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DOE / EA - 0405

ENVIRONMENTAL ASSESSMENT

Innovative Sulfur Dioxide Scrubbing System for Coal-Burning Cement Kilns

Passamaquoddy Tribe
Thomaston, Maine

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U.S. Department of Energy
Assistant Secretary for Fossil Energy

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1.0 INTRODUCTION

In compliance with the National Environmental Policy Act (NEPA), the U.S. Department of Energy (DOE) prepared this Environmental Assessment (EA) to evaluate the environmental impacts of a clean coal technology demonstration project that is proposed for cost-shared federal funding by DOE under the Innovative Clean Coal Technology (ICCT) program. The proposed action is the design, construction, and operation of a sulfur dioxide scrubbing system for coal burning cement kilns to be conducted at the Dragon Products Company Cement Plant in Thomaston, Maine.

1.1 Background

In December 1987, Congress made funds available to the Department of Energy (DOE) for an Innovative Clean Coal Technology (ICCT) Program via Public Law No. 100-202, "An Act Making Appropriations for the Department of Interior and Related Agencies for the Fiscal Year Ending September 30, 1988, and for Other Purposes" (the Act). The Act provided funds to support cost-shared projects designed to demonstrate the capabilities of emerging clean coal technologies to retrofit or repower existing facilities. DOE is authorized to conduct the ICCT program. DOE issued a Program Opportunity Notice (PON) on February 22, 1988, to solicit proposals to conduct cost-shared ICCT demonstration projects.

1.2 Purpose of and Need for the Action

The proposed action is intended to demonstrate the successful application of a practical, cost-effective method to control SO_2 emissions that could be used by the U.S. cement-making industry to achieve compliance with environmental standards without replacing existing cement-making facilities. The demonstration has been scaled to generate data from design, construction, and operation sufficient to enable private industry to assess the potential for commercial application of the technology.

environmental information is incomplete or unavailable, the trade-offs between short-term uses and long-term productivity, and the irreversible and irretrievable commitments of resources.

The second element for DOE's strategy for NEPA compliance involves preparation of a pre-selection, project-specific environmental review based on the project-specific environmental data and analyses that offerors supplied to DOE as part of each proposal. This analysis, for internal DOE use only, contains a discussion of the site-specific environmental, health, safety, and socioeconomic (EHSS) issues associated with the demonstration project. It includes a discussion of the advantages and disadvantages of the proposed and alternative sites and/or processes reasonably available to the offeror. A discussion of the environmental impacts of the proposed project on the existing environment and a list of all permits that must be obtained to implement the proposal are included. The document contains options for controlling discharges and management of solid and liquid wastes, and assesses the risks and impacts of implementing the proposed project. Because this pre-selection project-specific environmental review contains proprietary and/or confidential business information provided to DOE in the proposal, this document is not publicly available.

The third element of DOE's NEPA strategy provides for the preparation of site-specific NEPA documents for each of the projects selected for financial assistance under the PON. After considering the evaluation criteria, the program policy factors, the PEIA, and the preselection environmental review, the proposal "Innovative Sulfur Dioxide Scrubbing System for Coal-Burning Cement Kilns," submitted by the Passamaquoddy Indian Tribe was selected for award. This Environmental Assessment describes the proposed action scheduled for installation at the Dragon Products Company Cement Plant.

1.4 Scope of this EA

This EA has been prepared in accordance with the CEQ regulations implementing NEPA and with DOE NEPA guidelines. The scope of the EA was decided after

Products Company coal-burning cement plant by more than 80%, and will eliminate waste cement kiln dust. Waste kiln dust currently produced by the cement plant will be used to form a slurry to scrub SO_2 from the flue gas.

