2.0 PROJECT ALTERNATIVES

2.1 Agency-preferred Alternative

Two primary alternatives are evaluated in this EIS: Proposed Action and No Action. The BIA's Agency-preferred Alternative is the Proposed Action for all project components. The BPA's Agency-preferred Alternative is the Proposed Action transmission line route and interconnection location with the BPA transmission system at the McNary Substation. Reclamation has not identified an agency-preferred alternative for the power plant discharge water disposal location and associated infrastructure.

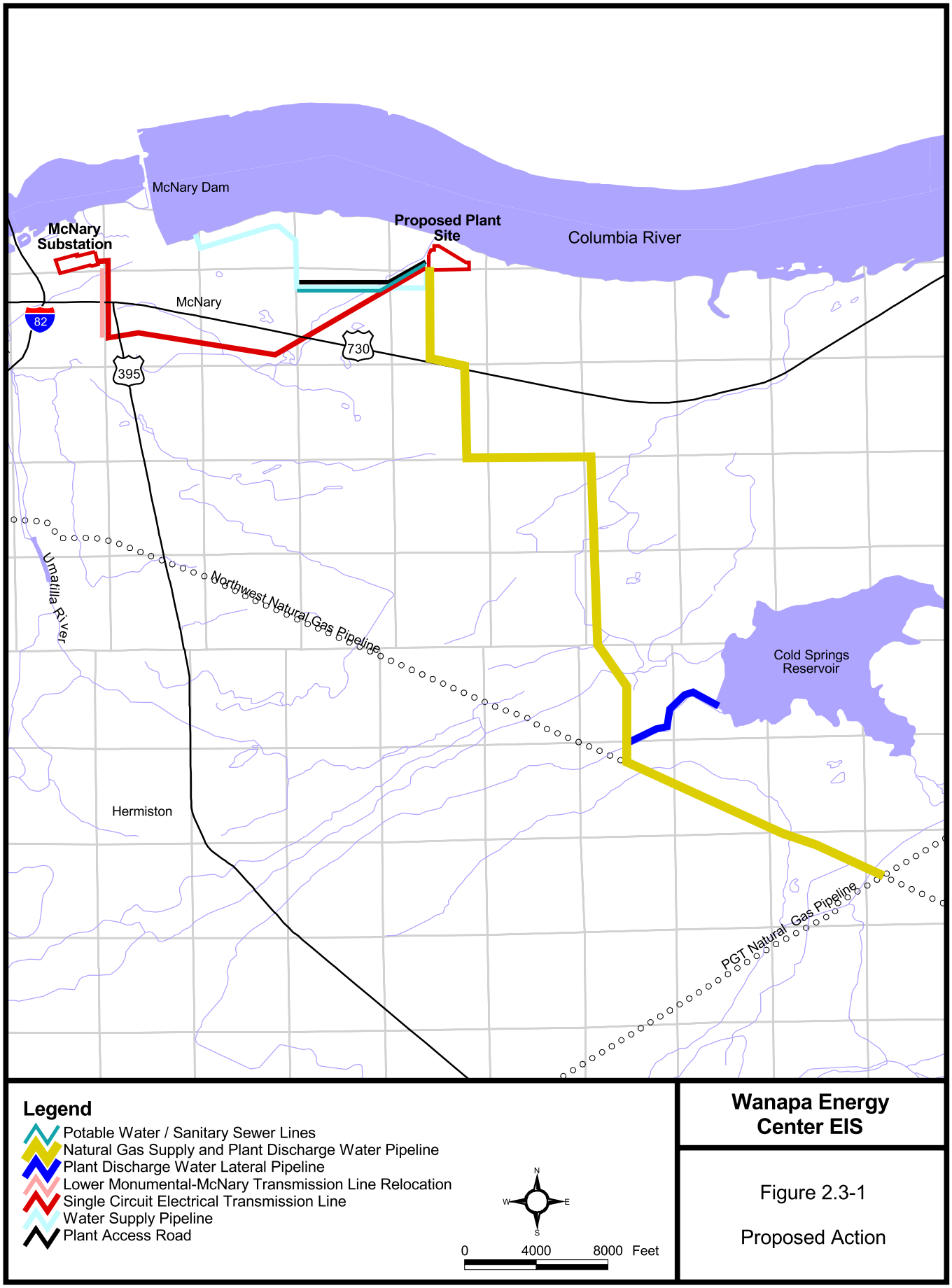
Project component alternatives (electrical transmission line, natural gas supply pipeline, and power plant discharge water disposal) have also been analyzed. Locations for these components that are different from the Proposed Action also could be selected by the lead federal agency (BIA), and cooperating agencies (BPA, Reclamation) in each agency's Record of Decision.

2.2 No Action

Under the No Action Alternative, none of the proposed Wanapa Energy Center facilities would be approved for construction by the lead and cooperating federal agencies. Evaluation of the No Action alternative is required by the Council of Environmental Quality (CEQ) Regulations for Implementing NEPA (Part 1502.14 Alternatives Including the Proposed Action).

2.3 Proposed Action

DW, the CTUIR, the Eugene Water & Electric Board, the City of Hermiston, and the Port of Umatilla would jointly build and operate, the Wanapa Energy Center, a new CCGT natural gas-fired electric power generation plant and ancillary supporting facilities. The location of the power plant and support facilities (transmission line, gas pipeline, and water pipelines) are shown in **Figure 2.3-1**. Collectively, these facilities are hereafter referred to as the Project. The following sections describe the major components of the project. **Table 2.3-1** provides the temporary and life-of-project land requirements for the various components.



Wanapa Energy Center EIS

Figure 2.3-1

Proposed Action

Table 2.3-1
Proposed Action Project Component, Surface Disturbance Areas, and Long-Term Land Requirements

	Temporary Disturbance (Acres)	Permanent Disturbance (Acres)	Permanent ROW Easement Width (feet)	Number of Structures
Plant Site	47.0	47.0	N/A	N/A
Transmission Line - Single Circuit and Access Roads	80.8	6.5	150 to 200	18
Transmission Line - Double Circuit and Access Roads	20.0	2.4	150 to 200	7
Gas ***Supply*** *Pipeline*	***128.0***	0.0	50	
Plant Discharge Water Pipeline	*1*	*1*	*2*	
Water Supply Line[3]	3.4	0.0	50	
Plant Site Access Road	8.5	4.3	25	
Total	***287.7***	***60.2***		

[1]Temporary and permanent disturbance included with gas supply pipeline.
[2]The plant discharge water pipeline would be offset 25 feet from the gas supply pipeline (same 50-foot ROW) except for the 1.6-mile segment parallel to the Feed Canal where the plant discharge water pipeline would be located in a separate 50-foot ROW.
[3]Potable water pipeline and sanitary sewer pipeline share the ROW with the water supply line from the plant to Beach Access Road.

Assumptions: Temporary disturbance width for Electric Lines = 150 feet.
Temporary disturbance width for Gas Lines = 100 feet.
Temporary disturbance width for Water Line = 50 feet.
Temporary disturbance width for Access Road = 50 feet.
Permanent disturbance for Electric Lines = number of power poles x 0.05 acre per pole.
Permanent disturbance width for Gas Lines = 0.0 foot.
Permanent disturbance width for Water Lines = 0.0 foot.
Permanent width for Plant Site Access Road = 25 feet.
Permanent width for Transmission Line Access Roads = 20 feet.

2.3.1 Electric Power Generation Plant

2.3.1.1 Location and Facilities

The proposed electric power generation plant would be located in the southern one-third of Section 7, T5N, R29E in Umatilla County, Oregon. The fenced plant site would occupy approximately 47 acres, within an overall area of 195 acres. The land would be leased from the CTUIR who, as beneficial owner, manages land within and adjacent to the site on the east and south. The northern property boundary is a fenceline located immediately south of an old railroad

grade that parallels the southern bank of the Columbia River. The Port of Umatilla owns the land situated immediately south and southwest of the site. The Two Rivers Correctional Institution (TRCI) is located on state land approximately 1 mile west of the site. The Wanaket Wildlife Area, owned by BPA and managed by the CTUIR, is located on a 1,800-acre block of land south and east of the proposed plant site.

Access to the site would be provided by the construction of a new paved road from an existing Umatilla County Road (Beach Access Road). The length of the new facility road would be approximately 1.4 miles. Beach Access Road provides access to U.S. Highway 730 (Columbia River Highway) located southwest of the site (**Figure 2.3-1**).

The electric power generation system would consist of "F class" advanced combustion turbine technology fueled exclusively with natural gas. Each gas-fired combustion turbine would be connected to a generator (CTG) to produce electricity. The exhaust gas from each combustion turbine would be directed through a structure of densely packed tubes through which water is pumped. The water would be converted into steam by the heat of the combustion turbine exhaust. These structures are called HRSGs. The steam produced in each pair of HRSGs would be combined and routed under pressure to drive one of the two steam turbine/generators to produce electricity. During periods of high electric demand, additional burners installed in the HRSGs could be fired to boost steam production and thereby provide supplemental electric generating capacity. In addition, inlet air evaporative coolers would be utilized at the inlet to each gas turbine to enhance the performance of the combustion turbine during hot weather.

Spent steam from the steam turbine/generators would be cooled and condensed in a surface condenser, using water cooled in two mechanical draft cooling structures with high performance drift eliminators. Condensed water from the surface condenser would then be sent back to the HRSG for reuse in making steam.

Since electricity is created from both the combustion turbine and the steam turbine, facilities like the Wanapa Energy Center are known as "combined-cycle" facilities. By contrast, "simple-cycle" facilities allow the hot combustion gases from the gas turbine to be released through the exhaust stack. Combined-cycle facilities are thus more efficient as they are able to generate more electricity from every unit of fuel consumed.

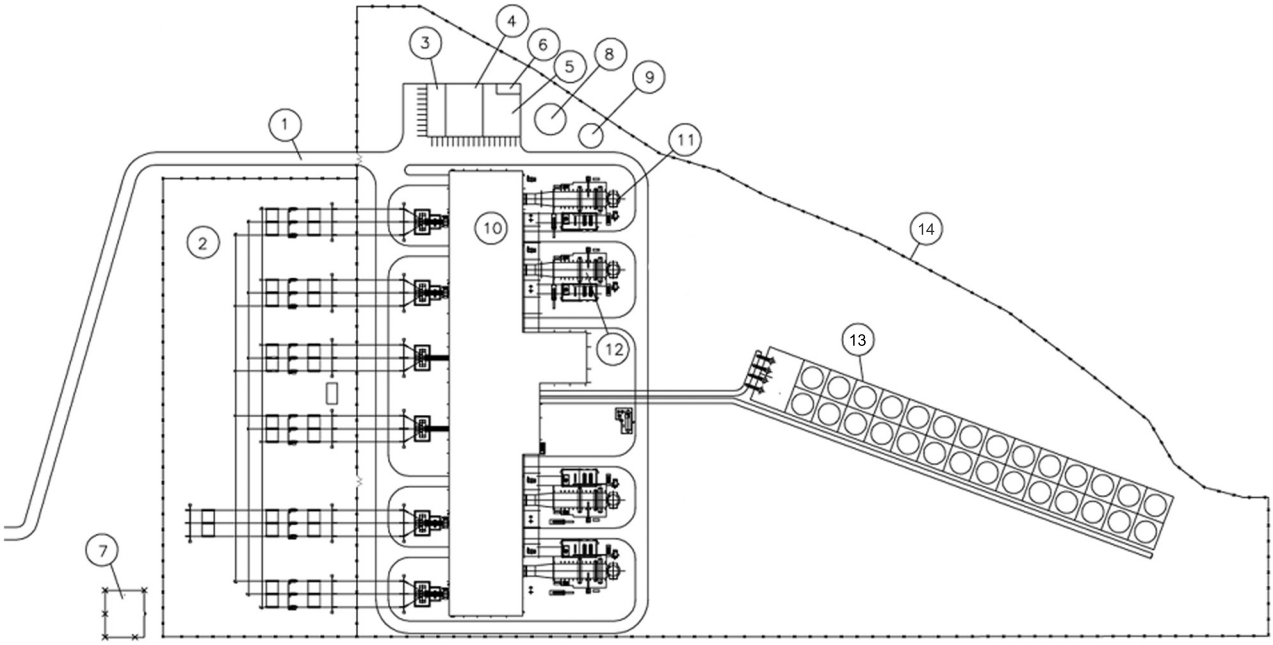
The major structural features of the facility include the turbine building, the administration building, the water treatment building, a natural gas metering building, a warehouse, switchyard, diesel fuel pumps, raw water storage tank, demineralized water storage tank, HRSGs, HRSG exhaust stacks, electrical and control modules, secondary pump modules, and cooling structures (**Figure 2.3-2**). The HRSGs and HRSG exhaust stacks would be connected to the turbine building. The site also would contain tanks for water treatment and pollution control chemicals such as aqueous ammonia, sulfuric acid, and other chemicals.

The turbine building would enclose the lead combustion turbine generators, the steam turbine generators and associated steam surface condensers, steam piping, and the control room. The administration building would contain offices, locker rooms, plant control rooms, maintenance areas, and equipment storerooms. The water treatment building would enclose the water treatment equipment and also include warehouse and maintenance facilities (**Figure 2.3-3**). The HRSGs, exhaust stacks, generator step-up transformers, cooling structures, and water storage tanks would all be located outdoors. It is anticipated that each of the 4 exhaust stacks would be 213 feet tall, which would be the tallest elements at the site. There would be two stacks for each of the two generating blocks. The cooling structures would be contained within a 110-foot x 850-foot area adjacent to the turbines.

Air emission control equipment at the project would include dry low- NO_x combustors and a SCR system for NO_x control and oxidation modules for carbon monoxide (CO) control. These technologies would allow the project to comply with the Best Available Control Technology (BACT) for all criteria pollutants, including NO_x, CO, volatile organic compounds (VOCs), particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10},) and sulfur dioxide (SO_2)/sulfuric acid (H_2SO_4). This level of BACT controls meets or exceeds all BACT controls utilized at recently permitted and constructed combined cycle power plants within Oregon and Washington.

Chemical storage areas would be surrounded by concrete containment curbing with drains that are connected to chemical collection or treatment facilities. Lockable drain valves would be used where appropriate. All areas of potential oil or lubrication spills also would be protected by concrete containment structures with drains directed to an oil/water separator. A concrete containment area would be located beneath diesel fuel tanks and filling hookup areas to capture and contain unlikely fuel spills and overfills.

FACILITIES LEGEND	
PT #	DESCRIPTION
1	ACCESS ROAD
2	SWITCHYARD
3	ADMINISTRATION BUILDING
4	WAREHOUSE/MAINTENANCE
5	WATER TREATMENT BUILDING
6	DIESEL FIRE PUMPS
7	SITE GAS METERING & CONDITIONING AREA
8	RAW WATER STORAGE TANK
9	DEMINERALIZED WATER STORAGE TANK
10	TURBINE BUILDING
11	EXHAUST STACK
12	HEAT RECOVERY STEAM GENERATOR
13	COOLING TOWER
14	SITE SECURITY FENCE



Wanapa Energy Center EIS

Figure 2.3-2

Plant Site

10/07/03

Wanapa Energy Center EIS

Figure 2.3-3

Three-dimensional Ground Level View of Plant Facilities

Storm water runoff would be contained and diverted via a system of surface drains to a holding pond with sufficient volume to hold the required design storm event. This storm water would be monitored before it is discharged through a permitted outfall offsite.

2.3.1.2 Construction

The site would be cleared and graded to provide a level surface for equipment and facilities' foundation pads. Because the site is located on basalt cap rock, some rock drilling and blasting may be required, as well as importation of fill. No off-site disposal of rock is expected. Concrete foundations and pads would be poured.

The turbine sets are very large and heavy, and may be delivered by river barge, railroad, or truck, depending upon size and weight restrictions. The major project components (turbines, HRSGs, HRSG exhaust stacks, cooling structures, storage tanks, pumps, transformers) would be delivered to the site, and installed on the concrete pads. Steam piping and electrical systems would be connected to the power generation units. The turbine building would be erected around the turbines. The remaining buildings (water treatment, administration) would be constructed in a manner to allow efficient use of man and material.

The plant would be constructed in two phases. Each phase would include one block consisting of two gas turbines, two HRSGs, two stacks, one steam turbine, one cooling structure, three generators, and other facilities for an operable generating plant.

2.3.1.3 Operation

With both phases and all turbines in operation, the plant would generate a nominal average of 28,800 MW hours per day for two 600-MW (nominal) blocks. The plant would operate 365 days per year, with periodic partial shutdowns for maintenance on an established schedule.

The electric generation process would consume approximately 10.2 million cubic feet of natural gas per hour. The volumes (tons per year) of estimated natural gas combustion emissions of priority pollutants and other compounds are summarized in Chapter 3.0.

It is estimated that operation of the Wanapa Energy Center would produce approximately 1,200 cubic yards of solid waste from routine operations per year. Waste would be stored in closed

on-site roll-off bins. Recyclable materials would be separated from the solid waste stream. Solid waste would be collected periodically by a private contractor and hauled to a licensed disposal facility.

Most of the solid waste would be generated from the water pretreatment system. The primary type of solid waste resulting from this process would be silt from the raw water supply. The silt would be removed from the raw water through a combination of filtration, flocculation, and clarification. A non-hazardous solid waste product (i.e., filter cake) would be discharged from the filter press system. The filter cake material would be delivered to a suitable disposal facility.

A variety of industrial chemicals would be required for different parts of the electric power generation process. Demineralizer regeneration chemicals would be stored in the water treatment building or in nearby tanks. HRSG feedwater treatment chemicals and laboratory chemicals would be stored in the turbine building. Aqueous ammonia for the SCR system would be stored in a double-walled tank outside the turbine building.

The following information summarizes the types of chemicals used for various plant needs.

