoidable adverse impacts on the human environment. A summary discussion of these impacts is included in this section; however, more-detailed discussion on impacts for each resource area can be found in the appropriate subsections of Section 4.1.

Unavoidable adverse impacts would occur due to land disturbance. Some plants and small animals could be displaced during land clearing and excavation activities. Biological surveys indicate that construction of treatment and storage facilities at WNYNSC is not expected to disturb sensitive plants or animals, or alter or destroy sensitive habitat. Although noise levels would be relatively low outside the immediate construction areas, the combination of noise and associated human activity would displace small numbers of animals surrounding the construction areas. New land disturbance would be greatest under the Sitewide Removal Alternative, particularly due to the extensive excavation activities associated with remediation of the Cesium Prong.

Geologic materials (i.e., gravel, sand, soil, etc.) would be required for new facility construction and backfilling during excavation. Some onsite geologic resources could be used to satisfy this demand and would represent an unavoidable adverse impact. Grading and revegetation of native plant species would restore the areas from which materials would be acquired.

Adverse impacts on subsurface soils and groundwater, and subsequently on nearby surface water bodies, would be unavoidable over the long term due to historic releases of contaminants, and, for some alternatives, the maintenance of onsite disposal areas. The greatest impact on water resources would be experienced under the No Action Alternative, where WNYNSC facilities could be conservatively assumed to degrade over time, without repair or mitigation, leading to the eventual release of contaminants, and where construction of more-robust control features over permanent disposal facilities would not be completed. All decommissioning alternatives are designed to enhance the long-term performance of the site. The long-term performance assessment with projected impacts on various receptors is detailed in Section 4.1.10 of this chapter.

The Sitewide Removal Alternative would result in the fewest unavoidable adverse impacts due to radiological and hazardous chemical exposure from contaminant releases to groundwater or from assumed unmitigated erosion. This alternative would decontaminate the entire site to residual radiological levels that would result in a dose less than 25 millirem per year for any foreseeable onsite receptor. Because the land would be available for release for unrestricted use, except for a facility for orphan waste storage, the Sitewide Removal Alternative would not depend on institutional controls or monitoring and maintenance over the long term.

As discussed in Section 4.1.10.3.1, implementation of an alternative where waste would remain on site and institutional controls would continue would result in an estimated radiological dose to offsite receptors of less than 25 millirem per year. Exposure impacts from nonradiological hazardous chemicals would also be very low. The health risk for exposure to nonradiological chemicals would be dominated by radiological exposures.

Institutional controls are considered an important part of any alternative, and act to minimize potential impacts. For purposes of analysis, however, it is assumed that institutional control is lost in the future, and that there would be no effort to restore institutional controls or to mitigate impacts from such loss, neither situation being considered likely. These assumptions could potentially lead to unmitigated erosion and/or intruders within site boundaries and would result in radiological dose impacts on humans. The unmitigated erosion scenario could lead to doses of a few tens of millirem per year for some individual offsite receptors. The population receptor scenarios analyzed for unmitigated erosion would result in doses comparable to annual background doses. Onsite intruder scenarios would result in much larger doses to individual intruders under the No Action Alternative compared to results for the Sitewide Close-In-Place Alternative. Most of the intruder dose would be attributable to direct disturbance of the NDA and SDA. The Sitewide Close-In-Place Alternative would cover these burial grounds with multi-layered engineered barriers and, therefore, would limit direct contact and doses to intruders.

Unavoidable impacts on floodplains and wetlands would occur as the result of implementing any of the decommissioning alternatives. The Sitewide Removal Alternative would have the greatest impact on floodplains and wetlands. Floodplain impacts would occur in the short-term during Cesium Prong remediation work, removal of the North and South Reservoirs and dams, and streambed remediation along Erdman Brook and Franks Creek. These impacts on floodplains would not be permanent. Direct impacts on jurisdictional wetlands would occur as a result of Cesium Prong remediation work in the vicinity of WMAs 3, 4, and 5, and along Quarry Creek. Other wetlands that would be impacted would be in the vicinity of the SDA during exhumation and in the vicinity of WMA 12 during closure of the dams and reservoirs.

Under the Sitewide Close-In Place Alternative, construction of engineered barriers over the SDA and NDA would encroach upon and permanently alter the 100-year floodplain. Furthermore, under the Sitewide Close-In-Place Alternative, construction of erosion control features in and around the facilities would impact floodplain performance and wetlands. Phase 1 of the Phased Decisionmaking Alternative would not adversely or directly impact floodplains or wetlands, although these resources could be adversely impacted depending on the scope of Phase 2 activities.

Construction activities undertaken for any of the decommissioning alternatives could have an indirect adverse impact on wetlands due to erosion and sedimentation from earthmoving activities. Most of the indirect impacts on wetlands could be mitigated as described in Chapter 6, Section 6.5.

Even with application of best management practices, some fugitive dust and noise generation, soil erosion, and increased vehicular traffic would be unavoidable during construction of treatment facilities and removal of buried waste material and contaminated soil. These impacts would be relatively minor and temporary in nature.

Unavoidable adverse impacts on air quality would occur due to emission of various chemical and radiological constituents during treatment facility construction and operations. Under all alternatives, nonradiological emissions are not expected to exceed NAAQS. Chemical and radiological emissions would also not exceed NESHAPs.

Retrieval and treatment of waste under normal operating conditions would also result in unavoidable radiation exposure to workers and the general public. Workers would have the highest levels of exposure; however, doses would be administratively controlled. Incremental annual dose contributions to the offsite MEI, general population, and workers are discussed in Section 4.1.9. These doses are not expected to exceed regulatory standards or administrative control limits.

Generation of some waste products would be unavoidable, including transuranic waste, low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste. Wastes generated during construction and operations would be collected, stored, and shipped for suitable treatment, recycling, or disposal in accordance with applicable Federal and state regulations, as described in the waste management sections of this chapter. Activities would be conducted and operations optimized to generate the smallest amount of waste practical. The Sitewide Removal Alternative has the highest potential for generating waste for which a final disposition pathway has not been identified, and thus may require indefinite storage on site.

4.6.2 Irreversible and Irretrievable Commitments of Resources

This section describes the major irreversible and irretrievable commitments of resources that have been identified under each alternative considered in this EIS (see Table 4–61). A commitment of resources is irreversible when primary or secondary impacts limit future options for a resource. An irretrievable commitment refers to the use or consumption of resources neither renewable nor recoverable for future use. In general, the commitment of capital, land, energy, labor, and materials during implementation of the alternatives would be irreversible or irretrievable. Implementation of any of the alternatives considered in this EIS, including the No Action Alternative, would entail the irreversible and irretrievable commitment of land, labor, construction materials (e.g., steel, and concrete), geologic resources, energy and fossil fuels, and water. **Table 4–61** presents the major resource requirements that would be irreversibly or irretrievably consumed under each alternative. For waste containers, roll-on/roll-off and Sealand containers are not included as an irretrievable resource because these containers are reused and not buried with the waste. However, it is assumed that these containers would be refurbished approximately every 20 loads. The consumption of resources in the table has been divided into decommissioning and monitoring and maintenance categories, with the exception of Phase 1 of the Phased Decisionmaking Alternative. In the case of Phase 1, for purposes of analysis, resource commitments are assumed to include anything consumed within 30 years (the table does not distinguish between decommissioning or monitoring and maintenance activities). For all other alternatives, decommissioning activities are well defined and the consumption of resources is finite. Resources associated with decommissioning activities would generally occur in the short term and are presented as totals. Resources associated with monitoring and maintenance activities are cumulative. Because these resources would generally occur for an indefinite period of time, they are presented on an annual basis. For the Sitewide Close-In-Place Alternative, monitoring and maintenance resources would be expended as part of a long-term stewardship program.

4.6.2.1 Sitewide Removal Alternative

This alternative would consume the most labor, utilities, waste containers, and in some cases, the most material resources; however, after implementing this alternative, no additional monitoring and maintenance resources would be consumed on an annual basis because the entire site would be available for release for unrestricted use. However, commensurate with the aggressive nature of the cleanup, a large amount of waste would be generated, potentially including orphan waste. Potential orphan waste would not have an identified disposal pathway, and management of this waste on site would require the annual consumption of resources until final disposition is determined. Unrestricted release of land dedicated to the long-term storage of orphan waste would also be delayed. This would involve the continued use of the Container Management Facility occupying approximately 24.3 hectares (60 acres) of land. The estimated monitoring and maintenance resources for long-term storage of orphan waste are displayed in parentheses in Table 4–61.

4.6.2.2 Sitewide Close-In-Place Alternative

This alternative would consume the most material resources associated with the backfilling and/or grouting of void spaces and the construction of engineered surface barriers. Most of the decommissioning resources would be committed within the first 7 years; however, for purposes of analysis those associated with the operation and demolition of the Interim Storage Facility were assumed to continue for 26 more years. Monitoring and maintenance resource commitments would begin after 7 years and would continue indefinitely as part of a long-term stewardship program. Monitoring and maintenance activities would include annual maintenance of erosion control features, environmental monitoring, maintenance of the engineered surface barriers, as-needed replacement of the North Plateau Groundwater Plume permeable treatment wall about every 20 years, and as-needed replacement of the site security system about every 35 years. The land areas retained for management of disposal areas (e.g., North Plateau, SDA, and NDA) would be considered a permanent commitment of land resources.

Table 4–61 Irreversible and Irretrievable Commitment of Resources

	Sitewide Removal Alternative		*Sitewide Close-In-Place Alternative*		*Phased Decisionmaking Alternative*			*No Action Alternative*	
						Total [e]			
Resource	*Decommissioning*	*M&M (annual)* [a]	*Decommissioning* [b]	*M&M (annual)* [c]	*Phase 1* [d]	*Decommissioning*	*M&M (annual)*	*Decommissioning* [f]	*M&M (annual)* [f, g]
Land (hectares)	0 (24)		233		659	0 - 233		658	
Labor (FTEs)	15,000	0 (20)	2,350	23	3,010	2,350 - 15,000	0 - 23	0	74
Materials									
Concrete (cubic meters)	55,300	0	6,940	0	3,960	6,940 - 55,300	0	0	0
Concrete Block (square meters)	5,980	0	0	0	0	0 - 5,980	0	0	0
Cement (cubic meters)	520	0	150	0	250	150 - 520	0	0	0
Grout (cubic meters)	260	0	56,300	0	480	260 - 56,300	0	0	0
Soil (cubic meters)	1,107,000	0	917,000	18,300	95,300	917,000 - 1,107,000	0 - 18,300	0	0
Sand, Gravel, and Stone (cubic meters)	31,700	0	1,099,000	10,500	1,150	31,700 - 1,099,000	0 - 10,500	0	370
Clay (cubic meters)	71,200	0	149,000	1,740	68,600	71,200 - 149,000	0 - 1,740	0	0
Zeolite (cubic meters)	0	0	1,680	84	1,680	0 - 1,680	0 - 84	0	84
Bentonite (cubic meters)	950	0	26,900	0	1,470	950 - 26,900	0	0	0
Asphalt (metric tons)	2,440	0	0	0	0	0 - 2,440	0	0	2
Roofing Felt (square meters)	0	0	0	0	0	0	0	0	890
Steel (metric tons)	23,800	0	90	0	580	90 - 23,800	0	0	0
Sheet and Helical Piling (metric tons)	11,100	0	330	0	1,850	330 - 11,100	0	0	0
HDPE Sheeting (square meters)	74,600	0	0	0	0	0 - 74,600	0	0	0
Geomembrane (square meters)	0	0	367,000	0	129,000	0 - 367,000	0	0	3,410
Fabric (square meters)	3,140	0	0	0	0	0 - 3,140	0	0	0
Geotextile (square meters)	6,790	0	132,000	0	0	6,790 - 132,000	0	0	0
Slurry Materials (liters)	959,000	0	0	0	0	0 - 959,000	0	0	0

	Sitewide Removal Alternative		*Sitewide Close-In-Place Alternative*		*Phased Decisionmaking Alternative*			*No Action Alternative*	
						Total [e]			
Resource	***Decommissioning***	***M&M (annual)*** [a]	***Decommissioning*** [b]	***M&M (annual)*** [c]	***Phase 1*** [d]	***Decommissioning***	***M&M (annual)***	***Decommissioning*** [f]	***M&M (annual)*** [f, g]
Utilities									
Electricity (megawatt-hours)	724,000	0 (930)	113,000	1,110	145,000	113,000 - 724,000	0 - 1,110	0	3,550
Natural Gas (cubic meters)	121,971,000	0 (148,000)	18,053,000	176,000	23,123,000	18,053,000 - 121,971,000	0 - 176,000	0	569,000
Diesel Fuel (liters)	32,204,000	0 (38,300)	25,738,000	191,000	9,545,000	25,738,000 - 32,204,000	0 - 191,000	0	33,600
Gasoline (liters)	8,954,000	0 (0)	2,755,000	27,900	793,000	2,755,000 - 8,954,000	0 - 27,900	0	9,500
Potable Water (liters)	624,921,000	0 (805,000)	97,943,000	957,000	125,449,000	97,943,000 - 624,921,000	0 - 957,000	0	3,126,000
Raw Water (liters)	3,099,832,000	0 (3,656,000)	455,316,000	4,347,000	586,176,000	455,316,000 - 3,009,832,000	0 - 4,347,000	0	14,340,000
Waste Containers [h]									
Lift Liners	185,000	0	1,660	14	21,600	1,660 - 185,000	0 - 14	0	1
55-gallon drums	29,600	0 (15)	830	0	5,750	830 - 29,600	0	0	140
B-25 Boxes	41,700	0	1,570	2	7,770	1,570 - 41,700	0 - 2	0	120
High Integrity Containers	1,080	0	0	0	220	0 - 1,080	0	0	0

FTE = full-time equivalent, HDPE = high-density polyethylene, NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, SDA = State-Licensed Disposal Area, M&M = monitoring and maintenance, Raw Water = non-potable water and augmentation water.

[a] The site would be released for unrestricted use and no additional resources would be consumed. Parenthetical values represent the annual resources that would be required for storage of orphan waste.

[b] Includes the commitment of resources for operations and demolition of the Interim Storage Facility.

[c] As part of a long-term stewardship program, annual monitoring and maintenance commitments would include North Plateau Groundwater Plume permeable treatment wall replacement about every 20 years (annualized), site security system replacement about every 35 years (annualized), and maintenance of erosion control features.

[d] Includes all resource commitments for Phase 1 activities in the first 30 years.

[e] Phase 2 of the Phased Decisionmaking Alternative would involve the additional consumption of resources and potentially the unrestricted release of additional land areas. It is expected that the additional consumption of resources during Phase 2 would be generally between those for the Sitewide Removal and Sitewide Close-In-Place Alternatives, depending on the combination of activities selected for Phase 2, minus some of the resources expended to achieve decommissioning in Phase 1. If the Phase 2 decision for the SDA is continued active management, use of some resources would be bounded by those for the No Action Alternative

[f] No decommissioning activities would take place beyond the starting point of the EIS. M&M resources would be consumed on an annual basis indefinitely. Diesel fuel for the No Action Alternative includes diesel fuel and heating oil.

[g] Annual monitoring and maintenance commitments include SDA and NDA geomembrane replacements about every 25 years (annualized) as well as replacement of roofs and the permeable treatment wall about every 20 years (annualized).

[h] The highest demand for one-time use waste containers was used, depending on the disposal option (DOE/Commercial or Commercial). Roll-on/roll-off and Sealand containers are reusable and are not buried with waste as one-time use containers; therefore, these containers are not considered an irretrievable resource.

Note: To convert hectares to acres, multiply by 2.471; cubic meters to cubic yards, multiply by 1.3079; square meters to square yards, multiply by 1.196; metric tons to tons, multiply by 1.1023; liters to gallons, multiply by 0.26418. One FTE = 2,080 worker hours per year.

Sources: WSMS 2009a, 2009b, 2009c, 2009d.

The potential does exist for the generation of orphan waste similar to the Sitewide Removal Alternative. Unlike the Sitewide Removal Alternative, there would be suitable areas of the site retained under management to accommodate the long-term storage of this waste, and the quantities and risk of potential orphan waste would be much less. Therefore, no additional commitment of resources beyond those monitoring and maintenance resources already assumed is expected to be necessary for the onsite storage of orphan waste under the Sitewide Close-In-Place Alternative.

4.6.2.3 Phased Decisionmaking Alternative

This alternative addresses the decommissioning of some aspects of the site and defers other aspects until a later date. For this alternative, the commitment of resources under Phase 1 represents all activities, studies, and tests that would be implemented until Phase 2 activities are defined. For purposes of analysis, a 30-year Phase 1 period is assumed. Because many decommissioning activities would be deferred, an unknown quantity of resources would be committed in the future after Phase 2 activities have been evaluated and determined. The exact quantity of resources that would be consumed during Phase 2 is dependent on the combination of decommissioning activities that would be implemented; however, it is expected that the consumption of resources for the entire alternative would generally lie between those estimates for the Sitewide Close-In-Place and Sitewide Removal Alternatives, minus some of the resources expended to achieve a portion of the decommissioning in Phase 1 (e.g., demolition of the Main Plant Process Building). If the Phase 2 decision for the SDA is continued active management, the consumption of resources for the entire alternative would be bounded for some resources by the No Action Alternative.

4.6.2.4 No Action Alternative

This alternative entails no decommissioning activities to be implemented beyond the starting point of this EIS; therefore, there are no commitments of resources for decontamination and decommissioning activities. However, this alternative does consume the most labor and utilities on an annual basis for continuing monitoring and maintenance activities. This consumption of resources on an annual basis would continue indefinitely. The monitoring and maintenance commitment of resources includes replacement of the SDA and NDA geomembrane covers about every 25 years, replacement of the facility roofs and permeable treatment wall about every 20 years, and the maintenance of access roads on site. The annual consumption of resources would likely increase over time, because the effort to maintain the site and its buildings in a similar state would also become more difficult with the passage of time and the deterioration of structures.

4.6.3 Relationship Between Short-term Use of the Environment and Long-term Productivity

Pursuant to NEPA regulations (40 CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. "Short-term," for purposes of analysis in this section of the EIS, is the active project phase under each alternative during which the majority of construction, operations, and decommissioning activities would take place. "Long-term" is defined in this section of the EIS as the timeframe that extends beyond conclusion of the short term for each alternative. For purposes of human health impact analysis, "long-term" is defined differently in Section 4.1.10. Short-term and long-term uses of the environment in the broader context include elements of unavoidable adverse impacts and an irreversible and irretrievable commitment of resources in order to enhance the long-term productivity of the human environment. Unavoidable adverse environmental impacts are discussed in Section 4.6.1. The irreversible and irretrievable commitment of resources is discussed in Section 4.6.2.

The objective of any Proposed Action would be to demonstrate and implement the alternative that, on balance, would yield the greatest benefit to the public. For any EIS alternative to be considered favorable from a human health perspective, an increase in worker and public exposure under controlled circumstances (i.e., facility decommissioning) in the short term would lead to a decrease in exposure to the unprotected public and environment over the long term. The selection of an alternative would, in part, need to consider the balance of short-term impacts against long-term benefits as demonstrated and discussed throughout Section 4.1. Also, the consumption of resources in the short term could lead to the unrestricted release of certain portions of the site.

Regardless of location, air emissions associated with decommissioning actions would introduce small amounts of radiological and nonradiological constituents to the atmosphere around WNYNSC. Over time, these emissions would result in additional loading and exposure, but would not impact compliance with air quality or radiation exposure standards at WNYNSC (except possibly for $PM_{2.5}$ and PM_{10}). There would be no significant residual environmental effects on long-term environmental viability.

Under certain alternatives, and in addition to short-term use of the environment, the emplacement of engineered surface barriers over portions of the North Plateau and/or permanent waste disposal areas would be considered a long-term use of the environment, and thus, a decrease in the long-term productivity for these locations. In other parts of the site, buildings and equipment could be decontaminated and demolished and the affected areas restored to either green- or brownfield sites, ultimately returning these areas to productive use.

While emplacement of engineered barriers would lead to a decrease in long-term productivity for small portions of the site where permanent burial grounds are located, it would lead to increased protection of groundwater resources over the long term and a reduced exposure risk to individual and population receptors, especially when evaluating the onsite intruder scenarios.

Adverse impacts on wetlands and floodplains would generally increase with the aggressive nature of each alternative in remediating the site and the associated increase in disturbance of land areas.

Most disturbed wetlands could have an additional adverse impact on local ecosystems; however, over the very long term, these ecosystems are expected to recover, especially with the implementation of restoration and mitigation measures. The emplacement of engineered barriers would have a relatively small, but permanent, impact on floodplains.

Implementation of any of the alternatives would result in continued employment, expenditures, and tax revenues being generated, which, in turn, would directly benefit the local, regional, and state economies over the short term. Local governments investing project-generated tax revenues into infrastructure and other required services could facilitate long-term economic productivity.

The quantity of short-term resources needed to implement any of the alternatives analyzed in this EIS would not affect the long-term productivity in the region.

4.6.3.1 Sitewide Removal Alternative

The short-term duration of this alternative would take approximately 60 years to complete. This alternative would have the most significant short-term impacts. Large areas of land would be disturbed, including previously undeveloped areas for excavation and remediation of the Cesium Prong. Significant volumes of waste would be generated and would require offsite disposal. Commensurate with the exhumation and removal of contamination, this alternative would result in the highest exposure potential for onsite workers. In contrast, the enhancement of long-term productivity would be the greatest, because the entire site would be eventually released for unrestricted use. However, shipment of waste to offsite disposal facilities could reduce the long-term productivity for these locations. With the large areas of land that would be disturbed under the Sitewide Removal Alternative, the greatest impact on wetlands would occur under this alternative as compared to the other alternatives analyzed (see Section 4.1.6.1). These impacts would offset some of the enhancements to long-term productivity of the site gained by achieving unrestricted release criteria.

4.6.3.2 Sitewide Close-In-Place Alternative

The short-term period of this alternative would involve approximately 7 years of significant onsite decommissioning activities, followed by implementation of a long-term stewardship program. During the decommissioning period, vitrified high-level radioactive waste would be moved to the Interim Storage Facility pending offsite transportation. As compared to the Sitewide Removal Alternative, the eventual decay of the Cesium Prong would lead to reduction of adjacent area boundaries and the unrestricted release of additional land, without the short-term impacts on the environment that would result from excavation and or operation of wastewater treatment systems. Where engineered surface barriers would be installed, this alternative would remove portions of the site from long-term productive use. As discussed in Section 4.1.10.3, when compared to the No Action Alternative, the projected levels of radiological exposure over the long term to both onsite and offsite receptors would be significantly reduced, assuming loss of institutional controls after 100 years. The reduction in projected exposures would be achieved through construction of engineered barriers over waste burial sites and facilities that would be closed in place, and the construction of erosion control features that would protect these areas. However, the emplacement of engineered barriers and construction of erosion control features would permanently alter some floodplains. Some wetland areas would be adversely impacted, although to a lesser degree than under the Sitewide Removal Alternative.

4.6.3.3 Phased Decisionmaking Alternative

The Phased Decisionmaking Alternative pursues selected decommissioning actions, while deferring other decisions until more-effective solutions can be analyzed. Phase 1 of this alternative would involve decommissioning activities in the first 8 years, including movement of vitrified high-level radioactive waste to the Interim Storage Facility pending offsite transportation, and followed for analysis purposes by up to 22 years of ongoing monitoring and maintenance of the areas of the site that had been deferred to Phase 2 decommissioning actions. The Phase 2 decision would be based on a variety of studies and analyses that would begin during the Phase 1 decommissioning period. Phase 2 decommissioning activities would involve additional short-term impacts. The overall enhancement to the long-term productivity of the environment would remain unknown until Phase 2 activities had been determined; however, Phase 1 activities would serve to preserve the ability to maximize this enhancement by stabilizing and/or removing contaminated media from the site premises. Phase 1 activities analyzed under the Phased Decisionmaking Alternative would not adversely impact any wetlands or floodplains. The continued maintenance of some facilities, while decontaminating and decommissioning others, would result in some short-term impacts. The precise long-term impacts on human health and the environment cannot be determined for Phase 2 until the scope has been fully defined; however, long-term impacts are expected to be generally bounded by the Sitewide Close-In-Place and Sitewide Removal Alternatives. If the Phase 2 decision for the SDA is continued active management, long-term impacts for some exposure scenarios and receptors would be bounded by the No Action Alternative.

4.6.3.4 No Action Alternative

Under the No Action Alternative, environmental resources would continue to be committed to operations at WNYNSC on an annual basis. This commitment would serve to maintain existing environmental conditions with little or no enhancement of the long-term productivity of the environment. With the passage of time and the release of contaminants from onsite sources, the extent to which future remedial action would enhance the long-term productivity of the site would decrease. Under exposure scenarios involving onsite intruders, as discussed in Sections 4.1.10.3.2.1 and 4.1.10.3.2.2, significant, radiological exposures could occur to humans. Floodplains and wetlands would not be impacted, because no decommissioning actions would be taken.

CHAPTER 5
APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

5.0 APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

Decommissioning and/or long-term stewardship of the Western New York Nuclear Service Center must be implemented in a manner that ensures the protection of public health, safety, and the environment through compliance with all applicable Federal, State, and local laws, regulations, Orders, and other requirements or policies. This chapter identifies those Federal, State, and local laws, regulations, Orders, and requirements or policies relevant to this *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*.

5.1 Background

The alternatives analyzed in this *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center (Decommissioning and/or Long-Term Stewardship EIS)* are described in Chapter 2. To provide a general context to the regulatory requirements discussed in this chapter, the types of activities involved in the implementation of the environmental impact statement (EIS) alternatives are restated here, including the operation of existing facilities; construction and operation of new facilities; closure, decommissioning, and dismantlement of facilities; rehabilitation of facility sites; management, transportation, and disposal of radioactive, hazardous, and mixed wastes; and long-term stewardship of remaining facilities.

The requirements that establish the cleanup and decommissioning criteria for the Western New York Nuclear Service Center (WNYNSC) are embodied in Federal and New York State environmental, safety, and health regulations and Orders promulgated under various statutory authorities. Generally, compliance with these criteria can be measured against established numerical standards or values for radioactive or hazardous constituents in the environment. These often require a permit, license, or approval. Section 5.7 summarizes in tabular form a listing of the potentially applicable laws, regulations, and Orders discussed.

Section 5.2 identifies the applicable Federal environmental, safety, and health laws, regulations, and requirements for WNYNSC. Section 5.3 discusses major applicable Executive Orders. Section 5.4 identifies the applicable U.S. Department of Energy (DOE) regulations and Orders. Section 5.5 discusses the New York State laws, regulations, agreements, and requirements that are applicable to the West Valley Demonstration Project (WVDP) decommissioning and State-Licensed Disposal Area (SDA) management activities. Section 5.6 discusses consultations with agencies and federally recognized American Indian Nations. These regulatory requirements address issues such as protection of public health and the environment, worker safety, historic and cultural resources, and emergency planning.

5.2 Federal Environmental, Safety, and Health Laws, Regulations, and Requirements

The regulations applicable to WNYNSC (including WVDP) encompass a broad range of Federal and state laws, requirements, Executive Orders, and agreements addressing cultural, environmental, health and safety, transportation, and other issues. Generally, these regulations are relevant to how the work involved in performing a proposed action would be conducted to protect workers, the public, and cultural and environmental resources. Some of these require permits or consultation with other agencies or governing bodies. The status of required consultations is discussed in Section 5.6 and correspondence related to those consultations is presented in Appendix O. The Federal laws applicable to WNYNSC decommissioning and long-term stewardship are identified and briefly discussed in this section, and are presented in alphabetical order by Federal act. More detail is provided for the requirements, such as the NRC License Termination Rule, that are specific to or have unique provisions that apply to WNYNSC or WVDP.

American Indian Religious Freedom Act of 1978 (42 United States Code [U.S.C.] 1996)—The American Indian Religious Freedom Act protects American Indians' rights of freedom to believe, express, and exercise traditional religions. DOE and the New York State Energy Research and Development Authority (NYSERDA) have communicated with the Seneca Nation of Indians to determine if there are artifacts, traditional burial grounds, or sacred areas that could be affected by completing WVDP.

Antiquities Act of 1906, as amended (16 U.S.C. 431 *et seq*.)—The Antiquities Act protects historic and prehistoric ruins, monuments, and antiquities, including paleontological resources, on federally controlled lands from appropriation, excavation, injury, and destruction without permission.

Archaeological and Historic Preservation Act of 1960, as amended (16 U.S.C. 469 *et seq*.)—The Archaeological and Historic Preservation Act establishes procedures for preserving historical and archaeological resources. While it is unlikely that cultural or archaeological resources would be discovered under any alternative, erosion control strategies could disturb areas along streambanks, which have a higher potential to contain culturally significant resources. Analysis of environmental compliance included assessing the EIS alternatives for possible impacts on prehistoric, historic, and traditional cultural resources.

Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. 470aa *et seq.*)—The Archaeological Resources Protection Act requires a permit for any excavation or removal of archaeological resources from Federal or American Indian lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed are to remain the property of the United States. Consent must be obtained from the American Indian Tribe or the Federal agency that has authority over the land on which a resource is located before issuance of a permit. The permit must contain terms and conditions requested by the Tribe or Federal agency.

Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq.*)—The 1954 Atomic Energy Act, as amended, provides fundamental jurisdictional authority to DOE and the U.S. Nuclear Regulatory Commission (NRC) over Governmental and commercial use of nuclear materials, respectively. It authorizes DOE to establish standards to protect health or minimize dangers to life or property for activities under DOE's jurisdiction. It gives the NRC responsibility for licensing and regulating commercial uses of atomic energy and allows that agency to establish dose and concentration limits for protection of workers and the public for activities under its jurisdiction.

DOE implements its responsibilities under the Atomic Energy Act through regulations (set forth in Title 10, Chapter II, of the *Code of Federal Regulations* (CFR) and enumerated as applicable in Table 5–1 (see Section 5.7) and through its series of Orders and associated standards and guidance (see Table 5–2 in Section 5.7). DOE Orders for worker and public radiation protection, environmental safety and health, security, and sound management would be applicable to WVDP activities conducted by DOE under all the alternatives analyzed in this EIS.

NRC licensing and radiation protection, environmental safety and health, security, and management policies are applicable to activities conducted by NYSERDA for facilities at WNYNSC that are under the 10 CFR Part 50 license but outside the authority of the WVDP Act. These and other NRC regulations are codified under Title 10, Chapter I, of the CFR and are enumerated as applicable in Table 5–1. NYSERDA's NRC license for WNYNSC will become a factor when WVDP is completed. The technical specifications and certain other portions of NYSERDA's NRC license are currently in abeyance pending completion of WVDP.

Nuclear Regulatory Commission License Termination Rule (10 CFR Part 20, Subpart E)—The Atomic Energy Act of 1954 assigned the NRC responsibility for licensing and regulating commercial uses of atomic energy. The NRC (and its predecessor, the Atomic Energy Commission) fulfilled this responsibility at WNYNSC by licensing the facility from 1966 to 1981, when the license was suspended to execute the 1980 WVDP Act. Although the NRC suspended the technical specifications and certain other portions of the license pending completion of WVDP, the agency maintained certain authorities under the WVDP Act that included prescribing decommissioning criteria for tanks where the high-level radioactive waste solidified under the project was stored, as well as the facilities, materials, and hardware used in solidification activities. In support of determining the decommissioning criteria for WVDP, the NRC published a draft policy statement for public comment in December 1999 (64 *Federal Register* [FR] 67952). After considering public comment, the NRC issued a final policy statement in February 2002 prescribing the use of the NRC's License Termination Rule as the decommissioning criteria for WVDP (67 FR 5003). (See the following discussion for more detail on the NRC final decommissioning policy statement.) NYSERDA's NRC license for WNYNSC will become a factor when DOE has completed its obligations under the WVDP Act. At that time, the license could be reinstated or terminated, depending on the alternative selected.

The License Termination Rule does not apply a single public dose criterion for meeting license termination requirements. Rather it provides for a range of criteria. The License Termination Rule specifies that a site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent (TEDE) to the average member of the critical group that does not exceed 25 millirem per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as is reasonably achievable (ALARA). The License Termination Rule goes on to specify that a site will be acceptable for license termination under restricted conditions if the licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background levels to the average member of the critical group will not exceed 25 millirem per year. Even if institutional controls were to fail, the TEDE to an individual should not exceed 100 millirem per year. If it is demonstrated that the 100-millirem-per-year TEDE criterion is technically not achievable or is prohibitively expensive in the event of failure of institutional controls, the individual TEDE criterion may be as high as 500 millirem per year. However, in circumstances where restricted release is required, if the 100-millirem-per-year TEDE criterion is exceeded and/or the use of alternate criteria has been determined, the area would be rechecked by a responsible government entity no less frequently than every 5 years. Resources would have to be set aside to provide for any necessary control and maintenance of the institutional controls. Finally, the License Termination Rule permits alternative individual TEDE criteria of up to 100 millirem per year plus ALARA considerations for restricted release, with institutional controls established after a public participation process. Compliance with the dose criterion involves assessment of the total dose to a receptor from all of the NRC-regulated facilities.

License termination procedures for the closure or long-term management of facilities at WNYNSC would be established under NRC operating license CSF-1. Currently the technical specifications and certain other portions of NYSERDA's license are in abeyance pending completion of WVDP.

The Atomic Energy Act is also the statutory basis for the U.S. Environmental Protection Agency (EPA) to set environmental radiation protection standards (i.e., 40 CFR Part 191) generally applicable to the management of high-level radioactive waste and transuranic waste activities at WNYNSC. The Atomic Energy Act authorizes the NRC to enter into an agreement with a state in which the NRC will discontinue and the state will assume regulatory authority over certain radioactive materials. The New York State Department of Health (NYSDOH) and the New York State Department of Environmental Conservation (NYSDEC) have established regulatory authority under the Agreement State Program for some site activities. The specific activities are discussed in more detail in Section 5.5.

Clean Air Act of 1970, as amended (42 U.S.C. 7401 *et seq.*)—The Clean Air Act is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act requires each Federal agency with jurisdiction over properties or facilities engaged in any activity that might result in the discharge of air pollutants to comply with all Federal, state, interstate, and local requirements with regard to the control and abatement of air pollution. Section 109 of the Clean Air Act directs EPA to set National Ambient Air Quality Standards for criteria pollutants. EPA has identified and set National Ambient Air Quality Standards for the following criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. Section 111 of the Clean Air Act requires establishment of national performance standards for new or modified stationary sources of atmospheric pollutants. Section 160 of the Clean Air Act requires that specific emission increases must be evaluated prior to permit approval to prevent significant deterioration of air quality. Section 112 requires specific standards for release of hazardous air pollutants (including radionuclides). Emissions of air pollutants are regulated by EPA in 40 CFR Parts 50 to 99.

EPA regulations at Subpart H of 40 CFR Part 61 and 40 CFR Part 63 require DOE to notify and obtain needed approvals before constructing a new source of radionuclide or hazardous emissions, respectively. The standards also apply to closure and decommissioning activities, such as demolition or excavation, that result in fugitive emissions of radionuclides into unrestricted (public access) areas. If there are any radioactive emissions to the air from facilities remaining after decommissioning WVDP is completed, these emissions would contribute to the dose "from all sources" used to determine compliance with decommissioning criteria.