The goal of this project is to demonstrate the technical and economic feasibility of Recovery Scrubber Technology, and at the same time, demonstrate the following useful environmental features:

- An effective method to control SO_2 emissions from coal-fired cement plants
- A vehicle to reconstitute waste kiln dust to raw material feed for reuse by the cement kilns
- Elimination of waste kiln dust which has heretofore required disposal in a landfill area
- Recovery of potassium sulfate, a salable by-product from the process

2.2 Project Location

The site of the proposed project is the Dragon Products Company cement plant. This plant was originally owned by the Passamaquoddy Indian Tribe, and was later sold to Cementos Del Norte, USA. The Dragon Products Company cement plant is a 1500-acre industrial facility, situated on the southern coast of Maine between Thomaston and Rockland, in Knox County. Figure 2-1 shows the regional location of the proposed project. The cement plant is located in an area that has been mined for limestone since the 1700s. The area consists of fields and scrub vegetation interspersed with quarries (active and inactive). The quarries are long, narrow excavations following a bed of limestone. The current quarry operated by the cement plant is the largest excavation in the area, with an elevation of 80 ft. (above MSL) and a depth of 150 ft. from the surface. The immediate area around the cement plant is not industrialized.

The proposed project area is adjacent to existing cement plant structures, and close to the area where waste kiln dust is handled. The project will occupy approximately 16,315 square feet (0.37 acre), over a two-acre tract of land. Buildings to be constructed for the project are listed in Table 2-2.

TABLE 2-1

LAND REQUIRED FOR THE PROPOSED PROJECT STRUCTURES

Structure	Dimensions (ft)	Area (ft^2)
K_2SO_4 Building	50 x 102	5100
Distilled Water Tank	50 x 50	2500
Reaction Tank	52 x 52	2704
Settling Tank	50 x 50	2500
Heat Exchanger	63 x 45	2835
New Stack	24 x 24	576
Dilution Tank	10 x 10	100
	Total area :	16,315

