Appendix L USDA Soils Information

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Yakama Nation Irrigated Area, Washington, Part of Yakima County

WIP Drop 4 Vicinity

June 4, 2012

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

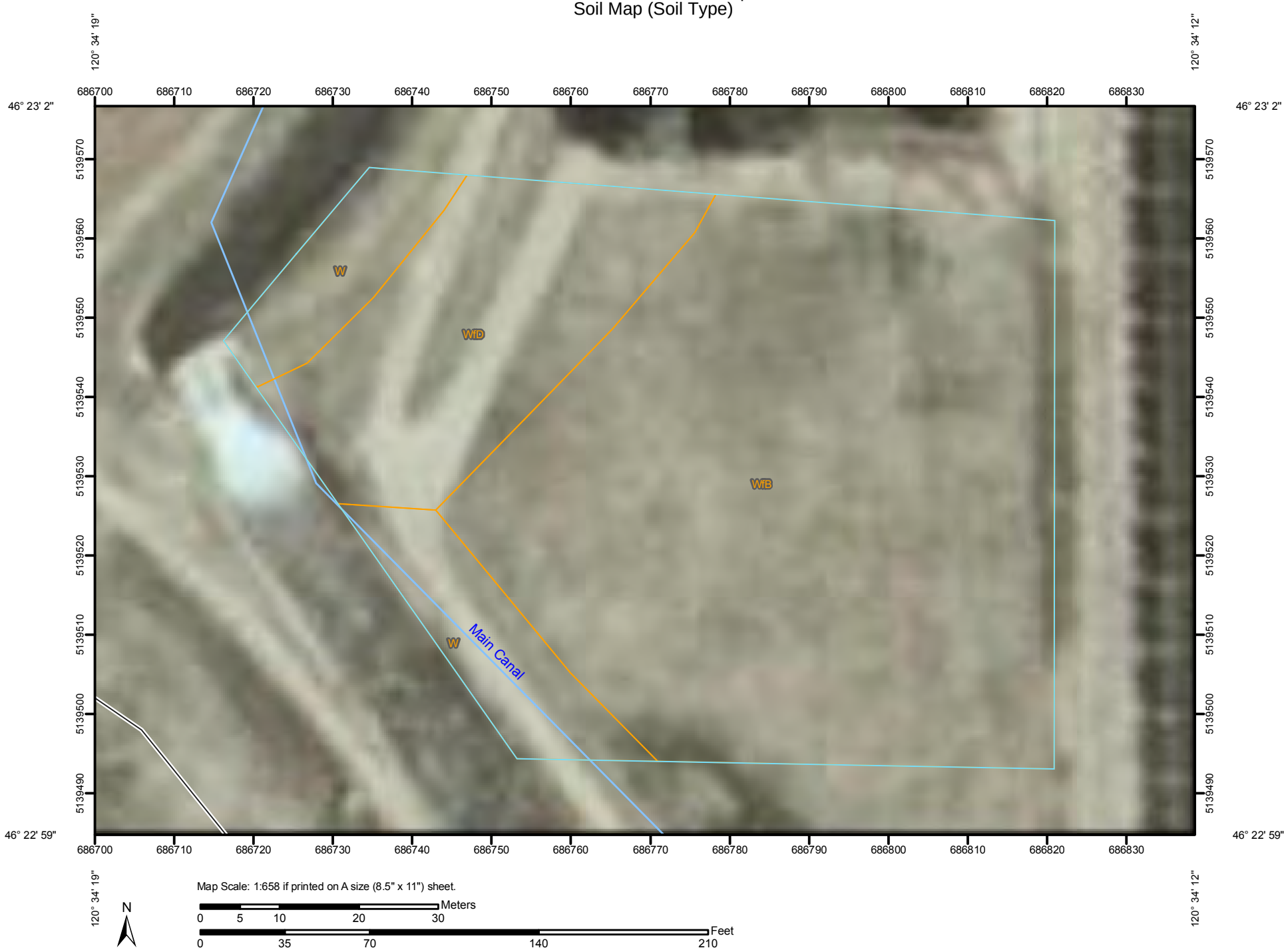
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Soil Type)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:658 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Yakama Nation Irrigated Area, Washington, Part of Yakima County
Survey Area Data: Version 6, Feb 16, 2011

Date(s) aerial images were photographed: 7/16/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Soil Type)

Yakama Nation Irrigated Area, Washington, Part of Yakima County (WA678)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
W	Water	0.2	12.4%
WfB	Warden silt loam, 2 to 5 percent slopes	1.1	68.2%
WfD	Warden silt loam, 8 to 15 percent slopes	0.3	19.5%
Totals for Area of Interest		**1.6**	**100.0%**

Map Unit Descriptions (Soil Type)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If

intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Yakama Nation Irrigated Area, Washington, Part of Yakima County

W—Water

Map Unit Composition
Water: 100 percent

Description of Water

Setting
Parent material: Alluvium

WfB—Warden silt loam, 2 to 5 percent slopes

Map Unit Setting
Elevation: 600 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 200 days

Map Unit Composition
Warden and similar soils: 100 percent

Description of Warden

Setting
Landform: Hillslopes, terraces
Parent material: Loess over lacustrine deposits

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.8 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 6e

Typical profile
0 to 12 inches: Silt loam
12 to 22 inches: Silt loam
22 to 60 inches: Stratified very fine sandy loam to silt loam

WfD—Warden silt loam, 8 to 15 percent slopes

Map Unit Setting

Elevation: 600 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 200 days

Map Unit Composition

Warden and similar soils: 100 percent

Description of Warden

Setting

Landform: Hillslopes, terraces
Parent material: Loess over lacustrine deposits

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability (nonirrigated): 6e

Typical profile

0 to 12 inches: Silt loam
12 to 22 inches: Silt loam
22 to 60 inches: Stratified very fine sandy loam to silt loam

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

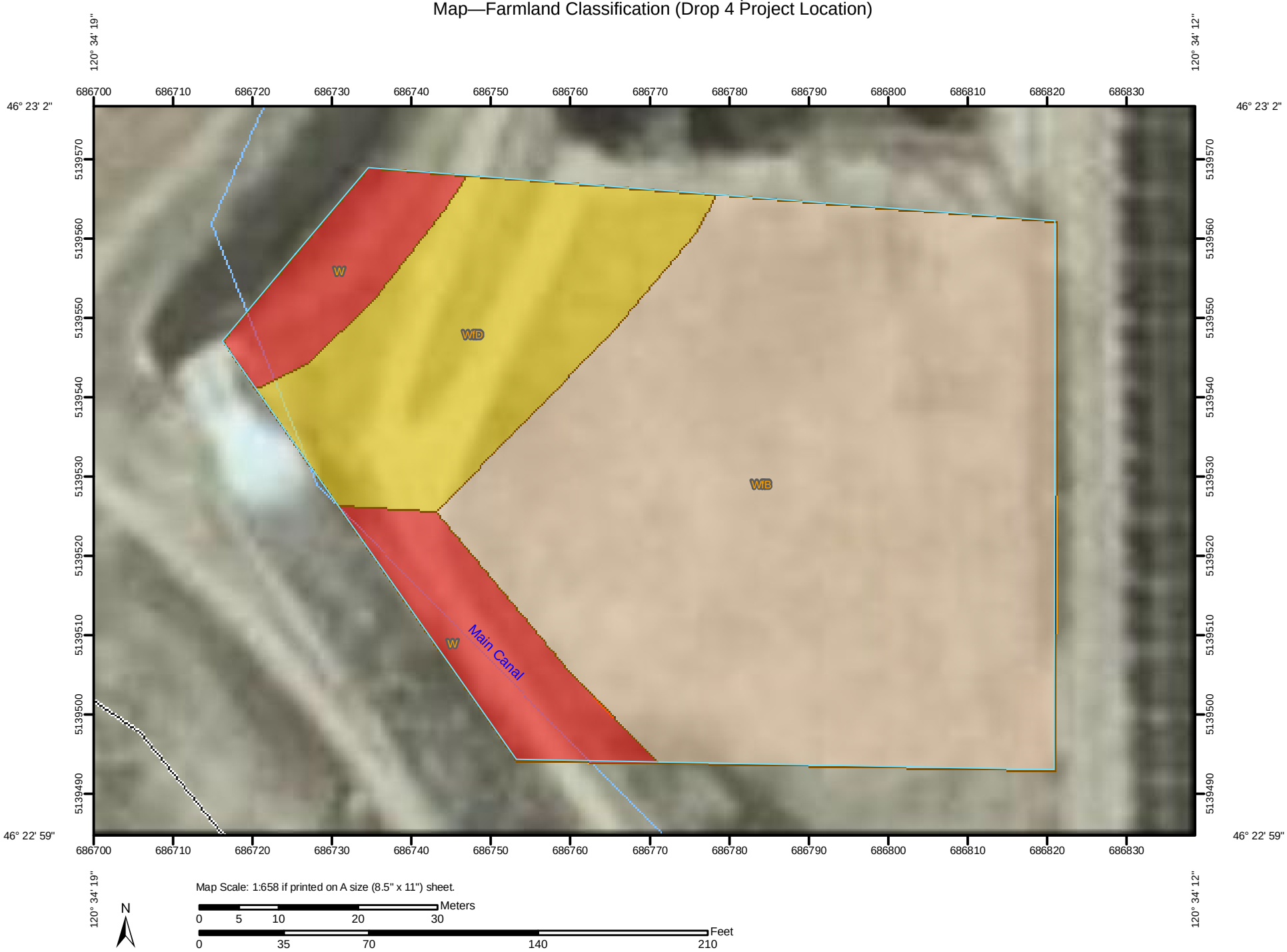
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification (Drop 4 Project Location)