The Clean Air Act requirements for nonradioactive constituents are enforced in New York State through the NYSDEC Division of Air Resources. The Clean Air Act requirements for radioactive emissions are enforced in New York State through EPA.

Clean Water Act (33 U.S.C. 1251 *et seq.*)—The Clean Water Act (formerly the Federal Water Pollution Control Act) was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." The act requires all branches of the Federal Government with jurisdiction over properties or facilities engaged in any activity that might result in a discharge or runoff of pollutants to surface waters to comply with Federal, state, interstate, and local requirements. Decommissioning activities would need to comply with Clean Water Act regulations relevant to wastewater, stormwater, and wetlands.

The Clean Water Act imposes limitations on wastewater and stormwater pollutant discharges through the National Pollutant Discharge Elimination System (NPDES) permitting program. NYSDEC assumed primary NPDES enforcement authority from EPA under the State Pollutant Discharge Elimination System (SPDES). See Section 5.5 for more detail.

WNYNSC contains wetlands that could be affected by decommissioning activities. Both Federal and New York State permits would be required if an activity could disturb or destroy a wetland area. If any decommissioning actions affect the floodplains of Franks and Buttermilk Creeks or certain biota dwelling in these habitats, these actions also would be subject to regulation.

The U.S. Army Corps of Engineers is the lead Federal agency for enforcement of Clean Water Act wetland requirements (33 CFR Part 320). Under Section 401 of the Clean Water Act, New York State has the authority to review and approve with or without conditions, or deny all Federal permits or licenses that might result in a discharge to state waters, including wetlands.

A Section 404 permit would need to be obtained from the U.S. Army Corps of Engineers before implementing any action, such as earthmoving activities and certain erosion controls that could disturb wetlands. Before a Federal activity can be permitted or authorized, New York State must issue a Section 401 Water Quality Certificate, certifying that the proposed activity would not violate water quality standards, and that it complies with other appropriate requirements of New York State law. The Federal and state permits and certification are obtained using the same form, and permit applications for activities affecting waterways and wetlands are reviewed by the U.S. Army Corps of Engineers in consultation with the U.S. Fish and Wildlife Service, the Soil Conservation Service, EPA, and NYSDEC.

Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act (42 U.S.C. 9601 *et seq.*)—The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) includes an emergency response program to respond to a release of a hazardous substance to the environment. Under CERCLA, EPA would have the authority to regulate hazardous substances at WNYNSC in the event of a release or a "substantial threat of a release" of those materials. Releases greater than reportable quantities would be reported to the National Response Center. Assessment of alternatives for environmental compliance includes consideration of whether hazardous substances in reportable quantity amounts could be present at the site during decommissioning.

EPA, as a cooperating agency, will review the cleanup plan, EIS, and other documents developed by DOE in conjunction with NYSERDA to provide early input so the remediated site would also meet the CERCLA risk range of 10^{-4} to 10^{-6} for excess lifetime cancer risk. Additionally, in 2002 and in keeping with its authority under CERCLA, EPA entered into a Memorandum of Understanding with NRC establishing a framework for their relationship on the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding is discussed in more detail in the following paragraph.

NRC and EPA Memorandum of Understanding

The NRC and EPA signed a Memorandum of Understanding establishing a framework for their relationship in the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding provides that EPA will defer exercise of its authority under CERCLA for facilities decommissioned under NRC authority. The Memorandum of Understanding includes provisions for NRC and EPA consultation at particular sites when, at the time of license termination (1) groundwater contamination exceeds EPA maximum contaminant levels, (2) NRC contemplates use of either the restricted release or alternate criteria for license termination options, and/or (3) residual radioactive soil concentrations exist that exceed levels defined in the Memorandum of Understanding (67 FR 65375; October 24, 2002).

Emergency Planning and Community Right-to-Know Act of 1986 (42 U.S.C. 11001 *et seq.*) (also known as SARA Title III)—This act requires emergency planning and notice to communities and government agencies concerning the presence and release of specific chemicals. EPA implements this act under regulations found in 40 CFR Parts 355, 370, and 372. Under Subtitle A of this act, Federal facilities are required to provide information (such as inventories of specific chemicals used or stored and releases that occur from these sites) to the State Emergency Response Commission and to the local emergency planning committee to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. Implementation of the provisions of this act began voluntarily in 1987, and inventory and annual emissions reporting began in 1988. DOE requires compliance with SARA Title III as a matter of DOE policy at its contractor-operated facilities.

Endangered Species Act of 1973 (16 U.S.C. 1531–1544)—The Endangered Species Act of 1973 requires Federal agencies to consult with the U.S. Fish and Wildlife Service to ensure that actions do not jeopardize threatened or endangered species or result in the destruction or adverse modification of critical habitat.

Farmland Protection Act of 1981, as amended (7 U.S.C. 4201 *et seq.;* 7 CFR Part 658)—The Farmland Protection Act requires the avoidance of any adverse effects on prime and unique farmlands. Its purpose is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses and to ensure that Federal programs are administered in a manner that, to the extent practical, will be compatible with state and local government and private programs and policies to protect farmland.

Federal Facility Compliance Act of 1992 (42 U.S.C. 6961 *et seq.*)—The Federal Facility Compliance Act enacted on October 6, 1992, amended the Resource Conservation and Recovery Act (RCRA) to eliminate sovereign immunity for Federal facilities managing mixed waste. For mixed waste, the Federal Facility Compliance Act requires a DOE facility to prepare a site treatment plan that establishes treatment schedules, with annual plan updates to account for development of treatment technologies, capacities, and changes in mixed waste inventories. DOE and NYSDEC entered into a Consent Order in August 1996 that requires completion of the milestones identified in the WVDP site treatment plan. Mixed wastes generated or managed during decommissioning must be handled in accordance with the site treatment plan. For example, mixed waste handling and management at the proposed Container Management Facility would have to conform to Federal Facility Compliance Act requirements, including documentation and accountability of the amounts and characteristics of wastes before and after processing in the facility.

Federal Insecticide, Fungicide, and Rodenticide Act of 1947, as amended (7 U.S.C. 136 *et seq.*)—The Federal Insecticide, Fungicide, and Rodenticide Act regulates the use, registration, and disposal of several classes of pesticides to ensure that pesticides are applied in a manner that protects the applicators, workers, and environment. Implementing regulations include recommended procedures for the disposal and storage of pesticides (40 CFR Part 165; 71 FR 47330, August 16, 2006, Final Rule) and worker protection standards (40 CFR Part 170).

Fish and Wildlife Coordination Act of 1934, as amended (16 U.S.C. 661–666e)—The Fish and Wildlife Coordination Act requires Federal agencies to consult with the U.S. Fish and Wildlife Service and the head of the state agency that administers wildlife resources in the affected state before performing any activity involving the impoundment, diversion, deepening, control, or modification of a stream or body of water. The agency would then produce a Fish and Wildlife Coordination Act report.

Hazardous Materials Transportation Act of 1975, as amended (49 U.S.C. 1801 *et seq.*)—The Hazardous Materials Transportation Act, as amended, is the major Federal transportation-related statute affecting DOE. Under the Hazardous Materials Transportation Act, the U.S. Department of Transportation promulgates requirements for marking, labeling, and placarding vehicles transporting hazardous materials; providing emergency response information; and training hazardous material transport personnel.

Low-Level Radioactive Waste Policy Act of 1980, as amended (42 U.S.C. 2021 *et seq*.)—This act amended the Atomic Energy Act to specify that the Federal Government is responsible for disposal of low-level radioactive waste, including Greater-Than-Class C waste, generated by certain activities, and that each state is responsible for disposal of other low-level radioactive waste generated within its borders. It provides for and encourages interstate compacts to carry out state responsibilities. As a result of the act, low-level radioactive waste owned or generated by DOE remains the responsibility of the Federal Government.

Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703 *et seq.*)—The Migratory Bird Treaty Act is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan, and Russia. The act stipulates that, except as permitted by regulations, it is unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, or kill any migratory bird. Removal of nuisance migratory birds and active nests at WNYNSC needs to be performed under permit. New York State requires a permit for taking destructive wildlife under Environmental Conservation Law (ECL) 11-0521. See New York State regulations in Section 5.5 for more details.

National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*)—NEPA requires that a Federal agency evaluate the potential environmental impacts of implementing any major Federal action significantly affecting the quality of the human environment. The Council on Environmental Quality has promulgated regulations to implement the procedural provisions of NEPA. These regulations are binding on all Federal agencies and are codified at 40 CFR Parts 1500 through 1508. These specify the content of an EIS and include cooperating agency and public involvement requirements. In addition, DOE has developed its own NEPA implementing regulations, which are codified at 10 CFR Part 1021. DOE is complying with these requirements in preparing this *Decommissioning and/or Long-Term Stewardship EIS*.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et seq.*)—The National Historic Preservation Act contains procedures for evaluating historic properties, consulting with interested parties, and protecting and preserving cultural resources.

Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001)—The Native American Graves Protection and Repatriation Act establishes provisions for the treatment of inadvertent discoveries of American Indian remains and cultural objects. When discoveries are made during ground-disturbing activities, the activity in the area must immediately stop, and reasonable protective efforts, proper notifications, and appropriate disposition of the discovered items must be pursued. This law would be invoked if any activity at WNYNSC led to discoveries of American Indian graves or grave artifacts.

Noise Control Act of 1972, as amended (42 U.S.C. 4901 *et seq.*)—Section 4 of the Noise Control Act directs Federal agencies to carry out programs in their jurisdictions "to the fullest extent within their authority" and in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare. This law provides requirements related to noise that would be generated by construction, operation, or closure activities associated with decommissioning and management activities at WNYNSC.

Nuclear Waste Policy Act of 1982, as amended (42 U.S.C. 10101, *et seq.*)—The Nuclear Waste Policy Act of 1982, as amended, formalizes the current Federal program for the disposal of high-level radioactive waste and spent nuclear fuel by directing DOE to characterize and evaluate Yucca Mountain for suitability as a potential repository for high-level radioactive waste and spent nuclear fuel; directing EPA to set generally applicable environmental radiation standards based on the authority of the Atomic Energy Act and other laws; and requiring the NRC to implement EPA standards by incorporating them into NRC licensing requirements for high-level radioactive waste and spent nuclear fuel repositories. Both EPA and the NRC have promulgated regulations pursuant to the act that establish standards to protect the public and to license disposal repositories.

EPA has promulgated generally applicable environmental standards in 40 CFR Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Wastes." The regulations in 40 CFR Part 191 establish standards for management and storage of spent nuclear fuel, high-level radioactive waste, and transuranic waste at facilities regulated by the NRC or Agreement States. The 40 CFR Part 191 regulations also establish radiation protection standards for spent nuclear fuel, high-level radioactive waste, and transuranic waste at disposal facilities operated by DOE that are not regulated by the NRC or Agreement States.

Sections 180 (a) and (c) of the Nuclear Waste Policy Act require DOE to transport high-level radioactive waste and spent nuclear fuel to the repository only in packages certified by the NRC and provide technical assistance and funding to train public safety officials of local government units along transportation routes. In its April 30, 1998, revised policy proposal (63 FR 23753), DOE established that local jurisdictions would be eligible for grants approximately 4 years before the first shipment through state or Tribal lands.

As indicated in the Administration's fiscal year 2010 budget, the Administration intends to terminate the Yucca Mountain program while developing nuclear waste disposal alternatives. Notwithstanding this decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of high-level radioactive waste and spent nuclear fuel. The Administration intends to convene a blue ribbon commission to evaluate alternative approaches for meeting these obligations. The commission will provide the opportunity for a meaningful dialogue on how best to address this challenging issue and will provide recommendations that will form the basis for working with Congress to revise the statutory framework for managing and disposing of high-level radioactive waste and spent nuclear fuel.

Occupational Safety and Health Act of 1970 (29 U.S.C. 651 *et seq.*)—Section 4(b)(1) of the Occupational Safety and Health Act exempts DOE and its contractors from the occupational safety requirements of the Occupational Safety and Health Administration. However, DOE's system of policies, Orders, and directives addresses worker safety (see Table 5–2). DOE Orders 5480.4 and 440.1A and 10 CFR Part 851 set forth environmental safety and health protection standards applicable to all DOE operations and contractors, and require that DOE and its contractors including those at WVDP comply with the Occupational Safety and Health Act standards at 29 CFR Part 1910.

Pollution Prevention Act of 1990 (42 U.S.C. 13101 *et seq.*)—The Pollution Prevention Act of 1990 establishes a national policy for waste management and pollution control that focuses first on source reduction, then on environmentally safe recycling, treatment, and disposal. DOE would prepare a pollution prevention plan for any new facilities constructed and operated during decommissioning.

Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments (42 U.S.C. 6901 *et seq.*)—RCRA regulates the treatment, storage, and/or disposal of hazardous waste and requires a hazardous waste permit for any facility that treats or stores large quantities of hazardous waste for more than 90 days or disposes of hazardous waste at the facility. Groundwater monitoring is required of nearly all RCRA facilities; if standards for certain contaminants are exceeded, corrective measures must be undertaken. RCRA also imposes cleanup standards for concentrations of hazardous constituents in soils. RCRA regulations are administered in New York State by NYSDEC. RCRA also provides the statutory authority for the EPA administrator and/or authorized state regulatory authority (NYSDEC) to require implementation of RCRA corrective actions to protect human health and the environment from releases or potential releases of hazardous waste and/or hazardous constituents at WNYNSC. In March of 1992, an RCRA Section 3008(h) Administrative Order on Consent (discussed separately in more detail in the following subsection) was issued by EPA and NYSDEC to DOE and NYSERDA, requiring implementation of the RCRA Corrective Action Program at WNYNSC. As a part of this Order, DOE and NYSERDA were required to perform corrective action activities including, but not limited to, interim measures to reduce or eliminate threats to human health and the environment if necessary, an RCRA facility investigation to determine if any release had occurred, and a Corrective Measures Study to evaluate selection of remedial alternatives for the Solid Waste Management Units (SWMUs) and any releases therefrom at WNYNSC.

Cleanup of any units subject to the RCRA programs would be performed in accordance with the RCRA Permitting and/or Corrective Action Programs, as applicable. Development of the closure/management strategy would involve consultation with regulators.

Administrative Order on Consent (RCRA 3008[h])

In 1992, an RCRA Section 3008(h) Administrative Order on Consent was issued by EPA and NYSDEC to DOE and NYSERDA. The Consent Order specifies the work to be performed by DOE and NYSERDA to protect human health and the environment from releases or potential releases of hazardous waste and/or hazardous constituents at WNYNSC. It requires RCRA facility investigations of onsite SWMUs to determine if there has been a release, or a potential for release, of hazardous waste and/or hazardous constituents from SWMUs. The Order also requires that corrective measures be taken, if necessary. All RCRA facility investigation reports for SWMUs originally identified in 1992 were completed by 1997. In addition, required notifications to EPA and NYSDEC have occurred for three additional SWMUs that were identified in 2003 and 2004. All identified SWMUs from which there has been a release, or a potential release, of hazardous constituents are under continuous monitoring (WVNS and URS 2004a).

The Consent Order also requires Corrective Measures Studies to be performed, if necessary, to evaluate selection of remedial alternatives for some of the SWMUs at WNYNSC.

Safe Drinking Water Act of 1974, as amended (42 U.S.C. 300(f) *et seq.*)—The Safe Drinking Water Act, as amended, establishes minimum national standards for public water supply systems in the form of maximum contaminant levels for pollutants, including radionuclides. Although NYSDOH has primacy for the Safe Drinking Water Act in New York, the water quality standards are implemented by NYSDEC, which administers the act in the state. Groundwater is not currently used as a public water supply at WNYNSC. The maximum contaminant level for manmade beta and gamma emitters is based on a dose limit of 4 millirem per year. This limit applies to community water systems, including any that might utilize waters from WNYNSC.

The Safe Drinking Water Act also mandates the establishment of a permit program to regulate the construction and operation of underground injection wells under the Underground Injection Control Program. EPA maintains authority over the Underground Injection Control Program and implements the regulations in New York State under 40 CFR Part 144 and 40 CFR Part 146. These regulations would apply to closure of the injection well in Waste Management Area 11 at WNYNSC.

Sole-Source Aquifer

WNYNSC overlies the Cattaraugus Creek Basin Aquifer, which is a federally designated sole-source aquifer pursuant to Section 1424(e) of the Safe Drinking Water Act. Therefore, this EIS is subject to EPA review of DOE activities associated with WVDP. If EPA review raises concerns that the project is not protective of groundwater quality or safe drinking water standards, as applicable, the agency can make specific recommendations or mandate additional pollution prevention requirements. Although New York State does not regulate the Cattaraugus Creek Basin Aquifer, under sole-source aquifer designation, the state's ECLs do apply to all sources of drinking water (surface and groundwater) throughout the state, including the Cattaraugus Creek Basin Aquifer. These regulations are discussed in more detail under New York State environmental regulations in Section 5.5 of this chapter.

The Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668–668d)—The Bald and Golden Eagle Protection Act makes it unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States. The U.S. Fish and Wildlife Service reviews EISs to determine whether the activities analyzed would comply with the Bald and Golden Eagle Protection Act.

Toxic Substances Control Act (15 U.S.C. 2601 *et seq.*)—The Toxic Substances Control Act (TSCA) regulates the manufacture, processing, distribution, and use of certain chemicals not regulated by RCRA or other statutes, including asbestos-containing material and polychlorinated biphenyls. Any TSCA-regulated waste removed from structures (e.g., capacitors contaminated with polychlorinated biphenyls) or discovered during decommissioning activities (e.g., contaminated media) would be managed in compliance with TSCA requirements in 40 CFR Part 761. The end-state evaluation for all alternatives considers compliance with TSCA.

Waste Isolation Pilot Plant Land Withdrawal Act of 1992 (Public Law 102-579), as amended by the Waste Isolation Pilot Plant Land Withdrawal Act Amendments (Public Law 104-201)—The Waste Isolation Pilot Plant Land Withdrawal Act required the withdrawal of land from the public domain for the purpose of creating and operating the Waste Isolation Pilot Plant (WIPP), the geologic repository in New Mexico designated as the national disposal site for defense transuranic waste. The act also defines the characteristics and amount of waste acceptable for disposal at the facility. The amendments to the act exempt waste to be disposed of at WIPP from RCRA land disposal restrictions. Prior to sending any transuranic waste from WVDP to WIPP, DOE would have to make a determination that the waste meets all statutory and regulatory requirements for disposal at WIPP.

West Valley Demonstration Project Act of 1980 (Public Law 96-368)—The WVDP Act established WVDP to demonstrate technologies for solidifying liquid high-level radioactive waste at WNYNSC. The act assigns DOE responsibility for solidifying the high-level radioactive waste on site and transporting the solidified waste to an appropriate Federal repository for disposal. The act also assigns DOE the responsibility to treat and dispose of low-level radioactive and/or transuranic waste generated during the solidification activities and decommission the WVDP facilities used as a part of WVDP.

The WVDP Act does not address termination of the NRC license for the site, or portions thereof. Any such license termination would be conducted (if license termination is possible and pursued) under the Atomic Energy Act of 1954, as amended. The WVDP Act authorized the NRC to prescribe decommissioning criteria for WVDP. The NRC exercised this authority starting in 1999 by publishing a draft policy statement on decommissioning criteria for WVDP. After a public comment period, the NRC issued a final policy statement in 2002 prescribing the NRC's License Termination Rule as the decommissioning criteria to be used at WVDP. A more-detailed discussion of the final policy statement follows. Additionally, a legal suit filed against DOE by the Coalition on West Valley Nuclear Wastes & Radioactive Waste Campaign challenging certain DOE actions with regard to disposal of the low-level radioactive waste generated as a part of WVDP resulted in a Stipulation of Compromise Settlement, which is discussed in more detail in a subparagraph that follows.

NRC Final Decommissioning Policy Statement

Under authority of the WVDP Act, the NRC published its final policy statement in 2002, adopting the NRC License Termination Rule provisions as the decommissioning criteria for the WVDP (67 FR 5003; February 1, 2002).

The criteria of the License Termination Rule applies to the decommissioning of (1) the high-level radioactive waste tanks and other facilities in which high-level radioactive waste solidified under WVDP was stored, (2) the facilities used in the solidification of the waste, and (3) any material or hardware used in connection with WVDP. The policy statement also provided criteria for the determination of wastes "incidental" to reprocessing and established that the calculated dose from this incidental waste is to be integrated with all the other calculated doses from the remaining material at the entire NRC-licensed site to ensure that the NRC decommissioning criteria are met.

Although the policy statement prescribes the use of the NRC's License Termination Rule as the decommissioning criteria for WVDP, the NRC recognizes that health and safety and cost-benefit considerations may justify the evaluation of alternatives that do not fully comply with the License Termination Rule criteria. Therefore, the NRC is prepared to provide flexibility to assure cleanup to the maximum extent technically and economically feasible (67 FR 5004). DOE may request alternative criteria and/or potential exemptions to the requirements under 10 CFR Part 20 Subpart E and Subpart N, respectively, based on site-specific analysis that demonstrates that public health and safety will be adequately protected with reasonable assurance (67 FR 5004). The policy statement also provides that the criteria in the License Termination Rule will also apply to the termination of NYSERDA's NRC license after the license is reactivated. For those portions of the site covered by the WVDP Act, it is NRC's intent that any exemptions or alternative criteria authorized for DOE to meet the provisions of the WVDP Act will also apply to NYSERDA at the time of site license termination, if license termination is possible (67 FR 5011).

Coalition on West Valley Nuclear Wastes & Radioactive Waste Campaign and DOE Stipulation of Compromise Settlement

In 1986, the Coalition on West Valley Nuclear Waste and Radioactive Waste Campaign ("coalition") filed an action in the U.S. District Court for the Western District of New York challenging certain proposed actions of DOE related to disposal of low-level radioactive waste generated from activities associated with solidification of high-level radioactive waste at WVDP. As a result of this action, the coalition and DOE entered into a Stipulation of Compromise Settlement ("stipulation"), dated May 27, 1987. In the stipulation, the coalition and DOE agreed, among other things, that an EIS addressing the closure of the post-solidification phase of WVDP would include analysis of the disposal of Class A and Class B/C low-level radioactive wastes "generated as a result of the activities of the Department of Energy at the WVDP and mandated by the Congress under the WVDP Act." Further, for consideration of any onsite disposal, DOE shall evaluate "erosion impacts and erosion control impacts and the need for erosion control measures." (Civil No. 86-1052-C, U.S. District Court, Western District of New York, May 27, 1987).

5.3 Federal Environmental, Safety, and Health Executive Orders

Executive Orders establish policies and requirements for Federal agencies. Executive Orders are applicable to Executive branch agencies, but do not have the force of law or regulation. The applicability of the following Executive Orders were considered as they relate to the proposed action at WVDP.

Executive Order 11514, Protection and Enhancement of Environmental Quality (March 5, 1970, as amended by Executive Order 11991, May 24, 1977)—This Order (regulated by 40 CFR Parts 1500 through 1508) requires Federal agencies to continually monitor and control their activities to (1) protect and enhance the quality of the environment, and (2) develop procedures to ensure the fullest practicable provision of timely public information and understanding of the Federal plans and programs that may have potential environmental impact so that views of interested parties can be obtained. DOE has issued regulations (10 CFR Part 1021) and DOE Order 451.1B for compliance with this Executive Order. This *Decommissioning and/or Long-Term Stewardship EIS* has been prepared in accordance with all NEPA regulations.

Executive Order 11593, Protection and Enhancement of the Cultural Environment (May 6, 1971)—This Order directs Federal agencies to locate, inventory, and nominate qualified properties under their jurisdiction or control to the National Register of Historic Places. This process requires DOE to provide the Advisory Council on Historic Preservation the opportunity to comment on the possible impacts of the proposed activity on any potential eligible or listed resources.

Executive Order 11988, Floodplain Management (May 24, 1977)—This Order requires Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken in a floodplain, and that floodplain impacts are avoided to the extent practicable. DOE has issued regulations at 10 CFR Part 1022, "Compliance With Floodplain and Wetland Environmental Review Requirements," to implement the requirements of Executive Orders 11988 and 11990 (44 FR 12596).

Executive Order 11990, Protection of Wetlands (May 24, 1977)—This Order requires Federal agencies to avoid any short- or long-term adverse impacts on wetlands wherever there is a practicable alternative and to provide opportunity for early public review of any plans or proposals for new construction in wetlands.

Executive Order 12088, Federal Compliance with Pollution Control Standards (October 13, 1978, as amended by Executive Order 12580, January 23, 1987)—This Order directs Federal agencies to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the Clean Air Act, the Noise Control Act, the Clean Water Act, the Safe Drinking Water Act, the TSCA, and RCRA.

Executive Order 12148, Federal Emergency Management (July 20, 1979)—This Order transfers functions and responsibilities associated with Federal emergency management to the director of the Federal Emergency Management Agency. The Order assigns the director the responsibility to establish Federal policies for and to coordinate all civil defense and civil emergency planning, management, mitigation, and assistance functions of Executive agencies.

Executive Order 12580, Superfund Implementation (January 23, 1987, as amended by Executive Order 13308, June 20, 2003)—This Order delegates to the heads of Executive departments and agencies the responsibility of undertaking remedial actions for releases or threatened releases that are not on the National Priorities List and removal actions, in non-emergency situations, where the release is from any facility under the jurisdiction or control of Executive departments or agencies.

Executive Order 12656, Assignment of Emergency Preparedness Responsibilities (November 18, 1988)—This Order assigns emergency preparedness responsibilities to Federal departments and agencies.

Executive Order 12856, Right-to-Know Laws and Pollution Prevention Requirements (August 3, 1993)—Executive Order 12856 directs Federal agencies to reduce and report toxic chemicals entering any waste stream; to improve emergency planning, response, and accident notification; and to meet the requirements of the Emergency Planning and Community Right-to-Know Act.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 11, 1994)—This Order requires each Federal agency to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

Executive Order 12902, Energy Efficiency and Water Conservation at Federal Facilities (March 8, 1994)—This Order requires Federal agencies to develop and implement a program for conservation of energy and water resources. As part of this program, agencies are required to conduct comprehensive facility audits of their energy and water use.

Executive Order 13007, Indian Sacred Sites (May 24, 1994)—This Order directs Federal agencies, to the extent permitted by law and not inconsistent with agency missions, to avoid adverse effects on sacred sites and to provide access to those sites to American Indians for religious practices. The Order directs agencies to provide protection of and access to sacred sites to the extent compatible with the project at hand.

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (April 21, 1997, as amended by Executive Order 13229, October 9, 2001, and Executive Order 13296, April 18, 2003)—This Order requires each Federal agency to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health or safety risks.

Executive Order 13112, Invasive Species (February 3, 1999)—This Order directs Federal agencies to act to prevent the introduction of or to monitor and control invasive (non-native) species, to provide for restoration of native species, to conduct research, to promote educational activities, and to exercise care in taking actions that could promote the introduction or spread of invasive species. During decommissioning, rehabilitation of disturbed areas would be accomplished by reseeding or revegetating areas with native plants and trees.

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (November 6, 2000)—This Order directs Federal agencies to establish regular and meaningful consultation and collaboration with Tribal governments in the development of Federal policies that have Tribal implications, to strengthen U.S. government-to-government relationships with American Indian Tribes, and to reduce the imposition of unfunded mandates on Tribal governments.

Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management (January 24, 2007)—This Order requires, among other things, Federal agencies to improve energy efficiency and reduce greenhouse gas emission through reduction of energy intensity. It also requires the agencies to ensure that at least half of the statutorily required renewable energy consumed by the agencies in a fiscal year comes from new renewable sources; to the extent feasible, the agencies must implement renewable energy generation projects. It requires agencies to reduce the quantity of toxic and hazardous chemicals and materials acquired, used, or disposed of, and maintain effective waste prevention and recycling programs. It also directs agencies to incorporate waste prevention and recycling in its daily operations and work to increase and expand markets for recovered materials. It also requires agencies to ensure that new construction and major renovations of agency buildings comply with guidance principles for high performance and sustainable buildings.

Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance (October 5, 2009)—This Order directs Federal agencies to increase energy efficiency; reduce greenhouse gas emissions; conserve and protect water resources; foster markets for sustainable technologies and environmentally preferable materials, products and services; and design, construct, maintain and operate high performance sustainable buildings. This Order also requires Federal agencies to prepare and provide to the Council on Environmental Quality and the Office of Management and Budget, and annually update, a Strategic Sustainability Performance Plan that identifies and tracks percentage reduction targets or other goals for each of the identified areas by which to measure progress toward meeting the performance requirements established by this Order.

5.4 U.S. Department of Energy Environmental, Safety, and Health Regulations and Orders

The Atomic Energy Act authorizes DOE to establish standards to protect health or minimize dangers to life or property for activities under DOE's jurisdiction. (DOE regulations and Orders do not apply to activities regulated by the NRC.) DOE regulations are found in Title 10 of the CFR. These regulations address such areas as energy conservation, administrative requirements and procedures, nuclear safety, and classified information.

For the purpose of this EIS, relevant regulations include the following: "Procedural Rules for DOE Nuclear Activities" (10 CFR Part 820), "Nuclear Safety Management" (10 CFR Part 830), "Occupational Radiation Protection" (10 CFR Part 835), "Compliance with the National Environmental Policy Act" (10 CFR Part 1021 and DOE Order 451.1B), and "Compliance with Floodplain and Wetland Environmental Review Requirements" (10 CFR Part 1022).

Table 5–2 in Section 5.7 lists the DOE Orders and policies potentially relevant to the alternatives evaluated in this *Decommissioning and/or Long-Term Stewardship EIS*.

5.5 New York State Environmental, Safety, and Health Laws and Regulations

The Atomic Energy Act authorizes the NRC to enter into an agreement with a state in which the NRC will discontinue and the state will assume regulatory authority over certain radioactive materials. NYSDOH and NYSDEC have established requirements under this Agreement State Program.

As of July 1, 2006, New York State authority for the Radiological Health Program, including ionizing radiation protection (12 New York Code of Rules and Regulations [NYCRR] Part 38), was transferred from the New York State Department of Labor to NYSDOH. As such, NYSDOH now has jurisdiction over the commercial and industrial use of radioactive materials in New York State, including the possession of radioactive materials at the SDA at WNYNSC. NYSDOH now maintains authority over the radioactive materials license (originally issued by the New York State Department of Labor) that authorizes NYSERDA to possess and manage emplaced radioactive waste at the SDA. The license requires NYSERDA to conduct its operations in accordance with a radioactive safety program to minimize radiation exposures to workers and the public resulting from SDA operations. Although NYSDOH is the lead agency for the protection of public health from any public health threat, including ionizing radiation, NYSDEC, under its responsibility as established in New York ECL, will serve as the lead agency for the decommissioning project.[1] NYSDOH will participate in the project by reviewing and concurring with NYSDEC on any remedial actions, thus ensuring that the public health is protected.

Under the New York Agreement State Program, NYSDEC has jurisdiction over discharges of radioactive material to the environment, including releases to the air and water, and disposal of radioactive waste in the ground. NYSDEC's role at the SDA is to ensure that NYSERDA properly maintains the integrity of the SDA, minimizes discharges of radioactive material to the environment, and properly closes the facility in a manner that is protective of the public health and environment and in compliance with 6 NYCRR Part 380, "Prevention and Control of Environmental Pollution by Radioactive Materials."

Additionally, NYSDEC has jurisdiction over inactive waste sites under the State Superfund Program (6 NYCRR Part 375) and discharges from SWMUs, as well as permitting and closure of RCRA interim and final status units under the Hazardous Waste Program (6 NYCRR Parts 370–374, 376). The New York State

[1] *Regulators Communication Plan on Application of Cleanup Requirements for Decommissioning the West Valley Site, Revision 1, May 20, 2003 (EPA et al. 2003).*

RCRA regulations apply to DOE and its contractors. The state-licensed sites and activities such as the SDA, however, are regulated under both NYSDEC radiation protection and RCRA regulations.

In addition to implementing some Federal programs, state legislatures develop their own laws. State statutes supplement as well as implement Federal laws for protection of air, water quality, and groundwater. State legislation may address solid waste management programs, locally rare or endangered species, and local historic and cultural resources. New York State laws and regulations applicable to alternatives evaluated in this EIS are enumerated and briefly discussed in this section. They are presented in alphabetical order.

Air Pollution Control Act (ECL 19-0101 *et seq.*)—New York State air quality regulations would be applicable to emission-producing activities during decommissioning, such as construction, excavation, and demolition; vehicle emissions; and waste treatment processes that would be performed under some alternatives. Under NYSDEC's air permitting program, a permit is required to operate an "air contamination source." WNYNSC holds a sitewide air permit issued by NYSDEC that could require modification to encompass emissions during decommissioning activities.

Clean Water Act ECL Articles 15, 17; 6 NYCRR Parts 649–758)—The Federal Clean Water Act allows for primary enforcement and administration through the states, provided the state program is at least as stringent as the Federal program. New York regulations with regard to ambient water quality standards and effluent limitations were substantially revised in 1973 as ECL Article 17 to conform to the Clean Water Act and facilitate assumption of authority for the Federal NPDES program from EPA to NYSDEC. The primary mechanism to control water pollution is the requirement that direct dischargers obtain an NPDES permit, or, in the case of states such as New York, where the authority has been assumed from EPA, an SPDES permit, pursuant to the Clean Water Act.

An important difference between the Federal regulations and New York State regulations is the definition of waters regulated by the state. ECL Article 17 not only includes all navigable waters within the state, but also encompasses all "bodies of…underground water," while the Clean Water Act only regulates surface waters. All fresh groundwater in New York State is Class GA with best use being designated as source of drinking water. The Cattaraugus Creek Drainage Basin Aquifer is located under WNYNSC and is thus subject to these New York State effluent limitations and ambient water quality standards. Therefore, this EIS is subject to NYSDEC review, and an SPDES permit is required under New York State law for all discharges to both surface waters and groundwater.

Endangered and Threatened Species Protection (ECL 9-1503, 11-0535 *et seq.*; 6 NYCRR Parts 182, 193)—The NYSDEC Bureau of Wildlife has identified a 1,619-hectare (4,000-acre) area, including all of WNYNSC, on the New York State critical habitat map as a deer wintering ground, in addition to the potential for the presence of state-listed threatened or endangered species on the site. Decommissioning activities that could potentially impact confirmed state-listed threatened and endangered plant species and the state's critical habitat must be coordinated through the NYSDEC Bureau of Wildlife.

New York Freshwater Wetlands Act (ECL 24-0101 *et seq.*; 6 NYCRR Part 663)—Six linked wetland areas identified on the southern portion of WNYNSC have been listed as a single wetland subject to state jurisdiction. Activities requiring a permit include draining, filling, or excavating wetlands and changing or obstructing the flow of water into or through wetland areas or within 30 meters (100 feet) of designated wetland areas. Because NYSDEC has identified a single state-jurisdictional wetland on WNYNSC, a permit would be required before certain activities within the wetland or its 30-meter-wide (100-foot-wide) buffer area could be implemented. Consultation with NYSDEC would be required if implementation of a global erosion control strategy could destroy or disturb the state-jurisdictional wetland.