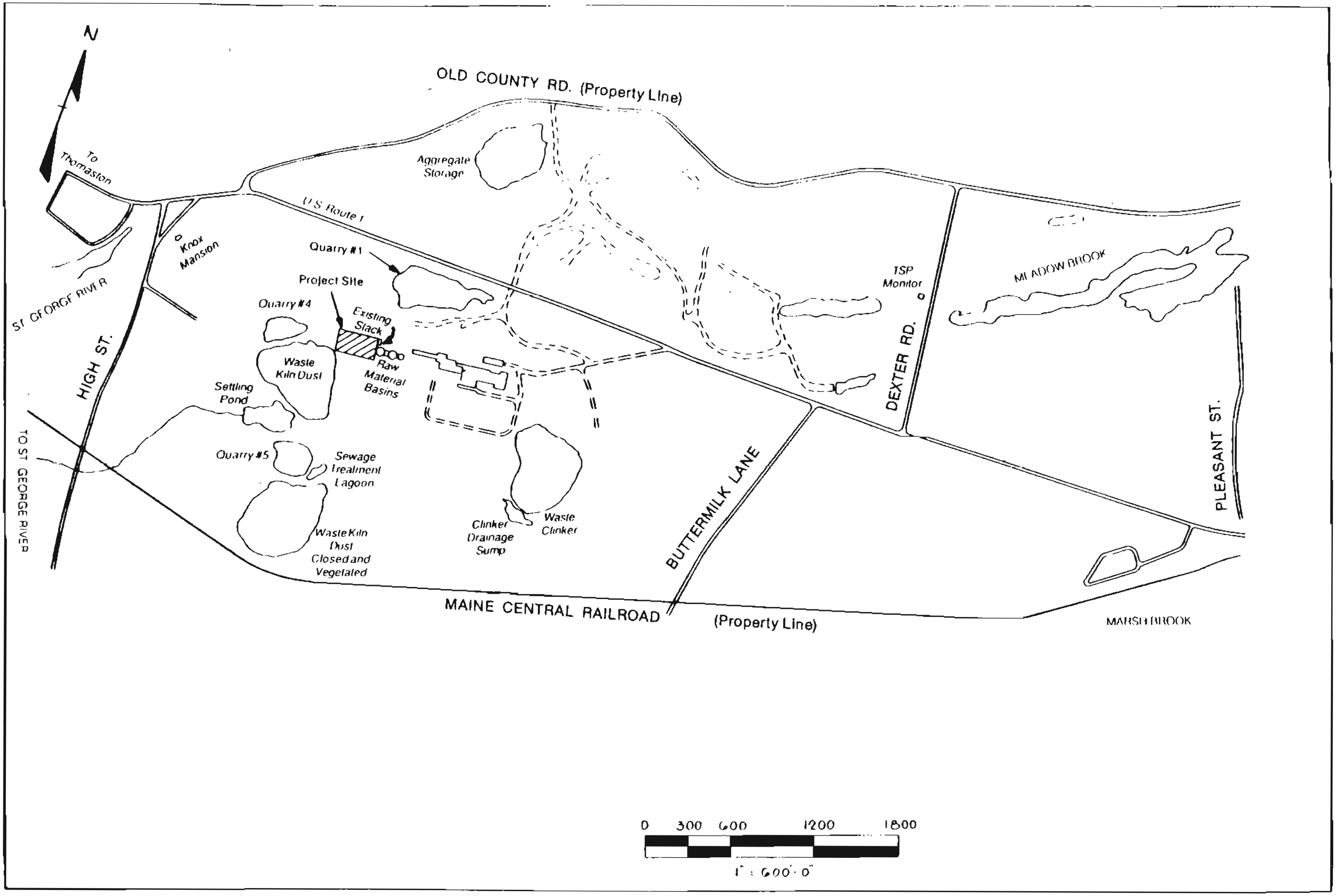

Figure 2-2. Property of the Dragon Products Company, Maine.

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TABLE 2-2

MAJOR CONSTITUENTS OF THE STACK GASES

Component	Concentration
Oxygen	10 %
Carbon dioxide	15 to 25%
Water	20 to 30%
Nitrogen	35 to 55%
SO_2	< 80 ppm
NO_x (as NO_2)	500 ppm

2.3.2 Wastes Generated

Wastes are generated at the Dragon Products Company due to the presence of alkali salts in the kiln dust which makes this material unsuitable for recycle. The raw material entering the kiln contains potassium in the form of orthoclase feldspar (a silicate mineral present in sand) and in the form of mica (a layer silicate in the limestone). Potassium is volatilized in the burning zone of the kiln and forms potassium oxide. The potassium oxide condenses in the cool end of the kiln and is removed in the baghouse with the waste kiln dust. This causes the kiln dust to be relatively high in potassium and sodium salts (compared with the cement plant feed), and makes it unsuitable for direct recycle to the kiln.

The amount of waste dust produced depends on kiln operating conditions. The average production of waste dust is 250 tons per day. This is equivalent to 20% of the daily average production of raw material from the quarry. After leaving the plant, waste dust passes through a pug mill (mixing mill) where water is added. Because the dust is partially cementitious, some agglomeration occurs which aids in dust control. This wetted dust is deposited in the on-site waste dust landfill. A previous landfill south of the current landfill has been closed and re-vegetated.

some level of cost recovery. The proposed process uses the waste dust in a slurry form to scrub the kiln exhaust gas for the removal of sulfur dioxide and, possibly, nitrogen oxides. In addition, the waste kiln dust would then be suitable as kiln feed raw material because the alkali metals are dissolved, reacted, and removed.

The mass balance for the Passamaquoddy Process is shown in Figure 2-3 and the chemistry is summarized in Table 2-3. The process produces two major by-products, solid material rich in potassium sulfate, and distilled water. The potassium sulfate will be sold as a fertilizer component. Table 2-4 gives an analysis of the potassium sulfate. An analysis of the distilled water is listed in Table 2-5.

TABLE 2-3

PROCESS CHEMICAL REACTIONS

Exhaust Gas Reactions: Exhaust plus water

Reactants Products

$SO_2 + H_2O = H_2SO_3$ (soluble)

$2\ NO_2 + H_2O + 1/2\ O_2 = 2HNO_3$ (soluble)

$CO_2 + H_2O = H_2CO_3$ (soluble)

$H_2SO_3 + HNO_3 = H_2SO_4 + HNO_2$ (soluble)

Dust Reactions: Kiln dust plus water

Reactants Products

$CaO + H_2O = Ca(OH)2$ (soluble)

$K_2O + H_2O = 2\ KOH$ (soluble)

Silica (insoluble)

Alumina (insoluble)

Iron oxide (insoluble)

Gas Reaction Products with Dust Reaction Products

Reactants Products

$Ca(OH)_2 + H_2CO_3 = CaCO_3$ (insoluble) + $2H_2O$

$2KOH + H_2SO_4 = K_2SO_4$ (soluble) + $2H_2O$

Silica (insoluble)