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Custom Soil Resource Report
Map—Farmland Classification (Drop 4 Project Location)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:658 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Yakama Nation Irrigated Area, Washington, Part of Yakima County
Survey Area Data: Version 6, Feb 16, 2011

Date(s) aerial images were photographed: 7/16/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification (Drop 4 Project Location)

Farmland Classification— Summary by Map Unit — Yakama Nation Irrigated Area, Washington, Part of Yakima County (WA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
W	Water	Not prime farmland	0.2	12.4%
WfB	Warden silt loam, 2 to 5 percent slopes	Prime farmland if irrigated	1.1	68.2%
WfD	Warden silt loam, 8 to 15 percent slopes	Farmland of unique importance	0.3	19.5%
Totals for Area of Interest			**1.6**	**100.0%**

Rating Options—Farmland Classification (Drop 4 Project Location)

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Hydric Rating by Map Unit (Drop 4 Project Location)

This rating indicates the proportion of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is designated as "all hydric," "partially hydric," "not hydric," or "unknown hydric," depending on the rating of its respective components.

"All hydric" means that all components listed for a given map unit are rated as being hydric, while "not hydric" means that all components are rated as not hydric. "Partially hydric" means that at least one component of the map unit is rated as hydric, and at least one component is rated as not hydric. "Unknown hydric" indicates that at least one component is not rated so a definitive rating for the map unit cannot be made.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria

are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

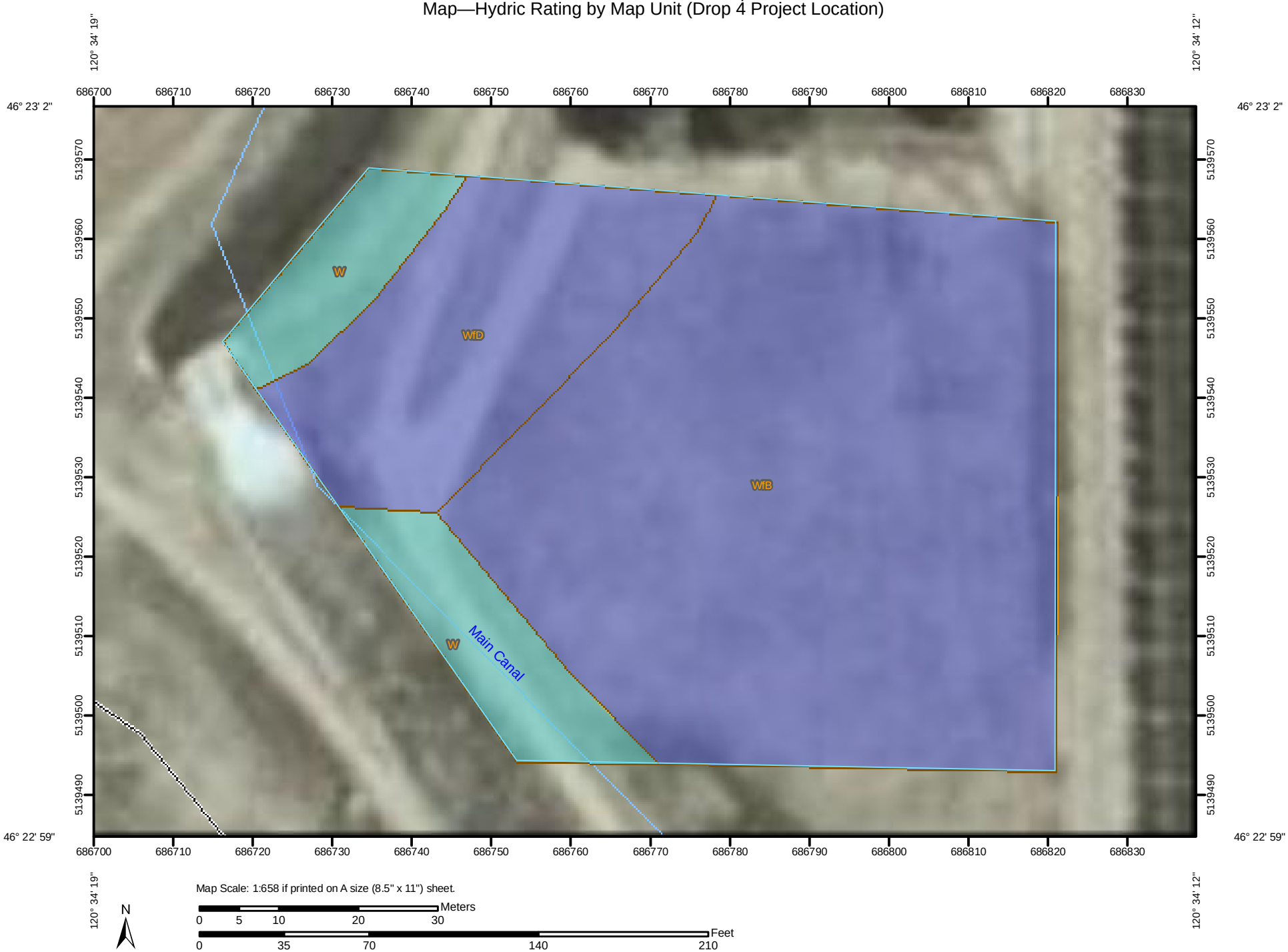
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Custom Soil Resource Report
Map—Hydric Rating by Map Unit (Drop 4 Project Location)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- All Hydric
- Partially Hydric
- Not Hydric
- Unknown Hydric
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:658 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Yakama Nation Irrigated Area, Washington, Part of Yakima County
Survey Area Data: Version 6, Feb 16, 2011

Date(s) aerial images were photographed: 7/16/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydric Rating by Map Unit (Drop 4 Project Location)

Hydric Rating by Map Unit— Summary by Map Unit — Yakama Nation Irrigated Area, Washington, Part of Yakima County (WA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
W	Water	Unknown Hydric	0.2	12.4%
WfB	Warden silt loam, 2 to 5 percent slopes	Not Hydric	1.1	68.2%
WfD	Warden silt loam, 8 to 15 percent slopes	Not Hydric	0.3	19.5%
Totals for Area of Interest			**1.6**	**100.0%**

Rating Options—Hydric Rating by Map Unit (Drop 4 Project Location)

Aggregation Method: Absence/Presence

Tie-break Rule: Lower

Soil Taxonomy Classification (Drop 4 Project Location)

This rating presents the taxonomic classification based on Soil Taxonomy.

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. This table shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalfs (Ud, meaning humid, plus alfs, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (Hapl, meaning minimal horizonation, plus udalfs, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, active, mesic Typic Hapludalfs.