New York State Environmental Quality Review Act (ECL 8-0101 *et seq.;* 6 NYCRR Part 617)—The New York State Environmental Quality Review Act requires all state and local government agencies to consider environmental impacts equally with social and economic factors during discretionary decisionmaking. This means these agencies must assess the environmental significance of all actions they have discretion to approve, fund, or directly undertake. The act requires the agencies to balance environmental impacts with social and economic factors when deciding to approve or undertake an action. This EIS has been prepared to meet NYSERDA's SEQR responsibilities for its decisionmaking process for management of WNYNSC.

Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments (ECL Article 27; Titles 7, 9; 6 NYCRR Parts 370–374, 376)—RCRA regulations are administered in New York State by NYSDEC. Facilities in New York State in existence when the regulations took effect can continue operations under interim status by submitting a RCRA Part A permit application to NYSDEC. WVDP has been operating under interim status since 1990, and in December 2004 transmitted a Part 373/RCRA permit application to NYSDEC for review and processing. In February 2005, NYSDEC indicated that they would begin their technical review. However, NYSDEC's review of the 2005 Preliminary Draft EIS and the ongoing work at WNYNSC has taken precedence. A revised Part 373/RCRA Permit Application will need to be submitted to update the facility information and changes.

Closure or management of RCRA interim or final status units would be performed in accordance with closure plans or other regulatory vehicles. Development of the closure/management strategy would involve consultation with regulators.

RCRA also provides the statutory authority for the EPA administrator and/or authorized state regulatory authority (NYSDEC) to require implementation of RCRA corrective actions to protect human health and the environment from releases or potential releases of hazardous waste and/or hazardous constituents at WNYNSC. In March of 1992, an RCRA Section 3008(h) Administrative Order on Consent was issued by EPA and NYSDEC to DOE and NYSERDA, requiring implementation of the RCRA Corrective Action Program at WNYNSC. As a part of this Order, DOE and NYSERDA were required to perform corrective action activities including, but not limited to, interim measures to reduce or eliminate threats to human health and the environment if necessary, an RCRA facility investigation to determine if any release had occurred, and, when directed by NYSDEC, a Corrective Measures Study to evaluate selection of remedial alternatives for SWMUs at WNYNSC.

State Pollutant Discharge Elimination System (ECL Article 17; 6 NYCRR Part 750 *et seq.*)—New York State's SPDES program is governed by ECL Article 17, as discussed in the preceding section on the Clean Water Act, and 6 NYCRR Parts 750 *et seq*. New York's SPDES program must be consistent with the applicable provisions of the Clean Water Act and the NPDES program and with the Federal implementing regulations applicable to municipal sewage treatment plants.

An SPDES permit from NYSDEC is required to discharge any pollutant to state waters from an outlet or point source. There are two SPDES permits for WNYNSC: DOE was issued a permit for WVDP, and NYSERDA was issued a separate permit for the SDA.

Construction activities impacting 0.4 hectares (1 acre) or more require an SPDES construction permit. The permit requires that all construction activities be conducted in conformance with state-derived performance standards for erosion control and stormwater management. Significant addition or modification to existing facilities and discharges would require modifying the WVDP SPDES permit and preparing a stormwater pollution prevention plan. An SPDES permit also would be necessary if a mobile wastewater treatment unit is used during decommissioning. An SPDES permit that includes provisions for long-term monitoring of surface water and surface water discharges could be required after decommissioning under restricted use scenarios.

Stream Protection Act (ECL 15-0501; 6 NYCRR Part 608)—With some exceptions, no person or public corporation may change, modify, or disturb the course, channel, or bed of a protected stream or remove any sand, gravel or other materials from the bed of a protected stream or its banks [classification and standard of C(T) or higher] without first obtaining a stream protection permit from NYSDEC (6 NYCRR 608.2, "Disturbance of Protected Streams"). Regulations at 6 NYCRR 608.3, "Dams and Impoundment Structures," may be relevant to alternatives altering the reservoir dams in Waste Management Area 12.

The New York State Historic Preservation Act (Parks, Recreation, and Historic Preservation Law Section 14.09; 9 NYCRR Parts 426–428)—The commissioner of parks, recreation and historic preservation, in consultation with the State Board for Historic Preservation, has established the New York State Register of Historic Places. Buildings or other facilities on or eligible for listing on the State Register of Historical Places and sites listed on the National Register of Historic Places are provided special protections.

Waste Transporter Permits (ECL Article 27; Titles 3, 9, 15; 6 NYCRR Parts 364, 372, 381)—As an Agreement State under the Atomic Energy Act, NYSDEC regulations require transporters of low-level radioactive waste or mixed waste into, within, and through the state to obtain a permit from NYSDEC and submit low-level radioactive waste manifests. These regulations are found in 6 NYCRR Parts 372 and 381, "Low-Level Radioactive Waste Transporter Permit and Manifest System." New York law also requires waste transporter permits for solid, industrial, and hazardous waste under 6 NYCRR Part 364.

Wells, Oil, and Petroleum Tanks (6 NYCRR Parts 555 and 613)—The "West Valley Regulators Communication Plan" (EPA et al. 2003) notes that cleanup must meet NYSDEC requirements for closure of abandoned oil and gas wells under 6 NYCRR Part 555 and comply with handling and storage of petroleum under 6 NYCRR Part 613.

5.6 Consultations

Certain laws, such as the Endangered Species Act (16 U.S.C. 1536), the Fish and Wildlife Coordination Act (16 U.S.C. 661), and the National Historic Preservation Act (16 U.S.C. 470f), require consultation and coordination by DOE with other governmental entities, including other Federal agencies, state and local agencies, and federally recognized American Indian governments. These consultations must occur on a timely basis and are generally required before any land disturbance can begin. Most of these consultations are related to ecological resources, cultural resources, and American Indian rights. The ecological resource consultations generally pertain to the potential for activities to disturb sensitive species or habitats. Cultural resource consultations relate to the potential for disruption of important cultural resources and archaeological sites. American Indian consultations concern the potential for disturbance of ancestral American Indian sites, the traditional practices of American Indians, and natural resources of importance to American Indians. Correspondence related to consultations are presented in Appendix O.

DOE has been in consultation with the appropriate Federal and New York State agencies and American Indian governments as required by other actions considered or taken at WNYNSC in the past, as identified in Sections 5.6.1 through 5.6.3. The consultations required under this *Decommissioning and/or Long-Term Stewardship EIS* and with the coordinating agencies and American Indian governments are discussed in the following sections.

5.6.1 Ecological Resources Consultations

DOE has completed consultations related to potential actions identified in this EIS and their possible impacts on ecological resources at WNYNSC. These consultations have been conducted with the appropriate regional and field offices of the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, and counterpart New York State agencies.

Consultations Required Under the Endangered Species Act of 1973 (16 U.S.C. 1531–1544)

In July 2008, DOE requested and received input from the U.S. Fish and Wildlife Service regarding the presence of threatened and endangered species on site. In June 2009, the U.S. Fish and Wildlife Service provided comments on the November 2008 Revised Draft EIS, including a concern that two endangered mollusks, the clubshell and rayed bean, could possibly occur on site or in nearby creeks. DOE's response to these comments indicated the clubshell and rayed bean, although reported in Cattaraugus County, were not found in Buttermilk or Cattaraugus Creeks when those streams were surveyed in 1991 (WVNS 1992b). Additionally, these mollusks were not reported by the New York Natural Heritage Program when that organization was consulted concerning state-listed species potentially present in the vicinity of the site (Seoane 2008). In August 2009, DOE sent a letter to the U.S. Fish and Wildlife Service requesting acknowledgement of DOE's determination that there would be no impacts on threatened or endangered species associated with proposed activities evaluated in this EIS.

The U.S. Fish and Wildlife Service was also consulted regarding potential impacts on migratory bird species. On June 12, 2007, DOE sent a letter to the Migratory Bird Permit Office of the U.S. Fish and Wildlife Service and the NYSDEC Division of Fish and Wildlife with a completed application package requesting renewal of the Federal Migratory Bird Depredation Permit and New York State Fish and Wildlife Depredation License for the site. The Federal and state permit and license, respectively, allow for the limited taking of certain migratory bird species and active and inactive birds nests to mitigate the transport and spread of radiological contamination and asbestos from delineated and controlled areas of WNYNSC. The transport and spread of radiological contamination and asbestos pose potential human health and safety concerns and could disrupt cleanup operations at the site.

Consultations Required Under the Clean Water Act (33 U.S.C. 1251 *et seq.*)

On March 21, 2006, the Buffalo District of the U.S. Army Corps of Engineers confirmed that wetlands under Federal jurisdiction exist on the property. This judgment was based on a field visit conducted on November 2, 2005, the review of applicable topographic wetland maps of the area, and a 2003 wetland delineation report (WVNS and URS 2004b). The wetlands identified by the U.S. Army Corps of Engineers were determined to be waters of the United States and therefore subject to regulation under Section 404 of the Clean Water Act. Further, the waters are part of an ecological continuum constituting a surface-water tributary system of Buttermilk Creek, Cattaraugus Creek, and Lake Erie. As such, authorization from the U.S. Army Corps of Engineers to work in these areas is necessary (Senus 2006). On December 28, 2005, NYSDEC Region 9 concurred with the wetland delineation conducted in 2003 and concluded that there are a number of wetlands that in aggregate constitute an Article 24 state jurisdictional wetland (Ermer 2005).

Since that time, a Supreme Court ruling was issued in the case of *Rapanos v. United States & Carabell v. United States* regarding the classification of isolated wetlands as jurisdictional. In July 2007, the U.S. Army Corps of Engineers, in conjunction with the U.S. Environmental Protection Agency (EPA and ACE 2007), issued new guidance implementing this decision, which indicates that under certain circumstances, isolated wetlands may constitute, in part or in aggregate, a jurisdictional wetland. In accordance with this guidance, for the purposes of analysis in this EIS, DOE is considering an additional 0.98 hectares [2.43 acres] at WNYNSC jurisdictional wetlands, which increases the total acreage of jurisdictional wetlands impacted by WVDP by 0.04 hectares [0.1 acres].

5.6.2 Cultural Resources Consultations

A cultural resources study for approximately 146 hectares (360 acres) that at the time were thought could be affected by future plans and/or WNYNSC closure activities was performed in 1990 (Pierce 1991). Based on information from that study submitted to the New York State Historic Preservation Office, it was determined that facilities on the Project Premises are not eligible for inclusion on the National Register of Historic Places (Kuhn 1995). Although no alternative is expected to impact important cultural resources, the potential for inadvertent discovery of prehistoric or archaeological resources exists. If any cultural resources were discovered during land-disturbing activities, those activities would be halted, and consultations would be conducted with the New York State Historic Preservation Office.

5.6.3 American Indian Consultations

Communications have been ongoing between DOE and the Seneca Nation of Indians, the only federally recognized American Indian government located in the area of WNYNSC. A Cooperative Agreement was signed in 1996 to foster government-to-government relationships between the Seneca Nation of Indians and DOE (Seneca Nation 1996). The Cooperative Agreement continues activities that promote an understanding of environmental and human health issues and has provided the resources needed to review and comment on previous environmental documents, formulate a baseline environmental sampling plan, compile preliminary information on population and lifestyles, and educate the Seneca Nation of Indians on issues related to WNYNSC.

In 2000, DOE and the Seneca Nation of Indians signed a Memorandum of Agreement for shipment of WVDP spent nuclear fuel and high-level radioactive waste, and foreign research reactor spent nuclear fuel across Seneca Nation of Indians lands. The Memorandum of Agreement provides for the safe and secure transportation of such material through coordination with the Seneca Nation of Indians (Seneca Nation 2000).

Other communications that have taken place with the Seneca Nation of Indians not specific to NEPA activities include the following:

- On March 26, 2002, a consultation between DOE and the Seneca Nation of Indians was held at the Cattaraugus Reservation Library to discuss local and national issues affecting the Seneca Nation of Indians and DOE.

- On April 10, 2004, the Seneca Nation Tribal Council approved the *Final Baseline Sampling Report* as an official publication of the Seneca Nation of Indians. This report describes the sampling that was undertaken by the Seneca Nation Environmental Department to understand the level of radioactivity present in Cattaraugus Creek water, sediment, soil, plants, and animals. This information will be used to help gauge any impact of future cleanup and closure activities at WNYNSC on the Cattaraugus Creek environment.

On July 21, 2008, DOE sent a letter to the Seneca Nation of Indians requesting consultation regarding preparation of this EIS, and met with the Tribal Council on December 18, 2008, for the formal consultation. A public meeting on the 2008 Revised Draft EIS was held at the William Seneca Building on March 31, 2008, during which the Seneca Nation of Indians' resolution stating the Tribe's position on the EIS was read. This resolution, submitted on the record as formal comment on the November 2008 Revised Draft EIS, completed the consultation process.

In addition, copies of the November 2008 Revised Draft EIS were sent for comment to federally recognized American Indian governments in states with radioactive waste disposal sites identified as potential disposition locations for waste generated as a result of activities evaluated in this EIS.

5.7 Summary Tables

Tables 5–1 and 5–2 provide a listing of the potentially applicable laws, regulations, Orders, and requirements discussed in the preceding sections.

Table 5–1 Major Laws, Regulations, and Requirements Potentially Relevant to the Decommissioning and/or Long-Term Stewardship of the Western New York Nuclear Service Center

Regulation/Agency	*Title/Application*
Nuclear Requirements	
NRC (10 CFR Chapter I)	*NRC – Licensing/Permitting/Decommissioning Requirements* [2]
42 U.S.C. 2011 *et seq.*	Atomic Energy Act
42 U.S.C. 2021 *et seq.*	Low-Level Radioactive Waste Policy Act
67 FR 5003	Decommissioning Criteria for the West Valley Demonstration Project (M-32) at the West Valley Site; Final Policy Statement
10 CFR Part 20	Standards for Protection Against Radiation
10 CFR Part 50	Domestic Licensing of Production and Utilization Facilities
10 CFR Part 61	Licensing Requirements for Land Disposal of Radioactive Waste
New York State – NYSDEC and NYSDOL	*New York State–Environmental Conservation Rules and Regulations*
6 NYCRR Part 380	Prevention and Control of Environmental Pollution by Radioactive Materials
6 NYCRR Part 381	Transporters of Low-Level Radioactive Waste
6 NYCRR Parts 382–383	Regulations for Low-Level Radioactive Waste Disposal Facilities and Financial Assurance Requirements
12 NYCRR Part 38	Ionizing Radiation Protection
TAGM 4003	DSHM-RAD-05-01
DOE (10 CFR Chapter II)	*U.S. Department of Energy*
10 CFR Part 820	Procedural Rules for DOE Nuclear Activities
10 CFR Part 830	Nuclear Safety Management
10 CFR Part 835	Occupational Radiation Protection
10 CFR Part 962	Byproduct Material
42 U.S.C. 2021 *et seq.*	Low-Level Radioactive Waste Policy Act of 1980, as amended
EPA (40 CFR Chapter I, Subchapter F)	*U.S. Environmental Protection Agency – Radiation Protection Programs*
40 CFR Part 191	Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste
Solid, Hazardous, and Toxic Waste	
EPA	*EPA – Hazardous Waste Requirements*
42 U.S.C. 6901 *et seq.*	Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments
40 CFR Parts 260–282	Hazardous Waste Management (RCRA)
40 CFR Part 761	PCBs Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (TSCA)
New York State – NYSDEC	*Hazardous Waste Requirements*
6 NYCRR Part 364	Waste Transporter Permits
6 NYCRR Parts 370–376	Hazardous Waste Management
6 NYCRR Part 613	Handling and Storage of Petroleum
6 NYCRR Part 555	Plugging and Abandonment
TAGM 4046	Determination of Soil Cleanup Levels
6 NYCRR Part 360	Solid Waste Management Facilities
DOE / NYSERDA	*Hazardous Waste Requirements*
42 U.S.C. 6961	Federal Facility Compliance Act
RCRA 3008(h)	Administrative Order on Consent

[2] NRC licensing and radiation protection, environmental safety and health, security, and management policies are applicable to activities conducted by NYSERDA for facilities at WNYNSC that are under the 10 CFR Part 50 license but outside the authority of the WVDP Act.

Regulation/Agency	***Title/Application***
Air Quality	
EPA	*Clean Air Act/Air Quality Requirements*
42 U.S.C. 7401 *et seq.*	Clean Air Act of 1970, as amended
40 CFR Parts 61 and 63	National Emission Standards for Hazardous Air Pollutants (NESHAPs)
40 CFR Part 50	National Primary and Secondary Ambient Air Quality Standards (NAAQS)
40 CFR Part 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
New York State – NYSDEC	*Clean Air Act/Air Quality Requirements*
6 NYCRR Parts 200–317	Air Resources
TAGM 4031	Fugitive Dust Suppression and Particulate Monitoring at Inactive Hazardous Waste Sites
ECL 19-0101 *et seq.*	Air Pollution Control Act (New York)
Water Quality	
EPA/U.S. Army Corps of Engineers/Other Federal Agencies	*Safe Drinking Water Act/Clean Water Act/Water Quality Requirements*
40 CFR Parts 141–149	Safe Drinking Water Act – National Primary and Secondary Drinking Water Standards/Underground Injection Control/Sole-Source Aquifer Requirements
40 CFR Parts 110–122, 131	Clean Water Act – NPDES Permit/Water Quality Standards
33 CFR Parts 320–330	Clean Water Act – Dredge and Fill Permits
10 CFR Part 1022	Compliance with Floodplain/Wetland Environmental Review Requirements
10 CFR Part 1021	National Environmental Policy Act Implementing Procedures
Executive Order 11990	Protection of Wetlands
Executive Order 11988	Floodplain Management
New York State – NYSDEC/ U.S. Army Corps of Engineers	*Safe Drinking Water Act/Clean Water Act/Water Quality Requirements*
6 NYCRR Part 750	Obtaining a State Pollutant Discharge Elimination System Permit
6 NYCRR Part 608	Use and Protection of Surface Waters
6 NYCRR Part 663	Freshwater Wetlands Permit Requirements
6 NYCRR Parts 700–706	Surface Water and Groundwater Classifications and Standards
ECL 55-0101 *et seq.*	Sole-Source Aquifer Protection
6 NYCRR Part 663	Freshwater Wetlands
Ecological Resources	
U.S. Fish and Wildlife Service	
50 CFR Part 402	Interagency Cooperation – Endangered Species Act of 1973, as amended
16 U.S.C. 661–666e	Fish and Wildlife Coordination Act
16 U.S.C. 703 *et seq.*	Migratory Bird Treaty Act
16 U.S.C. 668–668d	Bald and Golden Eagle Protection Act
Executive Order 13112	Invasive Species
7 U.S.C. 136 *et seq.*	Endangered Species Act
New York State – NYSDEC	
6 NYCRR Part 182	Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern
ECL 11-0521	Requires Federal and state bird depredation permits if activities disturb/remove nests
6 NYCRR 193.3	Protected Native Plants

Regulation/Agency	***Title/Application***
Cultural Resources	
EPA/Other Federal Agencies	
16 U.S.C. 469 *et seq.*	Archaeological and Historic Preservation Act
42 U.S.C. 1996	American Indian Religious Freedom Act
25 U.S.C. 3001	Native American Graves Protection and Repatriation Act
36 CFR Part 800 *et seq.*	National Historic Preservation Act
	Consultation with Seneca Nation of Indians
	The Seneca Nation of Indians Cooperative Agreement
Executive Order 13175	Consultation and Coordination with Indian Tribal Governments
Executive Order 13007	Indian Sacred Sites
Executive Order 11593	Protection and Enhancement of the Cultural Environment
New York State – NYSDEC	
9 NYCRR Parts 426–428	The New York State Historic Preservation Act
Land Use	
New York State	
Cattaraugus County Land Use Plan for the Year 2000	Encourage land use consistent with development policies
Pollution Prevention	
EPA/Other Federal Agencies	
42 U.S.C. 13101 *et seq.*	Pollution Prevention Act
Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Executive Order 12856	Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements
Environmental Justice	
Executive Order 12898	Environmental Justice
Transportation	
U.S. Department of Transportation	
49 U.S.C. 1801 *et seq.*	Hazardous Materials Transportation Act
New York State	
6 NYCRR Part 372	Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities
6 NYCRR Part 381	Low-Level Radioactive Waste Transporter Permit and Manifest System
Public and Occupational Health	
EPA/Other Federal Agencies	
42 U.S.C. 9601	Comprehensive Environmental Response, Compensation and Liability Act
42 U.S.C. 11001 *et seq.*	Emergency Planning and Community Right-to-Know Act
Executive Order 11514 (40 CFR Parts 1500–1508)	Protection and Enhancement of Environmental Quality
10 CFR Part 851	Worker Safety and Health Program
Executive Order 13045	Protection of Children from Environmental Health Risks and Safety Risks

CFR = *Code of Federal Regulations*, ECL = Environmental Conservation Law, EPA = U.S. Environmental Protection Agency, FR = *Federal Register*, NPDES = National Pollutant Discharge Elimination System, NRC = U.S. Nuclear Regulatory Commission, NYCRR = New York Code of Rules and Regulations, NYSDEC = New York State Department of Environmental Conservation, NYSDOL = New York State Department of Labor, NYSERDA = New York State Energy Research and Development Authority, PCBs = polychlorinated biphenyls, RCRA = Resource Conservation and Recovery Act, TAGM = Technical Assistance and Guidance Memorandum, TSCA = Toxic Substances Control Act, U.S.C. = United States Code.

Table 5–2 Selected U.S. Department of Energy Orders and Policies Potentially Relevant to Activities at the Western New York Nuclear Service Center

Order	*Title or Subject (date)*
Radiation	
425.1C	Startup and Restart of Nuclear Facilities (03/13/03)
433.1	Maintenance Management Program for DOE Nuclear Facilities (06/01/01)
435.1	Radioactive Waste Management (07/09/99; Change 1, 08/28/01)
474.1A	Control and Accountability of Nuclear Materials (11/22/00)
5400.5	Radiation Protection of the Public and the Environment (02/08/90; Change 2, 01/07/93)
5530.3	Radiological Assistance Program (01/14/92; Change 1, 04/10/92)
5660.1B	Management of Nuclear Materials (05/26/94)
Environment, Safety, and Health	
151.1B	Comprehensive Emergency Management System (10/29/03)
225.1A	Accident Investigations (11/26/97)
231.1 A	Environment, Safety, and Health Reporting (08/19/03; Change 1, 06/03/04)
414.1C	Quality Assurance (06/17/05)
420.1A	Facility Safety (05/20/02)
430.1B	Real Property Asset Management (09/24/03) – Addresses closure and decommissioning and decontamination of DOE facilities.
440.1A	Worker Protection Management for DOE Federal and Contractor Employees (03/27/98)
442.1A	Department of Energy Employee Concerns Program (06/06/01)
450.1A	Environmental Protection Program (06/04/08)
451.1B	National Environmental Policy Act Compliance Program (10/26/00; Change 1, 09/28/01)
5480.4	Environmental Protection, Safety, and Health Protection Standards (05/15/84; Change 4, 01/07/93)
Security	
142.2	Safeguards Agreement and Protocol with the International Atomic Energy Agency (01/7/04)
142.3	Unclassified Foreign Visits and Assignments (06/18/04)
470.1	Safeguards and Security Programs (09/28/95; Change 1, 05/21/96; Extended 05/11/06)
471.1A	Identification and Protection of Unclassified Controlled Nuclear Information; (06/30/00; Extended 07/07/06)
471.2A	Information Security Program (03/27/97; Extended 05/11/06)
471.4	Incidents of Security Concern (03/17/04)
472.1C	Personnel Security Activities (03/25/03)
473.1	Physical Protection Program (12/23/02)
Transportation	
460.1B	Packaging and Transportation Safety (04/04/03)
460.2A	Departmental Materials Transportation and Packaging Management (12/22/04)
Other	
470.2B	Independent Oversight and Performance Assurance Program (10/31/02)
1230.2	American Indian Tribal Government Policy (04/08/92)
5480.19	Conduct of Operations Requirements for DOE Facilities (07/09/90; Change 1, 05/18/92; Change 2, 10/23/01)

CHAPTER 6
POTENTIAL MITIGATION MEASURES

6.0 POTENTIAL MITIGATION MEASURES

This chapter describes the mitigation measures that could be used to avoid or reduce potential environmental impacts that may result from implementation of the alternatives analyzed in Chapter 4. As specified in the Council on Environmental Quality's (CEQ's) National Environmental Policy Act (NEPA) regulations (40 *Code of Federal Regulations* [CFR] 1508.20), mitigation includes the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
- Compensating for the impact by replacing or providing substitute resources or environments

A description of mitigation measures is also required by the New York State Environmental Quality Review Act (SEQR) (6 New York Code of Rules and Regulations [NYCRR] 617.9(b)(5)(iv)) for potential impacts identified in an environmental impact statement (EIS).

All of the decommissioning alternatives have the potential to produce short-term impacts on one or more resource areas. Alternatives that leave waste on site have the potential for long-term impacts on the resource areas. Mitigation measures for both decommissioning actions and long-term impacts are identified in this chapter. For purposes of analysis in this EIS, "short term" is the active project phase under each alternative during which the majority of construction, operations, and decommissioning activities would take place. "Long term" is defined as the timeframe that extends beyond conclusion of the short term for each alternative. For more information, see Chapter 4, Section 4.6.3, "Relationship Between Short-term Use of the Environment and Long-term Productivity."

This chapter reviews each of the resource areas covered in Chapter 4 and discusses: (1) the nature of potential impacts, (2) potential mitigation measures, and (3) how the need for mitigation measures changes with each of the alternatives. In accordance with 10 CFR 1021.331, a Mitigation Action Plan will be prepared that describes the plan for implementing commitments made in this EIS and its associated Record of Decision (ROD). Mitigation commitments included in the Mitigation Action Plan and in the ROD will reflect mitigation information presented in this chapter. In addition, requirements for SEQR Findings, similar to the ROD, will be met, including identification of mitigation measures that will be used to reduce or eliminate impacts associated with the selected alternative.

Table 6–1 provides a list of potential mitigation measures, resource areas, and EIS alternatives, and identifies which resource areas and alternatives would benefit from the selected measures. The potential mitigation measures are divided into three aspects of decommissioning: (1) those applicable during design and construction of new facilities or demolition of existing ones, (2) those applicable during facility operations (i.e., facilities that operate during decommissioning activities), and (3) those applicable over the long term. Table 6–1 does not include all of the mitigation measures described in this EIS for implementation of the proposed alternatives; rather it is meant to identify key potential mitigation measures that could be implemented during the various stages of decommissioning.

Table 6–1 Potential Mitigation Measures

Mitigation Measure	*Resource Area*											*EIS Alternative* [a]			
	Land Use and Visual Resources	***Geology and Soils***	***Water Resources***	***Air Quality and Noise***	***Ecological Resources***	***Cultural Resources***	***Socioeconomics***	***Human Health and Safety***	***Waste Management***	***Transportation***	***Environmental Justice*** [b]	***Sitewide Removal***	***Sitewide Close-In-Place***	***Phased Decisionmaking***	***No Action***
Potential Mitigation Measures During Design, Construction or Demolition [c]															
Visual screens, lower-profile buildings	√											√	√	√	
Erosion and sediment controls		√	√		√	√						√	√	√	
Buffer zones			√		√							√	√	√	
Wetlands and floodplain protection measures			√		√							√	√	√	
Spill control measures			√		√							√	√	√	
Dust suppression measures				√								√	√	√	
Selective location of laydown areas				√								√	√	√	
Use of low sulfur fuels in construction equipment				√								√	√	√	
Scheduling of construction activities			√	√	√		√			√		√	√	√	
Scheduling of transportation				√						√		√	√	√	
Personal protective equipment								√				√	√	√	
Road improvement, traffic controls				√				√		√		√	√	√	
Waste minimization									√	√		√	√	√	
Wastewater treatment systems			√					√	√			√		√	
Preventing contamination spread		√	√									√	√	√	
Potential Mitigation Measures During Facility Operations															
Road improvement, traffic controls				√						√		√		√	
Spill control measures			√		√							√	√	√	√
Personal protective equipment								√				√	√	√	√
Best available control technologies				√								√	√	√	
Confinement systems with ventilation controls and filters				√	√			√				√ [d]	√	√ [e]	
Wastewater treatment systems			√									√ [f]	√ [f]	√	√

Mitigation Measure	Resource Area											EIS Alternative [a]			
	Land Use and Visual Resources	Geology and Soils	Water Resources	Air Quality and Noise	Ecological Resources	Cultural Resources	Socioeconomics	Human Health and Safety	Waste Management	Transportation	Environmental Justice [b]	Sitewide Removal	Sitewide Close-In-Place	Phased Decisionmaking	No Action
Scheduling							√			√		√	√	√	√
Job placement and retraining services							√					√	√	√	
Emergency response personnel training								√		√		√	√	√	
Incorporate ALARA measures, including shielding								√				√	√	√	
Selection of transportation routes that limit impacts										√		√	√	√	
Potential Long-Term Mitigation Measures															
Engineered barriers			√ [g]		√			√					√ [h]	√	√
Access controls								√				√ [i]	√	√	√
Erosion controls		√ [j]	√ [j]									√ [j]	√ [j]	√ [j]	√ [j]
Environmental monitoring		√	√		√			√				√	√	√	√
Future site development	√											√	√	√	√

ALARA = as low as is reasonably achievable.

[a] A complete description of the alternatives is found in Chapter 2 of this EIS.

[b] No Environmental Justice mitigation measures have been identified because no disproportionately high and adverse impacts on minority or low-income populations have been identified.

[c] Some of these mitigation measures that are initially implemented for the construction of facilities that aid decommissioning (e.g., the Container Management Facility) would remain during the operating phase of the facility.

[d] e.g., (1) Waste Tank Farm Waste Processing Facility, (2) Container Management Facility, (3) various enclosures to support exhumation efforts.

[e] Enclosures to support exhumation effort.

[f] e.g., Leachate Treatment Facility.

[g] Circumferential hydrologic barriers utilized as a long-term mitigation measure for protection of water resources (i.e., groundwater quality).

[h] e.g., (1) Waste Management Area (WMA) 1 through WMA 3 hydraulic barrier walls and multi-layer cap, (2) WMA 2 lagoons engineered multi-layer cover, (3) NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area engineered multi-layer cover, (4) State-Licensed Disposal Area engineered multi-layer cover, (5) erosion control structures.

[i] Under the Sitewide Removal Alternative, the Container Management Facility would operate indefinitely until final disposition of decommissioning waste is realized. Access controls would be needed.

[j] Erosion controls as a long-term mitigation measure are more-permanent measures when compared with “erosion and sediment controls” for design, construction, or demolition that are more temporary in nature (e.g., mitigation measures usually employed during construction).

Table 6–1 is divided into three parts. The first part identifies potential mitigation measures that could be applied during design and construction of new facilities and existing facility demolition activities. Some of the mitigation measures that might be implemented as part of construction (e.g., screens, buffer areas, and road improvements) may continue during facility operations.

The second part of the table identifies a series of potential mitigation measures that could be applied during decommissioning activities, when facilities needed for these activities would be operating. These mitigation measures are intended to protect facility workers, reduce the discharge of hazardous material into the air and water, and reduce the impacts of material movement during decommissioning activities. Many of the mitigation measures are integrated into facility planning or design and are identified under the appropriate alternative.

The third part of Table 6–1 identifies potential mitigation measures that would reduce long-term impacts of releases of radioactive and hazardous materials from the waste remaining on site. Long-term environmental monitoring of groundwater quality and use of engineered barriers and erosion and access controls would identify potential environmental, safety, and health issues before they could become a problem and while less effort could be undertaken to properly mitigate any potentially adverse conditions. The long-term environmental monitoring program would include monitoring the effectiveness of the multi-layer cover system and barrier wall (for the NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area [NDA]) and monitoring the effectiveness of the cover system, barrier wall, and the French drain (for the State-Licensed Disposal Area [SDA]) in limiting infiltration of precipitation and groundwater into the burial areas (see Appendix C, Sections C.3.2.7.5 and C.3.2.8.5, of this EIS). The performance of the engineered barriers would be subject to monitoring and maintenance and the overall performance of the engineered isolation systems would be monitored using data from an environmental monitoring program.

6.1 Land Use and Visual Resources

Decommissioning of the Western New York Nuclear Service Center (WNYNSC) would result in beneficial changes to visual resources for the site as industrial facilities are removed, but the removal actions could result in short-term impacts on visual resources while construction, demolition, and earthmoving activities are conducted. Potential mitigation measures for these impacts include utilizing soil berms and vegetation as screening, lower-profile building designs, exterior colors that blend in with the surroundings, and directional lower-wattage lighting.

Implementation of any of the action alternatives would result in some areas of WNYNSC being available for release for other uses, such as future site development. However, the Sitewide Close-In-Place Alternative (and potentially Phase 2 of the Phased Decisionmaking Alternative) would involve the long-term commitment of land resources—an impact that would not be conducive to mitigation.

6.2 Geology and Soils

Construction and decommissioning activities would result in disturbance of soils. Adherence to best management practices for soil erosion and sediment control during land-disturbing activities would serve to minimize soil erosion and loss. In general, best management practices would include limiting the amount of time soils are exposed, limiting the area disturbed during any phase of a construction project, regrading to avoid steep slopes, and applying protective coverings to denuded areas during construction (e.g., mulching and/or geotextiles) until such time as disturbed areas can be revegetated or otherwise covered by facilities. These practices would greatly reduce the potential for soil loss. Soil loss and offsite transport would be further reduced by the use of appropriate sedimentation and soil erosion and control devices, including redirection of runoff, sediment traps, silt fences, staked hay bales, vehicle washdown stations, and other methods as weather conditions may dictate. Stockpiles of soil removed during construction would be covered with a geotextile or temporary vegetative covering to prevent loss by erosion. Temporary buildings could also be placed over construction sites to reduce soil erosion.

Temporary disturbance to soils outside the eventual footprint of new facilities would be limited by using paved parking lots or inactive areas within building footprints for material laydown, storage, and parking and by using narrow access corridors for construction equipment. To reduce the health risks from exposure to contaminated soils, areas would be tested prior to any ground disturbance.

Controlling the spread of contaminated media or materials or preventing the recontamination of remediated areas during decommissioning would be accomplished through the use of work sequencing, soil stabilization measures, temporary covers, and exclusion zones to reduce contaminant spread. Impacts on soils would also be mitigated by returning the uncontaminated soils to preexisting conditions to the extent possible. This would be accomplished by grading the land to its preconstruction topography.

6.3 Water Resources

Water resources include both surface water and groundwater potentially affected by implementation of project alternatives. Surface water would be protected from sediment by minimizing construction in or near water courses, by establishing vegetated buffer zones around water bodies, by implementing erosion and sedimentation control measures (see Section 6.2 of this chapter), and by avoiding soil-disturbing activities during wet seasons. Longer-term impacts on surface-water resources could also be mitigated by restoring water courses, ponds, and wetlands to their preconstruction conditions.