Alumina (insoluble)

Iron Oxide (insoluble)

Upon leaving the reaction tank, the spent scrubbing slurry will be pumped to a settling tank for separation of the dissolved and settlable solids. The settled solids will be returned to the kiln as part of the raw feed material. The liquid with dissolved solids will be pumped to the heat exchanger/crystallizer that cools the exhaust gas. The liquid will absorb the exhaust gas heat and the water will be evaporated yielding the solid alkali metal salts. The evaporated water will be condensed as high purity water (e.g., 1-50 ppm total dissolved solids depending upon final process design) and stored for process use, or be discharged. Analysis of the water produced is shown in Table 2-5.

Impurities in the water produced are representative of the dissolved material in the salt solution being distilled. There are no volatile organics or ammonia compounds in the salt solution. The maximum concentrations of impurities in the distillate are shown in Table 2-5.

TABLE 2-5
ANALYSIS OF WATER PRODUCED BY DISTILLATION
(Concentration (mg/L)

Chemical Species	Water Produced	Drinking Water Standards
Ca^{++}	5	No primary standard
Mg^{++}	2	No primary standard
SO_4^{--}	27	250
K^+	13	No primary standard
Na^+	2	No primary standard
Cl^-	1	250

The water used in making up the slurry from the cement kiln feed is obtained from an on-site quarry water supply; therefore, no additional make-up water is required. This water is then recovered in the distillation process. Because the recovered water is available for reuse in the recovery scrubber, no other source of water (city water or impounded rainfall) is required. Further, in dry years, this water may be used for additional process needs to augment the quarry water supply.

will be sized specifically for this project. The tanks (treatment tank, settling tank #1, settling tank #2, slurry dilution tank, and mixing tank) will also be designed specifically for this project.

Other site activities will include erection of the potassium sulfate storage building, instrumentation building, steel supports for the tanks, electrical and piping connections, and electrical and piping connections between system components. Figure 2-4 shows the layout of the buildings and tanks to be constructed for the project, relative to the existing cement plant structures.

The Recovery Scrubber must be connected to the existing plant during cement plant downtime. The duct can be installed during any shutdown with no impact on the cement making process. The cement plant normally undergoes process shutdown several times per year for minor repairs. After the erection of the component parts of the process, and connection of the piping and electrical controls, the process will be ready for start-up.

Phase 3 (Operation, Data Collection, Reporting and Disposition) will be conducted concurrently with the final start-up of Phase 2. The operation and data collection period will last for six months and end with issuance of a final report.

2.4.3 Resource Requirements

2.4.3.1 Energy Requirements

During construction, some fuel will be used to power mobile equipment such as welding machines and construction vehicles. The proposed project will use electrical energy and thermal energy. The additional electrical energy of 7.6 megawatt hours per year will be provided by the Central Maine Power Company. In the event of power failure from the Central Maine Power Company, the Dragon Products Company cement plant has a standby generator that can supply the power requirement for the existing and proposed operations. The cement plant currently uses approximately 56 megawatt hours per year.

Heat from the cement plant exhaust gas stream is currently discharged to the atmosphere during existing operations. The heat energy will be recovered by use of the heat exchanger in the Recovery Scrubber Process and will be used to evaporate all the water from the alkali metal salt solution and recover the potassium sulfate salts.

2.4.3.2 Land Requirements

The major components of the proposed project that require land resources are: the reaction, settling and rinse tanks, the heat exchanger, the crystallizer, and the potassium sulfate storage building. Storage is temporary, since all of the potassium sulfate can be sold easily. The combined area of these structures is 16,315 sq. ft. (0.37 acre), as was shown in Table 2-1. The various structures will be spread out over approximately two acres of land, shown in Figure 2-4.

The land requirements for landfill of the waste dust during existing operations will be eliminated. Thus, no additional land is required during the operation of the project.

employees. The engineering design labor by E.C. Jordan is practically all off-site. Thus a total of 3750 man-days should be required for construction of the project.

The on-site labor force will require living accommodations. There are adequate hotel and motel facilities in the Thomaston area to accommodate transient labor. If a contractor located within 100 miles of the project site is selected to perform the erection work, it is likely that few personnel will remain in the area overnight. Many people currently employed at the cement plant commute approximately 100 miles each working day.