- Demineralizer Regeneration Chemicals – Raw Columbia River water would be treated by ion exchange to produce demineralized water for the steam cycle make-up water. The demineralization systems would require the use of sodium hydroxide and sulfuric acid for regeneration of the exchange resins.

- HRSG Feedwater Treatment Chemicals – Demineralized water that would be used in the HRSG would require the addition of an oxygen scavenger, neutralizing amine solution to control pH, and phosphate for pH adjustment and scale control. These chemicals would be stored in self-contained storage tanks or containers and the chemicals would be injected into the feedwater and/or directly to the HRSGs. Periodic cleaning of the HRSGs would require the use of citric acid, sodium carbonate, sodium nitrite, sodium hydroxide, and various inhibitors. These wastewaters would be disposed of by a licensed contractor.

- SCR Chemicals – The SCR system would use an aqueous ammonia solution as a reagent for control of NO_x emissions.

- Cooling system treatment chemicals – Cooling water would be treated with small quantities of chemicals for corrosion protection, deposit control, pH control, and prevention of microbiological growth. These chemicals would include sulfuric acid, sodium hydrochlorite (bleach solution), and mixtures of inorganic phosphates, organic phosphates, and polymers. These chemicals would be stored in self-contained storage tanks or containers and the chemicals would be injected into the cooling structure basin.

- Other Materials – A number of miscellaneous chemicals, laboratory reagents, and equipment lubricants would be stored in small quantities within either the warehouse or other station buildings. Diesel fuel would be required for the diesel engine driven fire pump. Sulfuric acid would be required for the project's batteries. Compressed gases used at the project, such as carbon dioxide (CO_2) and nitrogen, would be stored outdoors in returnable cylinders. Hydrogen would be stored outdoors in high-pressure storage cylinders mounted aboveground or in trailers. Insulating mineral oil would be included with the transformer system. Sulfur hexafluoride would be used as an electrical insulating gas for the substation. Fire protection chemicals would include at least 15 Type BC (10 BC), 20-pound CO_2 hand-held extinguishers, and at least 25 Type ABC (20A120BC), 20 pound dry chemical extinguishers.

- Solid and Hazardous Wastes – Oil periodically pumped from the oil/water separators, turbine wash water, and periodic chemical cleaning wastes would be removed from the facility by a licensed hauler for disposal at a licensed facility.

Hazardous materials that would be used during the operation of the proposed project are listed in Table 2.3-2. Hazardous materials such as paints and lubricants would be stored in a diked or fenced and safe area.

Protective equipment would be provided for personnel use during chemical unloading. In addition, personnel working with chemicals would be trained in proper handling techniques and in emergency response procedures for chemical spills or accidental releases. Several programs would be developed to address hazardous materials storage, emergency response procedures, employee training, hazard recognition, fire safety, first aid/emergency medical procedures, hazardous materials release containment/control procedures, hazard communications,

Table 2.3-2
Anticipated Hazardous Chemical Use and Onsite Storage Capacity[1]

Chemical	*Chemical Use*	*Storage Capacity and Type*	*Location*
Aqueous ammonia (24.5%)[2]	*NO_X control*	*Two15,000-gallon tanks*	*Location to be determined*
Sulfuric acid (93%)	*pH and alkalinity control*	*One 1,000-gallon tank*	*Near the water treatment building*
		Two 6,000-gallon tanks	*Near the cooling tower*
Sodium hydroxide	*Softener treatment and silica removal*	*One 5,000-gallon tank*	*Near the cooling tower*
Magnesium hydroxide	*Softener treatment and silica removal*	*One 2,500-gallon tank*	*Near the cooling tower*
Polymer	*Sludge dewatering aid*	*One 250-gallon tank*	*Near the water treatment building*
Soda ash	*Softener treatment and silica removal*	*One 1,000-gallon tank*	*Near the cooling tower*
Sodium hypochlorite	*Prevention of biological growth in the raw water*	*One 100-gallon tank*	*Water treatment building*
	Control of biological growth in the circulating water	*One 4,500-gallon tank*	*Near the cooling tower*
Biocide	*Control of biological growth in the circulating water*	*One 200-gallon tank*	*Near the cooling tower*
Corrosion inhibitor	*Corrosion control in the circulating water*	*One 250-gallon tote*	*Near the cooling tower*
Anti-scalant	*Reverse osmosis scale control*	*One 50-gallon tank*	*Water treatment building*
Phosphate	*Boiler water chemistry control*	*One 75-gallon tank*	*Turbine building*
Amine	*Condensate water chemistry control*	*One 50-gallon tank*	*Turbine building*
Oxygen scavenger	*Boiler water chemistry control*	*One 50-gallon tank*	*Turbine building*
Gasoline	*Fueling motor vehicles*	*One 500-gallon tank*	*Location to be determined*
Diesel oil	*Fueling motor vehicles*	*One 500-gallon tank*	*Location to be determined*
Distillate fuel oil	*Fuel for emergency diesel driven fire pump*	*One 5,600-gallon tank*	*Fire pump house area*
Hydraulic oil	*Steam turbine operation*	*Two reservoirs of 4,600 gallons each*	*Turbine building*
	Combustion turbine operation	*Four reservoirs of 200 gallons each*	*Turbine building*
Steam turbine-generator seal oil	*Steam turbine operation*	*Two reservoirs of 14,000 gallons each*	*Turbine building*
Mineral oil	*Main transformer operation*	*Six reservoirs of 13,000 gallons each*	*Substation*
	Auxiliary transformer operation	*Two reservoirs of 2,400 gallons each*	*Substation*
Battery sulfuric acid	*Emergency batteries*	*To be determined*	*Turbine building*
Hydrogen gas	*Generator cooling*	*70,000 cubic feet of bulk storage*	*Turbine building*
Various compressed gases	*Various uses*	*To be determined*	*Various locations*

[1]*The storage capacity is estimated and would be confirmed before construction.*
[2]*To be confirmed.*

personnel protective equipment, and release reporting requirements. The plant has also committed to developing and implementing emergency plans addressing the following topics:

- ***plant evacuation,***
- ***fire or explosion,***
- ***natural gas release on-site,***
- ***natural gas release off-site,***
- ***aqueous ammonia spills on-site,***
- ***other chemical releases on-site,***
- ***diesel oil/gasoline release on-site,***
- ***floods,***
- ***weather abnormalities,***
- ***emergency freeze protection,***
- ***earthquake,***
- ***volcanic eruption,***
- ***personnel injury,***
- ***facility blackout, and***
- ***external facility threats (e.g., bomb threats).***

Details regarding the various plans would be developed and provided later.

Operation of the plant would not produce any spent fuel wastes such as ash. A small amount of sludge would result from the treatment of the plant raw water. The sludge would be disposed of in an approved landfill.

The power plant would be equipped with lights on utility poles to illuminate nighttime activities within the fenced area. Lights would be shielded to reduce glare and overall visibility from nearby public roadways and residences. The exhaust stacks would be lit with warning lights consistent with Federal Aviation Administration (FAA) requirements.

2.3.2 Natural Gas Fuel Supply

2.3.2.1 Location and Facilities

Natural gas would be supplied to the project via an underground 24-inch-diameter high-pressure pipeline that would connect to the Northwest Natural Gas Pipeline and/or Pacific Gas Transmission (PGT) Natural Gas Pipeline (**Figure 2.3-1**). The pipeline would be buried to a depth of approximately 4 feet at the top of the pipe. The pipeline would be constructed within a 100-foot-wide temporary construction ROW. A 50-foot-wide permanent ROW easement would be obtained from landowners.

The new 9.9-mile gas supply pipeline would be partially co-located with existing utilities (roads, pipelines) throughout its length. The pipeline would extend from interconnections with the Northwest and PGT pipelines where the two pipelines cross over at the Northwest Stanfield Compressor Station. The pipeline would be located parallel to Northwest Pipeline for about 2.5 miles. The pipeline would then turn northward and westward in a new ROW across farmland and rangeland to a terminus at the plant site (**Figure 2.3-1**).

A gate station would be constructed to connect the supply pipeline to the Northwest and PGT interstate main lines. The gate station would include metering, regulation, odorization, heating, and compression. The gate station would be located next to the Northwest Stanfield Compressor Station. PGT pipeline provides for sufficient pressure for direct delivery to the plant site. A gas compression system may be required at the gate station to transfer Northwest gas and to supply the required delivery pressure to the gas turbine. Current estimates indicate that 7,500 horsepower would be required to provide adequate pressure for the 1,200-MW generating plant.

2.3.2.2 Construction

The gas supply pipeline and associated aboveground installations would be designed, constructed, operated, and maintained in accordance with the USDOT regulations in 49 CFR Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*, and other applicable federal and state regulations. Among other design standards, 49 CFR 192 specifies pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel. It is

currently anticipated that the water discharge pipeline would be constructed within the same ROW as, and concurrently with, the natural gas supply pipeline.

The wastewater discharge pipeline would be located parallel to the natural gas pipeline, and would extend from the electric power generation plant, southward to the Feed Canal that delivers water to Cold Springs Reservoir. From the point where the pipelines cross the Feed Canal, a lateral wastewater pipeline would be constructed adjacent to the Feed Canal to a concrete spillway where the Feed Canal discharges water into Cold Springs Reservoir. Wastewater from the pipeline would flow by gravity over the same spillway into the reservoir. Where the two pipelines are co-located, the wastewater discharge pipeline would be offset from the natural gas pipeline by approximately 25 feet. The permanent 50-foot-wide ROW would encompass both pipelines. The wastewater discharge pipeline is discussed further in Section 2.3.4.

Landowners would be notified at least 5 days before the start of construction unless earlier notice is requested in the easement negotiations. Overland pipeline construction would generally proceed as a moving assembly line. Standard pipeline construction is composed of specific activities that make up the linear construction sequence. These operations collectively include survey and staking of the ROW, clearing and grading, trenching, pipe stringing, bending, welding, lowering-in, backfilling, hydrostatic testing, and cleanup and restoration. Special construction techniques would be used when constructing through rock and across paved roads, highways, and railroads. ***Pipelines would be bored under ditches and canals.*** It is expected that any wetlands encountered would be crossed during dry periods using standard construction techniques.

Survey and Staking

Prior to construction, the pipeline owner would complete land or easement acquisition. Civil survey crews would finalize surveys and locate, stake, and flag the pipeline centerline and the construction work area (e.g., nominal construction ROW and additional temporary workspace). Existing utility lines would be located and marked to prevent accidental damage during pipeline construction. A 100-foot-wide construction ROW with additional temporary use areas adjacent to the ROW where expanded work zones are needed would be staked.

Clearing and Grading

Fences would be cut before clearing and grading are conducted to provide access for equipment. Landowners would be notified of construction plans and schedules on their property. Any fence that needed cutting would be braced and secured to prevent the slacking of wires. Temporary gates would be installed across openings to control livestock and limit public access.

The construction ROW would be cleared of vegetation and graded to provide a level work surface for trench excavating equipment and a sufficiently wide work space for the passage of heavy construction equipment. Backhoes or wheel trenchers and rock saws, where necessary, would be used to excavate the pipeline trench. Excavated soil would be stockpiled adjacent to the trench. Subsoil would be segregated from topsoil and stockpiled in separate windrows. Temporary erosion controls would be installed immediately after initial disturbance of the soils and would be maintained throughout construction.

Trenching

Trenching of the ditch would conform to USDOT Title 49 CFR, Part 192 regulations. The pipeline trench would be excavated to a minimum width of approximately 12 inches wider than the diameter of the pipe and a minimum depth of approximately 6 feet to provide for a minimum of 4 feet of cover over the pipe. A bucket wheel excavator or a backhoe would normally be used for trench excavation. Where access across the trench is required, trench plugs or steel plates would be installed to permit safe crossing for livestock, wildlife, vehicles, equipment, or people. Fencing also would be installed at the access points to prevent entry into the trench.

In areas where rock is too extensive to trench, a rock saw would be used to cut and remove the rock. If the rock or sand produced from the cutting operation is deemed usable, it would be used as backfill. Any rock determined to be unsuitable as backfill material would be hauled off to an authorized disposal location and new, approved backfill material would be brought in.

Pipe Stringing, Bending, and Welding

Following trenching, sections of externally coated pipe would be transported by truck to the construction ROW, and placed or "strung" along the trench in a continuous line. Individual sections of the pipe would be bent where necessary to fit the contours of the trench, aligned,

welded together into long strings, and placed on temporary supports along the edge of the trench. Welds would be x-rayed to ensure structural integrity. Those welds that do not meet established specifications would be repaired or removed. Once the welds are approved, the welded joints would be coated with a protective coating equal to the rest of the pipeline to protect the pipeline from corrosion.

Lowering-In and Backfilling

The trench would be dewatered (if necessary), cleaned of debris, and padded as necessary before the pipeline is lowered into the trench. The welded pipe would be progressively lowered into the trench as work proceeds along the excavated trench. Warning tape would be placed over the pipe to warn unauthorized third-party excavators of the presence of the pipeline beneath. Trench barriers and breakers would be installed before backfilling to prevent water movement along the pipeline. Backfilling machines, backhoes, and graders would be used to backfill the pipeline trench. The trench would be backfilled using the excavated materials; subsoil would be replaced first, then the topsoil. If the excavated material is rocky, the pipeline would be padded with select fill from commercial borrow areas or by separating suitable material from the existing trench spoil. No topsoil would be used for pipeline padding. No foreign substances, including skids, welding rods, containers, brush, trees, or refuse of any kind, would be permitted in the backfill. If the subsoil material excavated from the trench is not suitable for any other reason, suitable material would be brought in as fill. After the trench is backfilled, the interior of the pipeline would be cleaned of any dirt, water, or debris by pipeline cleaning "pigs," which are propelled through the pipeline.

Pipe Testing

After backfill and cleaning, the pipeline would be hydrostatically tested or tested by an alternative approved method, according to USDOT specifications. If hydrostatically tested, water would be obtained from nearby surface waters or available municipal supplies. Test water would be pumped into each test section, pressurized to design test pressure, and maintained at that pressure for at least 8 hours. Any leaks detected would be repaired and the pipeline retested until the specifications are met. After testing a segment, the water may be pumped into the next test segment, discharged either through an energy dissipater and erosion control device off ROW, in upland areas, back into the source waterbody through an aeration type energy dissipater, or into a transport trailer tank.

Cleanup and Restoration

All work areas would be final graded and restored as closely as possible to preconstruction contours. To minimize future settling, the trench would either be crowned (with landowner permission) or compacted with tracked construction equipment. Surplus construction material and debris would be removed and disposed of at appropriate facilities. Initially, subsoil would be ripped to help alleviate compaction in agricultural areas and the topsoil would be returned to its original horizon. Permanent erosion controls (waterbars or slope breakers) would be installed within the ROW, except in agricultural and pastureland where the landowner has not consented to their installation.

Restoration would begin within 6 days of final grading, weather and soil conditions permitting, and the construction work areas that are not in cultivated croplands would be fertilized and seeded. The pipeline owner would be responsible for using reclamation seed mixes recommended by the Natural Resources Conservation Service (NRCS) for reclamation of the construction ROW and other disturbance areas. Specific seed mixes would be reviewed and approved by the appropriate agencies or landowners prior to application.

Private property, such as fences, gates, and driveways, would be restored to a condition equal to or better than preconstruction condition, and pipeline markers and warning signs would be installed at roads as required. In areas of new ROW, off-road vehicle control (trees, slash and timber barriers, gates, and fencing) may be installed as agreed with each landowner or land management agency.

Special Construction Situations and Techniques

Where pipeline construction would parallel an existing public road, the pipeline contractor would ensure that one traffic lane is always open, and that private driveways remain accessible. Depending upon the permits received from local and state agencies, major roadways would be bored to avoid damage to the surface and travel disruptions. Special construction methods may be required in basalt outcrop areas (trench blasting), and in large wetlands where saturated soils may be present. No new long-term access roads would be constructed to support pipeline operation.

- Rock – When rock is encountered during trenching, it would be cut and removed using a rock saw. If the rock or sand produced from the rock saw is deemed usable, it would be used as

backfill. Any rock determined to be unsuitable as backfill would be hauled off and new approved backfill would be brought in.

- U.S. Highway 730 Crossing – The geology in the area of this crossing is assumed to be mostly rock. Currently, an open cut trench is planned for this crossing, utilizing a rock saw. A traffic control plan would be implemented to minimize the effects on local traffic along this highway.

- Railroad and Canal Crossings – To avoid loss of service by open cut trenching of the railroad and canal crossings, the pipeline contractor would propose to use directional drilling or boring techniques as their first option. For directional drills or bores, pipe that is double-coated with standard yellow extruded polyethylene (X-True coat) and a minimum 0.25-inch Priatec extruded polyethylene coating would be installed. Two heat-shrinkable sleeves would provide appropriate protection at the joints of the entry and exit of the bore pipe.

- Proximity issues – Sufficient distance would be maintained from residential dwellings along the proposed route for safety reasons. Proximity to structures could result in minor route realignments, once a more detailed route survey is completed (see discussion of residential and farm structure locations in Chapter 3.0, Section 3.8) in relation to the pipeline.

2.3.2.3 Operation

The pipeline would deliver gas to the plant to meet the 10.2 million cubic feet per hour demand. To ensure integrity of the pipeline and to minimize any potential for pipeline failure, the completed pipeline system (including all ancillary facilities) would be operated and maintained in accordance with the applicable federal USDOT safety standards at 49 CFR, Part 192, and other applicable federal and state regulations. Operation and maintenance activities would include aerial and ground inspections, pipeline marker replacement, corrosion inspections, and stability and vegetation reestablishment inspections, among others.