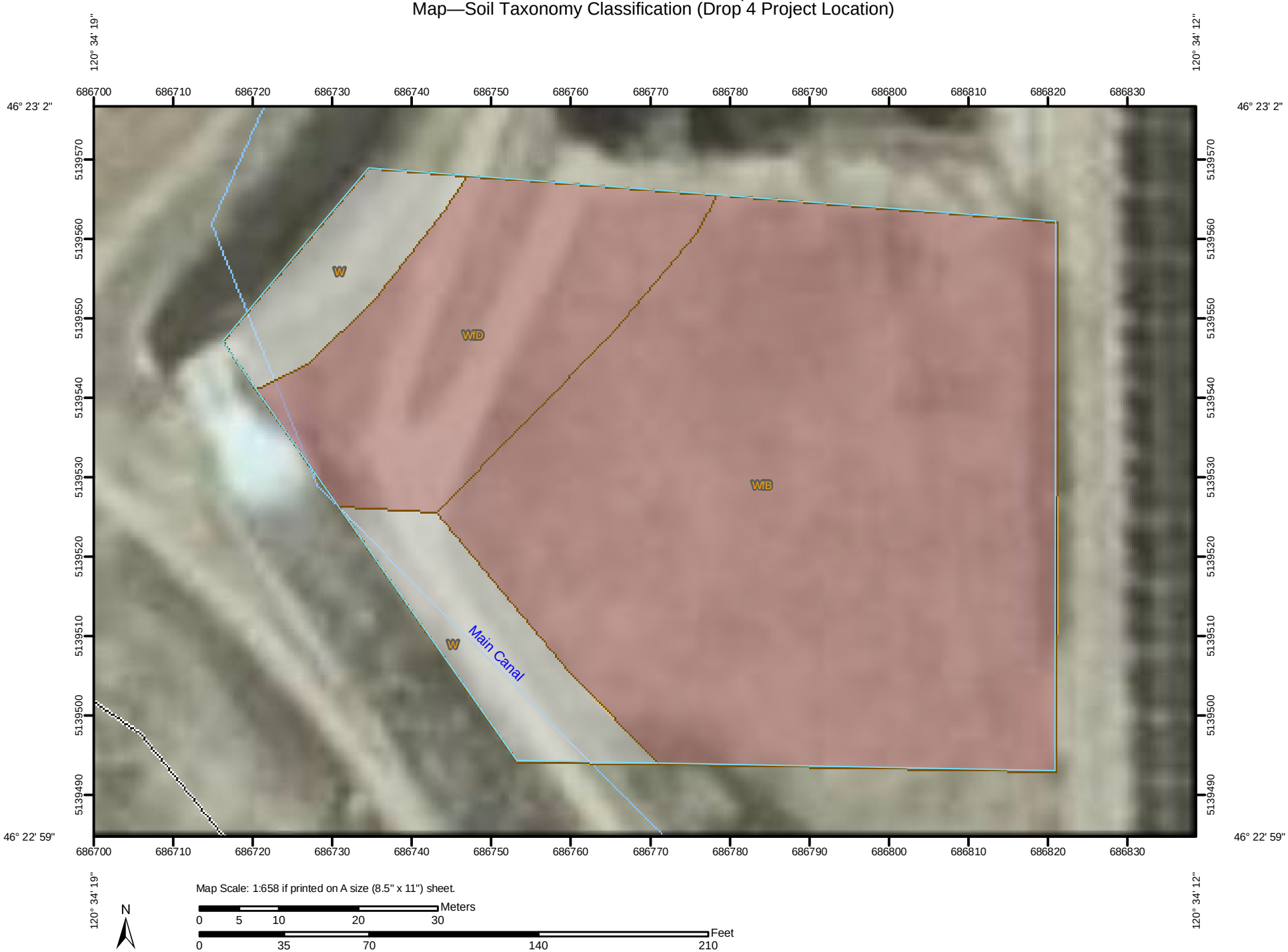
SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

References:

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. (The soils in a given survey area may have been classified according to earlier editions of this publication.)

Custom Soil Resource Report
Map—Soil Taxonomy Classification (Drop 4 Project Location)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Coarse-silty, mixed, superactive, mesic Xeric Haplocambids
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:658 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Yakama Nation Irrigated Area, Washington, Part of Yakima County
Survey Area Data: Version 6, Feb 16, 2011

Date(s) aerial images were photographed: 7/16/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Soil Taxonomy Classification (Drop 4 Project Location)

Soil Taxonomy Classification— Summary by Map Unit — Yakama Nation Irrigated Area, Washington, Part of Yakima County (WA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
W	Water		0.2	12.4%
WfB	Warden silt loam, 2 to 5 percent slopes	Coarse-silty, mixed, superactive, mesic Xeric Haplocambids	1.1	68.2%
WfD	Warden silt loam, 8 to 15 percent slopes	Coarse-silty, mixed, superactive, mesic Xeric Haplocambids	0.3	19.5%
Totals for Area of Interest			**1.6**	**100.0%**

Rating Options—Soil Taxonomy Classification (Drop 4 Project Location)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://soils.usda.gov/

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://soils.usda.gov/

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://soils.usda.gov/

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.glti.nrcs.usda.gov/

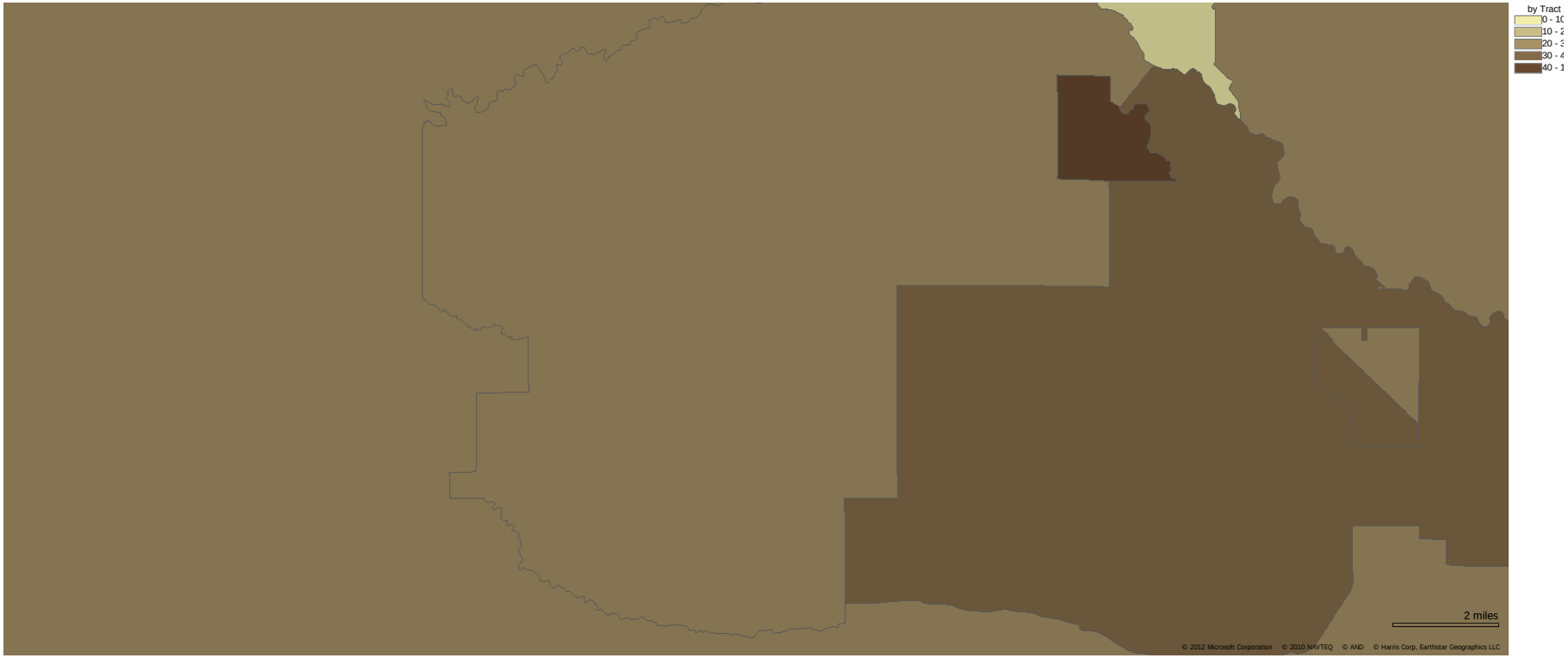
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://soils.usda.gov/