Basic on-site amenities for workers such as bathrooms, hot water showers, and a lunchroom are already at the site, and are expected to be adequate. These facilities now support the 100 man-day shift at the cement plant and can handle the anticipated increase in the labor force, with few modifications in managerial control. The largest adjustment will be a 15-minute variance in the lunch break, and starting and quitting times for the various workers. However, if the need arises, portable systems can be rented, temporarily, for the periods of high demand.

2.4.3.5 Material Requirements

The two categories of material requirements are: construction materials and operation materials. The materials for construction will include off-site fabricated equipment and the vendor-supplied materials including steel, wire, pipe, pumps, and motors. The materials for operation are already within the plant, and include kiln dust, exhaust gas, and waste heat available at the cement plant. Whenever the cement plant is operational, there will be adequate raw materials for the proposed project process. No materials for operation will be brought on-site from outside of the Dragon Products Company Cement Plant.

Discharge of SO_2, an atmospheric pollutant, will decrease as a result of the proposed project. The current SO_2 emission permit limit for the cement plant is 103 lb/hr. The present emission rate is approximately 80 lb/hr (Table 2-6), and the proposed project will reduce this emission rate to 15-20 lb/hr, a reduction of about 80%. NO_x removal due to the expected chemical reactions between the NO_x in the stack gas and the kiln dust slurry will be determined during this demonstration project.

High purity water will be produced as a result of distillation of the potassium sulfate solution. Up to 50 gallons per minute of this water may need to be discharged, if not used in the slurry making process. If it is necessary to discharge this water, then it will be diverted to quarry #5 for storage and subsequent discharge. There is no other waste produced by the process, except for treated storm water runoff and the municipal waste that will be generated by the labor force during construction and operation.

2.5 Alternatives to the Proposed Action

The alternatives discussed in the following sections were considered for all three elements of the NEPA strategy presented in Section 1.0, Introduction. A "no-action alternative" was considered in the programmatic analysis, as well as in the preparation of this document. Alternative sites and alternative technologies for the Clean Coal Technology demonstration projects in general were incorporated in the pre-selection review and alternative sites and technologies for this particular proposed action were considered in the preparation of this document. A brief summary of the alternatives is provided below.

2.5.1 No-Action Alternative

No action with respect to the proposed project would be equivalent to a decision by DOE not to follow through on its acceptance of the Passamaquoddy proposal for the United States. Because the Passamaquoddy proposal was designed to retrofit the Dragon Products Company Cement Plant, off-site alternative sites were not a viable consideration within the Passamaquoddy proposal.

Dragon Products Company has invested significant time and money in research and development efforts for the process, and intends to demonstrate the positive results of the proposed action. Because the process was designed and developed based on process-related variables at the Dragon Products Company Cement Plant, it is both reasonable and environmentally sound that the company should test the technology at its site.

3.0 EXISTING ENVIRONMENT

3.1 Atmospheric Resources

The coast of Maine where the demonstration project will be conducted has a humid continental climate, modified by ocean breezes. Typically, there are warm summers and moderate winters. The average summer temperatures are between 60 - 80^{0}F during the day, with a drop of 10^{0}F at night. Winter temperatures are 20 - 30^{0}F during the day, with slightly lower night temperatures. Temperatures of 30^{0}F below zero have been reported, but when these low temperatures do occur, they generally persist less than a day. Winds are generally from the northwest. Average speeds range from 5.5 to 10.6 mph. Data on wind speed, frequency, and direction used to plot a wind rose were obtained from the meteorological station owned and operated by the Dragon Products Company Cement Plant (see Figure 3-1). The average annual rainfall of the Rockland and Thomaston area is 49.67 inches. The area experiences an average snowfall of 65.8 inches. There were 89 days in 1988 when rainfall exceeded 0.1 inch.

The project site is located in the Central Maine Air Quality Control Region. For many years prior to 1987, the region was a nonattainment area for particulate matter. Effective in February, 1987, the region was redesignated as in attainment for particulate matter. For the other Criteria Pollutants, the region is in attainment for CO, SO_2, NO_2, and Pb and non-attainment for O_3.