Stormwater holding ponds would be constructed to decrease the impacts of runoff on surface-water quality by collecting, detaining, and conveying stormwater runoff from buildings and other impervious surfaces. Appropriate mitigation measures would include installation of erosion and sediment control structures, runoff interceptor trenches or swales, filter or silt berms/fences, sediment barriers or basins, rock-lined ditches/swales, slope shaping and retaining fences, surface-water runoff management, stormwater drainage structures, and waste management systems. Potential erosion in disturbed areas would be mitigated by applying topsoil, adding rip-rap, and planting native vegetation, as necessary. Natural stream design would be considered for restoration efforts where practicable. Sediment dredging is expected to occur only in relatively small streams that would be diverted before dredging commenced to prevent the migration of disturbed and potentially contaminated sediments downstream. Following excavation, surface water flow patterns would be re-established and the streambeds would be restored with material similar in nature to that which was removed. Sediment removal in or potentially affecting surface water would be performed in accordance with New York State Department of Environmental Conservation (NYSDEC) regulations and guidance for the management of sediment and dredged material. These requirements would be specified in a site-specific sediment control plan prepared before beginning such operations.

Surface water and groundwater would be protected from spills of hazardous materials with the development and implementation of spill prevention and contingency plans for instances in which hazardous materials are being handled. These plans would detail provisions for storage of hazardous materials and refueling of construction equipment within confines of protective berms, cleanup and recovery plans, and emergency response notification and protocols. The potential for spills would also be reduced by keeping vehicles and equipment in good working order to prevent oil and fuel leaks. Water contaminated as a result of operational spills would be contained and treated prior to discharge to surface streams.

Groundwater mitigation measures include spill prevention (described earlier in this section), prevention of the spread of contamination (see Section 6.2 of this chapter), groundwater monitoring, circumferential hydrologic barriers, redirection of stormwater runoff, and wetland protection.

Mitigation measures to protect wetlands would be used when there are major removal activities, particularly removal of soils associated with the nonsource area of the North Plateau Groundwater Plume, the Cesium Prong, and exhumation of the NDA and the SDA. Previous wetland studies and delineations have been performed for the site and are discussed in detail in Chapter 3, Section 3.8.2, and Appendix M of this EIS. Wetland impacts would be minimized by careful planning for construction rights-of-way and onsite construction vehicle transportation routes, perpendicular encroachment to known wetland areas, restoration of upgradient land areas prior to wetland encroachment, implementation and maintenance of best erosion and sedimentation practices, and restoration and/or compensatory replacement of wetland areas.

Floodplain impacts would be mitigated by coordinating with NYSDEC to ensure that guidance prescribed in its Floodplain Development and Floodway Guidance is followed and by restoring the floodplain to preexisting conditions. Additional mitigation measures would include minimizing construction in the floodplain, establishing vegetated buffer zones, and avoiding soil-disturbing activities during wet seasons. Stormwater runoff and erosion control measures identified in this section would also be employed to reduce impacts on the floodplain.

For alternatives under which waste would permanently remain on site (e.g., in-place closure of the Waste Tank Farm, NDA, or SDA), engineered barriers would be used to mitigate the effects of gradual migration of contaminants. Under the Sitewide Close-In-Place Alternative, the major facilities would be closed in place. The residual radioactivity in facilities with long-lived radionuclides would be isolated by specially designed closure structures and engineered barriers to control contamination. To control groundwater flow, for example, hydraulic barrier walls (e.g., vertical soil-bentonite slurry walls) would be constructed to divert groundwater flow around stabilized facilities. An upgradient chevron-shaped barrier wall would further reduce groundwater flow into the closed facilities area by laterally diverting groundwater flow around the circumferential slurry wall.

The performance of the engineered barriers to protect groundwater quality would be monitored as part of a long-term monitoring and maintenance system of mitigation measures (WSMS 2009c).

6.4 Air Quality and Noise

Construction activities would generate hazardous and criteria air pollutants, as discussed in Chapter 4, Section 4.1.5.1, of this EIS. Emissions from construction equipment would be mitigated by maintaining the equipment to ensure that the emissions control systems and other components function at peak efficiency. Best available control technologies would be utilized to control emissions. Additional air quality mitigation measures for construction emissions include the following:

- Using ultra-low sulfur diesel fuel in off-road construction equipment with an engine horsepower rating of 60 horsepower or above
- Where practicable, using diesel engine retrofit technology (e.g., diesel oxidation catalysts) in off-road equipment to further reduce emissions
- Limiting unnecessary idling times on diesel-powered engines
- Locating diesel powered exhausts away from fresh air intakes
- Reducing the number of heavy equipment trips
- Siting laydown areas as far from residences and sensitive receptors as practicable

Soils and unconsolidated sediments exposed in excavations and slope cuts during new facility construction would be subject to wind erosion if left exposed. In addition, fugitive dust emissions would occur as a result of land disturbance by heavy equipment and motor vehicles, causing suspension of soil particles in the air. Construction emissions would be mitigated using standard mitigation techniques, including watering and/or use of surfactants to control dust emissions from exposed areas, revegetation of exposed areas, watering of roadways, and minimizing construction activity under dry or windy conditions. To further ensure that airborne contaminants are not released to the atmosphere during soil excavation, the excavation work could take place beneath containment structures.

Facility decommissioning activities and new waste treatment facilities would generate airborne emissions of various pollutants, including radionuclides and nonradioactive organic and inorganic constituents. These emissions would be controlled using the best available control technologies to ensure that emissions comply with applicable standards. With the variety of air pollutant contributors and processes that would be deployed under the alternatives, there are a number of air pollutant control technologies that could be used. The technologies that would be used would be tailored for specific contaminants. Direct filtration or scrubbing are common mitigation measures for radionuclides and could be used under any of the alternatives.

Noise impacts during construction would be minimized by maintaining the equipment to ensure that the mufflers and other components are operating properly, by restricting the use of vehicle horns, and by using the quietest piece of equipment possible to get the job done. Additionally, construction activity would be limited to daytime hours to reduce disruptive sources of annoyance to nearby residents (i.e., scheduling construction activities to avoid or minimize adverse noise impacts).

6.5 Ecological Resources

Potential direct impacts on ecological resources would include habitat loss (including wetlands) and increased mortality of wildlife (i.e., terrestrial and aquatic fauna), as well as indirect impacts, such as displacement of wildlife from the affected area. Construction and decommissioning activities would incorporate mitigation measures for ecological impacts, such as avoidance of undisturbed habitat (e.g., nesting areas) and timing land-disturbing activities to avoid animal breeding seasons. For example, to avoid disturbing breeding bird populations, many of which are migratory, it might be necessary to undertake any required land-clearing during the non-breeding season (i.e., August 1 through March 15). In addition to protecting bird populations in general, conducting land clearing activities during the non-breeding season would meet the requirements of the Migratory Bird Treaty Act by protecting adults, their nests, and the young. Also, fencing would be used to deter wildlife from entering areas disturbed by construction. Where habitat would be affected, disturbed areas would be regraded and revegetated with native species according to a sitewide revegetation plan. Also, noise and increased human presence would be mitigated by properly maintaining equipment and keeping workers within the work zone. Pre-activity biological surveys would be performed as necessary. Although threatened and endangered species have not been recorded on the site, any mitigation actions deemed necessary through the consultation process regarding federally and state-listed threatened and endangered species would be implemented if such species were recorded on site in the future. (For applicable regulatory requirements, see Chapter 5, Section 5.6.1, "Ecological Resources Consultations.") Specific requirements for fish management, such as avoiding work in spawning habitats during spawning season (e.g., March 16 through July 14 for warm-water fish spawning habitat in Cattaraugus Creek), would be developed as part of the approval process prior to the closure of the reservoirs or remediation work taking place in streams.

Indirect impacts on wetlands and aquatic resources, such as sedimentation resulting from erosion, would be mitigated through the implementation of a soil erosion and sediment control plan. This could include the use of silt fencing, straw bales, rip-rap, regrading, and timely revegetation, as appropriate. To the extent practicable, revegetation using plants native to western New York would be used to mitigate impacts, particularly near surface waters. Stormwater runoff control measures, including erosion and sediment controls, would be installed, inspected, and maintained to prevent indirect impacts. Options to mitigate direct impacts on wetlands could range from the re-establishment of affected areas to the creation of new wetlands either on or off site. If needed, prior to the disturbance of any jurisdictional wetland, a Section 404 permit would be acquired from the U.S. Army Corps of Engineers, and in the case of a New York State freshwater wetland, a permit would be acquired from NYSDEC. Additionally, a mitigation plan would be developed that would fully address the compensation mechanism selected (i.e., compensatory mitigation, mitigation bank, or in-lieu fee mitigation) to mitigate wetland impacts (73 FR 19594).

While current biological conditions and mitigation guidelines are appropriate for determining mitigation requirements for impacts that would occur in the short term, they are not suitable for judging mitigation requirements that would not occur for many years because habitats and species assemblages may change over time. Consequently, the mitigation requirements for future activities that would occur under the alternatives considered would depend on the results of field surveys conducted just prior to initiating ground-disturbing activities and the mitigation guidelines in effect at that time.

6.6 Cultural Resources

Avoidance of identified cultural resources would be the primary form of mitigation wherever practical. However, collection or documentation of cultural resources and their context would be used if avoidance were not practicable. Chapter 3, Section 3.9, discusses cultural resources at WNYNSC. Since the majority of proposed activities would occur within previously disturbed areas or within or adjacent to the developed areas, the likelihood that these areas contain cultural materials intact or in their original context is small, as indicated by the results of previous cultural resource studies. Nevertheless, there is the potential to unearth or expose cultural materials during excavation, particularly along the creeks. To avoid the loss of cultural resources during construction, demolition, excavation, and site restoration, cultural resource surveys would be conducted in the area of interest. Although no alternative is expected to impact important cultural resources, the potential for inadvertent discovery of prehistoric or archaeological resources exists. If any cultural resources were discovered during land-disturbing activities, those activities would be halted, and consultations would be conducted with the New York State Historic Preservation Officer, and if appropriate, concerned American Indian Tribes. As appropriate, the U.S. Department of Energy would coordinate with the Seneca Nation of Indians to address any potential impacts that could result from implementing the alternative selected in the ROD. Land-disturbing activities would resume after impacts have been mitigated.

6.7 Socioeconomics

Socioeconomic impacts would occur during construction and decommissioning due to the addition of workers to perform these activities. These impacts would be mitigated by scheduling of construction and decommissioning activities in sequence rather than concurrently, although this could cause some delays in the initiation or completion of the projects and result in increased project costs.

The eventual completion of WNYNSC decommissioning activities and the associated reduction in onsite employment and expenditures would have an impact on site employees and the local economy. Adverse impacts on employees could be mitigated by the use of job placement and retraining services. Adverse impacts on the local economy could be mitigated by the future redevelopment of the site; however, at this time, no information is available about likely future uses of the site.

6.8 Human Health and Safety

Mitigation measures to protect workers from physical hazards during construction or demolition would involve safety reviews of planned activities and the implementation of best management practice safety measures, including bracing and stabilization of buildings and excavations during construction and demolition, wearing protective equipment, and conducting safety monitoring and inspections. These mitigation measures would comply with applicable Federal and state safety requirements.

Mitigation measures used to protect workers from radiological and chemical exposure hazards during construction, operation, and demolition activities would be derived from formal radiation protection programs and chemical hazards management programs. Examples of specific measures include personal protective equipment (e.g., Tyvek® suits, face masks), shielding (e.g., earth berms, concrete walls, steel plates, lead bricks), remotely operated robotic machinery, training for both hazards associated with specific work activities and emergency response personnel, and spreading the work across a larger number of workers. Radiation protection mitigation measures would include formal analysis by the workers, supervisors, and radiation protection personnel of the work in a radiological environment and identification of methods to reduce exposure of workers to the lowest practicable level. For all activities involving exposure to radiological materials or radiation, the principle of maintaining doses as low as is reasonably achievable (ALARA) would be followed. Examples of ALARA measures include minimizing time spent in the field of radiation, maximizing distances from sources of radiation, using shielding whenever possible, and/or reducing the radiation source. These mitigation measures would comply with applicable Federal and state safety requirements.

Many of the mitigation measures intended to protect workers, as well as the public, are integrated into the facilities that would be constructed to facilitate decommissioning, including the Waste Tank Farm Waste Processing Facility, Container Management Facility, various enclosures and confinement structures intended to facilitate waste exhumation, and the Leachate Treatment Facility. These facilities and engineered systems and their respective design elements that would reduce potential human health impacts are described in Appendix C. Section C.4 in Appendix C provides a detailed description of these facilities and enclosure and confinement structures, as well as some of the design elements that would be incorporated into their construction and operations to reduce potential human health impacts.

The construction and operation of waste management facilities and the decommissioning and removal of facilities, as well as long-term stewardship activities, would have impacts on worker and public health and safety. The primary mitigation measure to reduce the impacts on both workers and the public would involve the use of best management practices and engineered systems (both described in previous sections of this chapter) to limit access to and discharge of hazardous radioactive and chemical materials to the environment.

Long-term impacts on the public from exposure to contaminated media (i.e., soil, water, plants, and animals) would be mitigated through the use of access controls (e.g., fences, warning signs, and personnel to limit public access to contaminated areas) and engineered barriers designed to reduce the migration of contaminants to the accessible environment from the NDA and SDA or other areas where significant contamination would remain on site (e.g., Main Plant Process Building in Waste Management Area [WMA] 1, Waste Tank Farm in WMA 3 under the Sitewide Close-In-Place Alternative). In places where fencing would not be practical (e.g., along a public stream or creek), signs and mailings could be used to warn against ingestion of contaminated water, plants, and animals. The performance of engineered barriers would be monitored and maintained, where practical, and the overall performance of the engineered isolation systems would be monitored using data from an environmental monitoring program.

6.9 Waste Management

Waste management impacts would primarily be mitigated through efforts designed to minimize the volumes of waste generated for shipment to offsite disposal locations. These waste minimization efforts would be considered in the design of wastewater treatment systems as well as solid waste treatment systems, particularly those that support the Sitewide Removal Alternative, which would generate large volumes of waste. In addition, waste management impacts would be reduced through the use of best management practices such as proper waste segregation, handling, packaging, and storage.

6.10 Transportation

Both radiological and nonradiological impacts would result from shipment of radioactive or hazardous materials from WNYNSC to offsite disposal sites. To the extent practicable, transportation routes would be chosen to minimize the impacts from potential exposure to radiation during both incident-free transport and postulated accidents, as well as to minimize the potential for traffic fatalities. Measures that could be used to mitigate radiological impacts on individuals and populations along transportation routes include scheduling the transport of materials or wastes only during periods of light traffic volume and providing training for emergency response personnel. Local traffic impacts could be mitigated through the use of turning lanes for entering and exiting WNYNSC, as well as traffic signals at major intersections.

Implementing any action alternative would impact local traffic conditions, especially during the morning and afternoon commutes. Measures that would be used to mitigate traffic volume impacts, particularly for alternatives with higher levels of site employment, are employee programs and incentives for ridesharing, and employee programs that provide flexible hours or staggered work shifts.

6.11 Environmental Justice

No mitigation measures are expected to be necessary under any of the alternatives because no disproportionately high and adverse impacts on minority or low-income populations have been identified.

CHAPTER 7
REFERENCES

7.0 REFERENCES

ACDS (Agricultural and Community Development Services, LLC), 2007, *Agricultural and Farmland Protection Plan*, Columbia, Maryland, February.

AFIS (American Forces Information Service), 2005, *Commission Makes More BRAC Decisions*, D. Miles, American Forces Press Service, Washington, DC, August 26.

Arnett, E. B., W. K. Brown, W. P. Erickson, J. K. Fiedler, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. J. O'Connell, M. D. Piorkowski, R. D. Tankersley, Jr., 2006, "Patterns of Bat Fatalities at Wind Energy Facilities in North America," *Journal of Wildlife Management*: 72(1):61-78.

AWEA (American Wind Energy Association), 2007, *U.S. Wind Energy Projects – New York (as of 12/31/2007)* (accessed January 18, 2008, http://www.awea.org/projects/projects.aspx?s=New+York), Washington, DC, December 31.

Barasch, G. E. and R. H. Beers, 1971, *Aerial Radiological Measuring Surveys of the Nuclear Fuel Services Plant, West Valley, New York, 1968 and 1969*, AEC Report No. ARMS-68.6.9, EG&G, Inc. Goleta, California, April.

Bergeron, M. P. and E. F. Bugliosi, 1988, *Ground-Water Flow Near Two Radioactive-Waste-Disposal Areas at the Western New York Nuclear Service Center, Cattaraugus County, New York—Results of Flow Simulation*, U.S. Geological Survey Water-Resources Investigations Report 86-4351, U.S. Geological Survey, Albany, New York.

Blickwedehl, R. R., B. Beyer, D. Aloysius, M. W. Grant, T. Weiss, and W. Bridenbaker, 1989, *Characterization of Solvent Leakage and Migration NRC Licensed Disposal Area Western New York Nuclear Service Center, West V*alley, *New York*, Dames and Moore, Inc. and West Valley Nuclear Services Company, West Valley, New York, December 28.

BLS (U.S. Bureau of Labor Statistics), 2007, "Table 1. Incidence rates of nonfatal occupational injuries and illnesses by industry and case type, 2006," (accessed September 16, 2008, http://www.bls.gov/iif/oshwc/osh/os/ostb1765.pdf), Washington, DC, October.

BLS (U.S. Bureau of Labor Statistics), 2008, *Quarterly Census of Employment and Wages, Report of Total Employment in Cattaraugus and Erie Counties* (accessed March 28, 2008, http://data.bls.gov/PDQ/servlet/SurveyOutputServlet;jsessionid=f0302be5a843$3F$3FF$), Washington, DC, March 25.

Boothroyd, J. C., B. S. Timson, and R. H. Dana, Jr., 1979, *Geomorphic and Erosion Studies at the Western New York Nuclear Service Center, West Valley, New York*, NUREG/CR-0795, New York State Geological Survey/State Museum, Albany, New York, December.

Boothroyd, J. C., B. S. Timson, and L. A. Dunne, 1982, *Geomorphic Processes and Evolution of Buttermilk Valley and Selected Tributaries, West Valley, New York, Fluvial Systems and Erosion Study, Phase II*, NUREG/CR-2862, Earth Surface Research, Inc. and New York State Geological Survey, July 1.

Bower, B., 2007, DOE Director, West Valley Demonstration Project, *West Valley Demonstration Project Quarterly Interagency Roundtable* Presentation, Albany, New York, December 11.

Boyce, J. I., and W. A. Morris, 2002, "Basement-controlled faulting of Paleozoic strata in southern Ontario, Canada: new evidence from geophysical lineament mapping," *Tectonophysics* 353 (2002) pp. 151-171, Elsevier Science B.V., February 15.

Boyer, B., B. Carpenter, C. Renschler, and R. Kellam, 2009, *Cattaraugus Creek Watershed Resource Guide and Proposed Watershed Planning Strategy*, Cattaraugus Creek Watershed Project Team (accessed July 13, 2009 at http://www.law.buffalo.edu/Academics/courses/874/CattCr/Resource_Guide/Resource_Guide_Final.doc).

Cattaraugus (Cattaraugus County Department of Economic Development, Planning and Tourism), 2001, *Smart Development for Quality Communities, A Guidebook for Cattaraugus County, New York, Elements of a Countywide Vision*, Little Valley, New York, June 30.

Cattaraugus (Cattaraugus County Department of Economic Development, Planning and Tourism), 2006a, Route 219 – International Trade Corridor, Ashford Business and Education Park – Ashford, New York (accessed September 29, 2006, http://www.cattco.org/business_opportunities/pdfs/vol7files/ashford_park.pdf).

Cattaraugus (Cattaraugus County Department of Economic Development, Planning and Tourism), 2006b, Route 219 – International Trade Corridor, Ellicottville Business Park – Ellicottville, New York (accessed September 29, 2006, http://www.cattco.org/business_opportunities/pdfs/vol7files/eville_park.pdf).

Cattaraugus (Cattaraugus County Department of Economic Development, Planning and Tourism), 2006c, Route 219 – International Trade Corridor, Railyard Industrial Park – Great Valley, New York (accessed September 29, 2006, http://www.cattco.org/business_opportunities/pdfs/vol7files/greatvalley_railyard.pdf).

Cattaraugus (Cattaraugus County Department of Economic Development, Planning and Tourism), 2006d, Ellicottville Community Tourism and Cultural Centers, Ellicottville, New York (accessed September 29, 2006, http://www.cattco.org/business_opportunities/pdfs/vol7files/eville-tourism-center.htm).

Cattaraugus (Cattaraugus County Department of Economic Development, Planning and Tourism), 2006e, *Applying Smart Growth to Economic Development* (accessed August 31, 2006, http://www.cattco.org/planning/smart-growth.asp), Little Valley New York.

CCSD (Canadian Council on Social Development), 2007, *Poverty by Geography: Urban Poverty in Canada, 2000*, Ottawa, Ontario.

Census (U.S. Department of Commerce, U.S. Census Bureau), 2000, *Poverty in the United States – 1999*, p. 60–210, Economics and Statistics Administration, Washington, DC, September.

Census Canada (Statistics Canada), 2001, Profile for Canadian Census Subdivisions, 2001 Census, Ottawa, Canada, March 13.

Census Canada (Statistics Canada), 2008, 2001 Community Profiles (accessed January 29, 2008, at http://www12.statcan.ca/english/ profil01/CP01/Index.cfm?Lang=E), Ottawa, Canada.

Chamberlain, J., 2008, West Valley Environmental Services, Personal communication to C. M. Bohan, U.S. Department of Energy, West Valley, New York, Orphan Waste, April 9.

Chilsom, L., 2003, West Valley Nuclear Services Company, Nuclear Safety and Emergency Management, West Valley, New York, Personal communication (telecom) to D. Nemeth, Science Applications International Corporation, Washington, DC, "Letters of Agreement and Memoranda of Understanding – Fire Protection, Ambulance Services and Traffic Control" August 12.

Crawford, C. G., 2008, Planner, Cattaraugus County, Little Valley, New York, Personal communication (email) to J. Schinner, Science Applications International Corporation, Germantown, Maryland, "Cattaraugus County Land Use & Land Cover," February 4.

Crone, A. J. and R. L. Wheeler, 2000, *Data for Quaternary faults, liquefaction features, and possible tectonic features in the Central and Eastern United States, east of the Rocky Mountain front*, U.S. Geological Survey Open-File Report 00-0260 (available at http://pubs.usgs.gov/of/2000/ofr-00-0260).

CWVNW (Coalition on West Valley Nuclear Wastes), 1993, *Confirmation of Anomalous Westward Dip between Springville and West Valley, New York*, East Concord, New York, November 14.

Dames and Moore (Dames and Moore, Inc.), 1970, *Report: Site Environmental Studies, Seismo-Tectonics, Proposed Expansion, Nuclear Spent Fuel Reprocessing Facility, West Valley, New York*, Nuclear Fuel Services, Incorporated, July 11.

Dames and Moore (Dames and Moore, Inc.), 1983, *Seismic Hazard Analysis, West Valley Demonstration Project*, West Valley, New York, August 17.

Dames and Moore (Dames and Moore, Inc.), 1986, *Hydrologic Investigation of the Frequency of Emergency Spillway Overflow at the Western New York Nuclear Service Center Reservoirs, West Valley, New York*, February.

Dames and Moore (Dames and Moore, Inc.), 1992, *Seismic Hazard Analysis for the West Valley Demonstration Project*, West Valley, New York (unpublished report) January.

Dames and Moore (Dames and Moore, Inc.), 1995, New York State Energy Research and Development Authority, *Western New York Nuclear Service Center Off-Site Radiation Investigation*, 2 Vols., Pearl River, April 20.

Dana, Jr., R. H., R. H. Fakundiny, R. G. Lafleur, S. A. Molello, and P. R. Whitney, 1979a, *Geologic Study of the Burial Medium at a Low-Level Radioactive Waste Burial Site at West Valley, New York*, NYSGS/79-2411, New York State Geological Survey/State Museum, Albany, New York, February 9.

Dana, Jr., R. H., S. A. Molello, R. H. Fickies, and R. H. Fakundiny, 1979b, *General Investigation of Radionuclide Retention in Migration Pathways at the West Valley New York Low-Level Burial Site, Annual Report, September 1, 1997 – September 30, 1998,* New York State Geological Survey/State Museum, Albany, p. 99, NUREG/CR-0794, November.

DCJS (New York State Division of Criminal Justice Services), 2008, New York State Law Enforcement Personnel in 2007, Uniform Crime Reporting System, Albany, New York (accessed at http://criminaljustice.state.ny.us/index.htm), March 27.

Dietrich, C., 2008, Acting Director, Potter County Planning Commission, Coudersport, Pennsylvania, Personal communication to L. Wedande, Science Applications International Corporation, Interview Record – "Future Actions for Cumulative Impacts," April 7.

DOC (U.S. Department of Commerce), 2002, Table CO-EST2001-12-36, Time Series of New York Intercensal Population Estimates by County: April 1, 1990 to April 1, 2000, Population Division, U.S. Census Bureau (accessed at http://www.census.gov/popest/archives/2000s/vintage_2001/CO-EST2001-12/CO-EST2001-12-36.html), April 17.

DOC (U.S. Department of Commerce), 2006, 2006 *American Community Survey*, U.S. Census Bureau, Washington, DC.

DOC (U.S. Department of Commerce), 2007, 2000 Decennial Census – American Factfinder, Summary File 1, Census Bureau, (available at http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program= DEC&_submenuId= datasets _2&_lang=en&_ts=), December 12.

DOC (U.S. Department of Commerce), 2008a, U.S. population data, SF-1, U.S. Census Bureau, Washington, DC.

DOC (U.S. Department of Commerce), 2008b, U.S. population data, SF-3, U.S. Census Bureau, Washington, DC.

DOC (U.S. Department of Commerce), 2009a, Table 1: Annual Estimates of the Resident Population for Counties of New York: April 1, 2000 to July 1, 2008 (accessed at http//www.census.gov/popest/counties/tables/CO-EST2008-01-36.xls), March 19.

DOC (U.S. Department of Commerce), 2009b, *2007 American Community Survey*, U.S. Census Bureau (accessed on February 6, 2008, http://factfinder.census.gov/servlet/DatasetMainPageServlet?program=ACS&_submenuId= datasets_1&_lang=en&_ts=).

DOD (Department of Defense), 2005, *Base Closure and Realignment Report*, Vol. 1, Part 1 of 2, Washington, DC, May.

DOE (U.S. Department of Energy), 1978, *Western New York Nuclear Service Center Study Companion Report*, TID-28905-2, Washington, DC.

DOE (U.S. Department of Energy), 1980, *Final Environmental Impact Statement, Waste Isolation Pilot Plant*, DOE/EIS-0026, Assistant Secretary for Defense Programs, Washington, DC, October.

DOE (U.S. Department of Energy), 1982, *Final Environmental Impact Statement Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley*, DOE/EIS-0081, Assistant Secretary for Nuclear Energy, Office of Terminal Waste Disposal and Remedial Action, Washington, DC, June.

DOE (U.S. Department of Energy), 1990, *Radiation Protection of the Public and the Environment*, DOE Order 5400.5, Change 1, Washington, DC, June 29.

DOE (U.S. Department of Energy), 1996a, *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center*, Volumes 1 and 2, DOE/EIS-0226-D, West Valley Area Office, West Valley, New York, January.

DOE (U.S. Department of Energy), 1996b, *Final EIS for the Nevada Test Site and Off-Site Locations in the State of Nevada*, DOE/EIS-0243, Nevada Operations Office, Las Vegas, Nevada, August.

DOE (U.S. Department of Energy), 1997a, *Final Waste Management Programmatic Environmental Impact Statement, For Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-F, Office of Environmental Management, Washington, DC, May.

DOE (U.S. Department of Energy), 1997b, *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement,* Summary, DOE/EIS-0026-S-2, Carlsbad Area Office, Carlsbad, New Mexico, September.

DOE (U.S. Department of Energy), 1998, *Final Environmental Impact Statement on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site*, DOE/EIS-0277F, Assistant Secretary for Environmental Management, Washington, DC, August.

DOE (U.S. Department of Energy), 1999a, *Radioactive Waste Management Manual*, DOE M 435.1-1, Washington, DC, July 9.

DOE (U.S. Department of Energy), 1999b, *DOE Standard Radiological Control*, DOE-STD-1098-99, Washington, DC, July.

DOE (U.S. Department of Energy), 2000, *Clean Air Act General Conformity Requirements and the National Environmental Policy Act Process*, Environmental, Safety and Health, Office of NEPA Policy and Assistance, Washington, DC, April.

DOE (U.S. Department of Energy), 2002a, *Estimating Radiation Risk from Total Effective Dose Equivalent (TEDE)*, ISCORS Technical Report No. 1, Office of Environmental Policy and Guidance, DOE/EH-412/0015/0802, Rev. 1, Washington, DC, August.

DOE (U.S. Department of Energy), 2002b, *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*, DOE/EIS-0250, Office of Civilian Radioactive Waste Management, Las Vegas, Nevada, February.

DOE (U.S. Department of Energy), 2002c, *DOE Standard, Natural Phenomena Hazards Site Characterization Criteria*, DOE-STD-1022-94, Washington, DC, reaffirmed with errata April.

DOE (U.S. Department of Energy), 2002d, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*, DOE-STD-1153-2002, Washington, DC, July.

DOE (U.S. Department of Energy), 2002e, *Operating Experience Summary*, OE Summary 2002-19, Office of Environment, Safety, and Health, September 23.

DOE (U.S. Department of Energy), 2002f, *West Valley Nuclear Services Company, Report from the DOE Voluntary Protection Program Onsite Review, October 22-24, 2002*, DOE/EH-0665, Office of Environment, Safety and Health, Washington DC, November.

DOE (U.S. Department of Energy), 2003a, *DOE Occupational Radiation Exposure, 2002 Report*, DOE/EH-0675, Assistant Secretary for Environment, Safety and Health, Office of Corporate Performance Assessment, Washington, DC.

DOE (U.S. Department of Energy), 2003b, *Operating Experience Summary*, OE Summary 2003-05, Office of Environment, Safety, and Health, March 10.

DOE (U.S. Department of Energy), 2003c, *Operating Experience Summary*, OE Summary 2003-08, Office of Environment, Safety, and Health, April 21.

DOE (U.S. Department of Energy), 2003d, *Operating Experience Summary*, OE Summary 2003-23, Office of Environment, Safety, and Health, November 17.

DOE (U.S. Department of Energy), 2003e, *West Valley Demonstration Project Waste Management Environmental Impact Statement*, DOE/EIS-0337F, West Valley Area Office, West Valley, New York, December.

DOE (U.S. Department of Energy), 2003f, *Solid Waste Management Unit Assessment, SWMU #45 – Breach in Laundry Wastewater Line (EPA ID #NYD980779540)*, Ohio Field Office, West Valley, New York, December 22.

DOE (U.S. Department of Energy), 2004a, *DOE Occupational Radiation Exposure, 2003 Report*, DOE/EH-0688, Assistant Secretary for Environment, Safety and Health, Office of Corporate Performance Assessment, Washington, DC.

DOE (U.S. Department of Energy), 2004b, *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington*, DOE/EIS-0286, Richland Operations Office, Richland, Washington, January.

DOE (U.S. Department of Energy), 2004c, *Operating Experience Summary*, OE Summary 2004-10, Office of Environment, Safety, and Health, May 17.

DOE (U.S. Department of Energy), 2005a, *The Report to Congress on the Federal Archeology Program*, West Valley Demonstration Project, Ohio Field Office, West Valley, New York, February 8.

DOE (U.S. Department of Energy), 2005b, *Surveillance No. S05-003/E, Vitrification Cell Dismantlement Fire Events, January 18-28, 2005*, Ohio Field Office, West Valley Demonstration Project, West Valley, New York, February.

DOE (U.S. Department of Energy), 2005c, *Report from the DOE Voluntary Protection Program On-site Review*, DOE/EH-0714, Office of Environment, Safety and Health, Washington, DC, October.

DOE (U.S. Department of Energy), 2006a, *DOE Occupational Radiation Exposure 2005 Report*, Office of Health, Safety and Security, Office of Corporate Safety Analysis (available at http://www.eh.doe.gov/rems), Washington, DC.

DOE (U.S. Department of Energy), 2006b, *West Valley Demonstration Project Waste Management Environmental Impact Statement Supplement Analysis*, Revised Final, DOE/EIS-0337-SA-01, West Valley Demonstration Project, West Valley, New York, June 7.

DOE (U.S. Department of Energy), 2006c, *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project*, Final, DOE/EA-1552, West Valley Area Office, West Valley, New York, September 14.

DOE (U.S. Department of Energy), 2006d, *Finding of No Significant Impact, Proposed Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project*, DOE/EA-1552, West Valley, New York, September 14.

DOE (U.S. Department of Energy), 2007, *DOE Occupational Radiation Exposure, 2006 Report* (accessed January 2008, http://www.eh.doe.gov/rems), January.

DOE (U.S. Department of Energy), 2008a, *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*, DOE/EIS-0250F-S1, Office of Civilian Radioactive Waste Management, Las Vegas, Nevada, June.

DOE (U.S. Department of Energy), 2008b, *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada – Nevada Rail Transportation Corridor DOE/EIS-0250F-S2, and Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada, DOE/EIS-0369*, Office of Civilian Radioactive Waste Management, Las Vegas, Nevada, June.

DOE (U.S. Department of Energy), 2008c, *Environmental Protection Program*, DOE Order 450.1A, Office of Health, Safety and Security, Washington, DC, June 4.

DOE and NYSERDA (U.S. Department of Energy and New York State Energy Research and Development Authority), 1981, *Cooperative Agreement between United States Department of Energy and New York State Energy Research and Development Authority on the Western New York Nuclear Service Center at West Valley, New York*, September 18, as amended.

DOI (U.S. Department of the Interior), 1986, *Visual Resource Contrast Rating*, *BLM Manual Handbook H-8431-1*, Bureau of Land Management, Washington, DC, January 17.

Doran, S., 2008, Endangered Species Biologist, U.S. Fish and Wildlife Service, Cortland, New York, Personal communication (letter) to B. Bower, U.S. Department of Energy, West Valley, "Occurrence of Federally-Listed Threatened and Endangered Species Within the Vicinity of the West Valley Demonstration Project Site," New York, July 29.

Duckworth J. P., 1972, Nuclear Fuel Services, Inc., Letter to J. P. O'Reilly, U.S. Atomic Energy Commission, Subject: Sanitary Sewer Activity, February 25.

Duckworth, J. P., 1977, Nuclear Fuel Services, Inc., Memorandum to W. A. Oldham, Nuclear Fuel Services, Inc., Subject: Leak Testing of WTF Vent Line, Serial 9-77-45, May 25.

Ebel, J. E. and M. Tuttle, 2002, *Earthquakes in the Eastern Great Lakes Basin from a Regional Perspective*, Tectonophysics 353 (2002), pp. 17-13.

EDAC (Engineering Decision Analysis Company, Inc), 1975, *Seismic Investigation of the Nuclear Fuel Services, Inc., Reprocessing Plant at West Valley, New York*, EDAC 131.01, Palo Alto, California, January 1.

E&E (Ecology and Environment), 2006, *USACE Permit Supplemental Filing – Description of Proposed Action*, Noble Bliss Windpark, August 2.

EFLHD (Eastern Federal Lands Highway Division), 2008, *Active Projects* (accessed January 18, 2008, http://www.efl.fhwa.dot.gov/projects-active.aspx).

EG&G/EM (EG&G Energy Measurements), 1991, *An Aerial Radiological Survey of the West Valley Demonstration Project and Surrounding Area*, Survey Report, EGG-10617-1080, West Valley, New York, September.