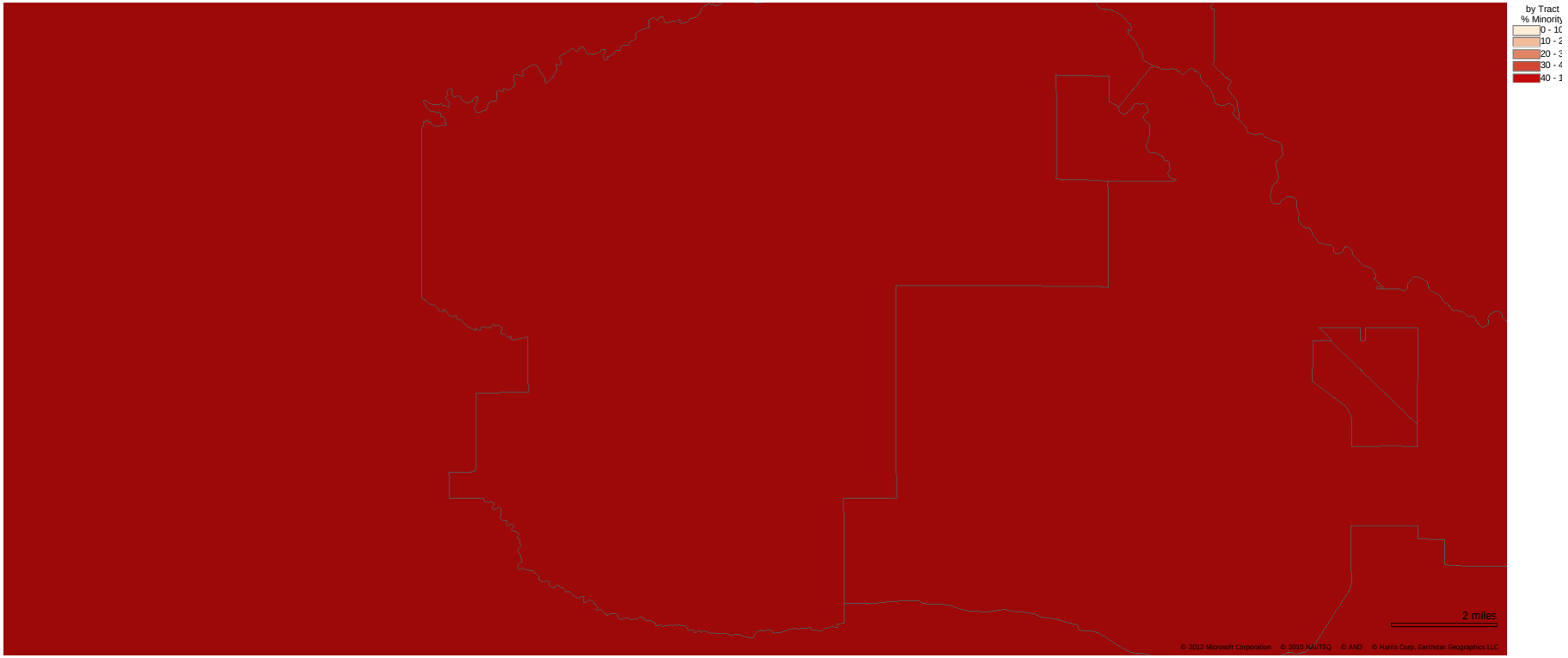
United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

Appendix M Environmental Justice Documentation

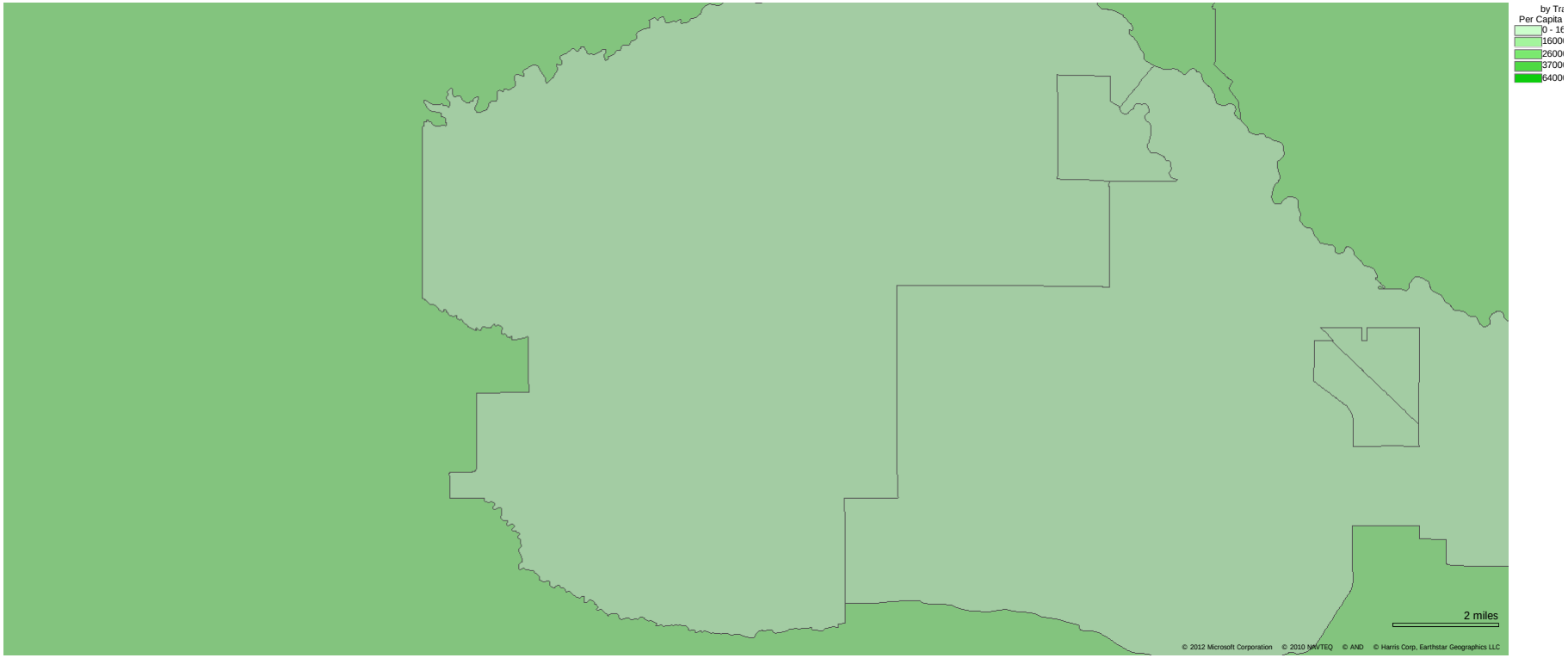
EJ View Population Below Poverty - YN Drop 4 Vicinity



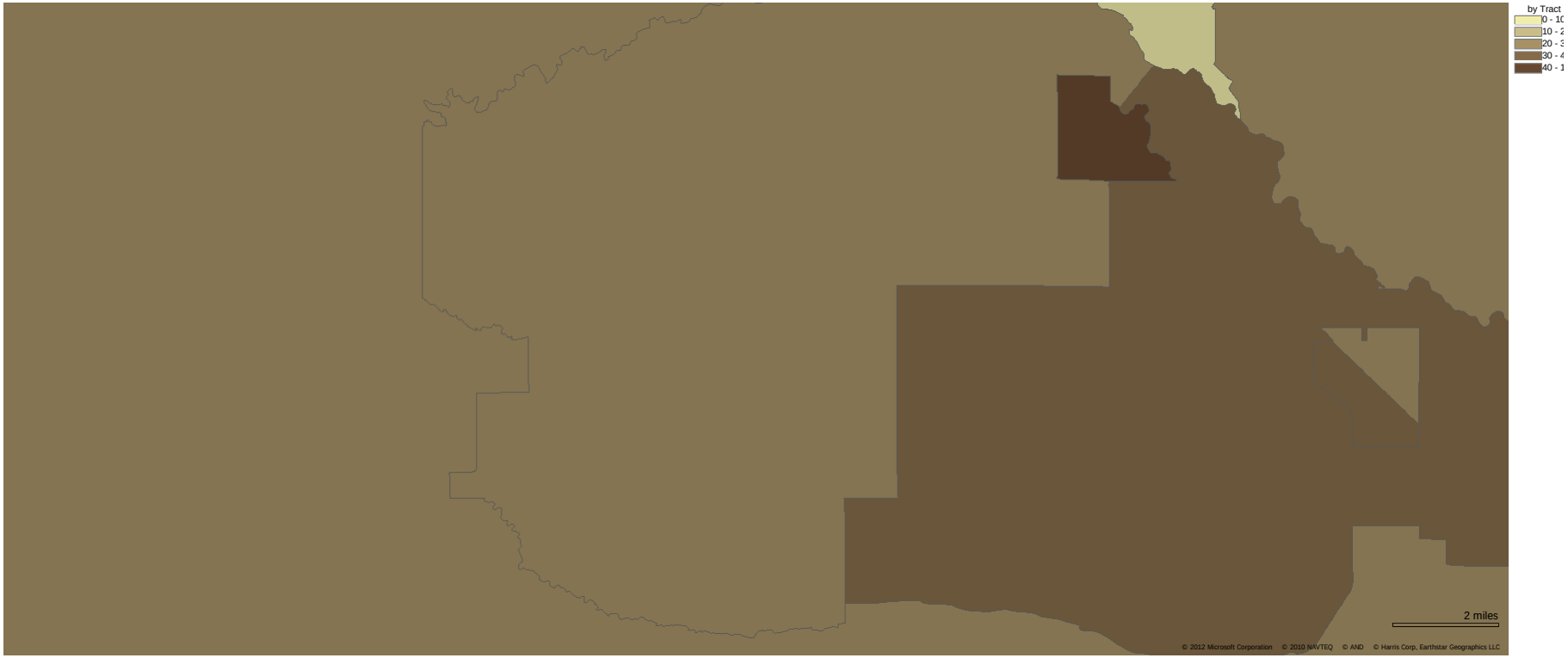
EJ View Minority Population - YN Drop 4 Vicinity