3.2 Land Resources

The project site will occupy two acres of the cement plant land. The site includes office buildings; paved surfaces surrounding the raw material storage basins and waste dust handling area; and unpaved surfaces, including the roadway used for waste dust transport, filled land adjacent to the waste dust handling area, lawns, and an abandoned railroad bed. There are no unique existing natural landforms within the proposed project area. The facility is underlain by Pre-cambrian limestone deposits modified by metamorphism to contain marble. Much of the original sedimentary structure of the rock has been destroyed by geologic activity. The limestone deposit includes calcium limestone and calcium-magnesium limestone along with various calcium silicate rocks. The Pre-cambrian age limestones in the vicinity of the cement plant are part of the Ogier Formation and related limestone sequences. The rocks were placed by thrust faulting, and stand out as an isolated limestone, bordered by other younger rock types.

The soils at the project site are not original material. The entire site has been modified by excavation or placement of fill. The surface soil, a glacial clay, was deposited in a marine environment. The topography is primarily gently sloped as a result of erosion of the clay soil. Most of the cement plant area, and all of the proposed project site area, has soil types which have been classified by the USDA as Dump pits (Dp), because the soil has been modified by excavation and filled with mine spoils. There are scattered exposures of limestone in mined areas or where surface soil cover is shallow. Further information on the area's soil types can be obtained from the Soil Survey of Knox and Lincoln Counties, published by the United States Department of Agriculture Soil Conservation Service (USDA 1987).

The project site falls in a zone where moderate damage could be expected if an earthquake occurred at the project site. Tank ruptures that might result from an earthquake would pose no environmental problems due to the non-hazardous constituents of the solutions the tanks contain.

also shown in Figure 3-2. Wetlands on cement plant property or adjacent properties will not be affected by the project.

The flood insurance rate map of the Town of Thomaston in Knox County, Maine classifies the project area as Zone C. Zone C designates areas that are outside the 500-year flood plain (FEMA, 1985). Figure 3-3 provides the flood insurance rate map of the Town of Thomaston.

3.5 Socioeconomic Resources

The proposed project site is in Thomaston, Maine between the residential districts of Thomaston and Rockland. These two, and other towns within a 35-mile radius, have a total population of approximately 50,000 people, and provide an economic base of labor and materials for the Dragon Products Company Cement Plant. The plant is also supported by two other cities, Bangor to the north and Portland to the south. Each of these cities is approximately 90 minutes from the Dragon Products Company by highway travel, which is not an uncommon commute time in this region.

Transportation of external manpower and materials to the project site will be accomplished by road, using U.S. Route 1, which connects to U.S. Route 95, a major highway. External construction manpower requirements, over and above the plant's in-kind labor contribution by plant personnel, is expected to be between 20 and 25 persons (40 to 50 car passes) per day. Truck traffic necessary to deliver equipment and materials should not exceed one truck per day. These increases are minor when compared with the estimated 478 car plus truck passes per day to carry out routine operations.

Knox Mansion, the former home of the Secretary of War under President Washington, and listed in the National Register of Historic Places, is the only building of historical importance near the project site. It is located about one-half mile from the cement plant.