Empire Geo-Services (Empire Geo-Services, Inc.), 2006, *Geotechnical Report for Evaluation and Monitoring of the Existing Slope, Northeast of Lagoon No. 3, West Valley Nuclear Services Company, West Valley, New York*, Hamburg, New York, March 24.

Engelder, T. and P. Geiser, 1979, "The relationship between pencil cleavage and lateral shortening within the Devonian section of the Appalachian Plateau," *Geology*, Vol. 7, pp. 460-464.

EPA (U.S. Environmental Protection Agency), 1974, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Marginal Safety*, EPA-550/9-74-004, Office of Noise Abatement and Control, Washington, DC, March.

EPA (U.S. Environmental Protection Agency), 1987, *Sole Source Aquifer Determination Cattaraugus Creek Basin Aquifer System in Cattaraugus, Erie, Wyoming and Allegany Counties, New York*, 52 FR 36100, September 25.

EPA (U.S. Environmental Protection Agency), 1989, *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A) Interim Final*, Washington, DC.

EPA (U.S. Environmental Protection Agency), 1999a, *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*, EPA 315-R-99-002, Office of Federal Activities, Washington, DC, May.

EPA (U.S. Environmental Protection Agency), 1999b, *Cancer Risk Coefficients for Environmental Exposure to Radionuclides, Federal Guidance Report No. 13*, EPA 402-R-99-001, Office of Radiation and Indoor Air, Washington, DC, September.

EPA (U.S. Environmental Protection Agency), 2003, Region II Sole Source Aquifers, *Cattaraugus Creek Basin Aquifer System*, Support Document (accessed July 13, 2005, http://www.epa.gov/region02/water/aquifer/index.html).

EPA (U.S. Environmental Protection Agency), 2006a, EPA Air Data – County Emissions Map – Criteria Air Pollutants, New York (available at http://www.epa.gov/air).

EPA (U.S. Environmental Protection Agency), 2006b, *NPL Factsheet, Peter Cooper, New York, EPA ID# NYD980530265*, October 3.

EPA (U.S. Environmental Protection Agency), 2007a, *National Priorities List Sites in New York* (accessed January 18, 2008, http://www.epa.gov/superfund/sites/npl/ny.htm), November 28.

EPA (U.S. Environmental Protection Agency), 2007b, *National Priorities List Sites in Pennsylvania* (accessed January 18, 2008, http://www.epa.gov/superfund/sites/npl/pa.htm), November 28.

EPA (U.S. Environmental Protection Agency), 2007c, EPA Air Data - Monitor Values Report - Criteria Air Pollutants, New York (available at http://www.epa.gov/air/data/monvals.html?st~NY~New%20York/).

EPA (U.S. Environmental Protection Agency), 2007d, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005*, Washington, DC, April 5.

EPA and ACE (U.S. Environmental Protection Agency and U.S. Army Corps of Engineers), 2007, *Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States* (accessed June 28, 2009 at http://www.epa.gov/owow/wetlands/pdf/RapanosGuidance6507.pdf), June 5.

EPA (U.S. Environmental Protection Agency, Region 2), U.S. Nuclear Regulatory Commission (NRC), New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), New York State Department of Labor (NYSDOL), 2003, *Regulators Communication Plan on Application of Cleanup Requirements for Decommissioning the West Valley Site,* Rev. 1, May 20.

Erie-Niagara (Erie and Niagara Counties), 2006, *Framework for Regional Growth, Erie + Niagara Counties, New York,* Final Report, October.

Ermer, M., 2005, Wildlife Biologist I, New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Region 9, Allegany, New York, Personal communication (letter) to M. Maloney, U.S. Department of Energy, West Valley, New York, "Wetland Delineation," December 28.

ESRI (Environmental Systems Research Institute), 2008, Data & Maps (available at http://www.esri.com/data/data-maps/overview.html), Redlands, California.

Fakundiny, R. H., J. T. Myers, P. W. Pomeroy, J. W. Pferd, and T. A. Nowak, Jr., 1978, "Structural Instability Features in the Vicinity of the Clarendon-Linden Fault System, Western New York and Lake Ontario", *Advances in Analysis of Geotechnical Instabilities*, *University of Waterloo Press*, SM Study No. 13, Paper 4.

Fakundiny, R. H. and P. W. Pomeroy, 2002, "Seismic-reflection profiles of the central part of the Clarendon-Linden fault system of western New York in relation to regional seismicity," *Tectonophysics*, Vol. 353, pp. 173-213, April 26.

FCC (Federal Communication Commission), 2006, *Radio Frequency Safety, Information on Human Exposure to Radio Frequency Fields from Cellular and PCS Radio Transmitters* (accessed September 1, 2006, http://www.fcc.gov/oet/rfsafety/cellpcs.html), January 9.

Ferrero, H., 2008, Planner, Livingston County Planning Department, Geneseo, New York, Personal communication with L. Wedande, Science Applications International Corporation, Reston, Virginia, "West Valley Decommissioning EIS Project Request – Livingston County," March 25.

Fiedler, J. K., T. H. Henry, R. D. Tankersley, and C. P. Nicholson, 2007, *Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005*, Tennessee Valley Authority, Knoxville, Tennessee, June 28.

Fisk, A., 2008, Senior Planner, Niagara County Economic Development, Sanborn, New York, Personal communication with L. Wedande, Science Applications International Corporation, Reston, Virginia, "West Valley Decommissioning EIS Project Request – Niagara County," March 31.

Fujita, T. T., J. J. Tecson, and N. J. Levine, 1979, *A Site-Specific Evaluation of Tornado and High-Wind Risks at West Valley Site, New York*, SMRP Research Paper No. 178, November.

Gentner, M., 2008, West Valley Volunteer Hose Company, Record of Conversation between S. Schatzel, Science Applications International Corporation, Germantown, Maryland, March 11.

Geomatrix Consultants, Inc., 2007, *Focused Analysis of Remediation Alternatives for Groundwater Plume Expansion and Seepage to Surface Water, West Valley Demonstration Project – North Plateau Strontium-90 Plume, West Valley, New York*, Project No. 13302, Rev. 4, Amherst, New York, May 30.

Giles, P., 2004, *Low Income Measurement in Canada*, Income Research Paper Series, Catalogue No. 75F0002MIE – No. 11, Ottawa, Canada, December.

Gill (Bradley R. Gill Consulting Group), 1999, *Geologic Report covering portions of Erie, Cattaraugus, Allegany and Wyoming Counties*, Hamburg, New York, May.

Gill, B. R., 2005, Geologic Report covering portions of Erie, Cattaraugus, Allegany and Wyoming Counties, (a continuation and expansion of earlier work entitled: Regional Geologic Mapping Analysis of Certain Horizons in the Vicinity of the Western New York Nuclear Service Center, Town of Ashford, Cattaraugus Co., New York), Earth Energy Consultants, Lakeview, New York, April.

Glotz, D., 2008, Planning Director, Warren County, Pennsylvania, Personal communication with L. Wedande, Science Applications International Corporation, Reston, Virginia, "West Valley Decommissioning EIS Project Request – Warren County," April 8.

G&W (Genesee and Wyoming Inc.), 2008, Information about rail operations in the Western New York/Pennsylvania region (accessed February 7, 2008, http://www.gwrr.com/default.cfm?action=rail &section=3B3a).

Hadley, J. B. and J. F. Devine, 1974, Seismotectonic map of the Eastern United States, U.S. Geological Survey, Map ME-620, Washington, D.C.

Holzworth, G. C., 1972, *Mixing Heights, Windspeeds and Potential for Urban Air Pollution Throughout the Contiguous United States*, Publication No. AP-101, U.S. Environmental Protection Agency, Office of Air Programs, Research Triangle Park, North Carolina, January.

Horizon (Horizon Wind Energy), 2008, *New York State Wind Power Development* (accessed on January 18, 2008, http://www.horizonwind.com/projects/whatweredoing/newyork/default.aspx).

Horowitz, C., 2008, Ellicottville Town Planner, Town of Ellicottville, New York, Personal communication with L. Wedande, Science Applications International Corporation, Reston, Virginia, "West Valley Decommissioning EIS Project Request – Cattaraugus County," April 11.

Isaacson, J. H., 2008, Senior Planner, Cattaraugus County Economic Development, Planning & Tourism, New York, Personal communication with L. Wedande, Science Applications International Corporation, Reston, Virginia, "West Valley Decommissioning EIS Project Request," March 25.

Jacobi, R. D., 2002, "Basement faults and seismicity in the Appalachian Basin of New York State," *Tectonophysics* 353 (2002), pp. 75-113, Elsevier Science B.V., April.

Jacobi, R. and J. Fountain, 1996, *Determination of the Seismic Potential of the Clarendon-Linden Fault System in Allegany County*, Final Report, New York State Energy Research and Development Authority, Albany, New York, pp. 2106, June 11.

Jacobi, R. and J. Fountain, 2002, "The character and reactivation history of the southern extension of the seismically active Clarendon-Linden Fault System, western New York State," *Tectonophysics* 353 (2002) 215-262, Elsevier Science B.V., February 14.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik, 2007, *Annual Report for the Maple Ridge Wind Power Project Postconstruction Bird and Bat Fatality Study*, Syracuse, New York, May 31.

Johnson and Michelhaugh, 2003, *Transportation Routing Analysis Geographic Information System (TRAGIS) User's Manual*, ORNL/NTRC-006, Oak Ridge National Laboratory, Oak Ridge, Tennessee, June.

Kaleta, M., 2008, Village of Springville, New York, Personal communication with L. Wedande, Science Applications International Corporation, "West Valley Decommissioning EIS Project Request – Village of Springville," April 11.

Kappel, W. M. and W. E. Harding, 1987, *Surface-Water Hydrology of the Western New York Service Center, Cattaraugus County, New York*, U.S. Geological Survey Water-Resources Investigations Report 85-4309, Ithaca, New York.

Keel, R. 1984, "Specification for Completion of Lagoon 1 Decommissioning and Contamination Hardstand Removal", Memorandum FB:84-0045, to E. G. Hess, West Valley Demonstration Project, April 2.

Kool, J. B. and Y. S. Wu, 1991, *Ground-Water Flow and Transport Modeling of the NRC-Licensed Waste Disposal Facility, West Valley, New York*, NUREG/CR-5794, prepared by HydroGeologic, Inc. for the Nuclear Regulatory Commission, October.

Kuhn, R. D., 1995, New York State Office of Parks, Recreation and Historic Preservation, Historic Preservation Coordinator, Waterford, New York, Personal communication (letter) to P. L. Piciulo, Program Director, U.S. Department of Energy, West Valley, New York, June 15.

La Fleur, R. G., 1979. *Glacial Geology and Stratigraphy of Western New York Nuclear Service Center and Vicinity, Cattaraugus and Erie Counties, New York,* USGS Open File Report 79-989, Albany, New York.

Lewis, W. H., 1968, Nuclear Fuel Services, Letter to John A. McBride, U.S. Atomic Energy Commission, forwarding Nuclear Fuel Services Inc. Quarterly Report for October 1 Through December 31, 1967, January 29.

Liao, S.C.C., D. Veneziano, and R.V. Whitman, 1988, *Regression Models for Evaluating Liquefaction Probability*, Journal of Geotechnical Engineering, ASCE 114 4 (1988), pp. 389–411.

Luckett, L. W., 1995, Dames and Moore, *Western New York Nuclear Services Center Off-Site Radiation Investigation, Volume I: Summary Report*, December 1.

Lunden, D. L., 2008, *West Valley Decommissioning EIS Project Request – McKean County,* Director, McKean County Planning Commission, McKean County, Pennsylvania, Personal communication with L. Wedande, Science Applications International Corporation, April 8.

Mahan, S. A., 2007, *Informal Memo from USGS Luminescence Dating Lab*, U.S. Geologic Survey, March 15.

Malone, K., 2003, West Valley Nuclear Services Company, West Valley, New York, Personal communication to J. Hammelman, Science Applications International Corporation, "Answers to More Socioeconomic Questions," May 14.

Malone, K., 2006, West Valley Nuclear Services Company, West Valley, New York, Personal communication (email) to K. Folk, Science Applications International Corporation, "Stream Flow Information," June 19.

Martin, T. H., 2000, *A New Look at Gravel Mining in Cattaraugus County (Twenty First Century Planning for the Route 16 Corridor)*, Cattaraugus County Department of Economic Development, Planning, and Tourism, West Valley, New York, September 26.

McDonald, J. R., 1981, Assessment of Tornado and Straight Wind Hazard Probabilities, University of California, July.

McKinney, T. F., 1986, Dames and Moore, Letter to West Valley Nuclear Services Company, *Letter Report Review of Erosion Projections*, *Low-Level Waste Disposal Area*, Western New York Nuclear Service Center, West Valley, New York, July 8.

Mellor, R. A., 2005, West Valley Nuclear Services Company, Memorandum #AA:2005:0001, forwarding the *Final Assessment Report on Unplanned Exposures to Facility Workers in the Vitrification Dismantlement Project*, February 8.

Michalczak, L., 2003, *Head End Ventilation (HEV) Cell Radioisotope Inventory Report*, RIR-403-012, Revision 0, West Valley Nuclear Services Company, West Valley, New York, April 29.

MOBILEDIA, 2007, *Cell Phone Towers – Buffalo, New York* (accessed on January 18, 2008, at http://www.cellreception. com/towers/towers.php), July 16.

Mogg, 2003, Dispatcher, New York State Police, Olean, New York, Personal communication to D. Nemeth, Science Applications International Corporation, "Police Support," Washington, DC, August 12.

Moore, T., 2008, County of Chautauqua Industrial Development Agency, Personal communication to L. Wedande, Science Applications International Corporation, Reston, Virginia, "West Valley Decommissioning EIS Project Request – Chautauqua County, New York," April 16.

NCI (National Cancer Institute), 2008, "National Cancer Institute State Cancer Profiles," (accessed January 2008, http://statecancerprofiles.cancer.gov/cgi-bin/quickprofiles/profile.pl?36&001), January.

NCRP (National Council on Radiation Protection and Measurements), 2009, *Ionizing Radiation Exposure of the Population of the United States*, NCRP Report No. 160, Bethesda, Maryland.

Neuhauser and Kanipe, 2003, *RADTRAN 5 User's Guide*, SAND 2003-2354, Sandia National Laboratories, Albuquerque, New Mexico, July.

NHTSA (National Highway Traffic Safety Administration), 2006, Traffic Safety Facts 2004 Data, National Center for Statistics and Analysis, Washington, DC (accessed at http://www-nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/), January.

NOAA (National Oceanic and Atmospheric Administration), 2007, *2007 Local Climatological Data Annual Summary with Comparative Data, Buffalo, New York*, National Climatic Data Center, Asheville, North Carolina.

Noble (Noble Environmental Power) 2008, *Our Windparks – Main Page* (accessed on March 18, 2008, http://www.noblepower.com/our-project/index.html).

Noble Allegany Windpark, LLC, 2008, *Final Environmental Impact Statement for the Noble Allegany Windpark, Allegany County, New York*, 002270_NP18_09-B2585, prepared by Ecology and Environment Inc., Bliss, New York, September.

Noble Wethersfield Windpark, LLC, 2007, *Final Environmental Impact Statement for the Noble Wethersfield Windpark, Wyoming County, New York*, prepared by Ecology and Environment Inc., Bliss, New York, August 20.

North, E. D., 1968, Nuclear Fuel Services, Inc., Letter to L. D. Low, U.S. Atomic Energy Commission, Subject: Need to Suspend Dissolver Operations, March 22.

NRC (U.S. Nuclear Regulatory Commission), 1977, Memorandum from J. C. Stepp, Chief Geosciences Branch, DSE, to R. M. Bernero, Chief, Fuel Reprocessing and Recycle Branch, NMSS, Subject: West Valley, NFS Site, April 6.

NRC (Department of Defense, Department of Energy, Environmental Protection Agency, Nuclear Regulatory Commission), 2002, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Revision 1*, (NUREG-1575, Rev 1; EPA-402-R-97-016, Rev. 1, DOE/EH-0624, Rev 1.), Washington, DC, August.

NRC (U.S. Nuclear Regulatory Commission), 2006, *Consolidated NMSS Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria*, NUREG-1757, Vol. 2, Rev. 1, September.

NRCC (Northeast Regional Climate Center) 2003a, Comparative Climatic Data for the United States, Lowest Temperature of Record (accessed at http://www.nrcc.cornell.edu/ccd/lowtmp98.html), August 7.

NRCC (Northeast Regional Climate Center) 2003b, Comparative Climatic Data for the United States, Highest Temperature of Record (available at http://www.nrcc.cornell.edu/ccd/hghtmp98.html), August 7.

NRCC (Northeast Regional Climate Center) 2003c, Comparative Climatic Data for the United States, Maximum Wind Speed (available at http://www.nrcc.cornell.edu/ccd/maxwnd98.html), August 7.

NRCC (Northeast Regional Climate Center) 2003d, Comparative Climatic Data for the United States, Average Wind Speed (available at http://www.nrcc.cornell.edu/ccd/wndspd98.html), August 7.

NWCC (National Wind Coordinating Committee), 2004, *Wind Turbine Interactions with Birds and Bats: A Summary of Research Results and Remaining Questions*, Fact Sheet, Second Edition, Resolve, Inc., Washington, DC, November.

NWS (National Weather Service), 2003, Personal communication (telecom) with J. Holian, Science Applications International Corporation, Germantown, Maryland, "Prevailing Wind Direction - Longterm (1996 - 2002)," Buffalo, New York, September 25.

NYS Physician Profile (New York State Physician Profile), 2009, "Search for Physician Profile Information," Cattaraugus and Erie County (accessed April 21, 2009, http://www.nydoctorprofile.com/welcome).

NYSDEC (New York State Department of Environmental Conservation), 1992, *US EPA Region II Administrative Order on Consent Docket II*, RCRA 3008(h)-92-0202, Proceedings Under Section 3008(h) of the RCRA amended, March.

NYSDEC (New York State Department of Environmental Conservation), 1994, *Determination of Soil Cleanup Objectives and Cleanup Levels TAGM 40406*, Division of Technical and Administrative Guidance Memorandum (accessed October 30, 2008, http://www.dec.ny.gov/regulations/2612.html), January 24.

NYSDEC (New York State Department of Environmental Conservation), 1998a, Classifications-Surface Waters and Groundwaters, New York State Codes, Rules and Regulations, Title 6, Chapter X, Parts 701 et seq, amended March 1998 (accessed July 11, 2005, http://www.dec.state.ny.us/website/regs/ part701.html#701.7).

NYSDEC (New York State Department of Environmental Conservation), 1998b, *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations,* Technical and Operational Guidance Series 1.1.1, Division of Water (accessed October 21, 2008, http://www.dec.ny.gov/docs/water_pdf/ togs111.pdf), June.

NYSDEC (New York State Department of Environmental Conservation), 2003, Wetland Functions and Values, April 3.

NYSDEC (New York State Department of Environmental Conservation), 2004a, *New York State Oil, Gas and Mineral Resources 2002*, Nineteenth Annual Report, Division of Mineral Resources (accessed July 12, 2005, http://www.dec.state.ny.us/website/dm n/2002prelim.html), Albany, New York, July 12.

NYSDEC (New York State Department of Environmental Conservation), 2004b, The New York State Final 2004 Section 303(d) List of Impaired Waters Requiring a TMDL, September 24, 2004 (accessed July 11, 2005, http://www.dec.state.ny.us/website/dow/303dlist.pdf), July 11.

NYSDEC (New York State Department of Environmental Conservation), 2004c, State Pollutant Discharge Elimination System (SPDES) Discharge Permit, SPDES Number NY-000 0973, West Valley Demonstration Project, effective date 02/01/04, expiration date 02/01/09, modification dates 01/01/05, issued November 17, 2004.

NYSDEC (New York State Department of Environmental Conservation), 2005a, "Mineral Resources of New York State, Sand and Gravel Mines in New York State, Shale Mines in New York, Location of Wells Regulated by the Division of Mineral Resources" Division of Mineral Resources (accessed July 12, 2005, http://www.dec.state.ny.us/website/dmn/minres/).

NYSDEC (New York State Department of Environmental Conservation), 2005b, State Pollutant Discharge Elimination System (SPDES) Discharge Permit, SPDES Number NY-0269271, NYS Licensed Disposal Area, effective date 11/01/05, expiration date 10/31/10, issued September 28.

NYSDEC (New York State Department of Environmental Conservation), 2005c, *New York State Standards and Specifications for Erosion and Sediment Control,* Division of Water, Albany, New York, August.

NYSDEC (New York State Department of Environmental Conservation), 2006a, *Stratigraphic Section for Southwestern New York State*, Division of Mineral Resources (accessed September 29, 2008, http://www.dec.ny.us/website/dmn/southstrat.htm).

NYSDEC (New York State Department of Environmental Conservation), 2006b, *Minerals, Oil and Gas Lease Sales 2006* (accessed June 15, 2006, http://www.dec.state.ny.us/website/dmn/leasing/proposed.html).

NYSDEC (New York State Department of Environmental Conservation), 2006c, *Environmental Site Remediation Database Search* (accessed June 15, 2006, http://www.dec.state.ny.us/cfmx/extapps/ derfoil/index.cfm?pageid=3).

NYSDEC (New York State Department of Environmental Conservation), 2006d, *Zoar Valley Multiple Use Area Unit Management Plan, Final: Towns of Collins, Persia, and Otto*, (available at http://www.dec.ny.gov/docs/lands_forests_pdf), December.

NYSDEC (New York State Department of Environmental Conservation), 2007, "NYSDEC 2006 Region 9, Air Quality Data" Division of Air Resources (accessed December 11, 2007, http://www.dec.ny.gov/chemical/8536.html).

NYSDEC (New York State Department of Environmental Conservation), 2008a, List of Endangered, Threatened and Special Concern Fish and Wildlife Species of New York State (accessed January 16, 2008, http://www.dec.ny.gov/animals/7494.html).

NYSDEC (New York State Department of Environmental Conservation), 2008b, Commodity Data Search for Cattaraugus County, New York, Department of Mineral Resources database (http://www.dec.ny.gov/cfmx/extapps/MinedLand/search/commodity/index.cfm), March.

NYSDEC (New York State Department of Environmental Conservation), 2008c, Protected Native Plants (6 NYCRR 193.3) (accessed August 18, 2008, http://dec.ny.gov/regs/15522.html), August 18.

NYSDEC (New York State Department of Environmental Conservation), 2008d, *Environmental Site Remediation Database Search* (accessed January 18, 2008, http://www.dec.ny.gov/cfmx/extapps/derfoil/index.cfm?pageid=3).

NYSDEC (New York State Department of Environmental Conservation), 2008e, *Re: Facility: West Valley Demonstration Project*, DEC No.: 9-0422-00005/00006. SPDES No. 000 0973, August 27.

NYSDEC (New York State Department of Environmental Conservation), 2009, *Chemical and Petroleum Spills*, Division of Environmental Remediation, Albany, New York.

NYSDOH (New York State Department of Health), 2007, "New York State Cancer Registry," (accessed January 2008, http://www.health.state.ny.us/statistics/cancer/registry/).

NYSDOH (New York State Department of Health), 2009, "New York State Hospital Profile," Cattaraugus County Hospitals and Erie County Hospitals (accessed April 21, 2009, http://hospitals.nyhealth.gov).

NYSDOL (New York State Department of Labor), 2008a, 2007 CES employment by industry for Cattaraugus and Erie Counties, Erie County CES derived using QCEW statistics for Erie and Niagara Counties to proportion the Buffalo-Niagara Falls, New York Metropolitan Statistical Area by county (available at http://www.labor.state.ny.us/workforceindustrydata/apps.asp?reg=nys&app=emp).

NYSDOL (New York State Department of Labor), 2008b, *Local Area Unemployment Statistics for Cattaraugus and Erie Counties* (accessed July 25, 2008, http://www.labor.state.ny.us/workforceindustrydata/apps.asp?reg-nys&app-laus), July 25.

NYSDOT (New York State Department of Transportation), 2003, *Final Environmental Impact Statement/Final Section 4(f) Evaluation for P.I.N. 5101.53, U.S. Route 219, Springville to Salamanca, Erie and Cattaraugus Counties, N.Y.*, Buffalo, New York, January.

NYSDOT (New York State Department of Transportation), 2005, *NYSDOT Receives Approval to Extend U.S. Route 219 Freeway*, NYSDOT Region 5 Press Release, Buffalo, New York, May 25.

NYSDOT (New York State Department of Transportation), 2006, 2006 Traffic Data Report for New York State (accessed at https://www.nysdot.gov/portal/page/portal/divisions/engineering/technical-services/highway-data-services/traffic-data), Albany, New York.

NYSDOT (New York State Department of Transportation), 2008a, U.S. Route 219 Southern Expressway (accessed on February 3, 2009, http://www.nysdot.gov/portal/page/portal/regional-offices/region5/us-route-219-section5).

NYSDOT (New York State Department of Transportation), 2008b, US Route 219 (Springville to Salamanca) (accessed August 26, 2008, https://www.nysdot.gov/portal/page/portal/regional-offices/region5/projects/us-route-219/repository/rod219.pdf).

NYSDOT (New York State Department of Transportation), 2009, US Route 219 Southern Expressway, NY Route 39 to Peters Road - Section 5, Project I.D. No. 510153.

NYSED (New York State Education Department), 2008, New York State School and District Report Cards for School Year 2005-2006 (accessed January 11, 2008, https://www.nystart.gov/publicweb/), January 11.

NYSED (New York State Education Department), 2009, 2007-08 New York State District Report Card, Accountability and Overview Report (accessed at http://www.nystart.gov/publicweb/Home.do?year=2008), March 10.

NYSERDA (New York State Energy Research and Development Authority), 2003, *Public Notice, Availability of Notice of Intent to Prepare an Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*, New York State Department of Environmental Conservation, New York State Environmental Notice Bulletin, Albany, March 20.

NYSERDA (New York State Energy Research and Development Authority), 2006, Compilation of Information on Historical Releases at the Western New York Nuclear Service Center, July 13.

NYSERDA (New York State Energy Research and Development Authority), 2009a, Letter from P. Bembia, Program Director, to A. Rabe, Center for Health & Environmental Justice, Subject: NYSERDA comments on "The Real costs of Cleaning Up Nuclear Waste: A Full Cost Accounting of Cleanup Options for the West Valley Nuclear Waste Site," Albany, New York, March 25.

NYSERDA (New York State Energy Research and Development Authority), 2009b, *State-Licensed Disposal Area at West Valley, 2008 Annual Report*, West Valley Site Management Program, West Valley, New York.

NYSGS (New York State Geological Survey), 1979, *Research at a Low-level Radioactive Waste Burial Site at West Valley, New York - An Introduction and Summary*, NYSGS Open File Report 79-2413, New York State Geological Survey, Albany, New York, February 9.

NYSGS (New York State Geological Survey), 1990, New York State Geological Highway Map, Plate 2 Geologic Map and Cross Sections, Plate 3 Legend for Geologic Map, University of the State of New York, State Education Department, New York State Geological Survey, New York State Museum, Albany, New York.

Opalka, J., 2008, Planner, Erie County, Buffalo, New York, Personal communication to L. Wedande, Science Applications International Corporation, Reston, Virginia, "West Valley Decommissioning EIS Project Request - Erie County," March 28.

Ouassaa and Forsyth, 2002, "Interpretation of Seismic and Potential Field Data from Western New York State and Lake Ontario," *Tectonophysics* 353 (2002) pp. 115-149, Elsevier Science B.V., February 9.

Paoletta, D., 2003, Cattaraugus County Department of Economic Development, Planning and Tourism, Agricultural Districts Status Report Cattaraugus County, New York, *A Report on the NYS Agricultural Districts Program in Cattaraugus County and the Concepts, Procedures and Requirements of Agricultural Districts Law*, Little Valley, New York, April.

PG&E (Pacific Gas and Electric Company), 2002, *Diablo Canyon Independent Spent Fuel Storage Installation Safety Analysis Report*, Docket No. 72-26, October.

Pierce, C.A., 1991, *Stage 1 Cultural Resource Investigations at Selected Areas Within the Western New York Nuclear Service Center, Town of Ashford, Cattaraugus County, New York*, Volume 2 of 2, Pratt and Huth Associates, Williamsville, New York, March 25.

PNNL (Pacific Northwest National Laboratory), 1999, *Life-Cycle Cost and Risk Analysis of Alternative Configurations for Shipping Low-Level Radioactive Waste to the Nevada Test Facility*, DOE/CH/CRE-6-1999, Prepared for the Center for Risk Excellence, U.S. Department Energy, Chicago Operations Office, Richland, Washington, December.

PNNL (Pacific Northwest National Laboratory), 2007, *GENII Version 2 Users' Guide*, PNNL-14583, Rev. 2, Richland, Washington, March.

Prudic, D. E., 1986, *Ground-Water Hydrology and Subsurface Migration of Radionuclides at a Commercial Radioactive Waste Burial Site, West Valley, Cattaraugus County, New York*, U.S. Geological Survey Professional Paper 1325.

Risky, D., 2008, Allegany County Public Works, New York, Personal communication with L. Wedande, Science Applications International Corporation, Reston, Virginia, "Future Actions for Cumulative Impacts," April 10.

SAIC (Science Applications International Corporation), 2005a, *SDA Hazardous Material Inventory Estimate*, Germantown, Maryland, September.

SAIC (Science Applications International Corporation), 2005b, *NDA Hazardous Material Inventory Estimate*, Germantown, Maryland, September.

Sandia (Sandia National Laboratories), 1997, *Code Manual for MACCS2: Volume 1, User's Guide*, NUREG/CR-6613, SAND97-0594, Vol. 1, Washington, DC, March.

Savy, J. B., W. Foxall, N. Abrahamson, and D. Bernreuter, 2002, *Guidance for Performing Probabilistic Seismic Hazard Analysis for a Nuclear Plant Site: Example Application to the Southeastern United States*, NUREG/CR-6607, UCRL-ID-133494, Lawrence Livermore National Laboratory, Livermore, California, October.

Seed, H. B., I. M. Idriss, and I. Arango, 1983, "Evaluation of Liquefaction Potential Using Field Performance Data," *Journal of Geotechnical Engineering*, Vol. 109, No. 3, pp. 458-482, March.

Seneca Gaming Corporation, 2008, "Overview, Seneca Allegany Casino and Hotel" (accessed January 9, 2008, http://www.senecagamingcorporation.com/seneca-allegany-casino.cfm), January 3.

Seneca Nation, 1996, *Cooperative Agreement Between the Seneca Nation of Indians and the DOE-WVAO*, April 2.

Seneca Nation, 2000, *Memorandum of Agreement Between the Seneca Nation of Indians and the U.S. Department of Energy*, July.

Senus, M., 2006, Hydrologist, U.S. Department of the Army, Buffalo District, Corps of Engineers, Buffalo, New York, Personal communication (memorandum with attachments) to the J. H. Swailes, Director, West Valley Demonstration Project, U.S. Department of Energy, West Valley, New York, "Acceptance of Wetland Delineation," Application No, 98-973-0092(2), New York State Department of Environmental Conservation No. 9-0422-00005/00100, March 21.

Seoane, T., 2008, New York Natural Heritage Program, Albany, New York, Personal communication (letter) to J. Dundas, U.S. Department of Energy, West Valley, New York, State Rare Animals and Plants, Significant Natural Communities, and Other significant Habitats Within the Vicinity of the Western New York Nuclear Service Center, August 6.

SHPO (State Historic Preservation Office), 1995, Letter from R. D. Kuhn, Historic Preservation Coordinator, SHPO, New York State Office of Parks, Recreation and Historic Preservation, to P. L. Piciulo, Program Director, U.S. Department of Energy, West Valley, New York, "DOE West Valley Demonstration Project, Ashford, Cattaraugus County," June 15.

Snyder, Sr., B. E., 1993, Seneca Nation of Indians, President, Irving, New York, Personal communication (letter) to H. O'Leary, Secretary, U.S. Department of Energy, Washington, DC, "Support of Stated Goals of Environmental Restoration and Waste Management," December 16.

Southern Tier West (Southern Tier West Regional Planning and Development Board), 2004, *2004 Regional Development Strategy*, Center for Regional Excellence, Salamanca, New York.

Southern Tier West (Southern Tier West Regional Planning and Development Board), 2006, *2006 Regional Development Strategy, 2006 Comprehensive Economic Strategy* June, (available at http://www.southerntierwest.org/pdfs/rds/2006/2006%20rds.pdf).

Steiner, R., 2006, Washington Safety Management Solutions, West Valley, New York, Personal communication (email) to K. Folk, Science Applications International Corporation, Germantown, Maryland, "Need for Updated Utility Infrastructure Data for WNYNSC," June 22.

Steiner, R., 2008a, Washington Safety Management Solutions, West Valley, New York, Personal communication (email) to G. Roles, Science Applications International Corporation, Germantown, Maryland, "Need for Updated Utility Infrastructure Data for WNYNSC," February 19.

Steiner, R. 2008b, Washington Safety Management Solutions, West Valley, New York, Personal communication (email) to J. Hammelman and S. Crede, Science Applications International Corporation, Germantown, Maryland, "Probable Maximum Flood Modeling Results," August 7.

Stover, C. W., and J. L. Coffman, 1993, *Seismicity of the United States, 1568-1989 (Revised)*: U.S. Geological Survey Professional Paper 1527, Washington, DC.

Taylor, C. W., 1967, Nuclear Fuel Services, Memorandum to R. B. Keely and K. E. Valentine, Nuclear Fuel Services, May 23.

TERA (TERA Corporation), 1981, *Final Report: Seismic Hazard Analysis for West Valley, New York Site*, Berkeley, California, January.

Town of Alabama, 2008, *Draft Environmental Impact Statement for the Alabama Ledge Wind Farm, Town of Alabama*, *Genesee County*, *New York*, prepared by Tetra Tech EC, Inc., January 14.

Town of Arkwright, 2009, *Supplemental Environmental Impact Statement, Proposed Arkwright Wind Farm Project, Town of Arkwright*, *Chautauqua County, New York*, prepared by Tetra Tech EC, Inc., April.

Town of Perry, 2009, *Supplement to the Draft Environmental Impact Statement for the Dairy Hills Wind Farm Project, Towns of Perry, Warsaw, and Covington, Wyoming County, New York*, prepared by Environmental Design & Research, June 24.

Tuttle, M. P., K. Dyer-Williams, and N. L. Barstow, 1995, *Paleoliquefaction Study along the Clarendon-Linden Fault System*, Final Report, Palisades, New York, May 10.

Tuttle, M. P., K. Dyer-Williams, and N. Barstow, 1996, S*eismic Hazard Implications of a Paleoliquefaction Study Along the Clarendon-Linden Fault System in Western New York State*, Geological Society of America, Abstracts, Volume 28, No. 3, p. 106, February.

Tuttle, M. P., K. Dyer-Williams, and N. L. Barstow, 2002, Paleoliquefaction Study of the Clarendon-Linden Fault System, Western New York State, *Tectonophysics* 353 (2002) pp. 263-286, Elsevier Science B.V., February 15.

Urbon, W. G., 1968, Nuclear Fuel Services, Inc., Letter forwarding Quarterly Report for July 1 Through September 30, 1968 to U.S. Atomic Energy Commission, November 4.

URS (URS Corporation), 2001, Progress Report, Erosion Frame Monitoring, West Valley Demonstration Project, West Valley New York, September.