2.3.3 Water Supply and Treatment

2.3.3.1 Location and Facilities

Water for the proposed power plant would be obtained from the Port of Umatilla's regional raw water supply system. The Port of Umatilla diverts water from the Columbia River into the regional

raw water supply system in accordance with an existing municipal water use permit from the State Oregon approved in 1979 (***Permit No. 49497***). Presently, the permit is under an extension application, which would extend the permit date. No new state-administered water right, water rights transfer, or surface or groundwater permit would be needed for this water supply. The Port of Umatilla's raw water system serves the City of Hermiston and industrial users in northwestern Umatilla County. The committed uses represent a total of approximately 23.4 cubic feet per second (cfs) out of the total water right of 155 cfs (100.17 million gallons per day).

The present water intake system at the Port of Umatilla was built in 1995. The Section 10/404 permit with the USACE, Portland District was completed in 1994 (USACE 1994). The intake system is located at the Port of Umatilla Dock (River Mile [RM] 293 in the Columbia River) upstream of the boat launch ramp above the McNary Dam. It consists of a platform in the river with four canisters to hold pumps with three turbine type pumps installed and a fourth one to be installed in the existing empty canister if needed, pipelines to take water from the pumps to end-users, and a water treatment plant. A fourth pump would be added to the vacant canister if required to provide water for the Wanapa Energy Center and by making minor modifications to the pump manifold, if necessary. A pump house encloses the turbine pumps, air compressors, and other control equipment. No new construction in the river intake area would be required for the modification. The intake system contains a screen with 0.125-inch openings and maximum approach velocity of 0.4 cfs. These design features follow the National Marine Fisheries Service (NMFS) criteria for protecting salmonid species. The water supply pipeline from the pump house to the shoreline is attached above the pier deck.

The proposed location of the water supply pipeline is shown on **Figure 2.3-1**. ***A separate water pipeline for m***unicipal water would be ***constructed*** for sanitary, potable, and ***miscellaneous minor*** process uses. The project would interconnect with the municipal system at the nearest point where municipal water is available, likely ***at the intersection of Beach Access Road and the access road to the Two Rivers Correctional Facility***.

The HRSGs require the use of demineralized water since water impurities can accumulate in the steam tubes or damage the steam turbine blades. Therefore, water for process use would be demineralized at the project site. A tank would be constructed to hold the demineralized water. The cooling water reserve supply stored in the raw water storage tank would help avoid disruption in facility operation in the event of a disruption of water flow from the Port of Umatilla.

2.3.3.2 Construction

The steel (or plastic) water supply pipeline would be constructed using the same excavation, installation, and reclamation methods described for the natural gas supply pipeline. However, the water supply pipeline would not be subject to the weld and pipe strength tests required for gas supply lines. Construction of the demineralization system would be part of the overall plant construction process.

2.3.3.3 Operation

The project water demand would vary seasonally, depending upon the heat loading and evaporative cooling requirements. The estimated project withdrawal volume would be approximately ***8 to 12 million*** gallons per day, which represents ***8 to 12 percent*** of the total Port of Umatilla water right.

The volumes of raw water utilized by the project are represented in various units through the EIS. Table 2.3-3 lists the average and maximum water use rates in various units.

Table 2.3-3
Raw Water Supply

Annual Average and Maximum Flow Rate	*Raw Water Supply Two Blocks*	*Raw Water Supply One Block*
Average flow rate (annualized over 12 months)	*5,550 gallons per minute* *12.4 cfs* *8.02 MGD* *24.6 acre-feet/day* *8,979 acre-feet/year*	*2,775 gallons per minute* *6.18 cfs* *4.01 MGD* *12.3 acre-feet/day* *4,490 acre-feet/year*
Maximum flow rate	*7,975 gallons per minute* *17.7 cfs* *11.5 MGD* *35.2 acre-feet/day* *12,864 acre-feet/year*	*3,988 gallons per minute* *8.85 cfs* *5.6 MGD* *17.6 acre-feet/day* *6,432 acre-feet/year*

2.3.4 Process Cooling System and Wastewater Generation

2.3.4.1 Location and Facilities

A recirculating cooling system with mechanically induced draft evaporative cooling towers completed with highly efficient drift eliminators, would be used to minimize water use. The cooling towers would be located on the east side of the plant site, where they would receive hot water from the steam cycle condenser (**Figure 2.3-2**). Water (make-up water) would be added to the cooling system to compensate for evaporative losses, and the cooling tower drift and blowdown. An initial evaluation of the existing Columbia River water quality at the McNary Dam indicated that cooling water could be recirculated through the cooling system about 6 times and still meet applicable discharge standards for aquatic and wildlife use. An oil/water separator is proposed for treatment of process water in each power block and the demineralizer regeneration wastes would be neutralized. No additional process wastewater treatment is proposed. A domestic sewage pipeline would be connected to the ***City of*** Umatilla municipal system. Another option would be to treat sewage on site with a septic tank and leach field.

By meeting ***Oregon's aquatic*** and wildlife water quality standards ***(which are the most stringent of state water quality standards)***, the plant discharge would be suitable for discharge to surface water. The proposed ***plant discharge water pipeline*** route is illustrated on **Figure 2.3-1**. ***A process water retention pond with a 30-day storage capacity would be constructed and the plant discharge water*** would be conveyed by a ***16***-inch pipeline ***from the retention pond*** to a discharge point at the end of the Feed Canal immediately upstream of Cold Springs Reservoir. The water would be stored in the reservoir where it would mix with water delivered from the Umatilla and Columbia rivers. This water is then withdrawn for agricultural purposes.

2.3.4.2 Construction

Construction methods for the ***plant*** discharge water pipeline would be the same as those described for the gas and water supply pipelines. It is currently anticipated that the water discharge pipeline ***to the Cold Springs Reservoir*** would be constructed within the same ROW as, and concurrently with, the natural gas supply pipeline, and that it would extend from the electric power generation plant, southward to the end of the Feed Canal, where the ***plant discharge*** water would be ***released***. The ***plant*** discharge ***water*** pipeline would be offset from the natural gas pipeline by approximately ***25*** feet ***until the point where the gas pipeline and plant discharge water pipeline are no longer***

co-located.. The permanent ***50***-foot-wide ROW would encompass both the natural gas pipeline and the ***plant discharge*** water pipeline.

2.3.4.3 Operation

The ***estimated plant*** discharge ***water*** volume would be ***2.2*** million gallons per day under high ambient heat load conditions (summer), and about ***1.6*** million gallons per day under average ambient heat loads. These daily discharge volumes translate to discharge rates of ***1,527*** gallons per minute and ***1,111*** gallons per minute, respectively. The ***plant discharge water*** temperature is estimated to average 70 to 75 degrees Fahrenheit (°F).

The volumes of plant discharge water utilized by the project are represented in various units throughout the EIS. Table 2.3-4 lists the average and maximum water discharge rates in various units.

Table 2.3-4
Plant Discharge Water

Annual Average and Maximum Flow Rate	*Discharge Flow for Two Blocks*	*Discharge Flow for One Block*
Average flow rate (annualized over 12 months)	*1,111 gallons per minute* *2.4 cfs* *1.6 MGD* *4.8 acre-feet/day* *1,752 acre-feet/year*	*544 gallons per minute* *1.2 cfs* *0.8 MGD* *2.4 acre-feet/day* *876 acre-feet/year*
Maximum flow rate (instantaneous)	*1,527 gallons per minute* *3.4 cfs* *2.2 MGD* *6.7 acre-feet/day*	*754 gallons per minute* *1.7 cfs* *1.1 MGD* *3.35 acre-feet/day*

2.3.5 Electric Power Transmission

2.3.5.1 Location and Facilities

In response to a request from the applicant for interconnection and firm transmission, BPA may design and construct a 500-kV transmission system from the proposed 1,200-MW Wanapa Energy

Center in Umatilla County, Oregon, to BPA's existing McNary Substation in Umatilla County, Oregon. BPA would own and operate the interconnection transmission system.

Single-circuit 500-kV transmission structures would be constructed from the power plant site to McNary Substation. The length of the transmission line would be approximately 23,000 feet (4.36 miles) long. The proposed alignment parallels existing utilities (roads and transmission lines) over the majority of its length.

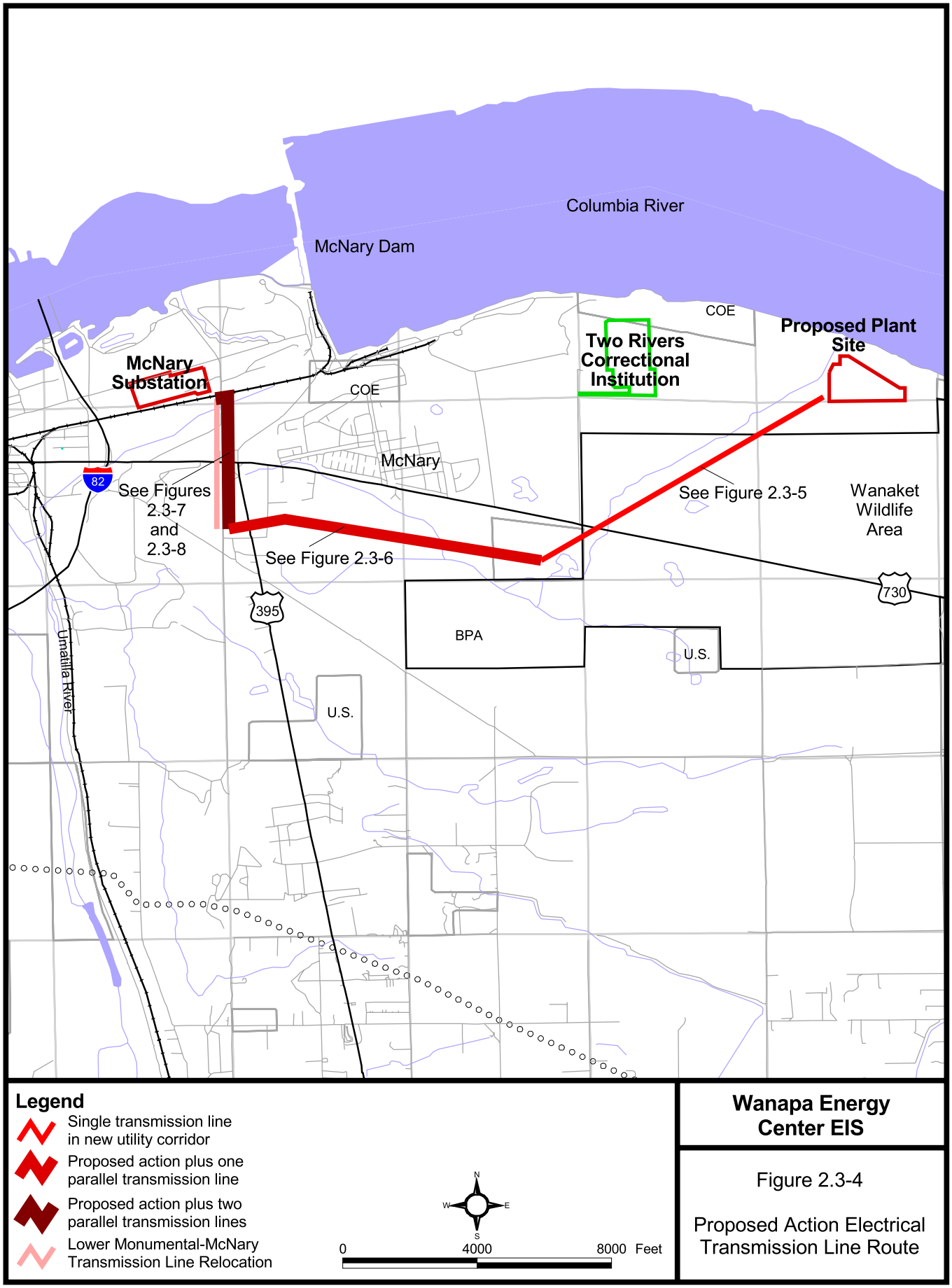
The new transmission line would traverse southwest from the project site in a new utility corridor until crossing and going south of U.S. Highway 730. The transmission line would then join the existing BPA transmission utility corridor and traverse west/northwest. Just after crossing U.S. Highway 395 and before turning north, the last ***5,800*** feet of the existing Lower Monumental-McNary line would be relocated onto new ***single***-circuit structures in a new corridor 125 feet east of the double-circuit structures that carry Calpine-McNary and McNary Loop to Lower Monumental-John Day. The new Wanapa-McNary line would then be connected to McNary Substation on the existing 500-kV single circuit structures in the corridor previously occupied by Lower Monumental-McNary (**Figure 2.3-4**).

Figures 2.3-5, 2.3-6, 2.3-7*, and 2.3-7a* illustrate the appearance of transmission line structures in corridors containing one, two, and three transmission lines, respectively. **Figure 2.3-8** shows where proposed Wanapa-McNary transmissions would replace the existing lower Monumental-McNary transmission line, and where a new single-circuit transmission line would be installed on double-circuit structures to carry the re-located lower Monumental-McNary transmission line. The other circuit would be reserved for a future transmission line interconnecting with the McNary Substation.

The facilities, equipment, and features to be constructed in the transmission line project include:

- About 25 steel lattice transmission structures, to support conductors, insulators, fiber optic cable, and ground wire;

- Counterpoise for lightning protection (buried around the structure);



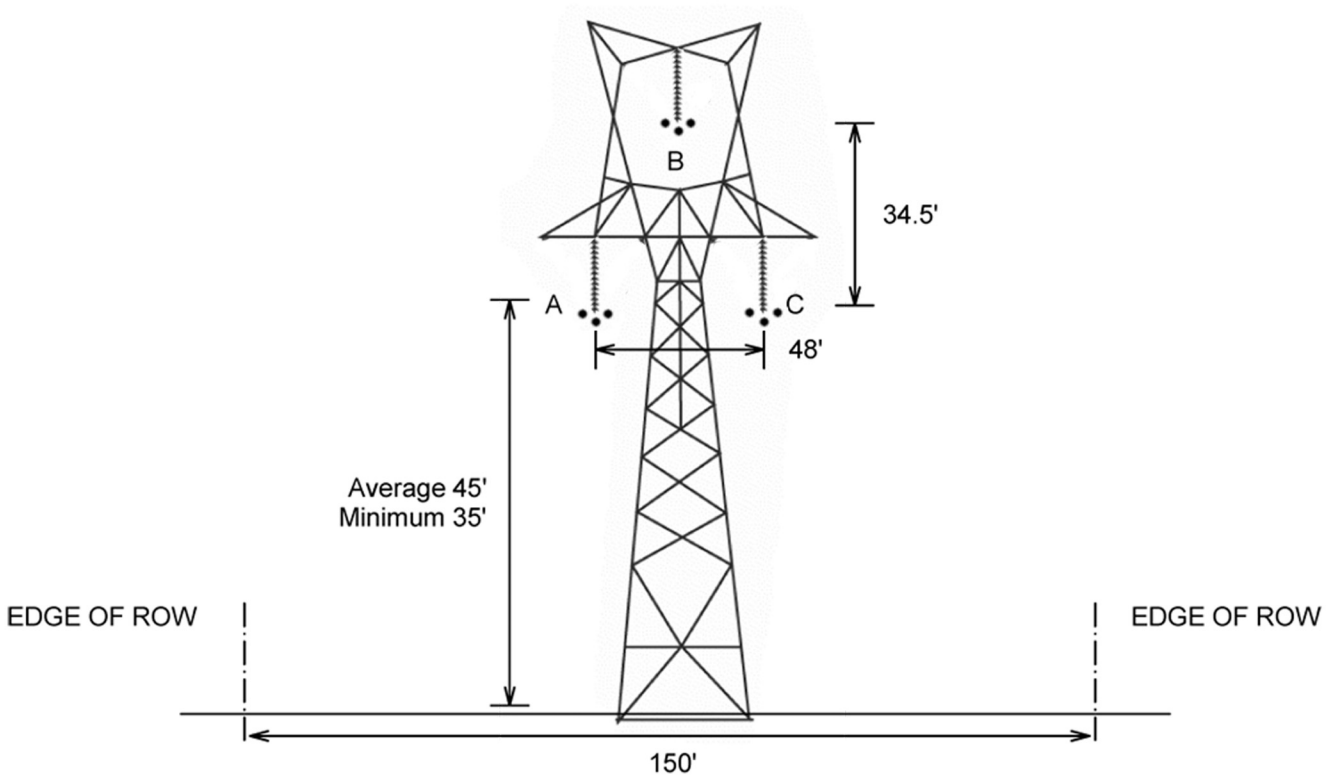
Wanapa Energy Center EIS

Figure 2.3-4

Proposed Action Electrical Transmission Line Route

11/24/04

Proposed Wanapa-McNary 500-kV Line
Voltage: 540 kV (average), 550 kV (maximum)
Peak current: 1445 (proposed)
Conductors: 3 x 1.300 in., 17.04 in. spacing

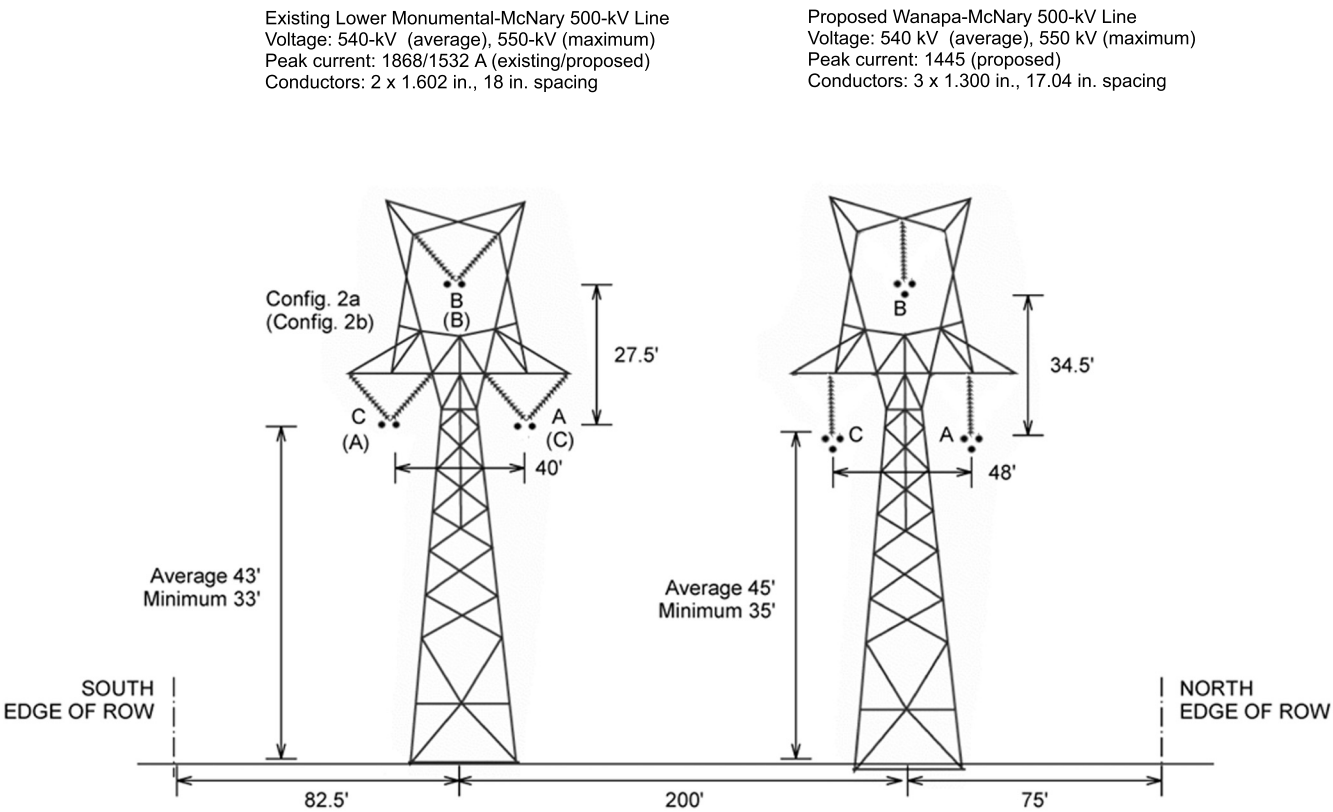


Source: BPA, 2003.