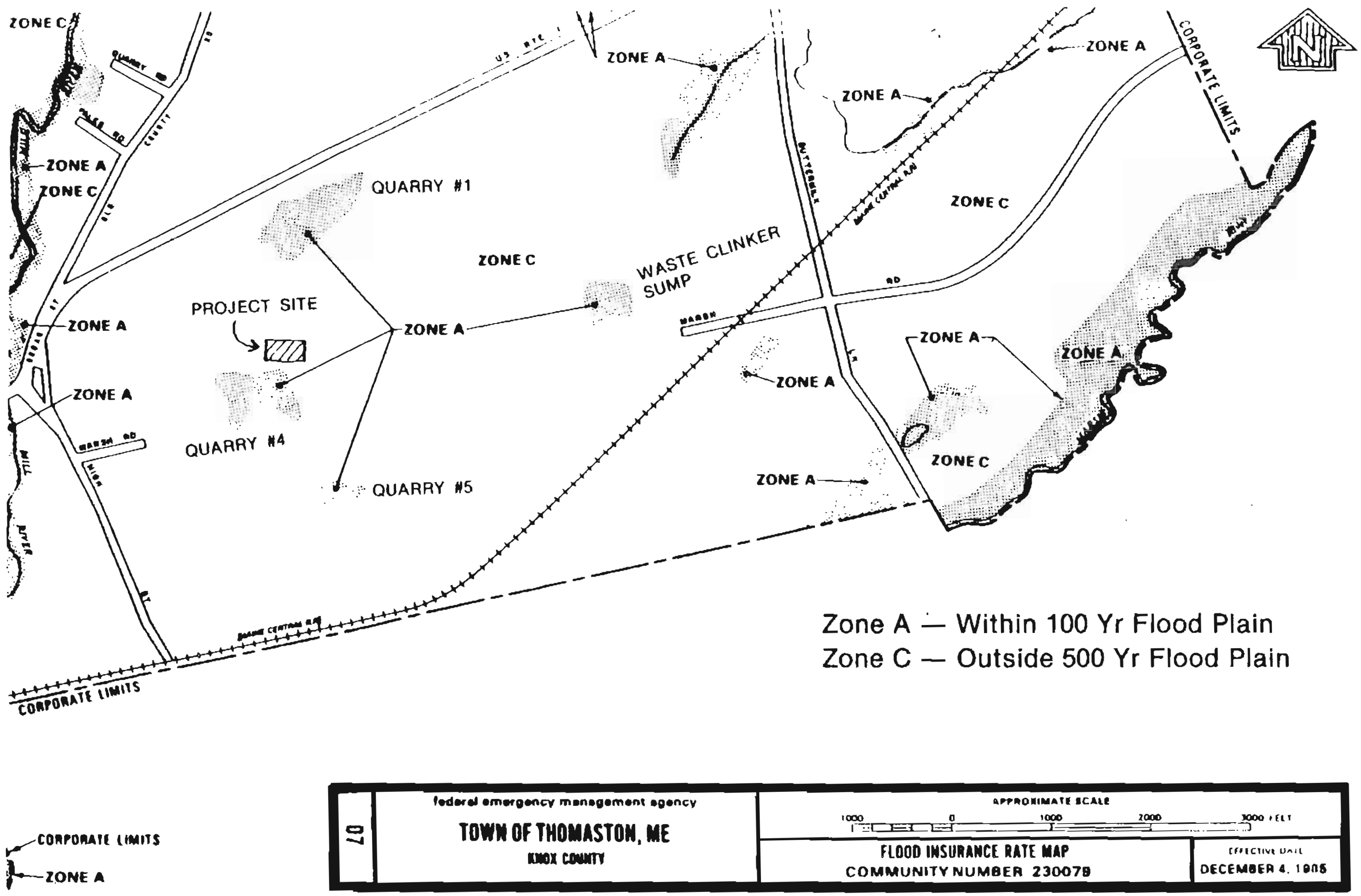

Figure 3-3. Flood Plain Map of the Project Area.

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The cement plant area is currently subject to windblown fugitive particulate matter from the plant area. A significant amount comes from the existing waste dust landfill and from waste dust handling operations. After installation of the waste kiln dust recovery scrubber, the existing waste dust landfill will be closed, capped, and seeded with vegetation as a restoration measure. Closure of this landfill will eliminate it as a source of fugitive particulate matter. This should have a beneficial impact on the air quality in terms of particulate matter. The waste kiln dust recovery scrubber, when operational, will consume all the waste kiln dust and return it as a water slurry to the cement making process; therefore, there will be no dust handling that will allow fugitive particulates. There will be a significant decrease in the total fugitive particulates from the cement plant area as a result of this project.

4.1.2 Land Impacts

Several beneficial land impacts will result from the proposed project. The land used for project construction will change from a waste dust handling area into a functioning part of the cement plant, thus improving the aesthetic appearance of the cement plant. The landfill currently used for dust disposal will be closed and vegetated. As a result this area will not contribute to fugitive dust emissions and, at the same time, will create a more attractive environment. Landfills for future disposal of dust will not be necessary.

The project is not expected to have any land impacts beyond the plant boundary. Therefore, there should not be any archaeological, cultural, architectural, or historical impacts from the project.