URS (URS Corporation), 2002a, *West Valley Demonstration Project, 2002 Land Use Survey In Support of the 2001 National Emissions Standard for Hazardous Air Pollutants (NESHAP) and Annual Site Environmental (ASER) Reports*, Revision 0, (TA-2002-3-019), March 13.

URS (URS Corporation), 2002b, *An Update of the Structural Geology in the Vicinity of the Western New York Nuclear Service Center, West Valley, New York*, West Valley, New York, May.

URS (URS Corporation), 2004, *Seismic Hazard Evaluation for the Western New York Nuclear Service Center, New York*, Oakland, California, June 24.

URS (URS Corporation), 2008a, Summary of Topography for WVDP and WNYNSC. Results of topographic analysis conducted by UIRS and submitted May 5, 2008.

URS (URS Corporation), 2008b, Memorandum from K. Sullivan to J. Hammelman and S. Crede, Science Applications International Corporation, *Probable Maximum Flood Inundation Study*, August 28.

USACE (U.S. Army Corps of Engineers), 2008a, *Formerly Utilized Sites Remedial Action Program* (accessed August 20, 2008, http://www.nan.usace.army.mil/business/prjlinks/fusrap/index.htm), New York District, August 20.

USACE (U.S. Army Corps of Engineers), 2008b, *FUSRAP* (accessed August 21, 2008, http://www.lrb.usace.army.mil/fusrap/), Buffalo District, August 21.

USDA NRCS (U.S. Department of Agriculture Natural Resources Conservation Service), 2005, "Official Soil Series Descriptions, Soil Series Name Search," (search for Churchville, Varysburg, and Hudson soil descriptions), Soil Survey Division (accessed September 1, 2005, http://soils.usda.gov/technical/classification/osd/), September 1.

USDOT and NYSDOT (U.S. Department of Transportation and New York State Department of Transportation), 2003a, *Noise Study Report, Supplement to Final Environmental Impact Statement/Final Section 4(f) Evaluation, P.I.N. 5101.53, U.S. Route 219*, Springville to Salamanca, (available at http://www.dot.state.ny.us/reg/r5/route219_feis_pdf.html), January.

USDOT and NYSDOT (U.S. Department of Transportation, Federal Highway Administration, and New York State Department of Transportation), 2003b, *Final Environmental Impact Statement / Final Section 4(f) Evaluation for P.I.N. 5101.53, U.S. Route 219, Springville to Salamanca, Erie and Cattaraugus Counties, N.Y.*, FHWA-NY-EIS-98-02F, Buffalo, New York, and Albany, New York, January.

USFS (U.S. Forest Service, U.S. Department of Agriculture), 2008, *Schedule of Proposed Actions for the Allegheny National Forest, 01/01/2008 to 03/31/2008*, (accessed January 18, 2008, http://www.fs.fed.us/sopa/forest-level.php?110919).

USGS (U.S. Geological Survey), 1979, Ashford Hollow quadrangle, New York (map), 1:24,000, 7.5 Minute Series, Washington, DC, USGS, 1964, photo revised.

USGS (U.S. Geological Survey), 2002, "Interpolated Probabilistic Ground Motion for the Conterminous 48 States by Latitude Longitude, 2002 Data," (search for Latitude 42.504 North, Longitude -78.6543 West [West Valley Demonstration Project centroid, New York]); page last updated June 14, 2005 (accessed September 2, 2005, http://eqint.cr.usgs.gov/eqprob/2002/index.php), September 2.

USGS (U.S. Geological Survey), 2005a, "Measuring Earthquakes," Earthquakes Frequently Asked Questions Page, Earthquake Hazards Program, National Seismic Hazard Mapping (accessed July 8, 2005, http://earthquake.usgs.gov/faq/meas.html), July 8.

USGS (U.S. Geological Survey), 2005b, "Magnitude and Intensity, Measuring the Size of an Earthquake, Magnitude/Intensity Comparison," EQ Facts and Lists Page, Earthquake Hazards Program (accessed July 8, 2005, http://earthquake.usgs.gov/bytopic/mag_int.html), July 8.

USGS (U.S. Geological Survey), 2005c, "Earthquake History of New York," page last updated August 5, 2003 (accessed July 9, 2005, http://neic.usgs.gov/neis/states/new_york/new_york_history.html).

USGS (U.S. Geological Survey), 2008, "Circular Area Earthquake Search," Earthquake Hazards Program, National Earthquake Information Center (available at http://neic.usgs.gov/neis/epic/epic_circ.html), August 28.

USGS and NYSGS (U.S. Geological Survey and New York State Geological Survey), 2003, *The Mineral Industry of New York*, (accessed July 12, 2005, http://minerals.usgs.gov/minerals/pubs/state/2003/nystmyb03.pdf).

Wald, D. J., V. Quitoriano, T. H. Heaton, and H. Kanamori, 1999, "Relationships between Peak Ground Acceleration, Peak Ground Velocity and Modified Mercalli Intensity in California," Earthquake Spectra, Vol. 15 (3), pp. 557-564 (available at http://www-socal.wr.usgs.gov/ shake/pubs/regress/regress.html), April.

Wierzbicki, W. M., 2006, West Valley Nuclear Services Company, West Valley, New York, Personal communication (letter) to J. H. Swailes, Director, U.S. Department of Energy, West Valley, New York, "Wetland Delineation – Corps of Engineers (COE) Request for Additional Information," January 12.

Winchow, R. P., 1967, Nuclear Fuel Services, Inc., Letter to E. R. Price, Director, Division of State and Licensing Regulations, U.S. Atomic Energy Commission, March 14.

WIVB, 2008, *People Want Answers on $15 Million Price Tag for Washed Out Road*, News 4, WIVB TV, accessed at http://www.wivb.com/Global/story.asp?s=8263538, May 19.

WSMS (Washington Safety Management Solutions LLC), 2005a, *Hazardous Materials in the Process Building at the Western New York Nuclear Service Center, A Residual Inventory Estimate in Support of Decommissioning EIS Alternative 3*, WSMS-OPS-05-0006, Rev. 0, West Valley, New York, April 25.

WSMS (Washington Safety Management Solutions LLC), 2005b, *Hazardous Materials in Subsurface Structures and Equipment in the Process Building at the Western New York Nuclear Service Center*, *A Residual Inventory Estimate in Support of Decommissioning EIS Alternative 4*, WSMS-OPS-05-0007, Rev. 0, West Valley, New York, May 16.

WSMS (Washington Safety Management Solutions LLC), 2005c, *Hazardous Chemical Inventory Estimate for the Waste Tank Farm*, WSMS-OPS-05-0008, Rev. 2, West Valley, New York, August 16.

WSMS (Washington Safety Management Solutions LLC), 2009a, *Sitewide Removal Alternative Technical Report*, WSMS-WV-08-0002, West Valley, New York, December.

WSMS (Washington Safety Management Solutions LLC), 2009b, *Sitewide Close-In-Place Alternative Technical Report*, WSMS-WV-08-0004, West Valley, New York, December.

WSMS (Washington Safety Management Solutions LLC), 2009c, *Phased Decisionmaking Alternative Technical Report*, WSMS-WV-08-0005, West Valley, New York, December.

WSMS (Washington Safety Management Solutions LLC), 2009d, *No Action Alternative Technical Report*, WSMS-WV-08-0003, West Valley, New York, December.

WSMS (Washington Safety Management Solutions LLC), 2009e, *Facility Description and Methodology Technical Report*, WSMS-WV-08-0001, West Valley, New York, December.

WVES (West Valley Environmental Services LLC), 2007a, *West Valley Demonstration Project Waste Minimization/Pollution Prevention Awareness Plan*, WVDP-087, Rev. 9, West Valley, New York, November 19.

WVES (West Valley Environmental Services LLC), 2007b, *Annual Summary for the North Plateau Strontium 90 Groundwater Plume October 1, 2006 – September 30, 2007*, December 31.

WVES (West Valley Environmental Services LLC), 2008, Data Call Materials.

WVES (West Valley Environmental Services LLC), 2009, *West Valley Demonstration Project North Plateau Background Soil Characterization Report,* WVDP-493, Rev. 2, West Valley, New York, February 24.

WVES and URS (West Valley Environmental Services LLC and URS Group Inc.), 2007, *Groundwater Trend Analysis Report 4th Quarter 2007*, West Valley, New York, December.

WVES and URS (West Valley Environmental Services LLC and URS - Washington Division), 2008, *West Valley Demonstration Project Annual Site Environmental Report for Calendar Year 2007*, West Valley, New York, December.

WVNS (West Valley Nuclear Services Company), 1992a, *Environmental Information Document, Vol. II, Seismology*, WVDP-EIS-005, Rev. 0, West Valley, New York, December.

WVNS (West Valley Nuclear Services Company), 1992b, *Environmental Information Document, Vol. XI, Ecological Resources of the Western New York Nuclear Services Center*, WVDP-EIS-010, Rev. 0, West Valley, New York, December.

WVNS (West Valley Nuclear Services Company), 1993a, *Environmental Information Document, Vol. III, Hydrology: Part 3 of 5, Erosion and Mass Wasting Processes,* WVDP-EIS-009, Rev. 0, West Valley, New York, February 12.

WVNS (West Valley Nuclear Services Company), 1993b, *Environmental Information Document, Vol. III, Hydrology: Part 1, Geomorphology of Stream Valleys*, WVDP-EIS-009, Rev. 0, West Valley, New York, January.

WVNS (West Valley Nuclear Services Company), 1993c, *Environmental Information Document, Vol. VI, Site Radiological Surveys*, WVDP-EIS-007, Rev. 0, West Valley, New York, January.

WVNS (West Valley Nuclear Services Company), 1993d, *Environmental Information Document, Vol. III, Hydrology, Part 4*, Groundwater Hydrology and Geochemistry, WVDP-EIS-009, Rev. 0, West Valley, New York, February.

WVNS (West Valley Nuclear Services Company), 1993e, *Environmental Information Document, Volume III, Hydrology: Part 5*, Vadose Zone Hydrology, WVDP-EIS-009, Rev. 0, West Valley, New York, February.

WVNS (West Valley Nuclear Services Company), 1993f, *Environmental Information Document, Vol. I, Geology*, WVDP-EIS-004, Rev. 0, West Valley, New York, March.

WVNS (West Valley Nuclear Services Company), 1993g, Internal WVNS Memorandum from WVNS to B. A. Carpenter, WVNS, Memorandum No. BI:93:0015, Subject: Liquefaction Potential of the Recessional Sequence, June 25.

WVNS (West Valley Nuclear Services Company), 1993h, *Environmental Information Document, Vol. VIII, Air Resources: Part 2, Meteorology*, WVDP-EIS-015, Rev. 0, West Valley, New York, December.

WVNS (West Valley Nuclear Services Company), 1994a, *Environmental Information Document, Volume X-A, Cultural Resources of the Western New York Nuclear Service Center*, WVDP-EIS-030A, Rev. 0, West Valley, New York, October.

WVNS (West Valley Nuclear Services Company), 1994b, *Environmental Information Document, Vol. IV, Soils Characterization, Appendices*, WVDP-EIS-008, Rev. 0, West Valley, New York, September 15.

WVNS (West Valley Nuclear Services Company), 1996, *Environmental Information Document, Vol. XI, Ecological Resources of the Western New York Nuclear Service Center*, WVDP-EIS-010, Rev. 0 (PC2), West Valley, New York, March.

WVNS (West Valley Nuclear Services Company, Inc.), 1997, *West Valley Demonstration Project, Site Environmental Report, Calendar Year 1996*, West Valley Nuclear Services Co., Inc. and Dames & Moore, West Valley, New York, June.

WVNS (West Valley Nuclear Services Company), 2004a, *Safety Analysis Report for Waste Processing and Support Activities*, WVNS-SAR-001, Rev. 9, West Valley, New York, March 8.

WVNS (West Valley Nuclear Services Company), 2004b, *Waste Minimization/Pollution Prevention Awareness Plan*, WVDP-087, Rev. 8, West Valley, New York, December 30.

WVNS (West Valley Nuclear Services Company), 2005, *West Valley Demonstration Project, Animal Control Operations*, WVDP-311, Rev. 4, West Valley, New York, June 13.

WVNS (West Valley Nuclear Services Company), 2006, *Waste Processing and Support Activities*, WVNS-SAR-001, Rev. 10, West Valley, New York, January 23.

WVNS (West Valley Nuclear Services Company), 2007, *Waste Processing and Support Activities*, WVNS-SAR-001, Rev. 11, West Valley, New York, June 28.

WVNS and Dames and Moore (West Valley Nuclear Services Company and Dames and Moore), 1997, *Resource Conservation and Recovery Act Facility Investigation Report Volume 1*, Introduction and General Site Overview, West Valley Demonstration Project West Valley, New York, WVDP-RFI-017, West Valley Nuclear Services Company, Inc., West Valley, New York, July 14.

WVNS and URS (West Valley Nuclear Services Company, Inc. and URS Group Inc.), 2002, *West Valley Demonstration Project, Annual Site Environmental Report, Calendar Year 2001*, West Valley, New York, August.

WVNS and URS (West Valley Nuclear Services Company, Inc. and URS Group Inc.), 2004a, *West Valley Demonstration Project, Annual Site Environmental Report, Calendar Year 2003*, West Valley, New York, August.

WVNS and URS (West Valley Nuclear Services Company, Inc. and URS Group, Inc.), 2004b, *2003 Wetland Delineation, West Valley Nuclear Site Assessment Area, Rock Springs Road, Town of Ashford, Cattaraugus County, New York*, Rev. 1, West Valley, New York, October.

WVNS and URS (West Valley Nuclear Services Company, Inc. and URS Group Inc.), 2005, *West Valley Demonstration Project, Annual Site Environmental Report, Calendar Year 2004*, West Valley, New York, August.

WVNS and URS (West Valley Nuclear Services Company, Inc. and URS Group Inc.), 2006, *West Valley Demonstration Project, Annual Site Environmental Report, Calendar Year 2005*, West Valley, New York, September.

WVNS and URS (West Valley Nuclear Services Company, Inc. and URS Group, Inc.), 2007, *West Valley Demonstration Project, Annual Site Environmental Report, Calendar Year 2006*, West Valley, New York, September.

WVNSCO (West Valley Nuclear Services Company), 1985, Unusual Occurrence Report WVNS-85-2-WTF-1, March.

WVNSCO (West Valley Nuclear Services Company), 1986a, Critique Minutes Log CM86078, "Radioactive spill and personnel contamination," West Valley, New York, December 22.

WVNSCO (West Valley Nuclear Services Company), 1986b, Critique Minute Log CM86079, "Sludge spill at the LLWTF," West Valley, New York, December 31.

WVNSCO (West Valley Nuclear Services Company), 1987a, Critique Minute Log CM87029, "Water spill from filter housing of PVU", West Valley, New York, March 2.

WVNSCO (West Valley Nuclear Services Company), 1987b, Critique Minute Log CM87095, "Leakage of contaminated liquid," West Valley, New York, August 20.

WVNSCO (West Valley Nuclear Services Company), 1994, *Environmental Information Document, Volume IV: Soils Characterization, West Valley Demonstration Project, West Valley, New York*, WVDP-EIS-008, Revision 0, September 15.

WVNSCO (West Valley Nuclear Services Company), 1995, *Subsurface Probing Investigation on the North Plateau at the West Valley Demonstration Project*, WVDP-220, Revision 0, West Valley, New York, May 1.

WVNSCO (West Valley Nuclear Services Company), 1997a, *Resource Conservation and Recovery Act Facility Investigation Report, Volume 4: Low-level Waste Treatment Facility*, West Valley Demonstration Project, West Valley, New York, WVDP-RFI-021, Revision 0, West Valley, New York, January 17.

WVNSCO (West Valley Nuclear Services Company), 1997b, *Resource Conservation and Recovery Act Facility Investigation Report, Volume 8: High-level Waste Storage and Processing Area*, West Valley Demonstration Project, West Valley, New York, WVDP-RFI-024, Revision 0, West Valley, New York, April 4.

WVNSCO (West Valley Nuclear Services Company), 1997c, Event Fact Sheet 97110, "Soil Contamination Found North of Lagoon 5," West Valley, New York, July 11.

WVNSCO (West Valley Nuclear Services Company), 1999a, *Geoprobe Investigation in the Core Area of the North Plateau Groundwater Plume*, WVDP-346, West Valley, New York, June 11.

WVNSCO (West Valley Nuclear Services Company), 1999b, Event Fact Sheet 99084, "Spill at Equalization Basin," West Valley, New York, August 12.

WVNSCO (West Valley Nuclear Services Company), 2000a, Event Fact Sheet 2000-017, "Small Amount of Mercury Discovered at Top of Floor Drain Cover," West Valley, New York, March 9.

WVNSCO (West Valley Nuclear Services Company), 2000b, Event Fact Sheet 2000-063, "Incidental Spill in CCPR," West Valley, New York, October 11.

WVNSCO (West Valley Nuclear Services Company), 2002, S*upplemental Hydrogeologic Investigation of the North Plateau Pilot Permeable Treatment Wall: Performance Assessment and Evaluation of Potential Enhancements*, West Valley, New York, November.

WVNSCO (West Valley Nuclear Services Company), 2004, "Occurrence Report After 2003 Redesign," OH-WV-WVNS-WVNSGEN-2004-0007, November 5.

WVNSCO (West Valley Nuclear Services Company), 2005, "Occurrence Report after 2003 Redesign," EM-OH-WV-WVNS-VFS-2005-0002, March 7.

WVNSCO (West Valley Nuclear Services Company), 2006, *WVDP Radiological Controls Manual*, WVDP-010, Rev. 27, West Valley, New York, November 8.

WVNSCO (West Valley Nuclear Services Company), 2007, Corrective Measures Study Work Plan for the West Valley Demonstration Project, WVDP-462 Rev. 0, West Valley, New York, January 9.

Yager, R. M., 1987, *Simulation of Groundwater Flow near the Nuclear-Fuel Reprocessing Facility at the Western New York Nuclear Service Center*, *Cattaraugus County*, *New York*, Geological Survey, Water-Resources Investigations Report 85-4308, U.S. Nuclear Regulatory Commission, Ithaca, New York.

Yager, R. M., 1993, U.S. Geological Survey, Ithica, New York, Personal communication (letter) to P. Bembia, NYSERDA, West Valley, New York, "Review of Environmental Information Documents," September 2.

Young, R. A., and R. D. Jacobi, 1998, "Bedrock-till Deformation Structure Along the Clarendon-Linden Fault Zone near Linden, NY–Tectonic or Glacial Origin?:" *Geological Society of America Abstracts with Programs*, Vol. 30, No. 1, p. 85.

Yuan, Y. C., S. Y. Chen, B. Biwer, and D. J. LePoire, 1995, *RISKIND – A Computer Program for Calculating Radiological Consequences and Health Risks from Transportation of Spent Nuclear Fuel*, Argonne National Laboratory, Report No. ANL/EAD-1, Argonne, Illinois.

CHAPTER 8
GLOSSARY

8.0 GLOSSARY

abrasion—To rub or wear off; to waste or wear away by friction, as to abrade rocks.

absorbed dose—The energy imparted by ionizing radiation per unit mass of the irradiated material (e.g., biological tissue). The units of absorbed dose are the rad and the gray. (See rad and gray.)

accident—An unplanned sequence of events that usually results in undesirable consequences.

actinides—A series of heavy radioactive metallic elements of increasing atomic number (Z number) beginning with actinium (89) and continuing through lawrencium (103).

activated carbon—A highly adsorbent powdered or granular carbon used to remove radioactive or toxic substances from liquids or gases.

aggregate—Hard inert materials such as sand, gravel, or slag used for mixing with a cementing material to form concrete.

air pollutant—Generally, an airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance of which emissions or atmospheric concentrations are regulated, or for which maximum guideline levels have been established because of potential harmful effects on human health and welfare.

air quality—The cleanliness of the air as measured by the levels of pollutants relative to standards or guideline levels established to protect human health and welfare. Air quality is often expressed in terms of the pollutant for which concentrations are the highest percentage of a standard (e.g., air quality may be unacceptable if the level of one pollutant is 150 percent of its standard, even if levels of other pollutants are well below their respective standards).

air-quality standards—The legally prescribed level of constituents in the outside air that cannot be exceeded during a specified time in a specified area.

alpha emitter—A radioactive substance that decays by releasing an alpha particle.

alpha particle—A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus and has a mass number of 4 and an electrostatic charge of +2. It has low penetrating power and a short range (a few centimeters in air). (Also see alpha radiation.)

alpha radiation—A strongly ionizing, but weakly penetrating, form of radiation consisting of positively charged alpha particles emitted spontaneously from the nuclei of certain elements during radioactive decay. Alpha radiation is the least penetrating of the four common types of ionizing radiation (alpha, beta, gamma, and neutron). Even the most energetic alpha particle generally fails to penetrate the dead layers of cells covering the skin and can be easily stopped by a sheet of paper. Alpha radiation is most hazardous when an alpha-emitting particle is ingested or inhaled by an organism.

ambient air—The surrounding atmosphere as it exists around people, plants, and structures.

aquifer—An underground geological formation, group of formations, or part of a formation that holds water and is capable of yielding a significant amount of water to wells or springs.

as low as is reasonably achievable (ALARA)—The approach to radiation protection to manage and control exposures (both individual and collective) to the workforce and to the general public to as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. ALARA is not a dose limit but a process that has the objective of attaining doses as far below the applicable limits of Title 10 of the *Code of Federal Regulations* Part 835 (10 CFR 835) as is reasonably achievable.

background concentration—The level of chemical elements or radionuclides in the natural environment not affected by human activities, found by taking measurements in areas unaffected by contamination.

background radiation—Radiation from: (1) cosmic sources; (2) naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); and (3) global fallout as it exists in the environment (e.g., from the testing of nuclear explosive devices).

best management practices—Structural, nonstructural, and managerial techniques, other than effluent limitations, to prevent or reduce pollution of surface water. They are the most effective and practical means to control pollutants that are compatible with the productive use of the resource to which they are applied. Best management practices are used in both urban and agricultural areas. Best management practices can include schedules of activities; prohibitions of practices; maintenance procedures; treatment requirements; operating procedures; and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

beta emitter—A radioactive substance that decays by releasing a beta particle.

beta particle—A charged particle emitted from a nucleus during radioactive decay, with a mass equal to 1/1,837 that of a proton. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron.

beta radiation—Ionizing radiation consisting of fast-moving beta particles (negatively charged) and positrons (positively charged) emitted from the nucleus of an atom during radioactive decay. Beta radiation is more penetrating, but less energized, than alpha radiation. Beta radiation is stopped by clothing or a thin sheet of metal.

bioaccumulation—The accumulation or buildup of contaminants in living systems by biological processes.

biota (biotic)—The plant and animal life of a region.

borrow pit—An excavated area where material has been dug for use as fill at another location (e.g., a gravel pit).

capillary fringe water—Water that is held in place by capillarity (a property of surface tension that draws water upwards) in the smaller void spaces of the porous material just above the water table (i.e., the capillary fringe).

cask—A heavily shielded container used to store or ship radioactive materials.

Cesium Prong—As used in this environmental impact statement (EIS), the area of surface soil contaminated by cesium-137, both on site and off site. This contamination resulted from abnormal releases to the atmosphere caused by reprocessing plant ventilation system failures. (See Appendix C, Section C.2.14, of this EIS.)

characteristic waste—Solid waste that is classified as hazardous waste because it exhibits any of the following properties or "characteristics": ignitability, corrosivity, reactivity, or toxicity, as described in 40 CFR 261.20 through 40 CFR 261.24 and Title 6 of the New York Code of Rules and Regulations Subpart 371.3 (6 NYCRR 371.3). (Also see hazardous waste, solid waste, and waste characterization.)

characterization—The determination of waste composition and properties, whether by review of process knowledge, nondestructive examination or assay, or sampling and analysis, generally done for the purpose of determining appropriate storage, treatment, handling, transport, and disposal requirements.

clay—The name for a family of finely crystalline sheet silicate minerals that commonly form as a product of rock weathering. Also, any particle smaller than or equal to about 0.002 millimeters (0.00008 inches) in diameter.

collective dose—The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sieverts.

committed dose equivalent—The radiation dose to some specific organ or tissue in the body after the intake of radioactive material. The period examined is commonly 50 years. Committed dose equivalent is expressed in units of rem or sieverts.

committed effective dose equivalent—The radiation dose obtained by multiplying committed dose equivalents (see committed dose equivalent) by weighting factors (applicable to the specific organ or tissue that is irradiated) and summing the resulting products. The period examined is commonly 50 years. Committed effective dose equivalent is expressed in units of rem or sieverts.

communities—Assemblage of plants and animals (dominated by one to a few species) that live in the same environment and that are mutually sustaining and interdependent.

concentration—The quantity of a substance in a unit quantity of a sample (e.g., milligrams per liter or micrograms per kilogram).

construction and demolition debris—Discarded nonhazardous material including solid, semisolid, or contained gaseous material resulting from construction, demolition, industrial, commercial, mining, and agricultural operations and from community activities. The category does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act (Title 42 of the *United States Code* Section 2011 et seq. [42 U.S.C. 2011 et seq.]).

contact-handled waste—Radioactive waste or waste packages whose external dose rate is low enough to permit contact handling by humans during normal waste management activities. "Contact-handled transuranic waste" means transuranic waste with a surface dose rate not greater than 200 millirem per hour. (Also see remote-handled waste.)

contamination—Unwanted chemical elements, compounds, or radioactive material on environmental media (e.g., soil, water, and air), structures (e.g., buildings), equipment, or personnel.

contour—Line connecting points of equal elevation on a map.

contour interval—The elevation difference between two adjacent contour lines.

creep—The slow mass movement of soil or rock down slopes (e.g., landslide), primarily driven by gravity, but facilitated by saturation with water and alternate freezing and thawing.

cultural resources—A prehistoric or historic district, site, building, structure, or object considered to be important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Usually divided into three major categories: prehistoric and historic archaeological resources, architectural resources, and traditional cultural resources.

curie—The basic unit to describe the intensity of radioactivity in a sample of material, equal to 37 billion disintegrations per second. Also, a quantity of any radionuclide or mixture of radionuclides that decays at a rate of 37 billion disintegrations per second.

decommissioning—Removing facilities such as processing plants, waste tanks, and burial grounds from service and reducing or stabilizing radioactive contamination. Includes the following concepts: the decontamination, dismantling, and return of an area to its original condition without restrictions on use or occupancy; partial decontamination; isolation of remaining residues; and continued surveillance and restrictions on use or occupancy.

decontamination—The actions taken to reduce or remove chemical or radioactive substances from environmental media (e.g., soil, water, and air), structures (e.g., buildings), equipment, or personnel. Radioactive decontamination may be accomplished by washing, chemical action, mechanical cleaning, or other techniques.

defense waste—Nuclear waste deriving from the manufacture of nuclear weapons and the operation of naval reactors. Associated activities, such as the research carried on in weapons laboratories, also produce defense waste.

deterministic—Referring to events that have no random or probabilistic aspects but proceed in a fixed, predictable fashion.

direct employment—As used in this EIS, direct employment refers to those jobs at the Western New York Nuclear Service Center (WNYNSC).

disposal—As used in this EIS, emplacement of waste so as to ensure isolation from the biosphere with no intent of retrieval, and requiring deliberate action to gain access after emplacement.

disposal area—A place for permanently isolating unwanted materials (e.g., radioactive waste) from the environment.

disposal facility—A natural and/or manmade structure in which waste is disposed. (Also see disposal.)

DOE Orders—Requirements internal to the U.S. Department of Energy (DOE) that establish DOE policy and procedures, including those for compliance with applicable laws.

dose (radiological)—The radioactive energy that is absorbed by one gram of material that has been irradiated. Dose measures include dose equivalent, effective dose equivalent, committed effective dose equivalent, or committed equivalent dose as defined elsewhere in this glossary.

dose equivalent**—**A measure of radiological dose that correlates with biological effect on a common scale for all types of ionizing radiation. Defined as a quantity equal to the absorbed dose in tissue multiplied by a quality factor (the biological effectiveness of a given type of radiation) and all other necessary modifying factors at the location of interest. Dose equivalent is expressed in rems or sieverts.

dose rate—The radiation dose delivered per unit time (e.g., rad per year, millirad per year).

drainage basin—A region or area bounded by a drainage divide and occupied by a drainage system; specifically, the tract of country that gathers water originating as precipitation and contributes to a particular stream channel or system of channels or a lake, reservoir, or other body of water.

drainage divide—A boundary line, such as along a topographic ridge, that separates two adjacent drainage basins.

drinking-water standards—Prescriptive limits on the maximum contaminant level that may be in water for it to be considered safe for human consumption.

effective dose equivalent**—**The dose value obtained by multiplying the dose equivalents received by specified tissues or organs of the body by the appropriate weighting factors applicable to the tissues or organs irradiated, and then summing all of the resulting products. It includes the dose from radiation sources internal and external to the body. The effective dose equivalent is expressed in units of rems or sieverts. (Also see committed effective dose equivalent.)

endangered species—Any species which is in danger of extinction throughout all or a significant portion of its range from natural or manmade changes in the environment. The list of endangered species can be found in 50 CFR 17.11 (wildlife), 50 CFR 17.12 (plants), 50 CFR 222.23(a) (marine organisms), and 6 NYCRR Part 182.

engineered barrier (controls)—Physical controls designed to isolate or contain wastes or hazardous materials (e.g., caps, entombment of facilities, contaminant immobilization).

environmental impact statement (EIS)**—**The detailed written statement that is required by section 102(2)(c) of the National Environmental Policy Act (NEPA) for a proposed major Federal action significantly affecting the quality of the human environment. A DOE EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality NEPA regulations in 40 CFR 1500-1508, and DOE NEPA regulations in 10 CFR 1021. The statement includes, among other information, discussions of the environmental impacts of the Proposed Action and all reasonable alternatives, adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources. A New York State EIS is prepared in accordance with the Environmental Conservation Law Sections 3-301(1)(b), 3-30301(2)(m) and 8-0113, as well as the 6 NYCRR 617 State Environmental Quality Review Act (SEQR) regulations.

environmental justice—The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and Tribal programs and policies. Executive Order 12898 directs Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations.

erosion— Natural processes that include weathering, dissolution, abrasion, corrosion, and transportation, by which material is worn away from the Earth's surface.

exposure—The amount of radiation or pollutant present in a given environment that represents a potential health threat to living organisms.

external accident—Accidents initiated by manmade energy sources not associated with operation of a given facility. Examples include airplane crashes, induced fires, and transportation accidents adjacent to a facility.

fault (geologic)—Fracture in the Earth's crust accompanied by displacement of one side of the fracture with respect to the other.

fission—The splitting of a nucleus into at least two other nuclei (elements) and the release of a relatively large amount of energy.

fission products—Nuclei (new elements) formed from the fission of heavy elements.

floodplain—That portion of a river valley, adjacent to the river channel, that is built of sediments during the present regimen of the stream and that is covered with water when the river overflows its banks at flood stages.

gamma-emitter—A radioactive substance that decays by releasing gamma radiation.

gamma radiation—High-energy, short-wavelength electromagnetic radiation emitted from the nucleus of an atom during radioactive decay. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or depleted uranium. Gamma rays are similar to x-rays, but are usually more energetic than x-rays. (Also see alpha radiation and beta radiation.)

gantry—A platform made to carry a traveling crane and supported by towers or side frames running on parallel tracks.

geologic repository—A system that is intended to be used for, or may be used for, the disposal of radioactive waste or spent nuclear fuel in excavated geologic media. A geologic repository includes (a) the geologic repository operations area, and (b) the portion of the geologic setting that provides isolation. DOE has been studying Yucca Mountain in Nevada as the location of a geologic repository. However, the Administration intends to terminate further development of the proposed geologic repository at Yucca Mountain. The Administration intends to convene a "blue ribbon commission" to evaluate alternative approaches for meeting these obligations, and to provide recommendations that will form the basis for working with Congress to revise the statutory framework for managing and disposing of spent nuclear fuel and high-level radioactive waste.

gradient—The elevation change within a given distance, particularly of a stream or a land surface.

gray—The SI (International System of Units) unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (1 gray is equal to 100 rad). (The joule is the SI unit of energy.) (See absorbed dose.)

Greater-Than-Class C (GTCC)—Low-level radioactive waste that exceeds the concentration limits established for Class C waste in 10 CFR 61.55. Greater-Than-Class C waste and transuranic waste can represent similar wastes. Waste containing transuranics that may be Greater-Than-Class C by U.S. Nuclear Regulatory Commission (NRC) classification could be considered transuranic by DOE.

groundwater—Water below the ground surface in a zone of saturation. *Related definition:* Subsurface water is all water that exists in the voids found in soil, rocks, and sediment below the land surface, including soil moisture, capillary fringe water, and groundwater. That part of subsurface water in voids completely saturated with water is called groundwater. Subsurface water above the groundwater table is called vadose water.

habitat—The environment or place where a plant or animal naturally or normally grows or lives (includes soil, water, climate, other organisms, and communities.)

half-life (radiological)—The time in which one-half of the atoms of a particular radionuclide disintegrate into another nuclear form. Half-lives for specific radionuclides vary from millionths of a second to billions of years.