Wanapa Energy Center EIS

Figure 2.3-5

Configurations for the Proposed Wanapa-McNary 500-kV Line Proposed Line with No Parallel Lines



Source: BPA, 2003.

Wanapa Energy Center EIS

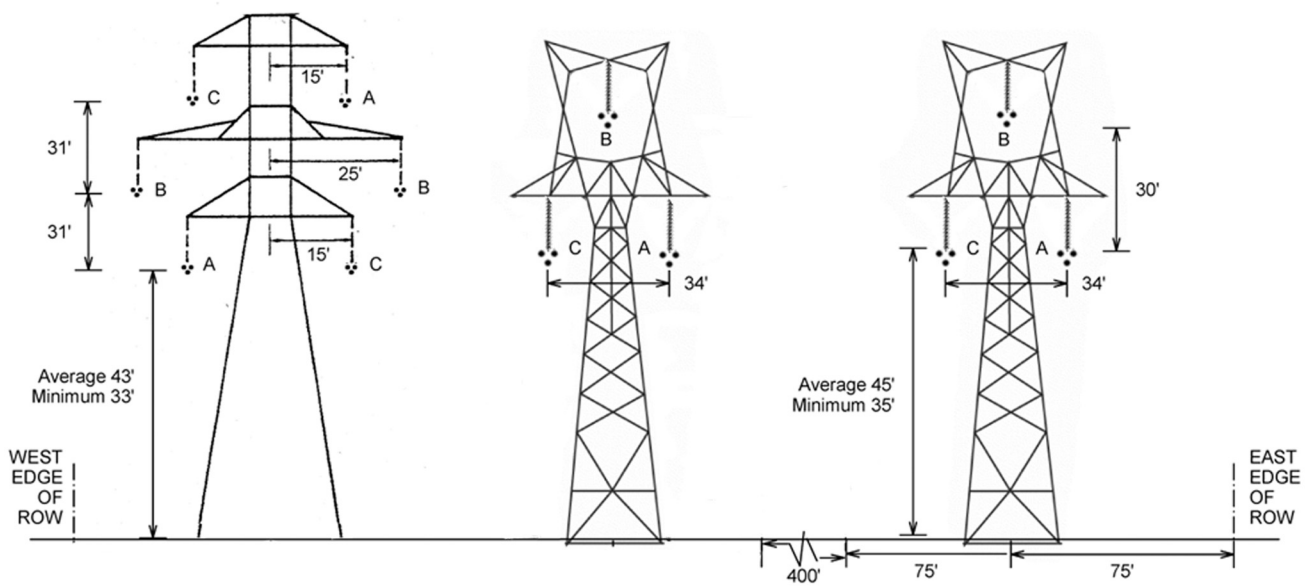
Figure 2.3-6

Configurations for the Proposed Wanapa-McNary 500-kV Line Proposed Line with One Parallel Line

Existing McNary-Coyote (Slatt)/
Calpine-McNary 500-kV Double-Circuit
Voltage: 540-kV (average), 550-kV (maximum)
Peak current: -1733/591 A (existing)
-1803/591 A (proposed)
Conductors: 3 x 1.302 in., 17.04 in. spacing

Proposed BPA 500-kV line with
relocated Lower Monumental-McNary 500-kV Line
Voltage: 540-kV (average), 550-kV (maximum)
Peak current: 1532 A (proposed)
Conductors: 3 x 1.300 in., 17.04 in. spacing

Replacement of Lower Monumental-McNary 500-kV Line with
Proposed Wanapa-McNary 500-kV Line
Voltage: 540-kV (average), 550-kV (maximum)
Peak current: 1868/1445 A (existing/proposed)
Conductors: 3 x 1.302 in., 17.04 in. spacing



Source: BPA, 2003.

Wanapa Energy Center EIS

Figure 2.3-7

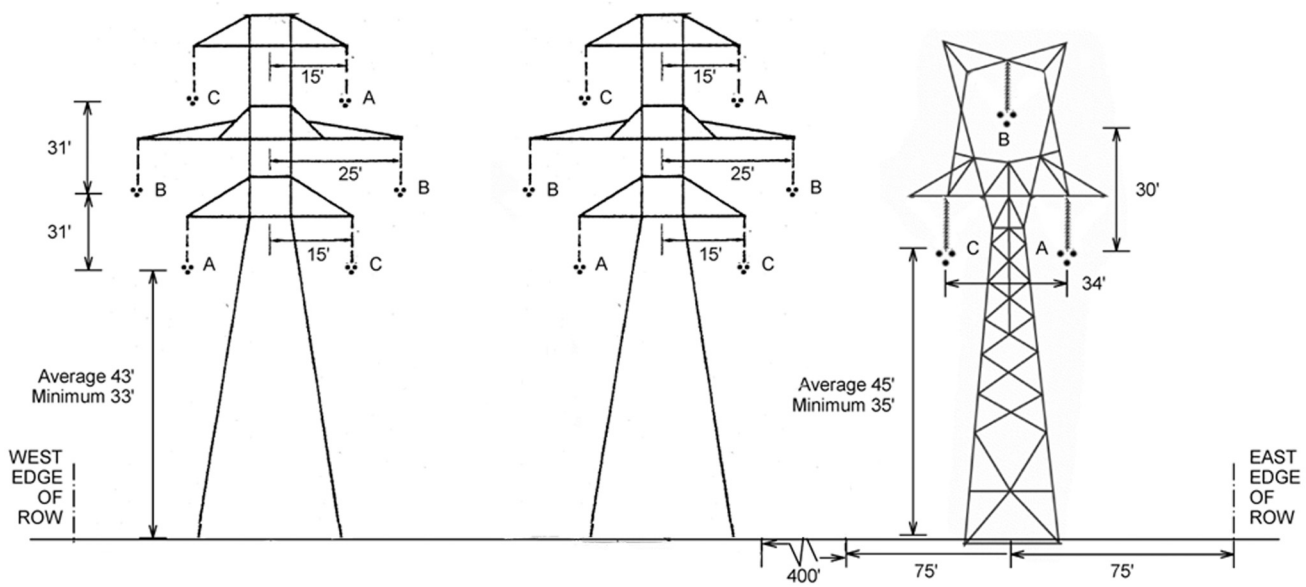
Configurations for the Proposed Wanapa-McNary 500-kV Line Proposed Line with Two Parallel Lines

12/01/04

Existing McNary-Coyote (Slatt)/
Calpine-McNary 500-kV Double-Circuit
Voltage: 540-kV (average), 550-kV (maximum)
Peak current: -1733/591 A (existing)
-1803/591 A (proposed)
Conductors: 3 x 1.302 in., 17.04 in. spacing

Alternative 1 BPA 500-kV line with
relocated Lower Monumental-McNary 500-kV Line
Voltage: 540-kV (average), 550-kV (maximum)
Peak current: 1532 A (proposed)
Conductors: 3 x 1.300 in., 17.04 in. spacing

Replacement of Lower Monumental-McNary 500-kV Line with
Proposed Wanapa-McNary 500-kV Line
Voltage: 540-kV (average), 550-kV (maximum)
Peak current: 1868/1445 A (existing/proposed)
Conductors: 3 x 1.302 in., 17.04 in. spacing

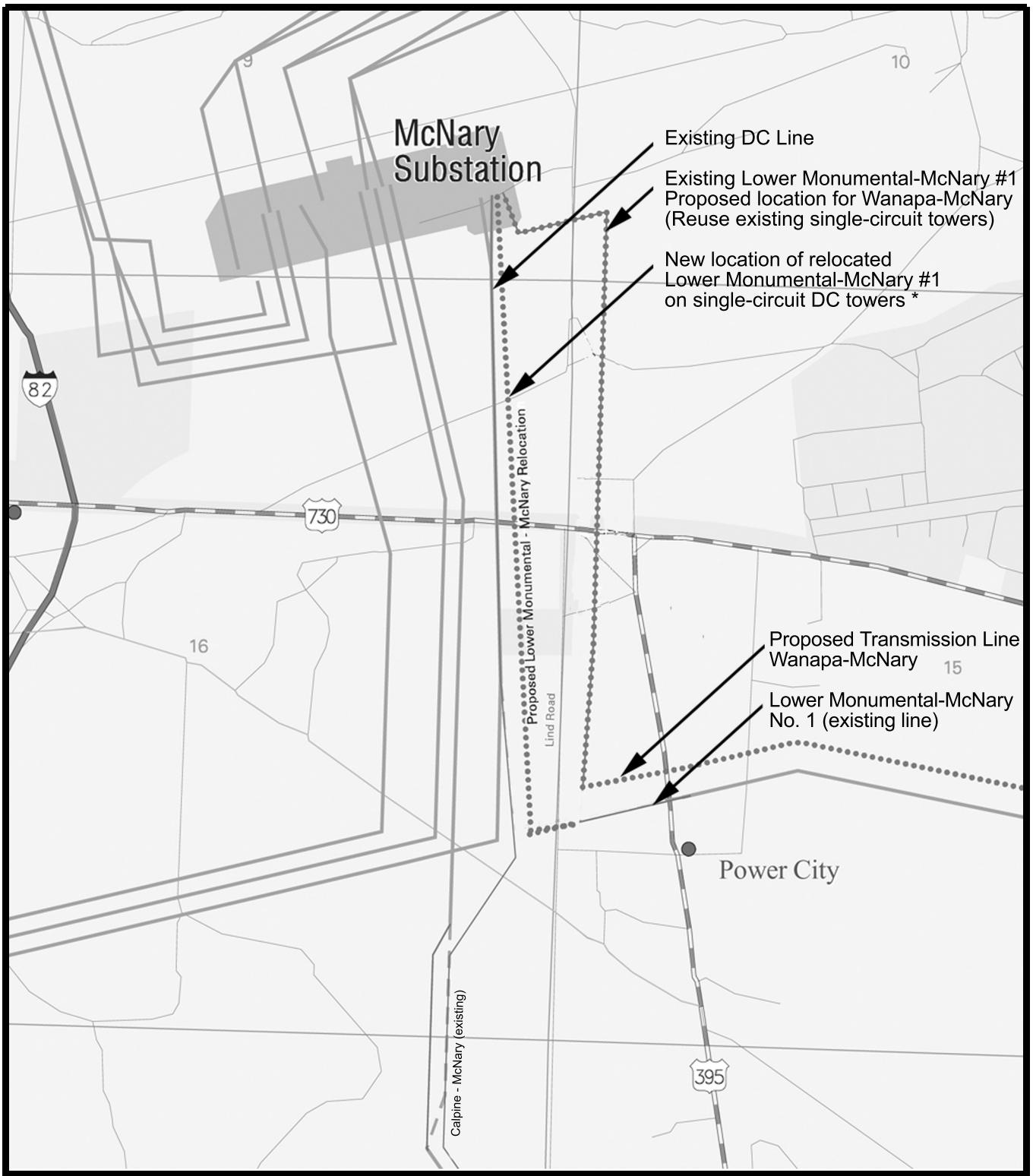


Source: BPA, 2003.

Wanapa Energy Center EIS

Figure 2.3-7(a)

Configurations for Alternative 1 Wanapa-McNary 500-kV Line Proposed Line with Two Parallel Lines



* See page 2.4.2 for description of optional transmission structure for Proposed Action and Line Alternative 1.

Source: BPA, 2003.

Wanapa Energy Center EIS

Figure 2.3-8

Electrical Transmission Line Modifications at McNary Substation to Accommodate the Wanapa Energy Center Project

- ROW purchases for transmission line corridor segments would vary from 150- to 200-foot-wide permanent ROW and access roads;

- 20 to 30 new spur roads, each approximately 250 feet long;

- Approximately 2 miles of new access roads;

- Culverts;

- New gates;

- Installation at the McNary Substation of equipment including a power circuit breaker, a disconnect switch, bus tubing and pedestals, and a substation dead end structure;

- A transmission dead end structure at both substations; and

- A switchyard at the Wanapa site, including all equipment listed above, plus a switchyard fence and rock surfacing.

The McNary Substation would be expanded about 160 x 750 feet, outside of the existing fence line on land to be acquired from the USACE, to accommodate the Wanapa Project.

2.3.5.2 Construction

Construction of the new electrical transmission line ROW would require obtaining 150-foot to 200-foot easements for the construction. Approximately 200 feet of new ROW width would be needed where the transmission line would be located parallel to an existing BPA transmission line.

System reliability requirements led BPA system planners to suggest a transmission line location at least 1,200 feet from the existing Lower Monumental-McNary 500-kV transmission line to protect against simultaneous dual outages of both 500-kV transmission lines. BPA system planners subsequently determined that a 1,200-foot separation would not be necessary because the consequence to overall transmission system reliability resulting from the loss of both transmission lines along this route would not be significantly worse than loss of a single transmission line. As a result, it is now proposed to locate the new transmission line about 200 feet from the existing

Lower Monumental-McNary 500-kV line. Configurations for the proposed new line in relationship to existing lines are illustrated in **Figure 2.3-8**.

The construction phases of the transmission line would consist of ROW acquisition and clearing, access road construction, structure construction and installation, conductor installation, and site restoration and cleanup. Each of these phases is described in greater detail below.

Clearing

Clearing around the structures and switchyards would include removal of all brush and debris and possibly grading to level the working area. On average, an area of approximately 0.25 acre would be disturbed for each of the structures required to support the transmission lines. Therefore, a total of 6.25 acres would be cleared or disturbed for transmission line structure placement.

Access Roads

Access roads are the system of roads that BPA's construction and maintenance crews would use to get to the structures or structure sites along the line. The roads would be designed to be used by cranes, excavators, supply trucks, boom trucks, log trucks, and line trucks. The transmission line access road system would include a ROW width of 50 feet for new roads and 20 feet for existing roads. BPA prefers road grades to be 15 percent or less, depending on the erosion potential of the soil. Roads are graded to provide a 16-foot-wide travel surface (somewhat wider on curves), with about 20- to 25-foot-wide total area disturbed (including drainage ditches), depending on site conditions (i.e., slope of road, soils, terrain, etc.). The road surface would consist of dirt, gravel, or rock.

Much of the existing transmission line corridor lies within 0.5 mile of public highways. Where the proposed transmission line parallels next to existing lines for most of the route, the proposed new line would utilize the existing access roads. The new transmission line could require some upgrades to existing access roads, construction of new access roads, construction of new access road spurs, and purchase of new access easements.

Staging Areas

Temporary staging areas would be needed along or near the proposed transmission line for construction crews to store steel structure components, conductor spools, other materials, and trucks. These materials would be delivered by truck to storage yards near the ROW.

Structure Footings

Four types of footings could be used, depending on the terrain and structure type: plate, grillage, rock anchors, or concrete footings.

Plate footings are 4-foot by 4-foot steel plates buried 10 to 12 feet deep.

Grillage footings are 12.5-foot by 12.5-foot assemblies of steel I-beams that have been welded together and buried 14 to 16 feet deep. Grillage footings are used to support heavier structures, such as dead end structures.

Rock anchor footings are used when a structure is built on bedrock. Holes are drilled into the bedrock, steel anchor rods are secured within the holes with concrete, and the structure footings are then attached to these rods. A track hoe is used to excavate the soil to allow footing placement. The excavation is usually 1 to 2 feet larger than the footing to be installed. Additional footing excavation could be required in certain soil types. The soil and rock materials removed are later used to backfill the excavation once the footings are installed. Excess material would be stockpiled and spread along the ROW.

Concrete footings are often used on a lattice steel structure when it is built in water or a wet area. There are two types of concrete footings that could be used. One type of concrete footing is steel reinforced concrete pier extending approximately 1 foot above the ground surface. ***This type of footing is excavated using a large drilling rig.*** The second type of concrete footing ***is*** a steel reinforced ***concrete cap*** with steel piles under it for further support.