EJ View Per Capita Income - YN Drop 4 Vicinity

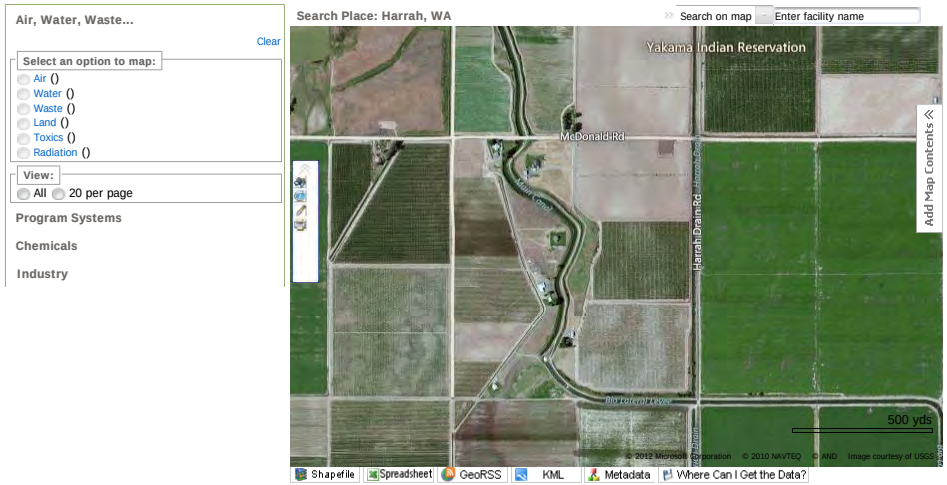


EJ View Population Below Poverty - YN Drop 4 Vicinity



Appendix N Siting Near Hazardous Operations Documentation

EPA: United States Environmental Protection Agency



No facilities displayed.

Legend

Primary Layer:

Facilities

active inactive all

All Types

Secondary Layer:

Wellhead Prot Zones (1yr)

Susceptibility Rating

- High
- Moderate
- Low
- Not Rated

Base Map Themes:

- Water Bodies/Streams
- County/City
- Major Roads/Streets
- Township/Range/Section
- Census Tracts 2000

Background Image:

- None
- USGS Topographic Map
- Aerial Imagery
- Shaded Relief Image

Appendix O Comparison Matrix: Issues Identified with Minor Environmental Consequences

Appendix O Comparison Matrix: Issues Identified with Minor Consequence

US Statutes, Executive Order, Or Identified Issue	Existing Conditions	Environmental Consequences		Identified Best Management or Mitigation Measures	
		Alternative A No Action	Alternative B Proposed Project	Alternative A No Action	Alternative B Proposed Project
Air Quality	The proposed project will not result in a significant impact to Air Quality. Information from Washington State Department of Ecology's (Ecology) web site indicated that the project site is within an attainment area (that is, not within an area of particulate, ozone or carbon monoxide maintenance). See Appendix P for supporting information.	No Change	During construction potential short term temporary increase in airborne dust and pollutant emissions from vehicles and machinery may occur, but are not anticipated to be significant contributors of air quality pollutants. Post construction power generation operations are not anticipated to be significant contributors of air pollutants.	Not Required	Prior to construction a management plan consistent with the Federal Air Rule for Reservation (FARR) requirements will be developed. Refer to Soils for dust suppression issues related to storm water management.
Soils	Soil is primarily Warden silt loam, a non-hydric soil. The topography in the proposed project site vicinity slope from the northwest at an approximate elevation of 850 feet (ft) above mean sea level (msl) to an approximate elevation of 800 ft above msl to the east and southeast. Refer to the Yakima County GIS topographical map located in Appendix H. The Main Canal north of the proposed project is located on the east side of a naturally occurring downward sloping bench common to the Toppenish Drainage basin. The existing Drop 4 spillway is located at the point where the Main Canal transitions away from the naturally occurring bench to the lower elevation of land surface located east of the bench. See Appendix L for USDA Soils information.	No Change	Potential soil disturbance during construction is expected to be less than 0.125 acres (approximately 5,200 sf) total and be contained within the existing WIP right-of-way. Soil disturbing activities during construction include excavation and backfill; soil compaction and mixing of surface/subsoils; contamination due to accidental machinery or equipment fluid spills; and loss of soil due to erosion and sedimentation. Adjacent areas proposed for construction staging and material lay down are periodically mowed by the private landowner and will not require modification to the soil surface, such as grading or compaction, prior to temporary construction use. The 5,200 sf of ground disturbance represents approximately 0.003 percent (%) of WIPs ROW associated with the main canal system and is not a significant soil impact.	None Required	Prior to construction a management plan consistent with the Stormwater Pollution Prevention Plan (SWPPP) requirements will be developed.
Wetlands Protection	There are no designated wetlands in the immediate vicinity of the project site. The USFWS Wetlands Map shows a freshwater emergent wetland approximately one mile west of the project site. Yakama County Geographical Information System (GIS) Land Information Portal (LIP) map does not identify the Main Canal as a wetland; rather the Main Canal is designated a manmade steam. See Appendix H for a copy of pertinent USFWS and Yakima County GIS maps. By design, both the Main Canal and Harrah Drain contain seasonal irrigation water. As a result, limited vegetation and potential habitat is present along the margin of these features.	Current operation activities include localized canal clearing and/or periodic disturbance of vegetation in close proximity to installed features and canal banks or removal of waterborne trash and vegetation that can impede irrigation water delivery.	Approximately 800 sf of water bearing manmade canal embankment will occur during construction. Canal embankments adjacent to the Drop 4 spillway are lined with concrete. Canal embankments farther removed from the spillway are unlined. Disturbance of 800 sf out of 765 miles of canal bank in not a significant wetland impact. See the Invasive Species and Noxious Weeds category in the Comparison Matrix: Issues Studied in Detail in Appendix Q and resource reports associated with invasive species located in Appendix F.	None Required	Construction phasing will be sequenced such that in canal work can be completed when the canals are not in use for irrigation water conveyance. Refer to the Comparison Matrix: Issues Studied in Detail in Appendix Q and resource reports located in Appendix F and Sections 3.4, 4.4 and 5.4 for additional discussion associate with water born invasive species and noxious weeds.