Hazard Index—The ratio of the potential exposure to a substance and the highest exposure level at which no adverse effects are expected. If the Hazard Index is calculated to be less than 1, then no adverse health effects are expected as a result of exposure. If the Hazard Index is greater than 1, then adverse health effects are possible.

hazardous chemical—Any chemical that is a physical hazard or a health hazard as defined under the Occupational Safety and Health Act and the Emergency Planning and Community Right-to-Know Act.

hazardous constituent—A constituent listed in 40 CFR 261, Appendix VII or VIII, that may cause a waste to be listed as a Resource Conservation and Recovery Act (RCRA) hazardous waste. "Hazardous waste constituent" means a constituent listed by the New York State commissioner in 6 NYCRR 371.4, or a constituent listed in section 371.3(e). This EIS uses the term "hazardous constituent" to encompass both the U.S. Environmental Protection Agency (EPA) and New York State definitions.

hazardous waste—A category of waste regulated under RCRA. To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20-24; 6 NYCRR 371.1(d)(1), 371.3 (ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by EPA in 40 CFR 261.3-33, or by the State of New York in 6 NYCRR 371.4. Toxicity is determined by the Toxicity Characteristic Leaching Procedure method as given in 40 CFR 261.24; 6 NYCRR 371.3(e). (Also see characteristic waste, RCRA, and solid waste.) (See hazardous constituent.)

head (hydraulic)—The driving force for fluid (water) flow. The head is typically measured in pounds per square inch or feet of water.

high-efficiency particulate air (HEPA) filter—An air filter capable of removing at least 99.97 percent of particles 0.3 micrometers (about 0.00001 inch) in diameter. These filters include a pleated fibrous medium (typically fiberglass) capable of capturing very small particles.

high-level waste or high-level radioactive waste—As used in this EIS, the high-level radioactive waste which was produced by the reprocessing of spent nuclear fuel at WNYNSC. This waste includes both liquid wastes, which are produced directly in reprocessing, dry solid material derived from such liquid waste, and such other material as the NRC designates as high-level radioactive waste for the purposes of protecting the public health and safety (West Valley Demonstration Project Act, Public Law 96-368, 94 Stat. 1347). Also see the definition of high-level radioactive waste in the Nuclear Waste Policy Act of 1982, as amended (Public Law 97-425, 96 Stat. 2201).

high-level radioactive waste solidification—See solidification (of high-level radioactive waste).

hydraulic conductivity—A measure of the rate at which water can move through a permeable medium (e.g., soil) at a specified pressure and temperature.

hydraulic gradient—The change in elevation of the water table over a distance, resulting in groundwater movement.

hydric—Characterized by or requiring an abundance of moisture.

hydrogeology—The study of the occurrence, distribution, and chemistry of all water, including groundwater, surface water, and rainfall.

hydrology—The study of water, including groundwater, surface water, and rainfall.

hydrophytic—A property of a plant that can grow in water or in soil too water-logged for most plants to survive.

industrial waste—As used in this EIS, nonradiological and nonhazardous solid, or semisolid material generated from site cleanup activities.

in-ground structures—As used in this EIS, manmade structures that are set in the ground, but are not underground (e.g., lagoons, pits, storage tanks).

in situ—In the natural or original position.

institutional controls—Measures taken by Federal or state organizations to maintain waste management facilities safely for a period of time. The measures, active or passive, may include site access control, site monitoring, facility maintenance, and erosion control.

intensity (of an earthquake)—A measure of the effects (due to ground shaking) of an earthquake at a particular location, based on observed damage to structures built by humans, changes in the Earth's surface, and reports of how people felt the earthquake. Earthquake intensity is measured in numerical units on the Modified Mercalli scale. (Also see Modified Mercalli Intensity Scale.)

interim status facility (under RCRA)—A hazardous waste management facility (i.e., treatment, storage, or disposal facility) subject to RCRA permit requirements. These facilities have been issued an interim status and are temporarily allowed to operate while awaiting a permanent permit. Such facilities are required to meet the interim status standards described in 40 CFR 265 until certification of final closure or, if the facility is subject to postclosure requirements, until postclosure responsibilities are fulfilled.

inventory, radionuclide—The total amount (by volume and/or activity) of radioactive material in a container, building, or disposal facility.

ion exchange— A unit physiochemical process that removes anions and cations, including radionuclides, from liquid streams (usually water) for the purpose of purification or decontamination.

isotherm—A line on a map or chart of the Earth's surface connecting points having the same temperature.

isotope—Any of two or more variations of an element in which the nuclei have the same number of protons (i.e., the same atomic number) but different numbers of neutrons so that their atomic masses differ. Isotopes of a single element possess almost identical chemical properties, but often different physical properties (e.g., carbon-12 and -13 are stable, but carbon-14 is radioactive).

isotropic—Exhibiting properties with the same values when measured along axes in all directions.

knickpoint—A point of abrupt vertical change in the elevation of a stream or its valley.

latent cancer fatality (LCF)—A statistically based estimate of deaths from cancer resulting from, and occurring some time after, exposure to ionizing radiation or other carcinogens.

latent cancer morbidity—A statistically based estimate of cancer incidences from, and occurring some time after, exposure to ionizing radiation or other carcinogens.

leachate—The solution formed when a liquid has percolated through a substance (e.g., the solution formed when water percolates through buried waste).

license termination rule—Refers to the final rule on "Radiological Criteria for License Termination," published by the NRC as Subpart E to 10 CFR 20.

long-term storage—As used in this EIS (and distinct from the regulatory definition of storage), the storage of hazardous waste: (a) on site (a generator site) for a period of 90 days or greater, other than in a satellite accumulation area, or (b) off site in a properly managed treatment, storage, or disposal facility for any period of time.

long-term stewardship—Activities necessary to ensure protection of human health and the environment following closure of a site. Long-term stewardship includes engineered and institutional controls designed to contain or to prevent exposure to residual contamination and waste such as monitoring and maintenance activities, record-keeping activities, inspections, groundwater monitoring and treatment, access control, posting signs, and periodic performance reviews.

low-level radioactive waste or low-level waste (LLW)—Waste that contains radioactivity and is not classified as high-level radioactive waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material (DOE Manual 435.1-1; 10 CFR 20.1003). In accordance with NRC regulations in 10 CFR 61.55, low-level radioactive waste is further classified into Class A, Class B, and Class C low-level radioactive waste. Low-level radioactive waste may also be categorized as low-specific-activity waste for the purposes of transportation analyses. Low-specific-activity wastes have low specific activity, are nonfissile, and meet certain regulatory exceptions and limits. Low-specific-activity wastes may be transported in large bulk containers.

maximally exposed individual (MEI)—A hypothetical individual whose location and habits are deliberately chosen to result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposure routes (e.g., inhalation, ingestion, direct exposure).

maximum contaminant level (MCL)—Under the Safe Drinking Water Act, the maximum permissible concentration of a specific constituent in drinking water that is delivered to any user of a public water system that serves 15 or more connections and 25 or more people. The standards set as maximum contaminant levels take into account the feasibility and cost of attaining the standard.

millirem—One thousandth of a rem. (Also see rem.)

mixed low-level radioactive waste—Low-level radioactive waste that also contains hazardous components regulated under RCRA (42 U.S.C. 6901 et seq.) and 6 NYCRR 381.17.

mitigation—(1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

Modified Mercalli Intensity Scale—The Modified Mercalli Intensity Scale is a standard of relative measurement of earthquake intensity developed to fit construction conditions in most of the United States. It is a 12-step scale, with values from I (not felt except by a very few people) to XII (damage total). A Modified Mercalli Intensity is a numerical value on the Modified Mercalli Scale. (See intensity [of an earthquake].)

morphology—The observation of the form of lands.

nanocurie—One billionth of a curie. (Also see curie.)

natural phenomena accidents—Accidents that are initiated by natural phenomena such as earthquakes, tornadoes, and floods.

nuclide—An atomic nucleus specified by its atomic weight, atomic number, and energy state; a radionuclide is a radioactive nuclide.

occupational dose—Whole-body radiation dose received by workers participating in a given task or over the course of employment.

offsite—Outside of the WNYNSC boundary.

on-premises—As used in this EIS, on the West Valley Demonstration Project Premises.

onsite—Within the WNYNSC boundary.

orphan waste—Waste that cannot currently be disposed of in an established or planned permanent disposal facility because the path forward for treatment and disposal has not yet been defined. Non-defense transuranic waste, Greater-Than-Class C waste, and commercial Class B and Class C wastes are current examples of WNYNSC orphan waste.

permeability—The rate at which liquids or gasses pass through materials in a specified direction. In hydrology, it is used to describe the capacity of a rock, sediment, or soil for transmitting groundwater. Permeability depends on the size and shape of the pores between soil particles and how they are interconnected.

person-rem—A unit of collective radiation dose applied to populations or groups of individuals (see collective dose); that is, a unit for expressing the dose when summed across all persons in a specified population or group. One person-rem equals 0.01 person-sieverts.

picocurie—One trillionth (10^{-12}) of a curie. (Also see curie.)

piezometer—An instrument used for measuring the pressure of groundwater.

piling—A cylindrical or flat member of wood, steel, or concrete often tapered at the lower end, hammered vertically into soil to form part of a foundation or retaining wall.

pollution prevention—The use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and waste into land, water, and air. For DOE, this includes recycling activities.

polychlorinated biphenyls (PCBs)—A group of toxic, persistent chemicals used for insulating purposes in electrical transformers and capacitors and in gas pipeline systems. Certain polychlorinated biphenyls are designated as hazardous waste according to 6 NYCRR 371.3.

population dose—See collective dose.

porosity—The volume of void space (air) in a soil sample divided by the bulk volume of the entire soil sample.

probable maximum flood (PMP)—The flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area.

public—Anyone who may be impacted by, interested in, or aware of the cleanup operations at WNYNSC. With respect to accidents analyzed in this environmental impact statement, the public includes anyone outside the boundary of WNYNSC at the time of the accident.

radiation absorbed dose (rad)—The basic unit of dose equal to the amount of energy from radiation imparted in an absorbing medium. A dose of one rad is the absorption of 0.01 joule per kilogram of absorbing material.

radioactive decay—The decrease in the amount of any radioactive material with the passage of time, due to the spontaneous emission from the atomic nuclei of either alpha or beta particles, often accompanied by gamma radiation. (Also see half-life.)

radioactive waste—In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or by-product material is subject to regulation as radioactive waste under the Atomic Energy Act. (Also see specific radioactive waste definition: Greater-Than-Class C, high-level radioactive waste, low-level radioactive waste, transuranic waste.)

radioactivity—*Defined as a process:* The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation. *Defined as a property:* The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

radiological survey—The evaluation of the radiation hazard accompanying the production, use, or existence of radioactive materials under a specific set of conditions. Such evaluation customarily includes a physical survey of the disposition of materials and equipment, measurements, or estimates of the levels of radiation that may be involved, and a sufficient knowledge of processes affecting these materials to predict hazards resulting from unexpected or possible changes in materials or equipment.

radionuclide—An unstable element that decays or disintegrates spontaneously, emitting radiation.

Record of Decision (ROD)—A concise public document that records a Federal agency's decision(s) concerning a Proposed Action for which the agency has prepared an EIS. The ROD is prepared in accordance with the requirements of the Council on Environmental Quality NEPA regulations (40 CFR 1505.2). A ROD identifies the alternatives considered in reaching the decision, the decision made, the environmentally preferable alternative(s), factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not. (Also see environmental impact statement.)

region of influence (ROI)—As used in this EIS, the region within a 80-kilometer (50-mile) radius from WNYNSC. As used in the socioeconomic analysis, a 50-kilometer (35-mile) radius from WNYNSC.

release fraction—The portion of the total inventory of radioactivity that could be released to the atmosphere in a given accident.

rem—A unit of radiation dose that reflects the ability of different types of radiation to damage human tissues and the susceptibility of different tissues to the damage. Rem is a measure of effective dose equivalent.

remote-handled waste—In general, refers to radioactive waste that requires special shielding or other means of protecting workers from unnecessary exposure. "Remote-handled transuranic waste" means transuranic waste with a dose rate of 200 millirem per hour or more at the surface of the waste package. (See contact-handled waste.)

repository—See geologic repository.

reprocessing (of spent nuclear fuel)—Processing of reactor-irradiated nuclear material (primarily spent nuclear fuel) to recover fissile and fertile material, in order to recycle such materials. Historically, reprocessing has involved aqueous chemical separations of elements (typically uranium or plutonium) from undesired elements in the fuel.

resins—As used in this EIS, material used to absorb contaminants.

Resource Conservation and Recovery Act (RCRA)—A law that gives EPA and authorized states the authority to control hazardous waste from "cradle to grave" (i.e., from the point of generation to the point of ultimate disposal), including its minimization, generation, transportation, treatment, storage, and disposal. RCRA also sets forth a framework for the management of nonhazardous solid wastes. (Also see hazardous waste and solid waste.)

retrieval—The process of recovering wastes that have been stored or disposed of on site so they may be appropriately characterized, treated, and disposed of.

rip-rap—An assemblage of stones, rocks, or chunks of concrete that are placed on slope embankments to prevent erosion.

risk—The probability of a detrimental effect on life, health, property, and/or the environment from exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (i.e., the product of these two factors). However, separate presentation of probability and consequence is often more informative.

runoff—That portion of precipitation, snow melt, or irrigation water that moves over the land surface as a sheet or channelized flow into surface waters (streams).

sanitary landfill—As defined in this EIS, a disposal facility that accepts nonhazardous and nonradioactive industrial waste. (Also see industrial waste.)

saturated zone—That part of the Earth's crust in which all naturally occurring voids are filled with water.

scientific notation—A notation adopted by the scientific community to deal with very large and very small numbers. Scientific notation uses a number times 10 and either a positive or negative exponent to show how many places to the left or right the decimal place has been moved. For example, in scientific notation, 120,000 would be written as 1.2×10^5, and 0.000012 would be written as 1.2×10^{-5}.

seep—A spot where groundwater discharges onto the land surface, often forming the source of a small stream.

seismicity—The study of the worldwide distribution of earthquakes; primarily related to location, size, and probability of occurrence.

sheet erosion—Soil particles that are removed in a fairly uniform layer by a continuous film of water that is moving over land surfaces.

shielding—Any material or obstruction used to absorb radiation in order to protect personnel or equipment.

sievert—The SI unit of radiation dose equivalent. The dose equivalent in sieverts equals the absorbed dose in grays multiplied by the appropriate quality factor (1 sievert is equal to 100 rem). (See gray.)

silt—A sedimentary material consisting of fine mineral particles, intermediate in size between sand and clay. In general, soils categorized as silt show greater rates of erosion than soils categorized as sand.

slump block—A mass of soil that slides down a bank as a single unit. Slump blocks form when water moves into deep fractures within banks, causes an increase in soil pore pressures, and reduces the strength of the soil.

slumping—The slipping of a mass of rock or soil, moving as a unit, down a slope or embankment.

slurry wall—An underground wall made of a watery mixture of insoluble matter (e.g., clay) used for preventing groundwater flow in a certain direction.

sole-source aquifer—A designation granted by EPA and authorized states when groundwater from a specific aquifer supplies at least 50 percent of the drinking water for the area overlying the aquifer. Sole-source aquifers have no alternative source or combination of sources that could physically, legally, and economically supply all those who obtain their drinking water from the aquifer. Sole-source aquifers are protected from Federal financially-assisted activities determined to be potentially unhealthy for the aquifer.

solid waste—1. In general, solid wastes are nonliquid, nonsoluble discarded materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes include sewage sludge, agricultural refuse, demolition wastes, and mining residues. 2. For purposes of RCRA regulation, solid waste is any garbage; refuse; sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and other discarded material. Solid waste includes solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. Solid waste does not include solid or dissolved material in domestic sewage or irrigation return flows or industrial discharges that are point sources subject to permits under Section 402 of the Clean Water Act. Finally, solid waste does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act. A more detailed regulatory definition of solid waste can be found in 40 CFR 261.2 and 6 NYCRR 360. (Also see hazardous waste and Resource Conservation and Recovery Act.)

solidification (of high-level radioactive waste)—As used in this EIS, the process employed from 1996 to 2000 to vitrify high-level radioactive waste into glass logs by the West Valley Demonstration Project. (Also see vitrification.)

solvents—Liquid chemicals, usually organic compounds, that are capable of dissolving another substance.

source term—The amount of a specific pollutant (e.g., chemical, radionuclide) emitted or discharged to a particular environmental medium (e.g., air, water) from a source or group of sources. It is usually expressed as a rate (i.e., amount per unit time).

special nuclear material (SNM)—A category of material subject to regulation under the Atomic Energy Act, consisting primarily of fissile materials. It is defined to mean plutonium, uranium-233, uranium enriched in the isotopes uranium-233 or -235, and any other material that the NRC determines to be special nuclear material, but it does not include source material.

spent fuel assemblies—Frame-like structures which contain spent nuclear fuel rods.

spent nuclear fuel—Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated.

stabilization—Treatment of waste or a waste site to protect the biosphere from contamination.

stakeholder—Any person or organization with an interest in or affected by future activities impacting cleanup of the site. Stakeholders may include representatives from Federal and state agencies, Congress, American Indian Tribal governments, unions, educational groups, industry, environmental groups, other groups, and members of the general public.

State Environmental Quality Review Act (SEQR)— A law promulgated by the State of New York, and prescribed by 6 NYCRR 617 that requires that all state and local agencies determine whether the actions they directly undertake, fund, or approve may have a significant impact on the environment and, if it is determined that the action may have a significant adverse impact, prepare or require the preparation of an EIS.

stochastic (effects)—Effects that occur by chance. In the radiation protection context, the main stochastic health effects from exposure to high levels of radiation are cancer and genetic effects.

storage (waste)—As used in this EIS, the collection and containment of waste in a retrievable manner, requiring surveillance and institutional control, as not to constitute disposal.

storage facility (RCRA)—A building used for storing radioactive or hazardous wastes for greater than 90 days.

stream downcutting—The abrasion and erosion of a streambed by debris and moving water.

stream terrace—Indicated by an abrupt vertical or definite sloping rise in elevation uphill/landward, identifying the outer edge of the floodplain. It is more or less flat or lightly rolling land parallel to the stream channel and very rarely or never floods.

succession—Relatively orderly, predictable, and progressive replacement of one plant community (called a stage) by another until a relatively stable climax community occupies the site (e.g., abandoned farm field to mature forest).

sump—A pit or reservoir serving as a drain or receptacle for liquids.

supernatant—The clear liquid overlying material that has settled, precipitated out of solution, or been separated by centrifugation.

tectonic—Relating to the deformation of the crust of the Earth.

tensile strength—The greatest longitudinal stretching stress a substance can bear without tearing.

thalweg—The line defined by the series of lowest points along a stream channel.

till—Earth material that was deposited by glaciers, consisting of clay, silt, sand, gravel, cobbles, and boulders intermingled.

topographic map—A map showing the relief of the land surface generally by means of contour lines.

transuranic—Refers to any artificially made, radioactive element whose atomic number is higher than that of uranium (atomic number 92), including neptunium, plutonium, americium, and curium.

transuranic waste—Radioactive waste that is not classified as high-level radioactive waste and that contains more than 100 nanocuries per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years (40 CFR 191).

tritium—A beta-emitting radioactive isotope of hydrogen whose nucleus contains one proton and two neutrons. Because it is chemically identical to natural hydrogen, tritium can easily be taken into the body by any ingestion pathway. The symbols for tritium are T and ^{3}H; the latter symbol is more frequently encountered.

tumulus—An artificial hillock or mound.

vadose zone (unsaturated zone)—The zone between the land surface and the water table (saturated zone); also called the zone of aeration.

vermiculite—A lightweight, highly water-absorbent material made of various micaceous minerals that are hydrous silicates.

vitrification—A waste treatment process that encapsulates or immobilizes radioactive wastes in a glassy matrix (e.g., borosilicate glass) to prevent them from reacting in disposal sites; involves adding chemicals and waste to a heated vessel and melting the mixture into a glass that is then poured into a canister.

waste characterization—The identification of waste composition and properties by reviewing process knowledge, nondestructive examination, nondestructive assay, or sampling and analysis. Characterization provides the basis for determining appropriate storage, treatment, handling, transportation, and disposal requirements.

***Waste Incidental to Reprocessing*—**Waste resulting from reprocessing spent nuclear fuel that is not highly radioactive and does not need to be disposed of in a geologic repository in order to manage the risk that it poses.

***Waste Incidental to Reprocessing Process*—**The process defined in Section II of DOE's *Radioactive Waste Management Manual* (DOE M 435.1-1) for determining whether spent nuclear fuel reprocessing plant wastes may be managed as Waste Incidental to Reprocessing. DOE Waste Incidental to Reprocessing determinations for wastes generated by West Valley Demonstration Project activities are subject to review by the NRC.

Waste Management Area (WMA)—For the purposes of this EIS, a geographic unit on site consisting of facilities and the surrounding grounds, including soil, piping, tanks, stored or buried waste, other underlying materials, and associated soil or groundwater contamination within a geographical boundary. There are 12 WMAs discussed in this EIS.

wetlands—An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in those conditions, including swamps, marshes, bogs, and similar areas.

wind rose—A circular diagram showing, for a specific location, the percentage of the time the wind is from each compass direction. A wind rose is used in assessing consequences of airborne releases and shows the frequency of different wind speeds for each compass direction.

worker—Any worker whose day-to-day activities are controlled by process safety management programs and a common emergency response plan associated with a facility or facility area. This definition includes any individual within a facility/facility area who would participate in or support activities required for implementation of the alternatives.

zeolite—Any of various hydrous silicates utilized for their adsorbent and catalytic properties. Inorganic ion-exchange materials used for water purification or water softening are often zeolites.

CHAPTER 9
INDEX

9.0 INDEX

A

B

C

D

E

F

G

H

L

M

N

O

P

R

S

T

U

V

W

CHAPTER 10
LIST OF PREPARERS

10.0 LIST OF PREPARERS

This *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* was prepared by the U.S. Department of Energy (DOE). The organizations and individuals listed below contributed to the overall effort in the preparation of this document. The New York State Energy Research and Development Authority (NYSERDA) reviewed and provided input to DOE on environmental impact statement (EIS) chapters, appendices, and support documents; prepared the Quantitative Risk Assessment for the State-Licensed Disposal Area (SDA); and prepared the "NYSERDA View on EIS Analyses and Results."

CO-LEAD AGENCIES

CATHY BOHAN, U.S. DEPARTMENT OF ENERGY
EIS RESPONSIBILITIES: EIS PROJECT MANAGER

TITLE: NEPA Compliance Officer, EIS Document Manager, and Tribal Point of Contact

PAUL BEMBIA, NEW YORK STATE ENERGY RESEARCH DEVELOPMENT AUTHORITY
EIS RESPONSIBILITIES: SEQR REVIEWER

TITLE: Director, West Valley Site Management Program

PREPARERS

SUZANNE C. CREDE, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: WEST VALLEY DEMONSTRATION PROJECT DOCUMENT PREPARATION PROJECT MANAGER

Education: M.A., Guidance and Counseling, West Virginia University
B.S., Chemistry, General Science, and Safety Education, West Virginia University

Experience/Technical Specialty:
Nineteen years. NEPA analysis and compliance and project management.

CHADI D. GROOME, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: FINAL EIS DOCUMENT MANAGER, CHAPTER 1 MANAGER

Education: M.S., Environmental Engineering Sciences, University of Florida
B.S., Zoology, Clemson University

Experience/Technical Specialty:
Twenty-seven years. Environmental and nuclear regulatory compliance, permitting, and licensing; NEPA compliance; NPDES permitting; radioactive and hazardous waste management.

JAMES E. HAMMELMAN, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: DRAFT EIS DOCUMENT MANAGER, PROJECT ENGINEER, APPENDIX L MANAGER

Education: M.S., Chemical Engineering, University of Washington
B.S., Chemical Engineering, Oregon State University

Experience/Technical Specialty:
Thirty-one years. Nuclear material processing, NEPA analysis and compliance, safety analysis, and program management.

HANA BINDER, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: TECHNICAL EDITOR

Education: B.A., Journalism, University of Oregon

Experience/Technical Specialty:
Three years. Technical writing and editing.

COURTNEY MILLS BRANDENBURG, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: LONG-TERM PERFORMANCE ASSESSMENT

Education: B.S., Chemical Engineering, University of Maryland, Baltimore County

Experience/Technical Specialty:
Three years. Nuclear and hazardous waste environmental technical support, human health impact technical support, groundwater modeling, and quality assurance.

KAREN O. BULL, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: WATER RESOURCES, FLOODPLAIN AND WETLAND ASSESSMENT, CHAPTER 6 AND APPENDIX M MANAGER

Education: Professional Designation in Business Management, University of California, Los Angeles Extension
B.A., Aquatic Biology, University of California, Santa Barbara

Experience/Technical Specialty:
Twenty-four years. NEPA analysis and compliance, water resources, and environmental regulatory compliance.

JOHN A. DIMARZIO, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: WASTE MANAGEMENT, CUMULATIVE IMPACTS

Education: M.S., Geology, George Washington University
B.S., Geology, University of Maryland

Experience/Technical Specialty:
Twenty-five years. NEPA compliance, geology, water resources, waste management, and cumulative impacts.

SANDRA DOTY, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: EROSION MODELING, APPENDIX F MANAGER

Education: M.S., Mineral Engineering, University of California, Berkeley
B.S., Geological Engineering, Colorado School of Mines

Experience/Technical Specialty:
Thirty-one years. NEPA compliance, geologic engineering, water resources, and modeling.

DANIEL W. GALLAGHER, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: APPENDIX I, HUMAN HEALTH IMPACTS

Education: M.E., Nuclear Engineering, Rensselaer Polytechnic Institute
B.S., Nuclear Engineering, Rensselaer Polytechnic Institute

Experience/Technical Specialty:
Twenty-nine years. Nuclear risk analysis.

MILTON E. GORDEN, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: CHAPTER 2, CHAPTER 3, AND APPENDIX C MANAGER, TRANSPORTATION ANALYSIS, PROJECT QUALITY MANAGER

Education: B.S., Nuclear Engineering, North Carolina State University

Experience/Technical Specialty:
Nineteen years. NEPA compliance, waste management, transportation, regulatory reviews, and technology transfer.

MICHAEL W. GRANT, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: GROUNDWATER MODELING SUPPORT, APPENDIX E MANAGER

Education: Ph.D., Chemistry, University of Tennessee
M.S., Chemical Engineering, University of Cincinnati
B.S., Chemistry, University of Tennessee

Experience/Technical Specialty:
Twenty-eight years. Environmental statistics, geostatistics, risk assessment, decision analysis, fate and transport modeling, and energy management.

AARON R. GREENE, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: CHAPTER 5 MANAGER, GIS SUPPORT

Education: M.S., Environmental Science, Indiana University, Bloomington
B.S., Environmental Science, Mansfield University

Experience/Technical Specialty:
Four years. Ecological field assessments, NEPA documentation, and GIS support.

SCOTT D. HEISER, P.E., PMP, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: RESOURCE COMMITMENTS

Education: M.S., Engineering Management, University of Maryland University College
B.S., Mechanical Engineering, Virginia Polytechnic Institute & State University

Experience/Technical Specialty:
Eighteen years. Engineering and environmental project management, environmental compliance, and site remediation.

GEOFFREY KAISER, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: LONG-TERM PERFORMANCE ASSESSMENT AND RISK ANALYSIS, APPENDIX H MANAGER

Education: Ph.D., Theoretical Elementary Particle Physics, Cavendish Laboratory, Cambridge, United Kingdom
M.A., Natural Sciences, University of Cambridge, United Kingdom
B.A., Natural Sciences, University of Cambridge, United Kingdom

Experience/Technical Specialty:
Thirty-one years. Project management, risk analysis, performance assessments and hazards, and consequence analysis.

ROY KARIMI, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: TRANSPORTATION, RISK ASSESSMENT, APPENDIX J MANAGER

Education: Sc.D., Nuclear Engineering, Massachusetts Institute of Technology
N.E., Nuclear Engineering, Massachusetts Institute of Technology
M.S., Nuclear Engineering, Massachusetts Institute of Technology
B.S., Chemical Engineering, Abadan Institute of Technology

Experience/Technical Specialty:
Twenty-nine years. Nuclear power plant safety, risk and reliability analysis, design analysis, criticality analysis, accident analysis, consequence analysis, spent fuel dry storage safety analysis, and probabilistic risk assessments.

STEVEN M. MIRSKY, P.E., SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: SHORT-TERM ACCIDENT ANALYSIS LEAD, APPENDIX I AND APPENDIX N MANAGER

Education: M.S., Nuclear Engineering, The Pennsylvania State University
B.S., Mechanical Engineering, The Cooper Union

Experience/Technical Specialty:
Thirty-three years. Safety analysis, nuclear power plant design and operations, foreign nuclear power plant system analysis, accident analysis, thermal hydraulics, and spent nuclear fuel dry storage safety analysis.

STEVEN E. MIXON, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: TECHNICAL EDITOR

Education: B.S., Communications, University of Tennessee

Experience/Technical Specialty:
Twenty-one years. Technical writing and editing to produce environmental impact statements, public information products, strategic and multi-year program plans, white papers, speeches, and other documents for Government and public use.

SHEA NELSON, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: LONG-TERM PERFORMANCE ASSESSMENT, QUALITY ASSURANCE REVIEWS

Education: M.E., Environmental Engineering, University of Maryland
B.A., Environmental Sciences, University of Virginia

Experience/Technical Specialty:
Nine years. Groundwater modeling, human health impacts, and quality assurance.

DOUG OUTLAW, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: HUMAN HEALTH IMPACTS AND RISK ASSESSMENT, QUALITY ASSURANCE REVIEWS

Education: Ph.D., Nuclear Physics, North Carolina State University
M.S., Nuclear Physics, North Carolina State University
B.S., Physics, North Carolina State University

Experience/Technical Specialty:
Thirty-one years. Nuclear physics, safety analysis, and risk assessment.

PATRICIA PAPA, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: PUBLIC PARTICIPATION

Education: B.A., Syracuse University Newhouse School of Public Communications

Experience/Technical Specialty:
Twenty-four years. Public outreach and public communication.

SHARON M. PIETZYK, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: ADMINISTRATIVE RECORD MANAGER

Education: M.S., Systems Management, University of Southern California
B.S., Biology, James Madison University

Experience/Technical Specialty:
Twenty-two years. NEPA compliance, ecological resources, cultural resources, waste management, comment response document, administrative record, quality assurance.

JOSEPH PRICE, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: LONG-TERM PERFORMANCE ASSESSMENT, APPENDIX D AND APPENDIX G MANAGER

Education: Ph.D., Chemical Engineering, University of Maryland
M.S., Chemical Engineering, University of Maryland
B.Ch.E., Chemical Engineering, University of Dayton

Experience/Technical Specialty:
Twenty-eight years. Performance assessments, safety analyses, human health impacts, and physical process modeling.

LINDA ROBINSON, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: PROJECT QUALITY ASSURANCE

Education: M.B.A., Loyola College
B.S., Earth Sciences Education, Texas Christian University

Experience/Technical Specialty:
Twenty-eight years. Nuclear and hazardous waste environmental project management, environmental regulatory compliance, public outreach, quality assurance.

SANDRA E. ROBINSON, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: CULTURAL RESOURCES

Education: A.A., General/Environmental Studies, Frederick Community College

Experience/Technical Specialty:
Twenty-five years. Cultural resources, performance assessments, accident investigations, regulatory compliance, records management, comment response documents, and technical editing.

GARY W. ROLES, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: CHAPTER 4 MANAGER, INFRASTRUCTURE

Education: M.S., Nuclear Engineering, University of Arizona
B.S., Mechanical Engineering, Arizona State University

Experience/Technical Specialty:
Thirty-one years. Radioactive waste management, regulatory and compliance analysis, and NEPA analysis.

SEAN T. SCHATZEL, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: SOCIOECONOMICS, ENVIRONMENTAL JUSTICE

Education: B.A., Political Economics/Public Administration, Bloomsburg University

Experience/Technical Specialty:
Three years. Socioeconomics and environmental justice.

JAMES R. SCHINNER, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: ECOLOGICAL RESOURCES, LAND USE AND VISUAL RESOURCES

Education: Ph.D., Wildlife Management, Michigan State University
M.S., Zoology, University of Cincinnati
B.S., Zoology, University of Cincinnati

Experience/Technical Specialty:
Thirty-seven years. Ecological field assessments, NEPA documentation, and regulatory reviews.

ROBERT L. SCHLEGEL, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: CHAPTER 2, CHAPTER 3, APPENDIX C, AND COMMENT RESPONSE DOCUMENT SUPPORT

Education: N.E., Nuclear Engineering, Columbia University
M.S., Nuclear Engineering, Columbia University
B.S., Chemical Engineering, Massachusetts Institute of Technology

Experience/Technical Specialty:
Forty-seven years. NEPA document preparation, Safety Analyses Report preparation, and assessment of radiological doses/associated adverse health impacts.

ALISON SMITH, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: TECHNICAL EDITOR

Education: B.A., English, Language, and Literature, University of Maryland, College Park

Experience/Technical Specialty:
Three years. NEPA document preparation.

ELLEN L. TAYLOR, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: COMMENT RESPONSE DOCUMENT MANAGER

Education: Ph.D., Biology, University of Pennsylvania
B.A., Zoology, University of Vermont

Experience/Technical Specialty:
Twenty-six years. Environmental compliance and NEPA assessments.

ROBERT H. WERTH, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: NOISE ANALYSIS, AIR QUALITY MODELING AND ANALYSIS, APPENDIX K MANAGER

Education: B.A., Physics, Gordon College

Experience/Technical Specialty:
Thirty-one years. Acoustics and air quality analysis, regulatory reviews, and NEPA documentation.

PATRICIA WHERLEY, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: TECHNICAL CONSULTANT

Education: B.A., Geography, The George Washington University

Experience/Technical Specialty:
Thirty-six years. NEPA compliance, public participation, and program management.

ZINTARS Z. ZADINS, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
EIS RESPONSIBILITIES: WEST VALLEY SITE SUPPORT

Education: Ph.D., Geological Sciences, University of Rochester
M.S., Geological Sciences, University of Rochester
B.A., Geology, Washington and Lee University

Experience/Technical Specialty:
Twenty-one years. Geology, Closure Engineering Reports/Technical Reports.

ROBERT STEINER, WASHINGTON SAFETY MANAGEMENT SOLUTIONS
EIS RESPONSIBILITIES: WSMS PROJECT MANAGER

Education: B.S. Geochemistry, State University of New York at Oswego

Experience/Technical Specialty:
Twenty-two years. Hydrogeology, Closure Engineering Reports/Technical Reports.

GREG TUCKER, UNIVERSITY OF COLORADO
EIS RESPONSIBILITIES: EROSION SENIOR TECHNICAL ANALYST

Education: Ph.D., Geosciences, The Pennsylvania State University
B.A., Anthropology, Brown University

Experience/Technical Specialty:
Fourteen years. Geomorphology, landscape evolution, sediment transport, and numerical modeling.

COOPERATING AGENCIES/REVIEWERS

The following agencies have provided guidance during the preparation of the Final EIS and reviewed the document, relative to their areas of expertise or regulatory jurisdiction, in order to determine its adequacy for public review. The State agencies performed a full and detailed review of the Revised Draft EIS during the public comment period and provided any comments that resulted from said review during the public review/comment period.

PAUL A. GIARDINA, U.S. ENVIRONMENTAL PROTECTION AGENCY
EIS RESPONSIBILITIES: NEPA REVIEWER

Title: Chief, Radiation and Indoor Air Branch, Region 2

KEITH MCCONNELL, U.S. NUCLEAR REGULATORY COMMISSION
EIS RESPONSIBILITIES: NEPA REVIEWER

Title: Deputy Director for Decommissioning and Uranium Recovery Licensing

EDWIN DASSATTI, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
EIS RESPONSIBILITIES: SEQR REVIEWER

Title: Director, Division of Solid and Hazardous Materials

NEW YORK STATE ENVIRONMENTAL QUALITY REVIEW ACT (SEQR) INVOLVED AGENCIES

ROBERT SNYDER, NEW YORK STATE DEPARTMENT OF HEALTH
EIS RESPONSIBILITIES: SEQR REVIEWER

Title: Radiological Health Specialist

CHAPTER 11
DISTRIBUTION LIST

11.0 DISTRIBUTION LIST

The U.S. Department of Energy provided copies of the *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* to Federal, State, and local elected and appointed government officials and agencies; American Indian representatives; national, state, and local environmental and public interest groups; and other organizations and individuals as listed. Approximately 200 copies of the complete Final EIS, 1,000 copies of the Summary of the Final EIS, and 700 CDs of the Final EIS were sent to interested parties.

Copies will be provided to others on request.