Transmission Line Structures

The structures for the proposed new single-circuit portions of the 500-kV line would be lattice steel and would average ***approximately*** 145 feet in height. The spans between the structures would be

approximately 1,000 to 1,500 feet, but would mirror (as closely as possible) the existing span lengths where the new line parallels an existing line. The ***new*** *single*-circuit structures would ***appear*** similar to those of existing lines in the area. The structures would be made of galvanized steel and may appear shiny for 2 to 4 years before they dull with the weather. About ***25*** single-circuit structures would be needed to carry the wires (conductors) for the proposed transmission line.

Two basic types of 500-kV steel lattice structures would be used: suspension (tangent or light-angle structures) and dead end structures. Suspension structures are used to elevate wires a safe distance above the ground on straight (tangent) or small angle on a line. Dead end structures are much stronger and heavier than tangent structures and cost 3 to 4 times as much as tangent structures. Because of the high cost, engineers try to minimize the number of sharp turns and angles when designing 500-kV transmission lines. ***The appearance of the proposed structure for this line is known as a delta design because the conductors form a triangle or delta shape.***

Transmission line structures are either assembled at the installation site and lifted into place by a large crane (30- to 100-ton-capacity) or assembled at a staging area and set in place by a large sky-crane helicopter. Using helicopters enables structures to be constructed more quickly and reduces ground disturbance. Helicopter construction could be more costly than conventional crane construction, but time saved by faster structure assembly sometimes reduces the cost differential. Bonneville's selected construction contractor would decide when helicopter-assisted assembly is appropriate. The construction contractor would not be selected until completion of the ROD for the proposed project. The structures are then bolted to the footings.

Conductors, Insulators, and Ground Wires

Conductors and insulators would be installed after transmission structure construction. Workers would first attach a small steel cable called the sock line to the structures. The other end of the sock line would be attached to the conductor. As the sock line is pulled through pulleys on the structures, it would pull the conductor from large reels mounted on trucks equipped with a brake system. This allows the conductor to be unwound and pulled through the structures under tension. The sock line is usually installed by a helicopter. The conductors would be attached to the structure using glass, porcelain, or fiberglass insulators. Insulators prevent the electricity in the conductors from moving to other conductors, the structure, or the ground. The conductor would be pulled through pulleys or travelers that are attached to the bottom of these insulators on each structure.

The locations where the trucks with conductor reels support the conductor installation process are called conductor-tensioning sites. These sites would likely be located every 2 to 3 miles along the transmission line corridor. A conductor-tensioning site typically disturbs an area of about 1 acre.

Two smaller wires, called overhead ground wires, would be attached to the top of the transmission structures. Overhead ground wires protect the transmission line against lightning damage. The diameter of each wire is typically 0.5 inch. BPA also could attach ***an approximately 0.6-inch-diameter*** fiber optic cable to the transmission structures to provide a communication link. If attached, it would be hung below the conductors. A series of wires called counterpoise could be buried in the ground at each structure***, if required by soil conditions***. These wires would establish a low resistance path to the earth for lightning protection.

Substation Facilities

At the McNary Substation, the east side of the substation would require an expansion measuring 160 x 750 feet, or about 2.75 acres. The substation expansion would be on land acquired from the USACE. Substations contain electrical equipment that enables BPA (and the applicant at the Wanapa Substation) to interconnect several different transmission lines, disconnect transmission lines for maintenance or outage conditions, and regulate voltage fluctuations. The following equipment associated with transmission line termination would be installed in either or both the Wanapa and McNary Substations at each end of the proposed project:

- A power circuit breaker;
- Substation dead end structures;
- Transmission dead end structures;
- A disconnect switch;
- Bus tubing and bus pedestals**;**
- ***Relaying /metering; and***
- ***Communication equipment.***

Site Restoration and Cleanup

The cleared or disturbed areas that are not directly covered by transmission structures, facilities, or accessories would be reseeded with naturally occurring shrubs and grasses at the end of the construction period. Vegetation within the transmission line ROW would be kept low growing to

allow safe and uninterrupted operation of the transmission line. The vegetation along the proposed transmission line predominantly consists of either low-growing shrub-steppe or agricultural crops. For this reason, little trimming or clearing would be required along the ROW during the construction phase.

2.3.5.3 Operation

The proposed transmission line would convey electricity between the power plant and the substation within the voltage range for which it was designed. During the life cycle of the project, BPA would perform routine, periodic maintenance and emergency repairs to the transmission line. For lattice steel structures, maintenance usually involves replacing insulators. Every 2 months, a helicopter would fly over the line to look for hot spots (i.e., areas where electricity may not be flowing correctly) or other problems indicating that a repair may be needed. Vegetation also is maintained along the line for safe operation and to allow access to the line. The area along the existing transmission line needs little vegetation maintenance because of the low-growing nature of a majority of the vegetation along the ROW.

2.3.6 Project Construction and Operation Work Force, Schedule

Based on a proposed commercial operation date ***in 2007***, engineering and construction of the power generation components ***are*** proposed to begin ***in 2005***. Overall, construction is estimated to take a total of 24 to 26 months. The relative construction schedules for the various project components are shown in **Figure 2.3-9.**

	2004				***2005***				***2006***				***2007***			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Plant Site (Electrical generating equipment, roads, water supply pipeline)																
Transmission Line																
McNary Substation addition																
Natural gas supply/***plant discharge water*** pipelines																

Figure 2.3-9. Schedule for Wanapa Energy Center Construction

The construction work force for the proposed power plant would range from 100 to 600 workers. It is expected that the work force would consist of a mix of specialty workers coming from other parts of the country, as well as workers from the CTUIR and the Hermiston, Umatilla, and Tri-

Cities area. The estimated work force numbers and equipment required for the other project components are listed in **Table 2.3-5**.

Table 2.3-5
Summary of Construction Activities for the Proposed Wanapa Energy Center

Type of Activity	Peak Work Force Numbers	Construction Duration (Months)	Types of Equipment
Power plant and access road	600	26	Light and heavy trucks, backhoes, concrete trucks, bulldozers, graders, cranes, air compressors, welding machines, power hand tools.
Natural gas***/plant discharge*** pipeline***s***	80	3	Light and heavy trucks, backhoes, bucket-wheel excavators, bulldozers, graders, side-booms, welding trucks, farm tractors.
Water ***supply, potable water, and sanitary sewer*** pipelines	20	3	Same as natural gas pipeline, except that welding trucks may not be needed if plastic pipeline is installed.
Electric transmission line/Substation	120	4	Cranes, light and heavy trucks, graders.
McNary Substation Expansion	50	12-18	Light and heavy trucks.

The operational work force would consist primarily of about 30 specialty workers responsible for monitoring power plant operations, conducting inspections, and making repairs.

2.3.7 Emergency Operations

In addition to the emergency plans and systems presented in Section 2.3.1.3, the fire protection system would be installed within the buildings and yard areas at the proposed power plant site. The system would be designed to meet the requirements of the Uniform Fire Code, as amended by Oregon and the National Fire Protection Association, and all other applicable fire protection standards. The fire protection system would include a fire water system, dry chemical extinguishing system, a CO_2 extinguishing system, and portable fire extinguishers. The characteristics of the various fire protection systems would be as follows:

- Fire Water System – This system would consist of a fire water supply loop, fire hydrants, sprinkler systems, and hoses placed at appropriate locations. The primary source of water for fire suppression would come from the Port of Umatilla raw water system, as discussed in Section 2.3.3. A diesel-driven fire pump would be part of the system to ensure operations during a power failure. A backup water supply for fire suppression would be provided in the reserve capacity in the raw water storage tank.

- CO_2 Systems – This system would protect the turbine housings, mechanical/electrical control enclosures of the turbines, switchgear room, and battery room. A visual or noise alarm would sound if the system is activated.

- Portable Fire Extinguishers – The type and number of portable fire extinguishers would conform to code requirements. The extinguishers would be placed at key locations within the power plant site.

2.3.8 Project Abandonment

The proposed Wanapa Energy Center would operate on an indefinite basis, assuming that water and natural gas supplies are available and a Firm Transmission Agreement is approved by BPA. Therefore, no abandonment is anticipated for the project.

2.4 Other Alternatives Carried Forward in the Analysis

2.4.1 Gas Supply/*Plant* Discharge *Water* Pipelines Route Alternatives

In addition to the proposed 9.9-mile-long route for the natural gas supply/***plant discharge water*** pipelines, ***six*** other alternative routes ***for the combined gas supply/plant discharge water pipeline routes*** are evaluated. The alternative routes would be approximately the same length as the proposed route, but would follow a more eastern (Alternatives 1, 3, 4***, 5, and 6***) or more western (Alternative 2) approach to the Stanfield Compressor Station from the power plant. All ***six*** alternate routes terminate at the Stanfield Compressor Station. The length and land requirements for each alternative are presented in **Table 2.4-1**. The alternative routes are described from north (plant site) to south (Stanfield Compressor Station).

Table 2.4-1
Component Alternative Land Requirements

	Natural Gas Supply/*Plant Discharge Water* Pipeline *Route* Alternatives						
	Proposed	**1**	**2**	**3**	**4**	***5***	***6***
Length (miles)	***11.2***	***11.5***	***11.8***	***11.3***	***10.8***	***11.7***	***12.0***
Temporary Disturbance (acres)	***128.0***	***131.3***	***133.8***	***129.3***	***122.7***	***96.8***	***106.6***
Permanent Disturbance (acres)	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
Permanent ROW Easement Width (feet)	***50***	***50***	***50***	***50***	***50***	***50***	***50***
Permanent ROW Easement (acres)	***67.9***	***69.7***	***71.5***	***68.5***	***65.5***	***70.9***	***72.7***

Electrical Transmission Line Alternatives				
	Proposed	**Alternative 1**	**Alternative 2**	**Alternative 3**
Length (feet)	23,450.6	27,980.7	20,927.2	20,913.8
Length (miles)	4.4	5.3	4.0	4.0
Temporary Disturbance (acres)	80.8	96.4	72.1	72.0
Permanent Disturbance (acres)	6.5	1.0	0.7	0.7
Permanent ROW Easement Width (feet)	150	150	150	150

Assumptions: Temporary disturbance width for Electrical Lines = 150 feet.
Temporary disturbance width for Gas Lines = 100 feet.
Temporary disturbance width for Water Line = 50 feet.
Temporary disturbance width for Access Road = 50 feet.
Permanent disturbance for Electrical Lines = number power poles (1,500-foot spacing) x 0.05 acre per pole.
Permanent disturbance width for Gas Lines = 0.0 foot.
Permanent disturbance width for Water Lines = 0.0 foot.
Permanent width for Access Road = 25 feet.

- Alternative 1 (**Figure 2.4-1**) – From the proposed power plant location, the route would follow the Proposed Action route for approximately 1.4 miles, at which point it would continue farther eastward approximately 2.3 miles along U.S. Highway 730 before proceeding southward approximately 4.4 miles to the existing Northwest Gas ROW. Once co-located alongside the existing Northwest Gas ROW, it would follow the existing line southeastward approximately

  2 miles to the interconnect point at the Stanfield Compressor Station. This alternative would follow existing roads for the majority of its length in a rural area.

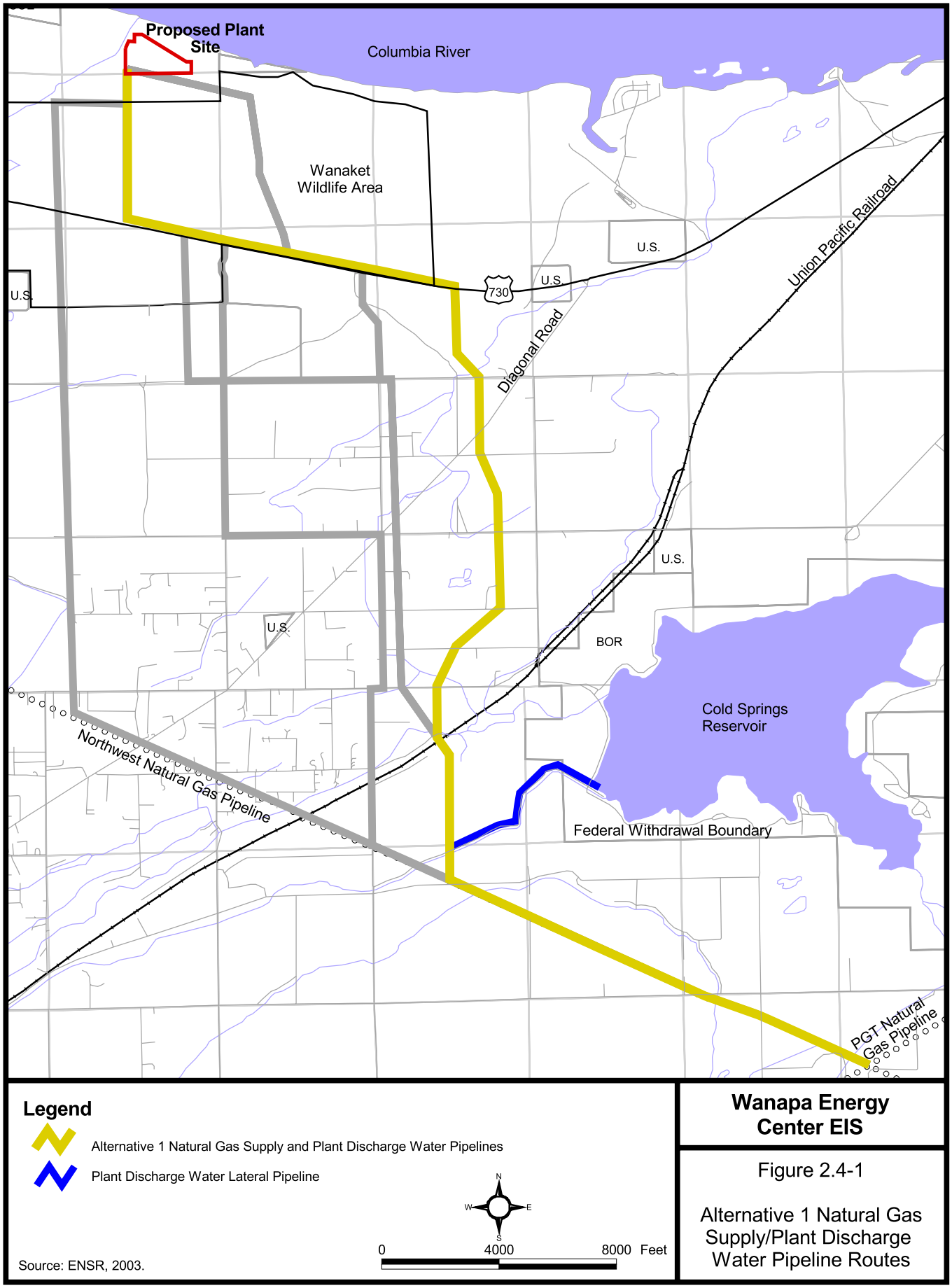


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Figure 2.4-1

Alternative 1 Natural Gas Supply/Plant Discharge Water Pipeline Routes

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- Alternative 2 (**Figure 2.4-2**) – From the proposed power plant location, the route would follow the Proposed Action route for approximately 1,000 feet, at which point it would proceed due westward for approximately 2,000 feet. It would then proceed approximately 4 miles due southward along an existing road to the existing Northwest Gas ROW. Once co-located alongside the existing Northwest Gas ROW, it would follow the existing line southeastward approximately 5.6 miles to the interconnection to the gas source pipelines at the Stanfield Compressor Station.

- Alternative 3 (**Figure 2.4-3**) – This alternative was developed to avoid existing wetlands and potential future developed wetlands on the Wanaket Wildlife Management Area. From the plant site, the pipelines would extend eastward across basalt outcrops, descend into a shallow canyon with deeper soils, and then follow and existing two-track road to an intersection with U.S. Highway 730. The pipelines would parallel U.S. Highway 730 eastward for approximately 1 mile, and then turn south across irrigated cropland to join the Proposed Action route to the Stanfield natural gas mainline interconnection.

- Alternative 4 (**Figure 2.4-4**) – This alternative was developed to avoid existing wetland and potential future developed wetlands on the Wanaket Wildlife Management Area. From the plant site, this alternative would follow the same route described in Alternative 3. At the intersection with U.S. Highway 730, the pipelines would parallel U.S. Highway 730 eastward for approximately 3 miles, and then turn south across irrigated cropland to join the Alternative 1 route to the Stanfield natural gas mainline interconnection.