US Statutes, Executive Order, Or Identified Issue	Existing Conditions	Environmental Consequences		Identified Best Management or Mitigation Measures	
		Alternative A No Action	Alternative B Proposed Project	Alternative A No Action	Alternative B Proposed Project
Noise Control	The project will not result in an increase in noise. Currently water overflows the concrete spillway, dropping approximately 20 ft, before impacting the water present in the concrete lined lower canal. There are no significant sound deadening features in the immediate vicinity of the spillway, such as above ground baffles or fencing that would decrease spillway noise. Noise levels at the base of the Drop 4 spillway on the east side of the canal ranged from approximately 70 to 85 decibels (dB). At a distance of approximately 50 ft east and 150 ft southeast (adjacent to the Main Canal) of the spillway base the noise levels drop to approximately 65 to 75 dB. The closest resident is located approximately 250 feet northeast of the spillway. Trees and landscape shrubs are present in close proximity to the southwest face of the residence. At a distance of approximately 200 ft northwest of the spillway, adjacent to the northwest residence landscaping and slightly beyond the topographic embankment, the noise levels drop to approximately 44 to 55 dB. The next two closes residences are approximately 575 ft northwest and southwest of the spillway and partially blocked from line-of-site by changes in the natural area topography. Refer to the Yakima County GIS topography map located in Appendix H.	No Change	The insulated generator house partially located below grade. The HUD guidelines state that a sound level of less than 65 dB is acceptable for noise sensitive use. Predicted noise levels during power generation are expected to be approximately 51 dB outside the generator building and below the current noise levels at the Drop 4 spillway and the HUD value for noise sensitive use. Operational noise levels that are similar as pre-construction conditions are not a significant noise impact. While short-term temporary noise generating activities associated with select construction activities may occur, it is unlikely that the intermittent noise levels will exceed noise generating activities common to agricultural crop production. Short-term temporary noise generation during construction that is consistent with routine noise generating area activities in not a significant noise impact.	None Required	Review of the selected generator building wall construction materials is incorporated into the proposed action. Short-term temporary noise generated during construction will be minimized to the extent possible. Noise generating activities during construction will be limited to daylight hours.
Siting of Projects Near Hazardous Operations and Toxic/Hazardous/ Radioactive Materials, Contamination, Chemical or Gas presence	Neither EPA's Enviromapper nor Ecology Facility Site Atlas (FSA) identified any locations of toxic or hazardous materials, or known locations of contamination at or in the immediate vicinity of the proposed project. EPA's Enviromapper identified two potential hazardous facilities near the project site. Both are located topographically downgradient and neither present a significant hazard to construction or operation of a small-scale hydroelectric power plant. See Appendix N for a copy of the Enviromapper documentation and Ecology FSA.	No Change	Hydroelectric power generation does not produce toxic, hazardous, or radioactive waste; however, minimal quantities of maintenance fluids will be present. The inline turbine design is such that there is no direct contact between irrigation water and maintenance fluid containing mechanisms. The presence of minimal quantities of maintenance fluids that do not come in direct contact with irrigation water are no a significant toxic, hazardous, radioactive or chemical impact.	None Required	Environmentally compatible products have been selected by YP for Drop 4 operational use consistent with product selection for the currently operation Drop 2 and Drop 3 hydropower facilities. Minimal quantities of surplus materials will be stored onsite. Spill prevention, control, and countermeasure (SPCC) BMPs have been designed into the project and will be implemented as a portion of standard operating procedures.

Appendix P Air Quality Documentation

DEPARTMENT OF ECOLOGY State of Washington http://www.ecy.wa.gov

Air Quality

Air Quality Maps of Maintenance Areas

Areas that have experienced persistent air quality problems are designated by the U.S. Environmental Protection Agency (EPA) as nonattainment areas. The federal Clean Air Act requires additional air pollution controls in these areas. Each nonattainment area is declared for a specific pollutant; however, nonattainment areas for different pollutants may overlap each other or share common boundaries.

EPA had designated 13 areas in Washington State as nonattainment. After air monitoring shows that a nonattainment area is meeting health-based air quality standards, EPA redesignated the areas as attainment. To be redesignated, an area must both meet air quality standards, and have a 10-year plan for continuing to meet and maintain air quality standards and other requirements of the Clean Air Act. Areas that are redesignated to attainment are called maintenance areas.

Here are the areas in Washington State designated as maintenance areas:

Ozone: Puget Sound (King, Pierce and Snohomish Counties) and Vancouver (Clark County) are maintenance areas.

Particulate Matter (PM_{10})Thurston County, Tacoma Tideflats, Kent Valley, and Seattle Duwamish, Spokane, Yakima, and Wallula (Sept 26, 2005) are maintenance areas.

Carbon Monoxide: Puget Sound (King, Pierce and Snohomish Counties) Yakima, Vancouver (Clark County) and Spokane are maintenance areas.

Ozone Maps

- King County
- Pierce County
- Snohomish County
- Clark County

Particulate Matter Maps

- Thurston County
- Tacoma Tideflats
- Kent Valley
- Seattle Duwamish
- Spokane
- Wallula
- Yakima

Carbon Monoxide Maps

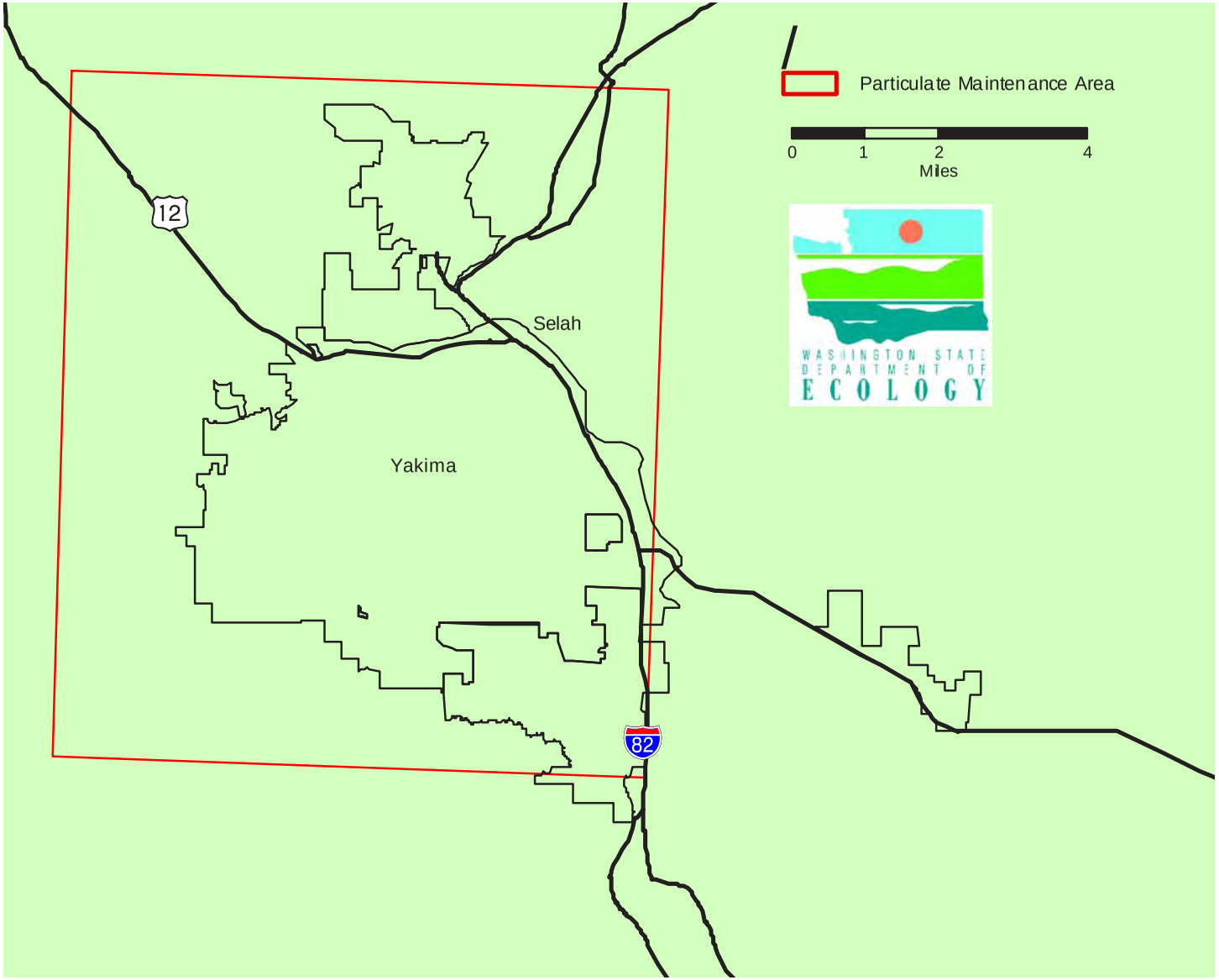
- King County
- Pierce County
- Snohomish County
- Clark County
- Spokane County
- Yakima County

Pollutant	Description	Sources	Health Effects
Carbon Monoxide (CO)	An odorless, tasteless, colorless gas which is emitted primarily from any form of combustion.	Mobile sources (autos, trucks, buses), Wood stoves, Open burning, Industrial combustion sources.	Deprives the body of oxygen by reducing the blood's capacity to carry oxygen; causes headaches, dizziness, nausea, listlessness and in high doses, may cause death.
Ozone (O_3)	Formed when nitrogen oxides and volatile organic compounds react with one another in the presence of sunlight and warm temperatures. A component of smog.	Mobile sources, Industry, Power plants, Gasoline storage and transfer, Paint.	Irritates eyes, nose, throat and respiratory system; especially bad for those with chronic heart and lung disease, as well as the very young and old, and pregnant women.
Particulate Matter PM_{10}	Particles of soot, dust, and unburned fuel suspended in the air.	Wood stoves, Industry, Dust, Construction, Street sand application, Open burning.	Aggravates ailments such as bronchitis and emphysema; especially bad for those with chronic heart and lung disease, as well as the very young and old, and pregnant women.