4.1.3 Water Quality Impacts

The major water quality impact will be the elimination of rainfall runoff from the waste kiln dust landfill which is currently collected and treated prior to discharge. Once the landfill is covered, there will be no need for treatment

The project will culminate with the closure of the existing landfill, which will be vegetated and restored and will improve the aesthetics of the area. Vegetation on the closed landfill will provide forage, as well as cover, for any wildlife that may use the area.

As a result of the foregoing and the small size of the proposed project site, a minor negative impact on the ecology of the area is possible during construction activities due to the increase in noise and dust as well as the paving of the construction area. The negative impact associated with these factors will affect the area ecology only during the construction phase of the project.

4.1.5 Socioeconomic Impacts

There will be a temporary increase in traffic to and from the cement plant during construction, and a very small increase during operation. Currently, raw materials (coal, oil, iron ore, gypsum, and sand) and finished products (crushed stone aggregate, ground limestone for scrubbers and agriculture, cement, and mortar) are shipped from the plant by truck at the rate of approximately 38,000 trucks per year. In addition to these shipments, there will also be deliveries of equipment and spare parts.

Transportation requirements of current plant employees and vendor representatives who visit the plant daily are also considered when evaluating traffic requirements. The total number of car and truck vehicle passes is estimated to be about 175,000 per year (ca. 478/day). The truck traffic necessary to deliver the equipment and material for the project is not expected to exceed an average of one truck per day. When construction has been completed and the system is in operation, the only increase in traffic will be for shipment of the recovered potassium sulfate (ca. 3500 TPY), at the rate of 175 trucks per year. The impact of this increased vehicular traffic on U.S. Route 1 will be insignificant. Both equipment deliveries, prior to operation, and potassium sulfate shipments during operation will increase traffic past the plant by approximately .005%

4.1.7 Impact Summary

The impact of this proposed project on the environment is positive and beneficial to area flora and fauna, as well as to the cement plant owners. The successful project will demonstrate a technology that will be beneficial to other cement plants with similar problems. The major highlights of the project are the conversion of present waste materials to useful by-products and the reduction of atmospheric emissions. High purity water is produced and waste kiln dust is converted to raw material feed and potassium sulfate. Any unused wastewater is of such high quality that its impact on the existing wastewater system is positive and beneficial.

5.0 REGULATORY COMPLIANCE

This section describes current permit requirements and regulations governing the operation of the Dragon Products Company Cement Plant. Modifications to the permits necessary to bring the proposed project into compliance, as well as the process by which these permit and permit modifications will be obtained, are also outlined. The Dragon Products Company Cement Plant operates on a variety of permits and licenses, including air permits, wastewater discharge permits, and solid waste management permits. Before describing the modifications, if any, that may be required for the proposed project, current permit requirements will be addressed.

5.1 Current Permit Requirements

5.1.1 Air Permit Requirements

A current Air Emission License (A-326-72-B-M) for SO_2, NO_x, and particulate matter was issued by the Maine Department of Environmental Protection. The cement plant now operates with emissions below the stipulated maximum allowable limits for SO_2 and particulate matter (Table 2-6). The License does not have

5.2.2 Water Permit Modifications

It is not anticipated that the increased volume of water produced will cause any significant change in the volume of water for disposal, because a portion of the water produced is utilized by the process. The quality of the current wastewater discharge will significantly improve as a result of the project. Therefore, no modification or amendment to the license will be required.

5.2.3 Solid Waste Management Permit Modifications

No solid waste permit for the deposition of waste kiln dust to the landfill is required by the proposed project since the need for additional landfills will be eliminated. Therefore, no permit modifications are expected. A closure plan detailing the type and thickness of landfill cover material and notation of the fertilizing and seeding intentions will, however, be required.

5.2.4 Other Permits Required

Building and plumbing permits issued by the Town of Thomaston will be required for construction of a potassium sulfate storage building and are expected to be issued in 1989, before commencement of construction. No other permits are required for the construction of this facility. Permits are not required for the construction of the tanks (treatment tank, settling tank #1, settling tank #2, slurry dilution tank, and mixing tank) that will be used in this project. This is because they will contain only solutions or slurries of the minerals used in cement making so that the failure of a tank will not significantly harm the environment.