- ***Alternative 5 (Figure 2.4-5) – This alternative was developed in response to comments from the Umatilla County Board of Commissioners (see Comment Letter #6 in Appendix C) and discussions with the Oregon Energy Facility Siting Council. The alternative avoids direct impacts to farmland, wetlands, and residences by routing the gas pipeline/plant discharge water pipeline along county roads within existing ROWs. From the plant site, this alternative goes south to Highway 730, follows U.S. Highway 730 east to Craig Road. The route goes south on Craig Road to East Walls Road and then proceeds east to South Edwards Road. The route then proceeds south to East Punkin Center Road where it turns west and then almost immediately south on South Edwards Road. The gas pipeline continues south on South Edwards Road and connects to the Northwest Gas Pipeline. The plant discharge water pipeline continues southeast along the Northwest Natural Gas Pipeline ROW until it***

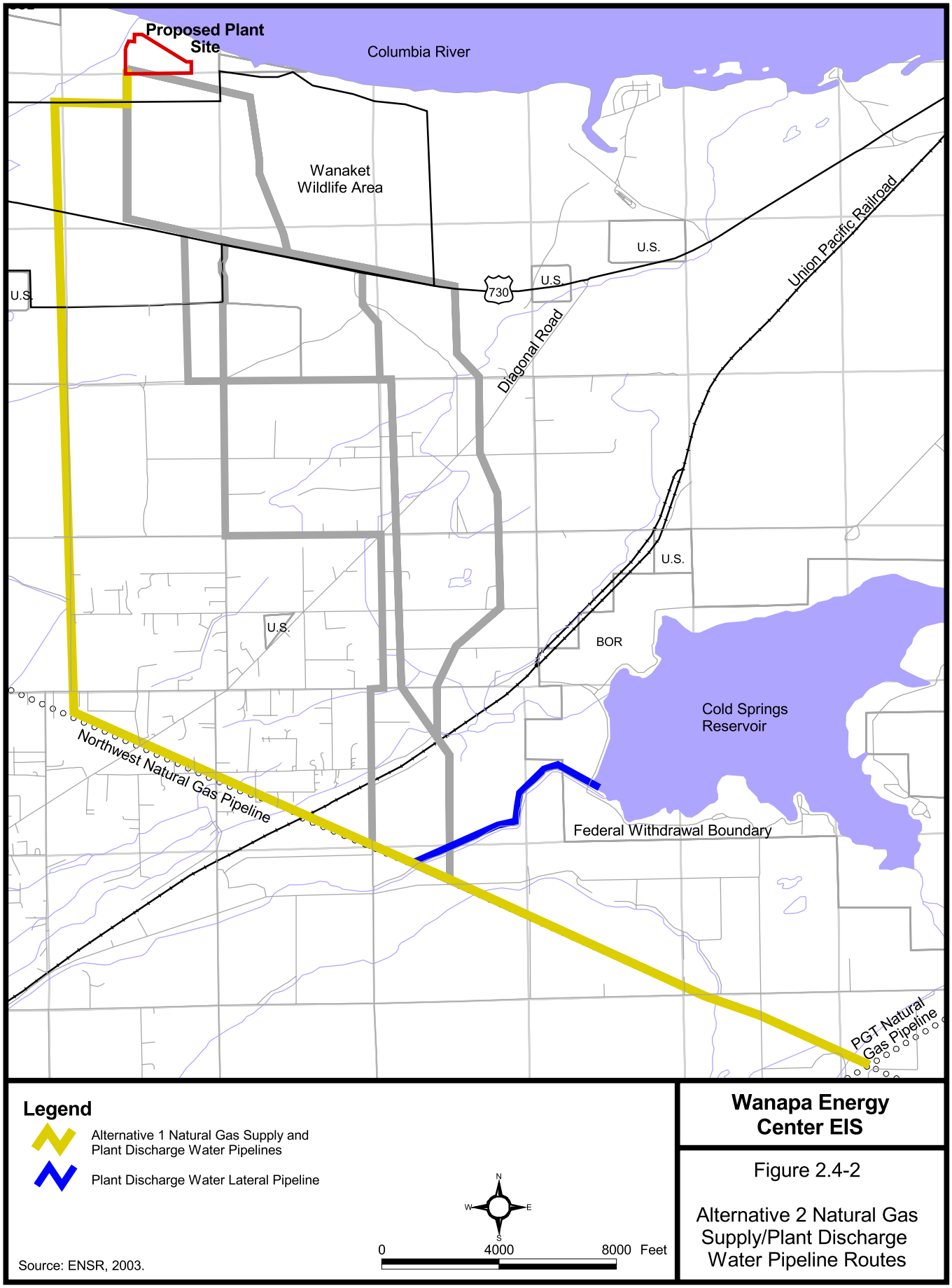

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Figure 2.4-2

Alternative 2 Natural Gas Supply/Plant Discharge Water Pipeline Routes

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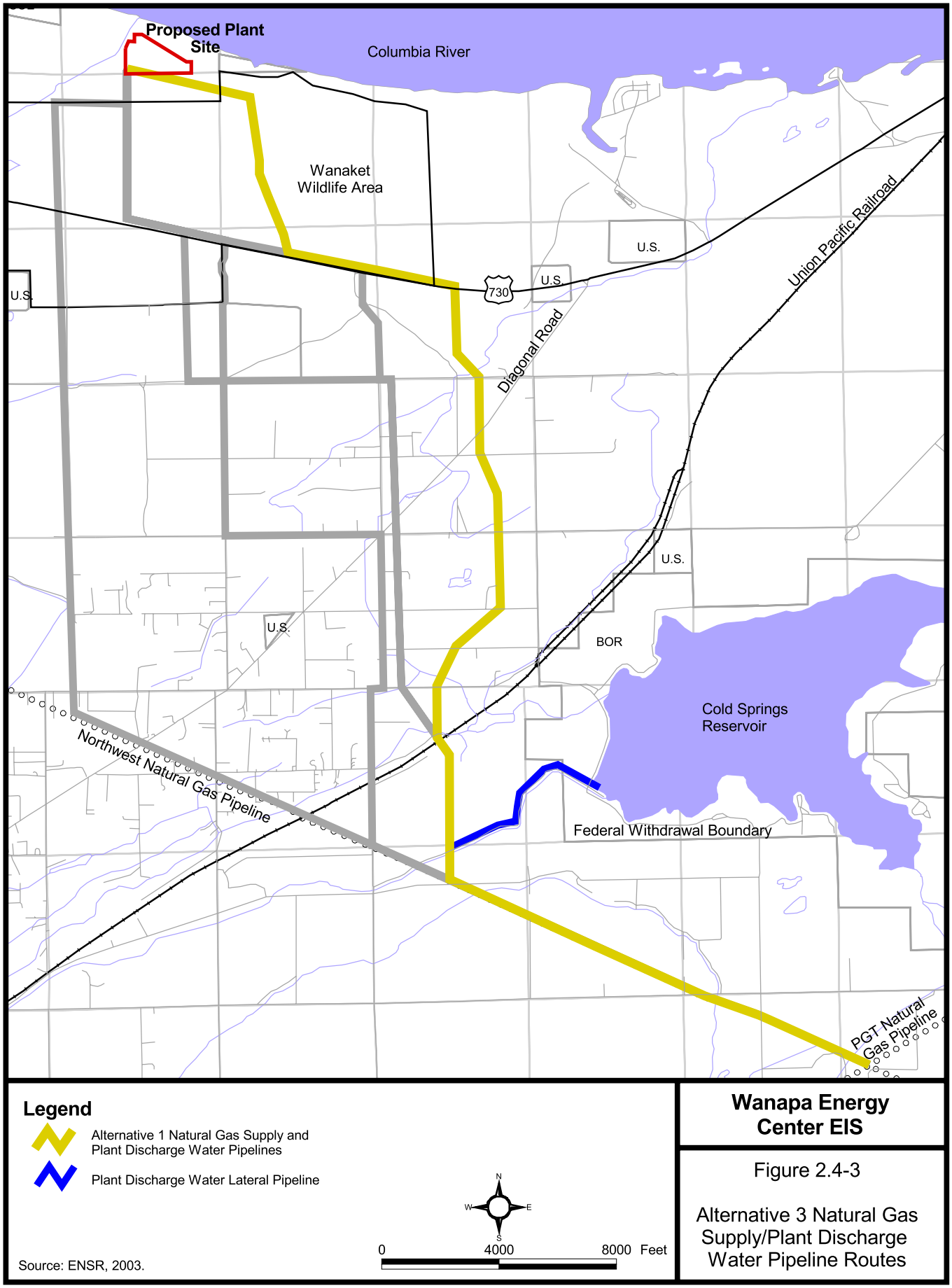

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Figure 2.4-3

Alternative 3 Natural Gas Supply/Plant Discharge Water Pipeline Routes

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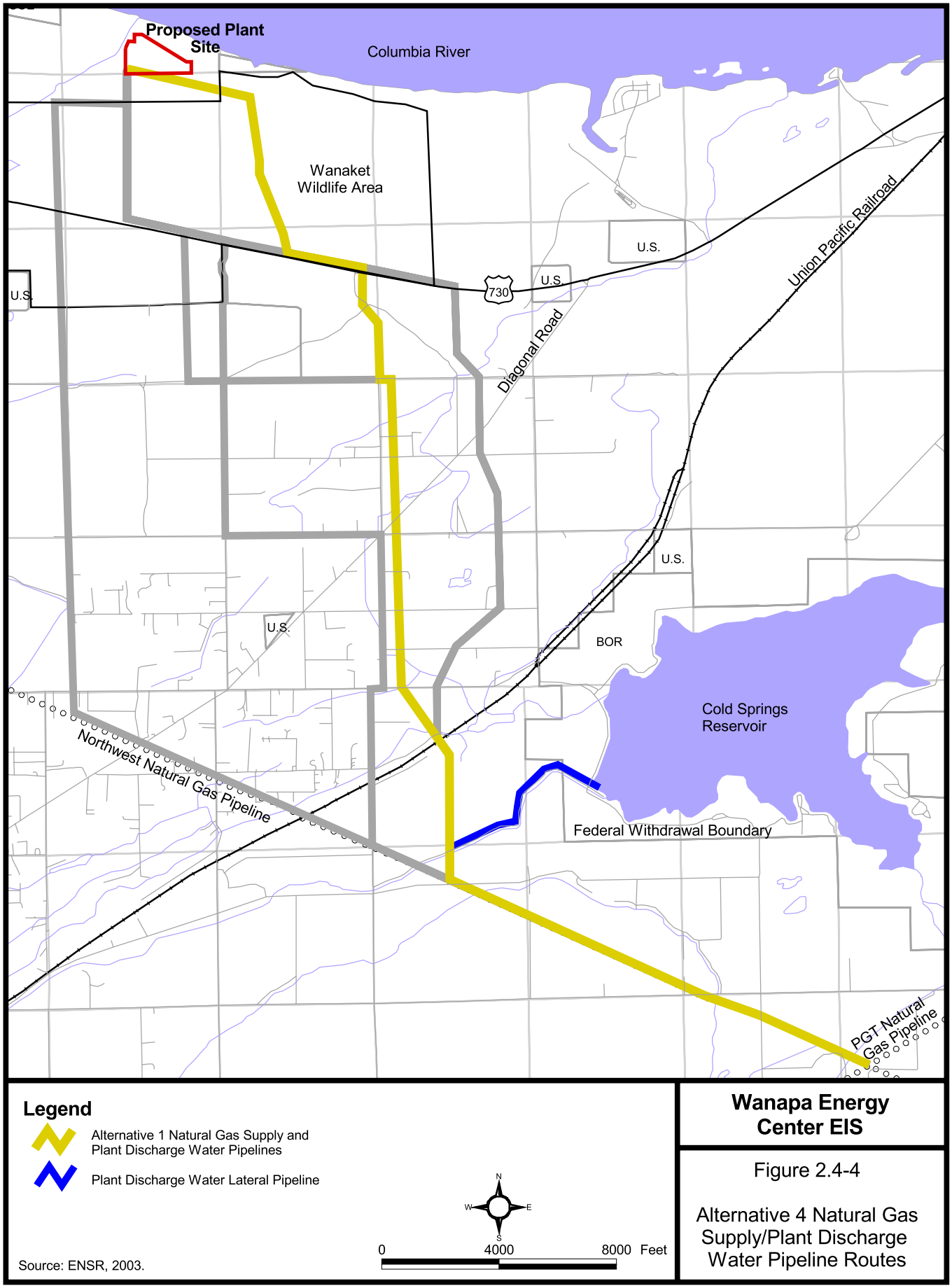

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Figure 2.4-4

Alternative 4 Natural Gas Supply/Plant Discharge Water Pipeline Routes

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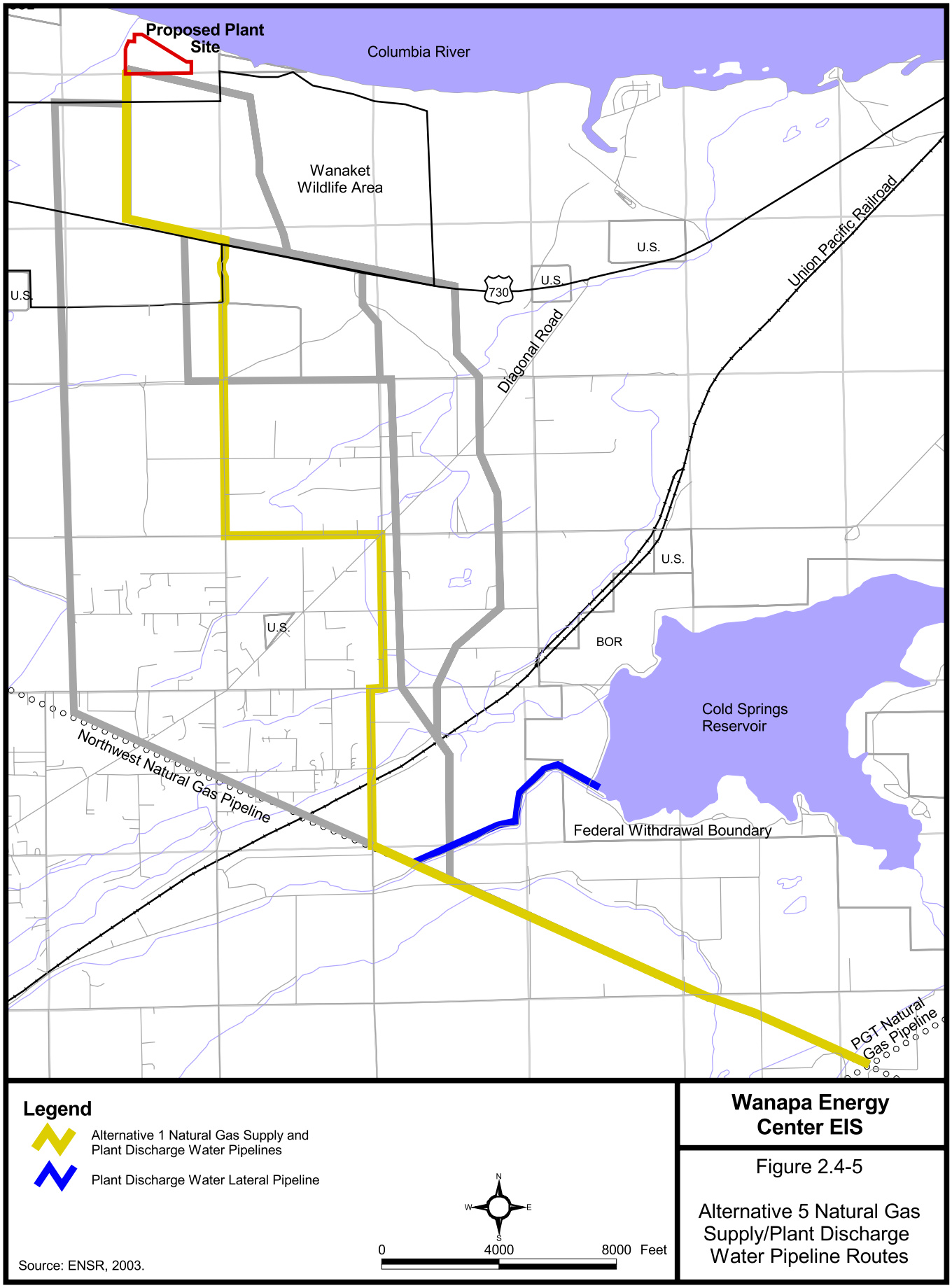

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Figure 2.4-5

Alternative 5 Natural Gas Supply/Plant Discharge Water Pipeline Routes

11/11/04

intersects with the Feed Canal. The plant discharge water pipeline would then follow the Feed Canal ROW in a northeasterly direction until it reaches Cold Springs Reservoir.

- ***Alternative 6 (Figure 2.4-6). This alternative was developed to reduce the impact of the plant discharge pipeline to federal facilities (Feed Canal). This alternative is the same as Alternative 5 until the pipelines reach the easternmost intersection of South Edwards Road and East Punkin Center Road. The gas pipeline would continue along the same route as Alternative 5. The plant discharge water pipeline would go east along East Punkin Center Road for approximately 1,500 feet and then would proceed south through private land. It would be bored under Canal A and the OWR&N railroad and then follow the existing farm road on private property in an easterly direction until it intersects with the Feed Canal. The remaining 2,200 feet to Cold Springs Reservoir would be in the Feed Canal ROW.***

2.4.2 Transmission Line Route Alternatives

In addition to the proposed route described above, three other alternative transmission line routes from the plant site to McNary Substation are evaluated. These alternatives range from 3.7 to ***5.3*** miles. The three alternative electrical transmission line ROWs considered by BPA include:

- Alternative 1 (**Figure 2.4-*7***) is a combined single- and double-circuit transmission line. The route would ***be approximately 5.3 miles long and would*** include ***27,700*** feet of single-circuit on new steel lattice structures (see Proposed Action). The route would traverse directly south from the project site, cross U.S. Highway 730, and then enter and follow the same alignment as the proposed route parallel to the existing BPA ROWs west/northwest and north.

- Alternative 2 (**Figure 2.4-*8***) is a new single-circuit tubular steel pole transmission line**,** ***approximately 4.0 miles long,*** in an entirely new ROW. The route would traverse west from the project site until it passes McNary Beach Access Road, then north until it meets the Alternative 3 route where it begins to traverse southwest, and then follows that same route southwest into the substation. A single tubular pole design that would reduce visual impacts is proposed for both Alternatives 2 and 3, which would both traverse the bluff on the south side of the Columbia River (**Figure 2.4-*9***). The single tubular steel poles would average 135 feet in height. The spans between the poles would be approximately 600 to 1,000 feet. The structures would be made of galvanized steel and placed on concrete pier footings.