United States Congress

U.S. Senate

The Honorable Robert Bennett, Utah
The Honorable Jeff Bingaman, New Mexico
The Honorable Maria Cantwell, Washington
The Honorable Saxby Chambliss, Georgia
The Honorable Jim DeMint, South Carolina
The Honorable John Ensign, Nevada
The Honorable Kirsten E. Gillibrand, New York
The Honorable Lindsey Graham, South Carolina
The Honorable Orrin Hatch, Utah
The Honorable Johnny Isakson, Georgia
The Honorable Jeff Merkley, Oregon
The Honorable Patty Murray, Washington
The Honorable Harry Reid, Nevada
The Honorable Charles E. Schumer, New York
The Honorable Tom Udall, New Mexico
The Honorable Ron Wyden, Oregon
Deb Aumick, Senator Catherine Young's Office
Katie Beirne, Legislative Director, Senator Charles Schumer's Office
Polly Trottenburg, Legislative Director, Senator Charles Schumer's Office
Lynn Williams, Regional Representative, Senator Charles Schumer's Office

U.S. Senate Committees

The Honorable Daniel K. Inouye, Chairman, Committee on Appropriations
The Honorable Thad Cochran, Ranking Member, Committee on Appropriations
The Honorable Byron L. Dorgan, Chairman, Subcommittee on Energy and Water Development
The Honorable Robert F. Bennett, Ranking Member, Subcommittee on Energy and Water Development
The Honorable Jeff Bingaman, Chairman, Committee on Energy and Natural Resources
The Honorable Lisa Murkowski, Ranking Member, Committee on Energy and Natural Resources
The Honorable Carl Levin, Chairman, Committee on Armed Services
The Honorable John McCain, Ranking Member, Committee on Armed Services
The Honorable Ben Nelson, Chairman, Subcommittee on Strategic Forces
The Honorable David Vitter, Ranking Member, Subcommittee on Strategic Forces

U.S. House of Representatives

The Honorable J. Gresham Barrett, South Carolina
The Honorable Timothy Bishop, New York
The Honorable Earl Blumenauer, Oregon
The Honorable Paul Broun, Jr., Georgia
The Honorable Joseph Crowley, New York
The Honorable Eliot Engel, New York
The Honorable John J. Hall, New York
The Honorable Doc Hastings, Washington
The Honorable Martin Heinrich, New Mexico
The Honorable Dean Heller, Nevada
The Honorable Brian Higgins, New York
The Honorable Maurice Hinchey, New York
The Honorable Steve Israel, New York
The Honorable Chris J. Lee, New York
The Honorable Nita Lowey, New York

The Honorable Ben Luján, New Mexico
The Honorable Daniel B. Maffei, New York
The Honorable Carolyn Maloney, New York
The Honorable Eric Massa, New York
The Honorable Jim Matheson, Utah
The Honorable Jerrold Nadler, New York
The Honorable Charles B. Rangel, New York
The Honorable Kurt Schrader, Oregon
The Honorable Jose E. Serrano, New York
The Honorable Louise Slaughter, New York
The Honorable Harry Teague, New Mexico
The Honorable Paul D. Tonko, New York
The Honorable David Wu, Oregon
Jana Powell, Senior Policy Advisor, Congressman Brian Higgins' Office
Warren Schmidt, Congressman Eric Massa's Office
Jonathan Weston, Congressman Brian Higgins' Office

U.S. House of Representatives Committees

The Honorable David R. Obey, Chairman, Committee on Appropriations
The Honorable Jerry Lewis, Ranking Member, Committee on Appropriations
The Honorable Peter J. Visclosky, Chairman, Subcommittee on Energy and Water Development
The Honorable Rodney P. Frelinghuysen, Ranking Member, Subcommittee on Energy and Water Development
The Honorable Henry A. Waxman, Chairman, Committee on Energy and Commerce
The Honorable Joe Barton, Ranking Member, Committee on Energy and Commerce
The Honorable Ike Skelton, Chairman, Committee on Armed Services
The Honorable Howard P. "Buck" McKeon, Ranking Member, Committee on Armed Services
The Honorable Jim Langevin, Chairman, Subcommittee on Strategic Forces
The Honorable Michael Turner, Ranking Member, Subcommittee on Strategic Forces

Federal Agencies

Advisory Council on Historic Preservation
U.S. Department of Agriculture
U.S. Department of Health and Human Services
U.S. Department of Homeland Security
U.S. Department of the Interior
U.S. Department of Transportation
 Federal Highway Administration
Federal Energy Regulatory Commission
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Nuclear Regulatory Commission
 Office of Federal and State Materials and Environmental Management Programs

Federal Officials

Molly Roach, Office of the U.S. Attorney

State Government

Georgia State Government

Governor
Sony Perdue

Nevada State Government

Governor
Jim Gibbons

New York State Government

Governor
David Paterson

New York State Attorney General
Andrew Cuomo, Attorney General
Linda White, Assistant Attorney General, Environmental Protection

State Officials
Judith Enck, Deputy Secretary for the Environment
Thomas Congdon, Deputy Secretary for Energy

New York State Senate
John A. DeFrancisco, Senator
John Flanagan, Senator
Ruth Hassell-Thompson, Senator
Kenneth P. LaValle, Senator
George D. Maziarz, Senator
Michael F. Nozzolio, Senator
George Onorato, Senator
Frank Padavan, Senator
Bill Perkins, Senator
Michael Ranzenhofer, Senator
William T. Stachowski, Senator
Antoine Thompson, Senator
Dale Volker, Senator
Catharine Young, Senator
Bill Nowak, Deputy Chief of Staff, New York State Senator Antoine Thompson
Jessica Phelan, Office of New York State Senator Catharine Young
Julie Sirianni, Office of New York State Senator Catharine Young

New York State Assembly
James G. Bacalles, Assemblyman
Philip Boyle, Assemblyman
Dan Burling, Assemblyman
William Colton, Assemblyman
Jane Corwin, Assemblywoman
Adriano Espaillat, Assemblyman
Gary D. Finch, Assemblyman
Joseph Giglio, Assemblyman
Timothy Gordon, Assemblyman
James P. Hayes, Assemblyman
Sam Hoyt, Assemblyman
Ellen Jaffee, Assemblywoman
David R. Koon, Assemblyman
David G. McDonough, Assemblyman
Crystal D. Peoples-Stokes, Assemblywoman
Jack Quinn, Assemblyman
Peter M. Rivera, Assemblyman
Mark Schroeder, Assemblyman
Louis R. Tobacco, Assemblyman
David R. Townsend, Jr., Assemblyman
Michael Brisky, District Manager for Assemblyman Joseph Giglio

New Mexico State Government

Governor
Bill Richardson

Oregon State Government

Governor
Ted Kulongoski

Oregon State Attorney General
John Kroger

Oregon State Senate
Ted Ferrioli, Senator
David Nelson, Senator

Oregon State House of Representatives
Bill Garrard, Representative
Bob Jenson, Representative
Greg Smith, Representative
Suzanne VanOrman, Representative

South Carolina State Government

Governor
Mark Sanford

Utah State Government

Governor
Gary Herbert

Washington State Government

Governor
Christine Gregoire

State NEPA Clearinghouses

Clearinghouse Coordinator, Nevada Clearinghouse Department of Administration
Ron Curry, New Mexico Environment Department
SEPA Unit Supervisor, Washington Department of Ecology
State Clearinghouse, Office of State Budget, South Carolina
Kelly Beck, Office of the Governor, Utah
James C. Hardeman, Georgia Department of Natural Resources

State NEPA Points of Contact

Rich Halvey, Western Governors' Association
Seth Kirshenberg, Energy Communities Alliance

State Agencies

New York State Department of Environmental Conservation (NYSDEC)
Pat Concannon, Engineering Geologist, Region 9
Ed Dassatti, Director, Division of Solid and Hazardous Materials
Robert Phaneuf, Chief, Hazardous Waste Engineering, Western Section
Tim Rice, Bureau of Radiation
James Strickland, P.E., Regional Hazardous Materials Engineer
Mu Hao Wang, P.E., Environmental Engineer
Lynn Winterberger, Division of Solid and Hazardous Materials

New York State Energy Research and Development Authority (NYSERDA)
Paul Bembia, Program Director
Hal Brodie, General Counsel
Robert Callender, Vice President for Programs
John Kelly, Project Manager
Andrea Mellon, Project Manager
David Munro, Deputy Counsel

New York State Department of Health (NYSDOH)
Gary Baker, Chief of Field Operations (retired)
Robert Snyder, Chief of Environmental/Radon Section

Local Government

Mayors
Charles Coolidge, Village of Ellicottville
Bill Krebs, Village of Springville
Jeff Pond, City of Salamanca
Elizabeth B. Weberg, Deputy Mayor, East Aurora

City Officials

Town of Amherst
Deborah Bruch Bucki, Town Clerk

Town of Ashford
Patricia R. Dashnaw, Town Clerk
Charles Davis, Councilman
Tim Engels, Highway Superintendent
Chris Gerwitz, Supervisor
John Pfeffer, Councilman

Village of East Aurora
Kimberly Reichert, Village Administrator, Clerk-Treasurer

City of Buffalo
Jacqueline E. Rushton, Senior Legislative Assistant

Town of Concord
Mary E. Bolt, Town Clerk
Gary Eppolito, Supervisor
Bill Snyder, Councilman

Town of Ellicottville
John Burrell, Supervisor

Town of Evans
Carol A. Meissner, Town Clerk

City of Lackawanna
Chuck Jaworski, Council President

Town of Lancaster
Johanna M. Coleman, Town Clerk

Village of Springville
Molly Frank, President, Chamber of Commerce
Terry Skelton, Village Office

Tonawanda
Janice R. Bodie, Clerk of the City of Tonawanda
Melissa Brinson, Town Clerk, Town of Tonawanda

Town of Wales
Sharon Marfurt, Town Clerk

County Officials

Allegany County
Curtis W. Crandall, Chairman, Allegany County Planning Board
Brenda Rigby Riehle, Allegany County Board of Legislators
Ron Stuck, Chairman, Allegany County Planning Board

Cattaraugus County
Chris Crawford, Economic Development and Planning
Barbara Hastings, Public Health Director, Department of Health
James Isaacson, Senior Planner, Department of Economic Development, Planning & Tourism
Ann Padlo, Planning Board
David Rivet, Commissioner, Department of Public Works
John Searles, Administrator
Joseph Williams, Economic Development, Planning & Tourism
Eric Wohlers, Director, Environmental Health, Health Department

Cattaraugus County Legislature
Crystal Abers, Chair, NYS District 1
James Boser, Legislator, NYS District 7
Jerry Burrell, Legislator, NYS District 5
Charles F. Hebdon, Legislator, NYS District 5
Patrick Murphy, Legislator, NYS District 2
Robert Neal, Legislator, NYS District 3
Donna Vickman, Legislator, NYS District 5
Lori A. Pangborn, Deputy Clerk

Erie County
Anthony Billittier, Commissioner, Department of Health
Chris Collins, County Executive, Town of Aurora
Kathy Frost, Commissioner, Department of Environment and Planning
Robert M. Graber, Clerk, State of New York, Legislature of Erie County
Paul Kranz, County Department of Environment and Planning
John Opalka, County Department of Environment and Planning
Town of Aurora

Genesee County
James Duval, Director, Planning Department

Livingston County
Heather Ferrero, Planner, Planning Department

McKean County
Deborah Lunden, Director, Planning Commission

Niagara County
Amy Fisk, Senior Planner, Economic Development
Cathie Synor, Assistant Clerk of the Legislature

Potter County
Charlotte Dietrich, Acting Director, Planning Commission

Warren County
Patricia Tatich, Director, Planning and Community Development

Wyoming County
Drew Shapiro, Director, Planning and Development
Richard Tindell, Director, Planning

Warren County, Pennsylvania
Dan Glotz, Director, Planning

Native American Representatives

Arizona
Daniel Eddy, Jr., Chairman, Colorado River Indian Tribes
Ona Segundo, Chairwoman, Kaibab Band of Southern Paiutes

California
Monty Bengochia, Chairman, Bishop Paiute Indian Tribe
Richard Button, Chairman, Lone Pine Paiute-Shoshone Tribe
Carl Dahlberg, Chairman, Fort Independence Indian Tribe
Mike Keller, Chairman, Benton Paiute Indian Tribe
Joe Kennedy, Chairman, Timbisha Shoshone Tribe
Virgil Moose, Chairman, Big Pine, Paiute Tribe of the Owens Valley
Charles Wood, Chairman, Chemehuevi Indian Tribe

Idaho

Brooklyn Baptiste, Assistant Secretary/Treasurer, Nez Perce Tribal Executive Committee
Samuel Penney, Chairman, Nez Perce Tribal Executive Committee

Nevada

Richard Arnold, Chairman, Pahrump Paiute Tribe
Diana Buckner, Chairwoman, Ely Shoshone Tribe
Wayne Dyer, Chairman, Yomba Shoshone Tribe
Jerry Millett, Chairman, Duckwater Shoshone Tribe
Phil Swain, Chairman, Moapa Band of Paiutes
Tammi Tiger, Chairperson, Board of Directors, Las Vegas Indian Center
Benny Tso, Chairman, Las Vegas Paiute Tribe

New York

Todd Gates, Seneca Nation of Indians, Tribal Council
Tony Memmo, Seneca Nation of Indians, Environmental Protection Department
Mark Paulus, Environmental Protection Department, Cattaraugus Territory, The Seneca Nation of Indians
Barry Snyder, President, Seneca Nation of Indians
Lenith K. Waterman, Clerk, Seneca Nation of Indians

New Mexico

John E. Antonio, Sr., Governor, Pueblo of Laguna
Peter Chestnut, Tribal Attorney, Pueblo de San Ildefonso
Ernest Mirabal, Governor, Pueblo of Nambe
George Rivera, Governor, Pojoaque Pueblo
Leon Roybal, Governor, Pueblo de San Ildefonso
Chandler Sanchez, Governor, Pueblo of Acoma
Joe Shirley, President, Navajo Nation
Neil Weber, Director, Department of Environment and Cultural Preservation, Pueblo de San Ildefonso

Oregon

Tom Bailor, Department of Science & Engineering, Confederated Tribes of the Umatilla Indian Reservation
Antone Minthorn, Chairman, Confederated Tribes of the Umatilla Indian Reservation

Utah

Lawrence Bear, Chairman, Executive Committee, Skull Valley Band of Goshute Indians General Council
Bruce G. Perry, Chairman, Northwestern Band of Shoshone Nation
Rupert Steele, Chairman, Goshute Business Council
Lora Tom, Chairperson of the Board of Directors, Paiute Indian Tribe of Utah Tribal Council

Washington

Russell Jim, Program Manager, Environmental Restoration/Waste Management, Yakama Nation
Ralph Sampson, Jr., Chairman, Yakama Nation

Public Reading Rooms and Libraries

Concord Library
18 Chapel Street
Springville, New York 14141
(716) 592-7742

WVDP Public Reading Room
U.S. Department of Energy
Ashford Office Complex
10282 Rock Springs Road
West Valley, New York 14171
(716) 942-4555

U.S. Department of Energy
FOIA Reading Room
Room 1E-190, Forrestal Building
1000 Independence Avenue, SW
Washington, DC 20585
(202) 586-3142

Organizations/Public Interest Groups

Nick Roth, Alliance for Nuclear Accountability
Susan Gordon, Alliance for Nuclear Accountability
Carolyn Thompson, Associated Press
Candace Head-Dylla, Bluewater Valley Downstream Alliance, Grants, NM
Jeff Wright, Business First
Judy Einach, Campaign Director, Coalition on West Valley Nuclear Wastes
Mac Legerton, Center for Community Action
Anne Rabe, Coordinator, Center for Health, Environment and Justice (CHEJ)
Deborah Liliestedt, Chautauqua Industrial Development Agency
Tom Moore, Chautauqua Industrial Development Agency
Carol Rasmussen, Chautauqua Industrial Development Agency
Brian P. Smith, Citizens Campaign for the Environment
William Cooke, Citizens Campaign for the Environment
Barbara Warren, Citizens' Environmental Coalition
City Clerk's Office Buffalo*
Betty Cooke, Coalition on West Valley Nuclear Wastes**
Joanne Hameister, Coalition on West Valley Nuclear Wastes
Leonora Lambert, Coalition on West Valley Nuclear Wastes
Kathy McGoldrick, Coalition on West Valley Nuclear Wastes
Ray Vaughan, Environmental Activist, formerly of the Coalition on West Valley Nuclear Wastes**
Daniel Hirsch, Committee to Bridge the Gap
Concerned Citizens of Cattaraugus County
Barry Miller, Concerned Citizens of Cattaraugus County
Lois Ann Zendarski, Concerned Citizens of Cattaraugus County
Melissa Bailey, Council of State Governments
Lisa Janairo, Council of State Governments
Kathleen Murphy, Daemen College
Russell Brown, DOCS Resistance
Don Longfellow and Pat Shelly, Downstream Denizens
Elizabeth Thorndike, President, E Collaborative
Jay Vance, Energy Solutions
James Rauch, Secretary, FACTS (For a Clean Tonawanda Site)
Julie Broyles, Friends of Zoar Valley
Louis Clark, Government Accountability Project
Mike Hutchinson, Supervisor, Gowanda Wastewater Treatment Facility, Cattaraugus Creek Basin Task Force
Gordon Edwards, Great Lakes United Nuclear Free Green Energy Task Force
Michael J. Keegan, Great Lakes United Nuclear Free Green Energy Task Force
Derek Stack, Great Lakes United Nuclear Free Green Energy Task Force
Leonore Lambert, Greater Buffalo League of Women Voters*
Rob Dallas, International Association of Machinists and Aerospace Workers
Frank Heinen, President-Lodge 2401, International Association of Machinists and Aerospace Workers
Sharon Turano, Reporter, Jamestown Post Journal
Robert Knoer, Knoer & Crawford
Ed Giardini, Jr., Laborer's Local #621
Paul R. Guenther, League of Women Voters
Betsey Swan, League of Women Voters of New York State
Mississippi State University
Rev. Stanford Bratton, Network of Religious Communities
Diane D'Arrigo, Nuclear Information and Resource Service*
Rick Miller, Olean Times Herald
Allen Pero, Operating Engineers Local 17
Doan Phung, PAI Operations
Frank Woolever, Pax Christi-Syracuse
Radioactive Waste Management Associates

Marvin Resnikoff submitted for Mina Hamilton, Radioactive Waste Management Associates
Chris Garvey, ReEnergy Solutions
Dennis Scott, ReEnergy Solutions
Joe Schmidbauer, Residents for Responsible Government
Harriet Lane Tower, Residents for Responsible Government
Laura Howard, Publisher/Editor, Salamanca Press
Laurence T. Beahan, Conservation Chair, Sierra Club, Niagara Group
Robert M. Ciesielski, Sierra Club, Niagara Group
Roger Downs, Sierra Club, Atlantic Chapter
Arthur Klein, Sierra Club, Niagara Group, Solid Waste Committee
Don Hancock, Southwest Research and Information Center
Molly Frank, President, Springville Chamber of Commerce
Kate Moody, Executive Director, Springville Chamber of Commerce
Patti Cecala, Editor, Springville Journal
Natalie Condor-Smith, Springville Journal
Thomas Barnes, STW Regional Planning & Development Board
Jack Mann, Acting Superintendent, Springville-Griffith Institute Central School
Kathy Kellogg, Reporter, The Buffalo News*
Margaret Sullivan, Editor, The Buffalo News
Joanne Hameister, The Coalition on West Valley Nuclear Wastes
Bill Logue, Citizen Task Force Facilitator, The Logue Group
The West Valley Citizen Task Force
Joe Atkinson, Ph.D., University at Buffalo
Navroze Amaria, URS Washington Division
Dennis Seipp, Director, URS Washington Division
Monica Wilson, News Director, WBEN-930 AM
Mike Nartker, Weapons Complex Monitor
Hillary Bowen, Superintendent, West Valley Central School
Bonnie Smith, Principal, West Valley Central School
Chuck Couture, West Valley Chamber of Commerce*
West Valley Citizen Task Force
Judy Einach, West Valley Citizen Task Force
Warren Schmidt, West Valley Citizen Task Force
Kathy McGoldrick, West Valley Coalition on Nuclear Wastes
Mark Gentner, Chief, West Valley Volunteer Hose Company
Roger Cook, Western New York Council on Occupational Safety and Health
Michael Alspaugh, Western New York Land Conservancy
Victoria Ross, Western New York Peace Center
Gladys Gifford, Western New York Presbytery*
Ellen Crooke, News Director, WGRZ-TV Channel 2
Bill McCarthy, Dayside Editor, WKBW-TV, Channel 7
News Director, WKBW-TV, Channel 7
Fred Haier, WSPQ Radio Station
Dennis McCauley, WVCS Board of Education
Stephen Kowalski, WVCS School Board
Pamm Lent, Assistant News Director, WIVB-TV Channel 4

* *Commented on the 1996 Draft EIS.*
** *Commented on the 1996 Draft EIS and the 2003 Notice of Intent.*

Individuals

Sharon Abel
Ikenna Achilihu
Frima Ackerhalt
Anthony Agnello
Joe Agnello
Vincent Agnello
Ken Ahlstrom
Michael Aidos
Alanson D. Aird
Geri Chapman Aird
Joanne Alderfer
Bob Alessi
Iris Alexander
Henry Allen
John Allen
Charles Alley
Kathleen M. Dunwoodie Aman
Grace Modica Amore
Eymi Aquino
Neil Arnold
David Ashley
Jacob Bajdas
Frank C. Baldwin
Alice Bartholomew
Dawn M. Bartlett
Joanne Macleod Bartlett
Arthur Beck, MD
Matthew Becker
Richard Bennett
Janet Bensman
Mary Louise Berg
Susan Bergman
Zachary Bernstein
Dr. H. Rosalie Bertell
Damien Betner
Kerri Bigler
Kenneth L. Bird
Glen Bishop
Sister Emily T. Bloom
Renate Bob
Tara Bono
Rev. Bronwen W. Boswell
Charlotte M. Boyer
Virginia W. Bradley
Lia and Avery Braico
Lia Braico
Marietta Bratton
Sean Brodfuehrer
Russell Brown
Christian Bucknell
James L. Burke
Jeff Burright
Edward Butler
Janita K. Byars, Ed. D.
Denis Byrne
James J. Byrne
Margie Campaigne
Marjorie Campaigne
John S. Campo
Astrid M. Cardona
Omar Cardenas
Barbara A. Carder
John Carey
Nancy M. Cassick
Barbara and Joseph Castiglia
Bob Catalano
Gerard Catalano
Judy Catalano
Andrew Cdao
Ji Young Chang
Edward and Mary Chapin
Bruce C. Chapman
Craig C. Chapman
Amy L. Chase
Sister Jean Cherry
Jane Chew
Jordan Christensen
Sister James Christopher
Wesley Churchill
Barbara Chutroo
Dorothy B. Cibula
Robert M. Ciesielski
Kilissa Cissoko
Diane Clark
Nicola Coddington
Thomas Connor
Gerarda E. Cook
Ron Cook
Anne Crowen
Diane D'Arrigo
Joyce L. Dailey
Lori Danison
Leonard Davis
Aubrey Dee
Katie L. DeLucia
Jessica Dempsey
William P. Denison
Kimberly DePerno
Heather Derrah
Linda A. DeStefano
Don Devine
Bill Dibble
Lee Diggs
Joseph Dimartino
Fanne M. Divine
Janet M. Donovan
Diane Doster
Ken Dow
Allyson Dubois
Roseanne Duffy
Crystal Dunning
Kathleen Duwe
Lori Eaton
Ann Eberle
Thomas J. Edinger
Joshua Ehrenpfort
Ann J. Eisenlord
Edward R. Eisenlord
Robert Engel*
Dinda Evans
Bonnie Faith-Smith
Robert Fakundiny, Ph.D
Margaret Faney
Brittany Brower Fererz
James F. Ferraro
Sister Patricia C. Fielese
Bridget M. Fitzgerald
Sister Concilia Flaherty
Bobbie Dee Flowers
Shawn Frank
Edgar Freud
Carolyn Friedman
Jeanne Fudala
Kevin Furlong
Sarah Gallagher
Marilyn J. Galley
Elaine Gardner
Anne Gayley
John Geddie
Sister M. Genevieve
Mark M. Giese
Gladys Gifford*
Rose M. Gilmore
Catherine Glasgow
Andrew Goldstein
Sister Sharon Goodremote, FSSJ
Janet M. Goodsell
Mary Louise Grace
Daryl Greene
Megan M. Gregory
Lee Gridley
Barbara Grosh
Carl Gutman
Charles Hahn
Eric Hahn
Eric S. Hahn
Joanne Hameister*
Shirley Hamilton
Amy Harlib
Dean B. Harper
Marlene Harrington
Shelby A. Harrington
Mark Hatley
Pam Hatley
Richard J. Hayden

Mary Jane Hayes
L. Hayms
Betty Heckman
Kathleen Heffern
Beth Hennessy
William T. Hennessy
Mary Herbst
David Hermanns
Joan Herold
Nora Herzog
Howard Hoffman Jr.
Elaine Hotelling
J. Michael House
Sister Kathleen F. Hove
Stephen Howell
Chester Hughes III
Elaine C. Hurst
Rosalinda Iacovitti
Ann Ingleman
Johanna Ingrao
Patti Jankowski
Bari Jay
Bonnie Jensen
Nikita Jolicoeur
Jack Jordaan
Mary Ann Jordan
Sister Michael M. Jordan, FSSJ
Teresa M. Joyce
Therese Joyce
Harvey Kaiser
Judith Karpova
Sister Mary Ellen Keady
Elizabeth Kay Keffe*
Elaine Kellick
Jeanne Kelly
Sister Ann Kelly
Shelly Kerker
Chicory Kettle
Mary Jane Kibby
D. S. Kiefer
Michael Kilmer
John V. Kim
Bill King*
Deborah King
Julie Parisi Kirby
Laurence Kirby
Arthur Klein
Donna Knipp
Angela Knisley
Charlotte Koons
Donald C. Kosloff
Marilyn Koszarek
David Kowalski
Jack Krajewski
Lawrence A. Krantz
James Kricker
Edward Kruger
Sister Joyce Kubinec
Jason Kulczyk
Tom Kunz
Sister Marvina Kupiszewski
Dolores Kurzdorfer
Mary Lou Lafferty
Mary Laffey
Brian LaLange
Charles Lamb
Hazel Landa
Rebecca Landy
Cecile Lawrence
Gerson & Debbie Lesser
Gerson Lesser, MD
Dede Lifgren
Margret Linich
Connie M. Lockwood
Leslie Logan
Kelley Louer
Elizabeth Lowes
Rose Marie Lucente
Larry Luckett
Tim Lund
Esther M. Lunde
Jake Mabee
Mary Ann Mache
Andy Mager
Steve Maheras
Margaret Mahoney
Sister M. Odilia Majcher
James Mammarella
Peter Maniscalco
Kevin Manne
John Mannion
Kenneth C. Margrey
Ken & Phyllis Margrey
Kathleen Maroney
Robert Martin
Benjamine Mason
Gary Mathe*
Sister Ann Peter Matt
Calypso Sky Hahn Maurer
Kelly Maurer
Virginia May
Maria Maybe
Tim Mayerat
Kathleen McCormick
Elise T. McDowell
John L. McDowell
Kathy McGoldrick
Elizabeth J. McGowan
Gloria McKenna-Brady
Clare McMaster
Suku Menon
Peter Mercurio
Annette Merio
Michael and Joanne Middagh
Columbia E. Miller
John F. Minges
Ron Missel
Orlando C. Monaco
Linda Cataldo Modica
Carol Mongerson, (Deceased)*
Steve Monroe
Amy Morris
Brian Moyer
Irene Marie Mulholland
Patricia Murphy
Mary Myers
Jean Marie Naples
Muriel Narotsky
Thomas Nelson
Julie Nentarz
Gladys Newton
Megan Noonan
Donald Nowak
Priscilla O'Brien
Mary O'Herron
Sharon L. O'Neil
Sister Frances Angela Olszewski
Sister Martha Olszewski
John Opalka
Celia Padginton
Vic Paglia
Ron Palmer
Christine Pasmore
Joe Patti
Shane P. Paulick
Kristen Pellizzari
Sister Helen Therese Pels
Suz Perrin
Susan Peterson
Charles Pfeffer
Kyle Phelps
Katie Phillips
Kristen Piccizearo
James L. Pickering*
Kate Pilletteri
Marilyn H. Plache
Robert Potter
Anna Rathmeir
Catherine Reimers
H. Reiser
L. Rigo
Devon Roblee
Rosa Rojas
Matthew Roland
Robert Rosenfield
Gilbert L. Rulon, Jr.
Donald Rychnowski
Seth Rutledge
Sister Judith Salzman
Dale Saltzman
Jen Savage

Jennifer Savage
Kathleen and Peter Sayadoff
Agnes A. Scanlan
David J. Schachne
Sister Ellen Michael Schafa
Donald R. Scherer
Melanie Scherer
Pete Scherer
John Schiener
Mariam R. Schneible
Melissa Scholl
Gudrun Scott
Muriel Segal
Olga Sekulich
Martha Shafer
Carol Sheibley
Laura Sheinkopf
Don Shelters
Alice Shields
Bob Sienkiewicz
Tim Siepel
Signature illegible
Signature illegible
Signature illegible
Walter Simpson
Judy M. Smith
Sister Catherine Smith
Stephen Merrill Smith
Larry V. Snider
Michael Sobczyk
Judy W. Soffler
Muriel Sourt
Richard M. Space
Barry Spielvogel
Margaret Spittler
Sister Marie Stachowiak
Ruth A. Stegner
James Steinwachs
Mary Steuer
Angela Steward
Lauren Stirling
David Stout
Martha Sullivan
Mary Sullivan
John Sumner
Elaine Swaine
Wendy Swearingen
Sister Mary Telesphore
Robert Tell
Sister Anzelma Thomas
Meryl Toan
Rita Tomasulo
Patricia K. Townsend
William Townsend
Sarah Tuttle
Karilyn Valesko
Christine Vogel
Bruce Vona
Teresa A. Waldron
Paul F. Walker
Paul Walker
Rick Walsh
Barbara Walton
Stefan Wawrzynski
Jeffrey Weaver
Suzanne Webster
Michele Weingart
Richard Weiskopf, MD
Elinor Weiss
Linda Weiss
Eric Wessman
Carla White
James R. White
Roberta Wiernik
Dave Wilcox
Debbie Wilcox
Rebekah A. Williams
Bridget Wilson
Deborah Wirth
Seth Wochensky
Jim Wolf
David Wollaber
J. Y.
Tammy Yekich
Sister M. Regis Zboch
Abe Zeitoun
Robert Zywno

* *Commented on the 1996 Draft EIS.*

Commentors on the 1996 *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at The Western New York Nuclear Service Center* (this list of Commentors who only commented on the 1996 Draft EIS is included for informational purposes only).

Adams, Colin J.
Ashford Concerned Citizens
City of Buffalo
Niagara Swim League
Bauer, Gary H.
Blake, Karen
Bolt, Mary E., Town Clerk
Bono, Lois, Concerned Citizens of Clarence, Inc.
Bross, Dr. Irwin D., Biomedical Metatechnology, Inc.
Buckley, David G.
Buckley, Elizabeth H.
Burlingham, Gilly
Burn, John M.
Cairns, Dorothy
Cairns, John M.
Chisolm, Larry
Coleman, Sara B.
Comfort, Jr., Gary C., U.S. Nuclear Regulatory Commission
Danforth, Kase D.
Duwe, Kathleen
Dayton, Cynthia
Dibble, Bill[1]
Dick, Dennis
Dick, Jeff
Dick, Susan
Dick, Violet
Dunbar, Madonna
Ebel, Donna
Engel, Barbara[1]
Feraldi, Helen
Feraldi, Philip D.
Fifield, Ivan S.
Fountain, Dr. John, University at Buffalo, SUNY
Fralkiewig, Mary
Furman, Donald E., Cattaraugus County Legislature
Galac, Sandra P.
Gerwitz, Henrietta M. (Deceased)
Gilpin, George
Giroux Jr., Joseph E., Springville Youth, Inc.
Goldstein, Andrew
Griffin, Susan B., Chenango North, Energy Awareness Group
Haberer, Richard E., Cattaraugus County Legislature
Hall, Gail
Hanson, Phyllis J.
Hargrove, Robert W., U.S. Environmental Protection Agency
Harrington, Dorothy F.
Hegeman, Nelson W.
Hegeman, Roberta
Helfer, Jerry S.
Helmer, Williams S., State of New York, Office of the Attorney General
Horozko, Beverly
Hurd, Robert C.
Hussein, Kathy
Isbister, David
Isbister, Marianne
Jacobi, Dr. Robert, University at Buffalo, SUNY
Johnsrud, Judith H., Environmental Coalition on Nuclear Power
Kaiser, Sam
Keil, Angelici
Kelley, Maureen
Kelly, Michael
Kennedy, Elizabeth
Kock, Irene, Nuclear Awareness Project
Koscherak, Stephen
Krezmien, Town of Concord
Kruse, Gladys
Kruse, Norbert
Kruse, Patsy
Kruse, Robert
Labarbera, Kim
Laco, Dorothy
Laco, Emil
Lathrop, Janis J.
Lercher, Aaron
Leyonmark, Glenda
Leyonmark, Margaret J.
Leyonmark, Pete
Lou A. Lester
Madonna, Anne
Madonna, Jennifer
Madonna, Joan
Madonna, Joseph
Madonna, Mary Jo
Madonna, Will
Mapes, Elaine
Mapes, Rex
Margrey, Kenneth
Mathe, Sharon J.[1]
McLean, Robert, Concerned Citizens of Clarence, Inc.
Melancon, Pat, Concerned Citizens of Clarence, Inc.
Miller, Timothy J.
Monckton, Marilyn
Moshu, Donald
Moshu, Vinginia

Murphy, Deborah A., Village of Springville
Myers, Sharon
Nolan, Wayne F.
Obad, Elizabeth A.
O'Conner, Thomas P.
Packring, Gordon
Pfeffer, John A.[1]
Pfleger, Suzanne M.
Plonka, Mary
Powking, Yazdon
Purcell, Michael, Citizen's Environmental Coalition
Rabe, Anne, Citizen's Environmental Coalition
Raddant, Andrew L., U.S. Department of Interior
Rauch, Jim, Coalition on West Valley Nuclear Wastes
Rhodes, Gordon
Robinson, Dr. Donald W.
Ryther, Nancy E.
Scharf, Delone
Schindler, Michael W., Seneca Nation of Indians
Sentman, Ruby, Presbyterian Woman in the Presbytery of Western New York
Sergel, Rodney G., Town of Ellicottville
Shelly, Patricia
Smith, Town of Concord
Snell, Dr. Fred M., University at Buffalo, SUNY
Spors, Linda
Spross, Beverley
Stalskesky, Mary

[1] *Copy of 2008 Revised Draft requested.*

Steffan, Town of Concord
Steinberg, Richard
Stephan, Betty
Sterman, David, New York State Department of Environmental Conservation
Stratton, Ruth M.
Tarbell, Aldine, Concerned Citizens of Clarence, Inc.
Tarbell, Calvin, Concerned Citizens of Clarence, Inc.
Thompson, John T.
Ticen Runk, Brenda
Timm, Town of Concord
Truax, Ronald, Allegany County Board of Health
Veira, Sonya
Wealeury, Craig R.
Weiss, Jim, Citizens Against Radioactive Dumping
Widger, John, Town of Ellicottville
Wiede, Jenny
Wildeman, Norman
Wilson, Michael P.
Winegar, Elizabeth E.
Winston, M. John
Wolf, James R.
Woolley, Margaret E.
Wooster, Margaret, Great Lakes United
Yuan, Lynn C., Square Y Consultants
Zimbardi, Dr. John, Cattaraugus County Legislature
Zimmerman, Emil