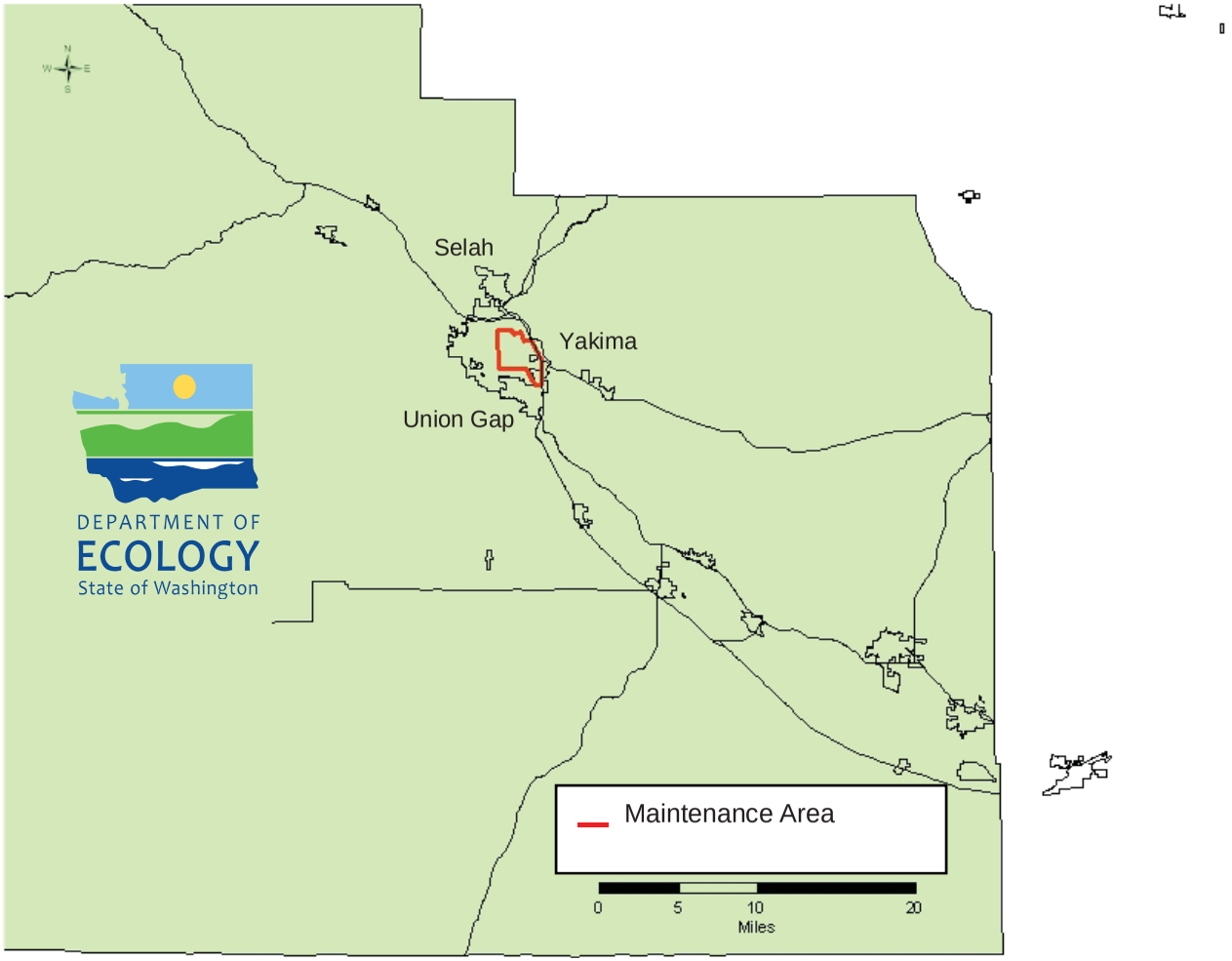
PDF forms and other type documents may require one of these free readers.

Contact Us:

Yakima County Particulate Maintenance Area



Yakima County Carbon Monoxide Maintenance Area



Appendix Q Comparison Matrix: Issues Studied in Detail

Appendix Q Comparison Matrix: Issues Studied in Detail

US Statutes, Executive Order, Or Identified Issue	Existing Conditions	Environmental Consequences		Identified Best Management or Mitigation Measures	
		Alternative A No Action	Alternative B Proposed Project	Alternative A No Action	Alternative B Proposed Project
Historic Preservation; Cultural and Archeological Resources	No historic, cultural or archeological issues have been identified at the Drop 4 location or in the immediate vicinity of the Drop 4 location. Yakama Nation (YN) Cultural Resource Program conducted a cultural resource survey of the project area in 2011. The Tribal Historical Preservation Officer (THPO) reviewed the project area and concurrent with the YN Cultural Resource Program provided a recommendation to the Cultural Committee to approve the 2011 Cultural Survey. Monitoring observations of geotechnical activities were documented in the 2011 YN Cultural Monitoring report, which additionally did not identify and issues. In 2012 the YN Cultural Resource Program completed an additional Cultural Survey. The YN THPO states in the June 5, 2012 letter that she has reviewed the documents submitted by the YN Cultural Resource Program. The THPO states that the project area has fill material and that no cultural resources were identified within the project area. The THPO recommended that cultural monitoring occur in ground disturbing activities that in areas adjacent to the drop that are not fill materials. Refer to Appendix A for Correspondence and Appendix F for YN Cultural Resource Committee action information. The total project area will include temporary easement on the east adjacent private land that was not included in the initial 2011 Cultural Survey. On April 24, 2012, YP requested that an additional cultural survey be completed of the final project area including temporary construction staging and material lay down areas.	No Change	Under the proposed project ground disturbance is an expected in an approximately 5,200 square foot (sf) area (about 1/8 of an acre) to a depth of 4 to 20 ft below existing grade. Additional adjacent private acreage that will be used for temporary construction staging and materials lay down area was not included in the initial cultural review. Cultural or archeological issues that have not previously been identified may be exposed and documented during ground disturbing activities.	None Required	The THPO and Cultural Resource Program recommendations associated with the project site inclusive of the adjacent private land used for temporary construction staging and materials lay down will need to be submitted to the Cultural Committee and a Cultural Committee Action issued prior to the commencement of construction. See Sections 3.2, 4.2 and 5.2 for additional discussion Construction efforts will require an appropriate level of monitoring throughout the construction process to help ensure that measures protective of potential cultural and archeological features are used and their intended results are achieved. Consistent with recommendations identified in the *Cultural Resources Survey Report of Yakima Power Drop 4 Phase I* report authored by Dave m. Woody, M.S., YN Archaeologist, dated January 2011 and good industry practice the following mitigation measures have been incorporated and will be implemented into the proposed action: ▪ Notify the Cultural and Archeological Department prior to initiating ground disturbance activities so that discretionary observation and monitoring can be scheduled. ▪ In the event that archaeological resources are discovered during ground disturbing tasks, work will stop or be redirected to another area of the project until the archaeological resource can be documented, its significance assessed, and appropriate mitigation strategies developed in consultation with the Tribal Historic Preservation Officer (THPO). ▪ In the event that the anticipated construction zone needs to be expanded, work will stop and an assessment of the potential for the expanded area to impact adjacent area resources will be prepared and the Tribal Cultural and Archeological Department will be consulted.
Threatened and Endangered Species Act and Potential Fish Presence	The proposed project will have **no effect** on Threatened or Endangered Species (TES). The YN Wildlife Resource Management (YNWRM) reviewed the available TES data and concluded that the proposed project will have **no effect** on the federally listed and candidate species. Refer to Appendix F for a copy of the YNWRN resource report.	No Change	No Change	None Required	None Required
	The YNFRM confirmed that the Main Canal, where the proposed project will occur, has been screened to prevent **salmonid fish from entering the waters**. Literature review indicated that Oncorhynchus mykiss (steelhead) and oncorhychus tshawytcha (Chinook) had been reported in Harrah Drain. Interviews with Mr. Nathan Longoria, Fisheries Biologist with YNFRM confirmed that Chinook have not been identified in the Harrah Drain system. The YNFRM reviewed the available fish data and concluded that the proposed project would have **no effect** on Steelhead populations in the Yakima Basin. The YNFRM decision is based on the reported Steelhead presence in Harrah Drain is more than 10 years old and the habitat present in Harrah Drain is extremely marginal. Refer to Appendix F for a copy of the YNFRM resource report and Sections 3.3, 4.3 and 5.3 for additional discussion.	No Change	Retention of water in the Main Canal for use in power generation may reduce the total flow available in Harrah Drain. The YNFRM reviewed the potential for salmonid fish to be present in Harrah Drain in the vicinity of Drop 4 and concluded that the proposed project will have **no effect** on Oncorhynchus mykiss (steelhead) populations in the Yakima Basin.	None Required	None Required