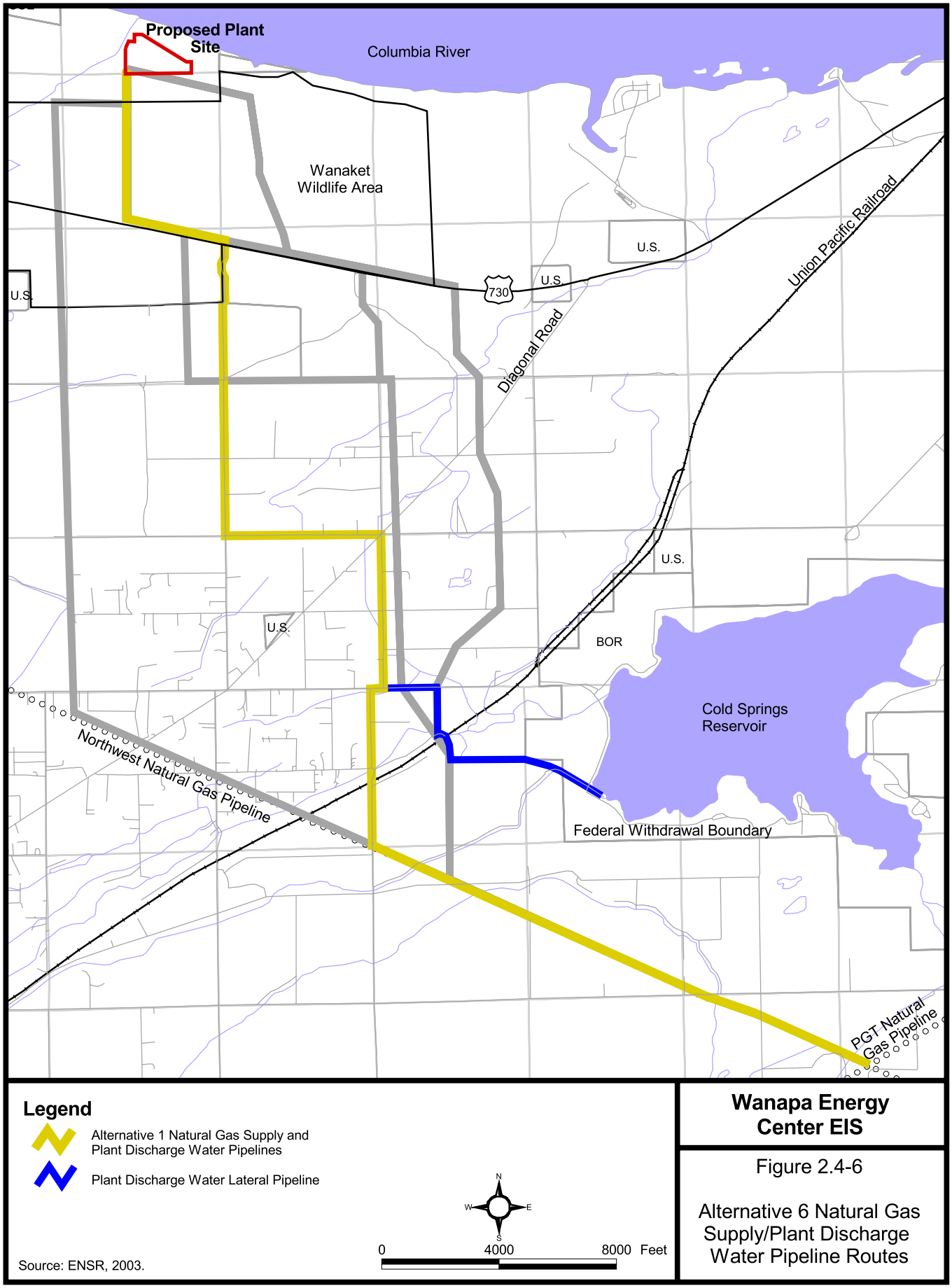

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Figure 2.4-6

Alternative 6 Natural Gas Supply/Plant Discharge Water Pipeline Routes

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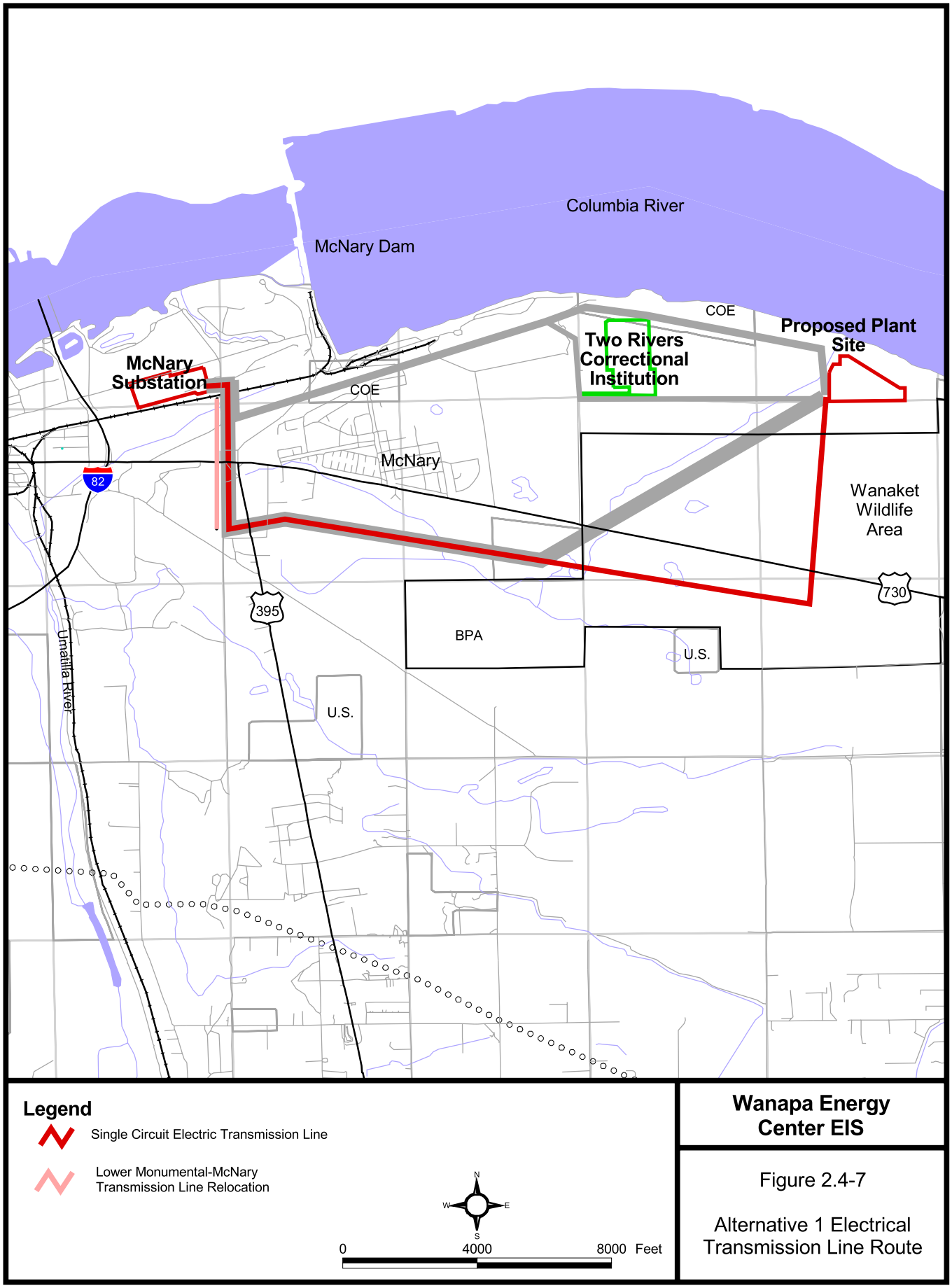

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Figure 2.4-7

Alternative 1 Electrical Transmission Line Route

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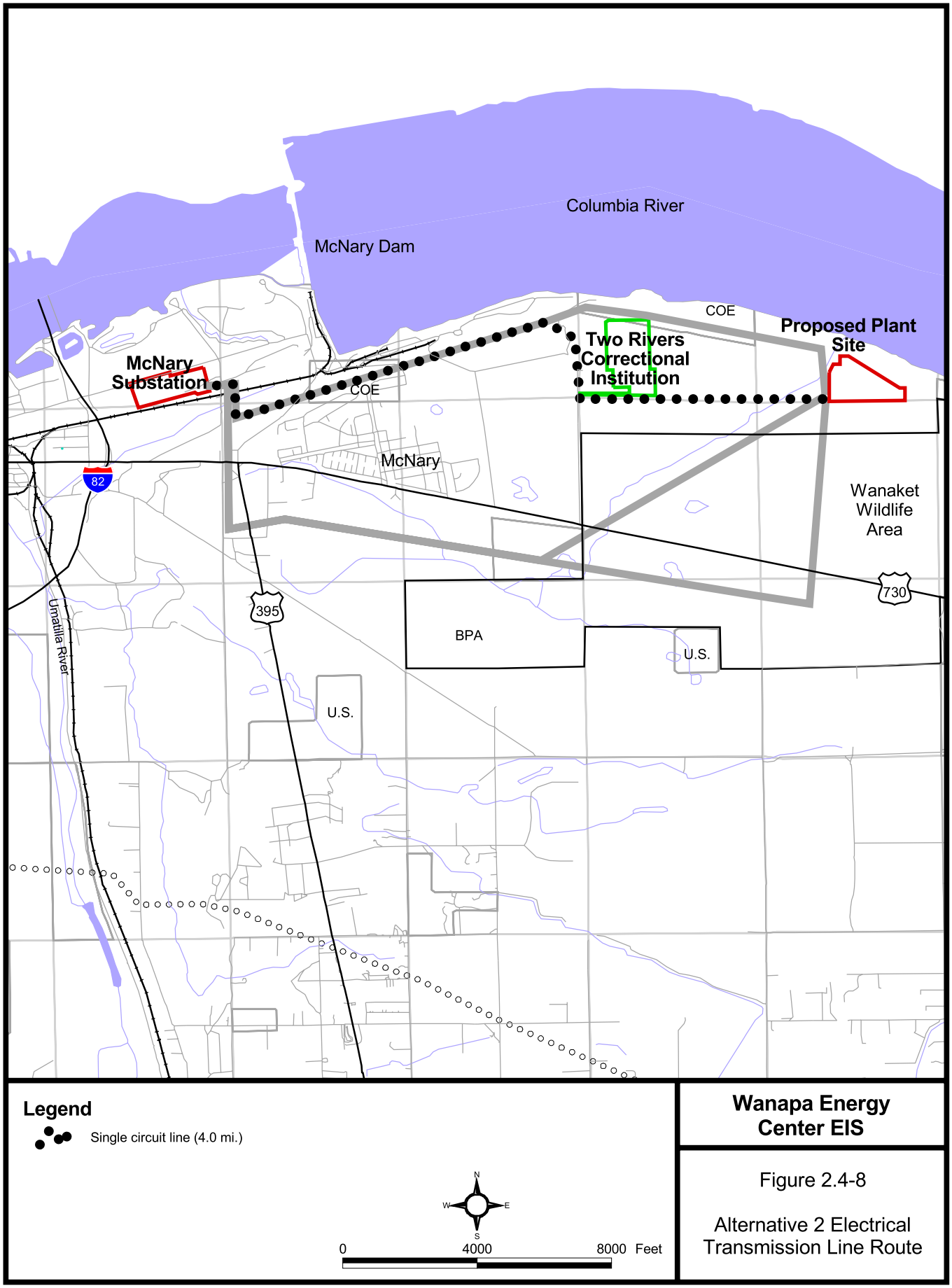

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Figure 2.4-8

Alternative 2 Electrical Transmission Line Route

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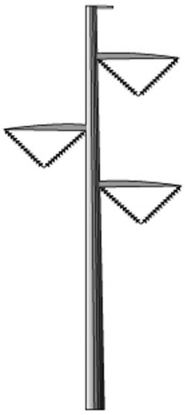

STRUCTURE TYPE	Single circuit 500 kV tubular
RIGHT-OF-WAY WIDTH	150 feet
AREA OF BASE	100 square feet
TYPICAL HEIGHT	135 feet
NUMBER OF STRUCTURES PER MILE (APPROX.)	4.8

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Figure 2.4-9

Single Shaft Steel Pole Electrical Transmission Structure

Source: BPA, 2003.

- Alternative 3 (**Figure 2.4-*10***) is a new single-circuit tubular steel pole transmission line**,** ***approximately 3.7 miles long,*** in an entirely new ROW. The route would traverse northwest from the project site until it nears and parallels the bluffs above the Columbia River, and then would traverse southwest into the substation.

- ***Optional Transmission Line Structure for Proposed Action and Alternative 1 (see Figure 2.3-7a) – Because of extensive development near McNary Substation, a double circuit, 500-kV structure may be used for the final 5,800 feet into McNary Substation to reduce congestion. The last seven single-circuit lattice steel towers would be replaced with double-circuit lattice steel towers. The new double-circuit structures would be approximately 180 feet in height with approximately 1,000- to 1,500-foot spans between structures.***

2.4.3 Water Supply Alternatives

The Columbia River represents the most abundant and reliable water supply in the region. The project would obtain water from an existing municipal and industrial intake structure. No other water supply and delivery option was identified that would reduce environmental effects relative to the Proposed Action.

2.4.4 Process Water Disposal Alternatives

The primary management problem for plant wastewater disposal is finding a suitable discharge location for the water year-round. Cold Springs Reservoir provides an existing, large volume surface storage option that allows the water to be reused for irrigated agriculture via the existing irrigation district canal system, and to provide water for wildlife and fishery purposes during the appropriate seasons. ***An alternative to discharging into Cold Springs Reservoir was developed in response to comments from USEPA (see Comment Letter No. 5 in Appendix C).***

<u>Discharge to the Columbia River</u>. A potentially feasible alternative to discharge to Cold Springs Reservoir would be discharge directly to the Columbia River via a pipeline (see Figure 2.4-11). The proposed route would be southeast for 1,500 feet from the plant site parallel to the Columbia River and then northeast for 1,000 feet to the river. After discussions with Oregon DEQ, it appears that obtaining a NPDES permit for discharge to the river would be possible. Plant discharge water would meet the most stringent state water quality standards except for temperature and TDS. Both of these parameters have limits specific to discharge to the