US Statutes, Executive Order, Or Identified Issue	Existing Conditions	Environmental Consequences		Identified Best Management or Mitigation Measures	
		Alternative A No Action	Alternative B Proposed Project	Alternative A No Action	Alternative B Proposed Project
Waterborne Invasive Species and Noxious Weeds	No invasive species or noxious weeds have been identified at the Drop 4 project location. For the past two years the YN Vegetative and Invasive Plant Management (VIPM) have surveyed the WIP ROW and controlling invasive plants. Refer to Appendix F for resource reports associated with invasive species and Sections 3.4, 4.4 and 5.4 for additional discussion.	No Change.	Temporary short-term construction activities could result in the translocation of invasive species or noxious weeds to the project site.	Continue invasive species and noxious weed surveys and species control on BIA ROW.	The YNFRM resource report recommended USFWS mitigation measures common to in stream work during construction to minimize the potential spread of invasive species. Similar mitigation measures are appropriate to prevent the spread of noxious weeds. Additionally, construction phasing will be sequenced such that in canal work can be completed when the canals are not in use for irrigation water conveyance. Refer to Section 3.4, 4.4 and 5.4 for additional discussion. Refer to Appendix A for correspondence and Appendix F for resource reports associated with invasive species and noxious weeds.
Design Considerations	The project is located within the WIP ROW, a manmade irrigation water conveyance system. The 2008 flow was estimated at 431 cubic feet per second (cfs) in the Main Canal in the vicinity of Drop 4, and 150 cfs in Harrah Drain. The Drop 4 location is within approximately 1,700 ft of a 34.5 kV transmission line owned and operated by Yakama Power and sourced by BPA Alfalfa substation. The Alfalfa substation operated in overheated conditions during summer peak electric demand months. The 2001 WSCC report did not include the WIP Main Canal in the water quality study; however "data gaps" were identified across all rating 10 areas of Salmonid habitat condition associated with Harrah Drain. There is no decommissioning plan for the spillway or Main Canal system in the vicinity of the Drop 4 site.	No Change.	Ground surface disturbance within the WIP ROW is estimated at approximately 5,200 sf (less than 0.125 acres). Generation of power within the existing transmission system will assist in meeting the summer peak electric demand and partially alleviate some of the strain on the Alfalfa substation. Water quality should remain unchanged as there is no routine direct contact between irrigation water and mechanical fluids or lubrications. For purposes of this EA the engineered life of the hydropower facility was estimated at 50 years. Structures constructed without considering decommissioning at end-of-serviceable life can increase the future cost of demolition.	None Required	A functional and reliable design that can be constructed within the available funding source has relatively low annual maintenance costs, and a seasonal revenue stream is essential to the success of a power generation facility project. A qualified team of YN professionals will review the design plans and refine the project criteria including considerations for future decommissioning. Construction sequencing will be coordinated such that work impacting stream banks will be completed during non-irrigation season. ▪ Spill prevention, control, and countermeasure (SPCC) BMPs will be designed into the project and will be implemented as a portion of standard operating procedures. ▪ The WIP right-of-way boundaries will be surveyed to confirm location. Any boundary line discrepancies will be resolved prior to construction implementation. ▪ The construction lay down and materials staging area will be temporarily fenced during the short construction time period. The area will be mowed, consistent with existing landowner practice, but ground disturbance is not expected to occur in this area. ▪ A gate will be installed on the existing shared gravel surfaced road access, between the construction lay down and materials staging area and the residential site to the northwest. ▪ A decommissioning plan will be developed for the Drop 4 hydropower facility prior to construction commencement.
Intentional Destructive Acts	Transportation, storage, or use of radioactive, explosive, or toxic materials does not occur at the Drop 4 site. The site does not offer any particularly attractive targets of opportunity for terrorists or saboteurs to inflict adverse impacts to human life, health, or safety.	Intentional destructive acts have the potential to occur now at the current site.	Impacts resulting from intentional destructive acts would be those resulting from the acts themselves, and would not be magnified by any aspect of the proposed project or alternatives.	None Required	Temporary construction staging and materials lay down areas should be fenced so as not to offer any particularly attractive targets of opportunity for terrorists or saboteurs to inflict adverse impacts to human life, health, or safety. Facility structures should be equipped with locks and fenced yards so as not to offer any particularly attractive targets inflict adverse impacts to human life, health, or safety.
Permit Requirements	Provisions for irrigation water to lands within the bounds of the Yakama Nation boundaries were presented in Senate Bill 6693 dated May 6, 1912. The BIA WIP continues to operate under the Senate Bill provisions.	No new permits would be required.	Delay in submitting permit applications or submitting incomplete applications can result in construction delays and increased project expense. Failure to complete regulatory required plans could result in construction delays and monitory penalties.	None Required	Permit applications and regulatory compliance plan, where required, will be completed early in the construction process so that the reviewing agency will have adequate time to process the application. Following is a summary of identified permits and regulatory compliance plans: ▪ FERC application of exemption ▪ WIP agreement ▪ CWA 401 C ▪ FARR dust suppression plan ▪ SWPPP Best Management Practice (BMP) plan

US Statutes, Executive Order, Or Identified Issue	Existing Conditions	Environmental Consequences		Identified Best Management or Mitigation Measures	
		Alternative A No Action	Alternative B Proposed Project	Alternative A No Action	Alternative B Proposed Project
Construction Implementation	During the EA scoping process the following potential issues were identified that could influence construction implementation. **Irrigation Season**: The WIP irrigation season is weather dependent and generally commences in early April and extends through late October. During this time period water is present in all of the canals and drains. **Shared Access Road**: One residential property, located approximately 250 east of Drop 4, shares a common gravel surfaced road with the WIP ROW access road.	No Change	Construction phasing will sequence work so that activities that potentially impact the canal bank, such as the inlet or outlet, are constructed during non-irrigation season. Exception for the inlet and outlet construction along the canal banks, other portions of the project are not restricted to non-irrigation season work. Installed gate systems or coffer-type dams may be used to isolate power generation facilities features that intersect the canal banks from other portions of the project that are still under construction during irrigation season. The temporary construction staging and materials lay down area is located on private land adjacent to the construction site. The primary access road to the Drop 4 site is shared with the adjacent landowner. During construction there will be a temporary short-term increase in traffic on the shared access road.	None Required	Construction implementation schedule will be developed concurrent with design considerations and permit requirements. Following are the mitigation measure associated with construction implementation issues: 1. **Canal Work**: Construction that impacts canal banks will be sequenced such that work will occur during non-irrigation season. All other work can be completed without regard to water presence in the canal. 2. **Temporary Short-term Noise Control:** Temporary short-term increases in noise generation will occur during select construction activities. Temporary short-term construction noise is anticipated to be within the range common to agriculture crop production. Construction noise generating activities will be limited to the extent feasible and will be restricted to daylight hours. 3. **Adjacent Residence Gate:** A gate will be installed across the driveway between the temporary construction staging and materials lay down area, and the adjacent residence. The gate is being constructed at the request of the adjacent landowner and will be constructed near the base of his drive to preclude unrestricted traffic from entering his residence during construction. The gate will additionally provide a visible barrier between the work site and his residence.

Appendix R Photographs

Exisitng spillway, view from southeast to northwest.

Downstream view.

Upper portion of existing spillway view to southwest.

Main Canal view to southwest of spillway.

Main Canal above spill gate view to north.

Closest residence to proposed project.

Proposed Harrah drain diversion location view to east.

Harrah drain near proposed diversion.