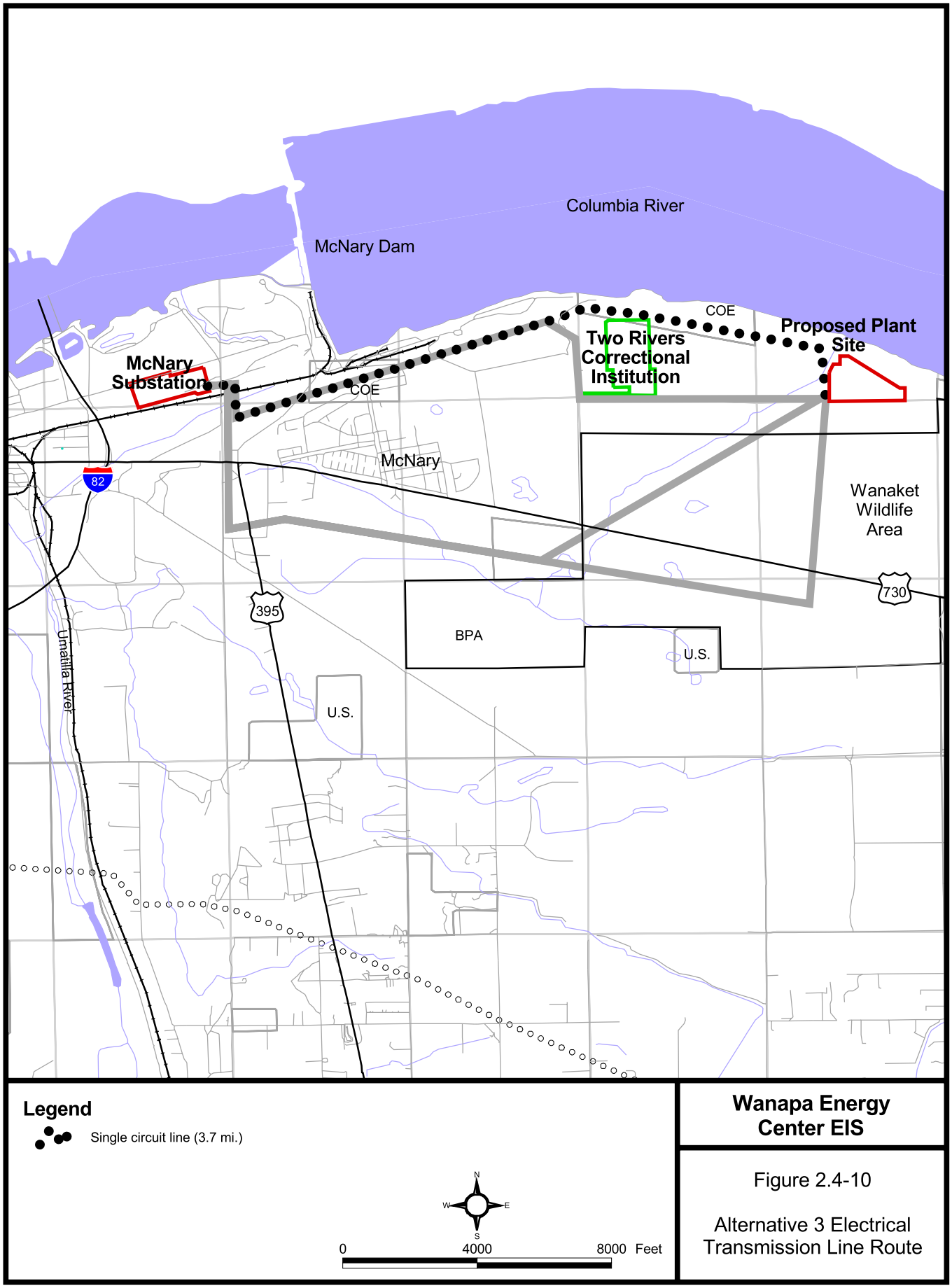

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Figure 2.4-10

Alternative 3 Electrical Transmission Line Route

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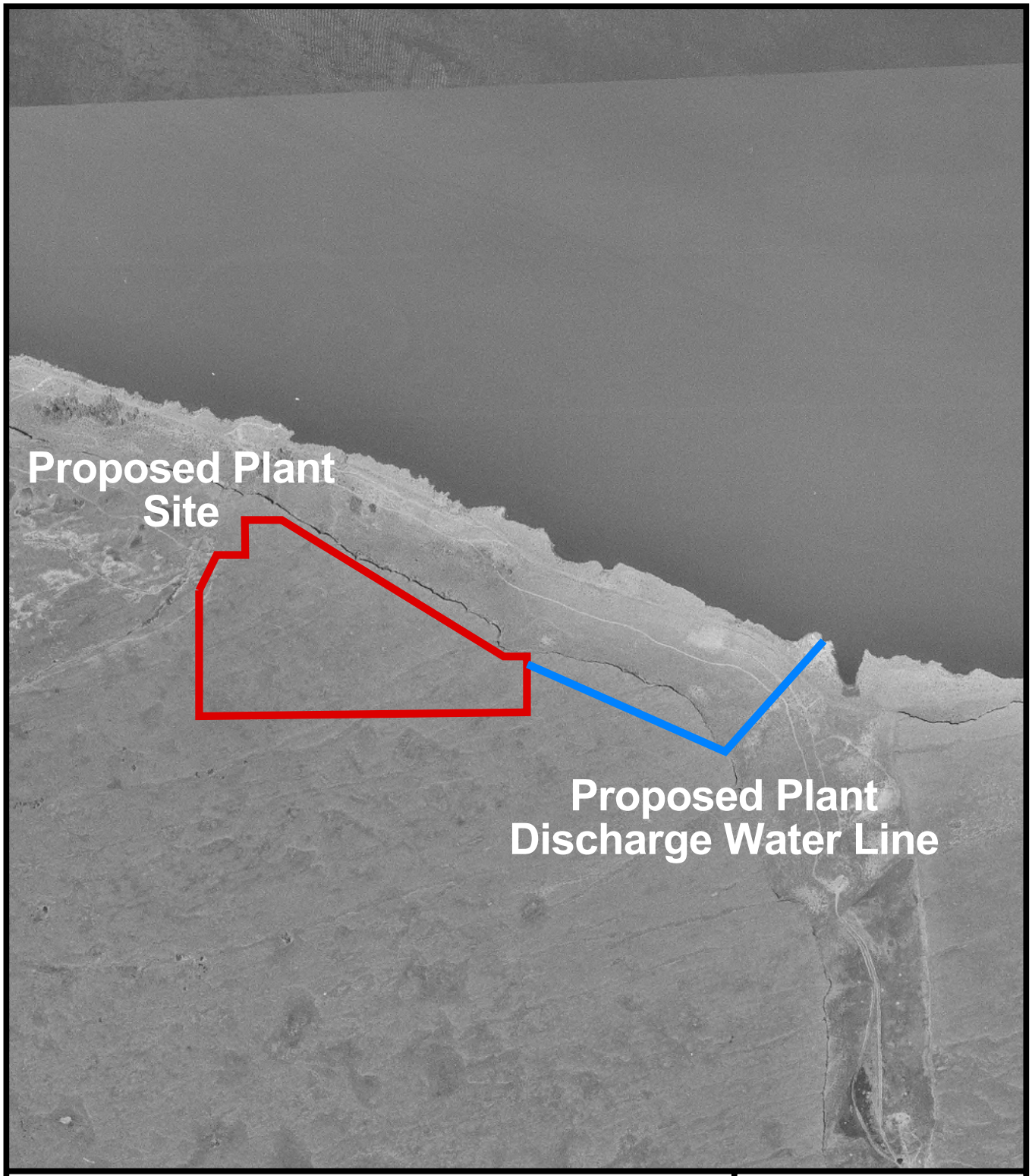

Legend

Plant Water Discharge Line

Proposed Plant Site

N
W
E
S

0 1000 2000 Feet

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Figure 2.4-11

Plant Discharge Water Line

11/11/04

Columbia River. However, with the application of a "mixing" zone and additional management of plant discharge water, these two special standards would be met at the edge of the mixing zone in the Columbia River as allowed in Oregon's water quality standards and regulations. A high rate bottom diffuser from the shoreline out into the main river channel would be utilized to discharge plant water. This technology would be applied to create a high volume, rapid rate of mixing the water with river water. This approach would quickly reduce temperature and TDS to acceptable levels to maintain river water quality.

A high volume/high rate diffuser is an engineered structure intended to facilitate the rapid mixing of plant discharge water with the receiving water and avoid relatively high concentrations of plant discharge water close to the point of discharge. Relative to a gravity discharge through a single pipe, the high rate diffuser accomplishes initial mixing in two related ways: 1) it distributes the plant discharge water to a number of separate ports so that the discharge is distributed to a larger portion of the receiving water and 2) the plant discharge water is discharged from each port at high velocity which entrains the receiving water. By rapidly mixing with the receiving water, the impact of plant discharge water on the Columbia River, even temporarily, is minimized. See Figure 2.4-12 for a typical diffuser design.

The diffuser design for discharge into the Columbia River would be based on state-of-the-art technology for rapid rate mixing. The diffuser itself may have a single high-rate discharge port or multiple discharge ports, depending on final design considerations. A preliminary screening analysis was conducted to estimate the area of potential effect or "mixing zone" in the Columbia River. This mixing zone would be the area of the river where water quality standards for temperature and TDS would be temporarily exceeded. The standards would be met at the edge of this mixing zone. The model that was used was EPA's CORMIX model which is widely used by NPDES permittees and permitting agencies to calculate the mixing zone created by various discharge scenarios. This initial screening run utilized conservative assumptions and default values since final outfall and diffuser designs have not been completed. The results of this screening run indicated that a single port diffuser, situated 50 feet from the river bank and on the bottom (one of several potential diffuser designs), would create a mixing zone approximately 3.4 feet in a downstream direction by 29.7 feet wide (toward the opposite river bank) by 13.1 feet deep. The Columbia River, at this approximate discharge location, is 58 feet deep and 3,920 feet wide. The estimated mixing zone potentially affects a relatively small part of the river. When specific design parameters for the discharge are determined, this mixing zone calculation would

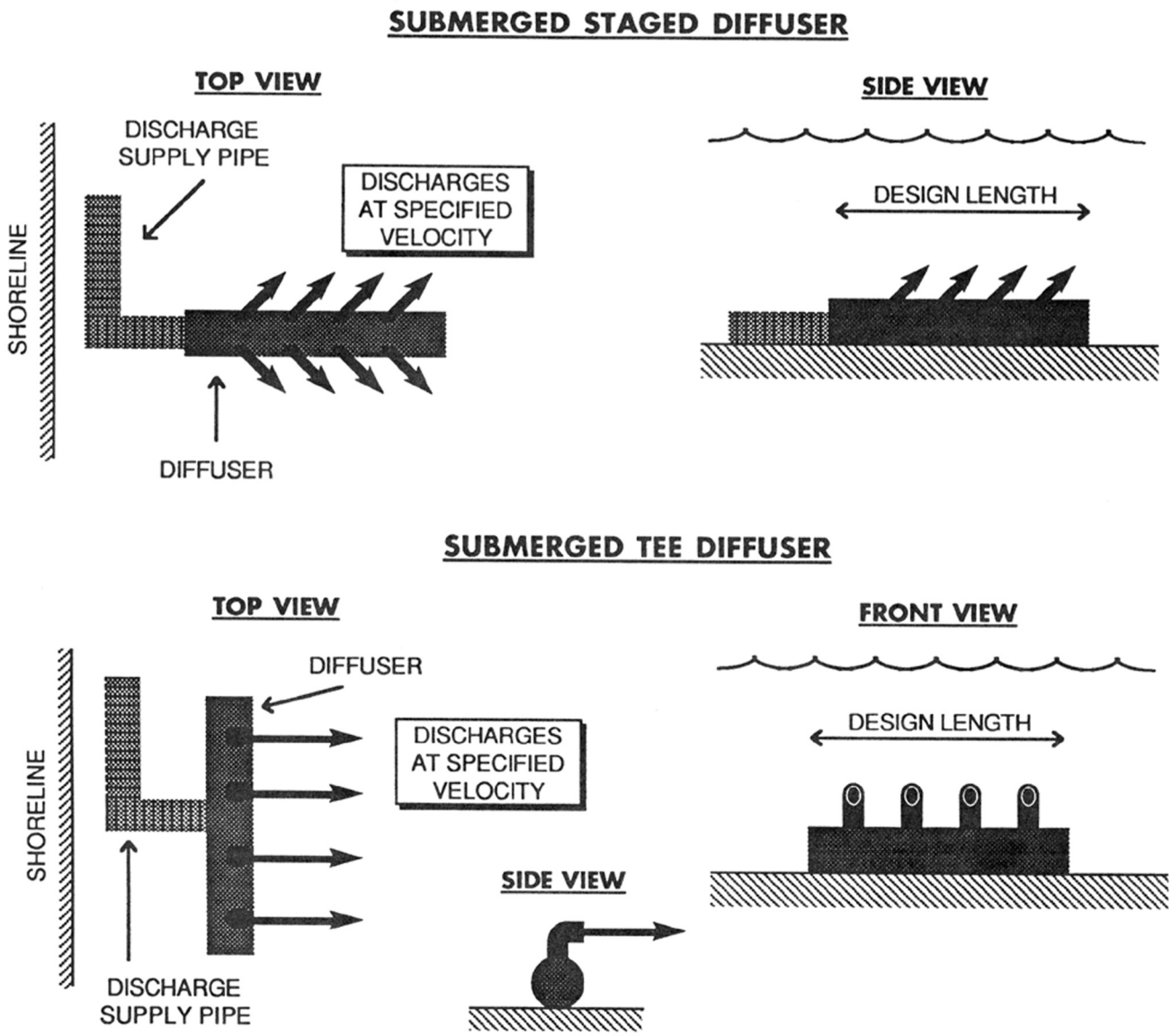

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Figure 2.4-12

Typical Diffuser Designs

be further refined and the calculation and supporting details would be submitted to ODEQ as part of the NPDES permit application.

Discussions with the permitting agency, Oregon DEQ, on the feasibility of this option are ongoing.

2.5 Alternatives Considered but Eliminated

2.5.1 Alternative Electrical Power Generation Systems

2.5.1.1 Wind Power Generation Systems

Wind power systems are rapidly emerging as an electrical power source in the Pacific Northwest. The proposed Wanapa Project is designed as a reliable, base-loading project capable of generating 1,200 MW. A wind power project alternative would not meet the project purpose and need because of the intermittent nature of wind power generation, and the very large land base requirements for installation of wind turbines that could not be achieved by the proposed project for the equivalent amount of electrical generating capacity.

2.5.1.2 Alternative Fuel Power Generation Systems

Coal, fuel oil, and biomass represent alternative fuels to natural gas. These alternate fuels would have to be transported by rail or truck to the Wanapa site. ***This alternative was eliminated b***ecause of regional air quality background conditions, ***which would make*** the relative cost of transporting these fuels to the site, and controlling air pollution from these fuels substantially greater than those required for natural gas available from a nearby natural gas pipeline.

2.5.1.3 Alternative Cooling Systems

Air cooled and hybrid cooling systems were evaluated as potential designs for the Wanapa facility. The feasibility of these designs is dependent on local climate characteristics. A dry cooling system at the Wanapa plant would add approximately $83,200,000 to the construction cost of the total facility or $41.62 million to the cost of one block of 600 MW (nominal). Because this system of cooling is less efficient, there would be a 4 to 5 percent power loss on the steam turbine generator, which must partly be made up by the combustion turbines and duct burners

resulting in higher fuel use and emissions. This would put the Wanapa project at a competitive disadvantage for development to the other water-cooled plants in the Pacific Northwest and thus, this alternative was eliminated from further consideration.

2.5.2 Alternative Power Plant Sites

Other sites in Umatilla and Morrow Counties were considered prior to selecting the proposed Wanapa Energy site. Other sites did not meet ideal conjunction of infrastructure connections provided by the Wanapa site, which include: 1) access to the BPA transmission grid; 2) access to a nearby allocated water supply; 3) access to a nearby natural gas supply source; 4) a suitable option for secondary uses of cooling system blowdown wastewater; and 5) proximity to the interstate highway system, nearby railroad service, and barge transportation on the Columbia River. Other siting factors included a rural location with a limited number of nearby residences, and the prior land use planning that promotes future industrial development near the Port of Umatilla.

Co-location of the Wanapa Energy Center with an existing power plant site was considered. It was concluded that no existing site would allow construction of a facility at the scale of the proposed project without raising new issues concerning air quality standards compliance for both the existing and new facilities.

None of these alternative sites would involve Indian trust land. Therefore, none would yield the socioeconomic benefits or the federal taxation advantages of the proposed site.

2.5.3 Alternative Natural Gas Supply/Wastewater Discharge Pipeline Routes

The ***proposed*** project gas supply point (crossover point between the Northwest and PGT interstate pipelines at the Stanfield Compressor Station) provides the best option for obtaining gas from more than one supplier. Consequently, a direct connection with either of these pipelines alone is a less favorable option from economic and supply reliability perspectives. Because the gas supply location is fixed, there is a limited range of routing options between this supply point and the plant site. The four routes evaluated in addition to the proposed action gas pipeline route provide a range of geographic alternatives that can be compared for their relative environmental effects.

2.5.4 Water Supply Sources

Because of the very limited ground water resources in eastern Oregon, large water consumers must rely on the major surface water systems in the region, primarily the Columbia River. As indicated in the Proposed Action, the Port of Umatilla has an existing allocation from the Columbia River that can be withdrawn for municipal and industrial purposes. Unless the electric power generation plant were moved to a different municipal/industrial intake point on the Columbia, there are no other existing approved water supply options capable of meeting the water requirements for a project of this size. An alternative considered was to establish a new water supply intake immediately north of the plant site. This alternative was rejected because of the potential new concerns related to migrating salmon, and the cost and operational requirements for a new water supply infrastructure that would have to be built within and next to the river.

2.5.5 Plant Discharge *Water Disposal* Alternatives

Other disposal options include a combination of water application for crops, and infiltration basins that would allow ponded water to percolate into underlying aquifers. These options, while potentially feasible, and currently being used by other power plants in the region, present infrastructure and reliability concerns.

Wanaket Wildlife Refuge. Early on in the project development, it was thought that the CTUIR might be interested in receiving water from the proposed facility to enhance wetlands on the adjacent Wanaket Wildlife Refuge. The refuge only needed water for a few months a year, so the project would still require another option for almost all of the plant discharge water. In addition, tribal wildlife managers stated that their priority for restoration was for upland areas on the refuge. However, some refuge land would be suitable for conversion to wetlands in the future, if current management priorities change.

Land Applying. Land applying plant discharge water has been an option for other power facilities; however, this specific alternative was eliminated from further consideration due to irrigation (seasonal water demand) and economic impacts to the project due to storage and treatment costs. One landowner suggested that he would accept the water if the project paid a fee and built a water treatment system and an associated water storage pond on the plant site. This type of treatment system would include facilities for filtration, coagulation, and clarification and it would produce a large volume of filtered solids that would require storage and disposal by

licensed contractors. The land owner would use the treated water for irrigation and potential sale to other users. The water storage pond on the plant site would have to be sized to store all the plant water in case there were no available users at certain times of the year. This water storage pond has been estimated to be 160 acres in area and 10 feet deep.

Similar applications on private lands also would only be required seasonally. Agricultural lands of 1,200 acres and a 100-acre, 10-foot deep storage pond at the plant site would be required for irrigation of acquired lands. The potential costs of land acquisition and construction of a large storage pond also would make the project economically infeasible. The nearby 300-MW Plymouth Generation Facility, which has completed its EIS, uses its discharge water for agricultural and irrigation purposes. The Plymouth plant is one-fourth the size of the proposed Wanapa project and generates wastewater only during the summer months when the cooling tower is operating.

Deep-hole Injection. Plant discharge water may be injected at levels below the aquifer at 3,000 to 4,000 feet. This option was eliminated for two reasons: 1) the cost of drilling in basalt to that depth; and 2) the cost of treating the plant discharge water to meet state drinking water quality standards in order to be injected into the aquifer. The plant site for the Wanapa project is characterized by shallow soil over deep basalt. Deep-hole injection on such soils would make the project economically infeasible to develop.

Discharge into Private Irrigation Ditch. An evaluation of private irrigation canals and ditches in the area was conducted to determine if any canals or ditches could be utilized to receive plant discharge water. ODEQ also was contacted to discuss the feasibility of permitting such a discharge situation. The only possible canal or ditch not used by Reclamation or HID with the necessary capacity was Cold Springs Wash, which is located north of Progress Road. It flows in a northeasterly direction and eventually drains to the Columbia River approximately 1.3 miles upstream of the Hat Rock State Park boat ramp. Discussions with ODEQ determined that TDS and temperature standards for the Columbia River would apply to plant discharge water since the wash discharges to the river. The variable flow in the wash would severely limit or eliminate mixing at certain times of the year. Plant discharge water would have to meet TDS and temperature standards at the end-of-pipe at the facility. The additional treatment to meet those standards would make the plant economically infeasible. In addition, it is not clear that the Cold Springs Wash's hydraulic capacity could handle full wash flow plus plant discharge water flow at certain times of the year.

Discharge to Municipal Sewage Treatment Facilities

Based on discussions with the City of Hermiston, the plant discharge water is considered too high quality for treatment by the city's sewage treatment plant. Sewage treatment processes are designed for high nutrient water since biological treatment and breakdown of contaminants are important steps in sewage treatment. Adding significant volumes of low nutrient water (such as Wanapa's discharge water) adds hydraulic loading and reduces the efficiency of treatment processes. Discussions with the city's engineer indicated that the only use they might have for some of the water would be to decrease the temperature of their final discharge. However, the city would only be interested in water 50ºF or less. It is not economically feasible for Wanapa to decrease plant discharge temperature for that purpose.