

Construction on Site (WAC 463-42-145)

WAC 463-42-145 PROPOSAL — CONSTRUCTION ON SITE.

The applicant shall describe the characteristics of the construction to occur at the proposed site including the type, size, and cost of the facility; description of major components and such information as will acquaint the council with the significant features of the proposed project.

[Statutory Authority: RCW 80.50.040(1) and chapter 80.50 RCW. 81-21-006 (Order 81-5), §463-42-145, filed 10/8/81. Formerly WAC 463-42-210.]

2.3 CONSTRUCTION ON SITE (WAC 463-42-145)

This section provides information on the proposed project and construction of the project in the following sections:

- Project Summary (Section 2.3.1)
- Power Plant Description (Section 2.3.2)
- Power Plant Construction (Section 2.3.3)

2.3.1 PROJECT SUMMARY

Duke Energy Grays Harbor, LLC, and Energy Northwest (the Certificate Holder) is proposing to expand the Satsop Combustion Turbine (CT) Project by 600 megawatts (MW), doubling the generating capacity of the project. Like Phase I, Phase II will consist of two combustion turbine generators and a single steam turbine generator. Certain facilities installed for Phase I, such as the operations and control office, warehouse, workshops and stores, gas regulation and treatment, and the water treatment building are adequately sized to serve both Phase I and Phase II, and new facilities of this type are not required.

A combined cycle plant uses exhaust gases from the combustion turbine that might otherwise be exhausted into the atmosphere without recapturing any of the heat content. In the proposed project, natural gas and air will be mixed and ignited in a combustion turbine. The combustion turbines produce about one-half of the plant's electrical output, and emit hot gases as a byproduct. The hot gases exhausted by the combustion turbines will be used to produce steam in a heat recovery steam generator (HRSG). The high-energy steam from the HRSG will be piped into a steam turbine that generates the remaining one-half of the unit's electrical output.

The total estimated value of Phase II at the completion of the construction is approximately \$400 million for construction of the plant. The Certificate Holder estimates that the annual operating and maintenance costs will be approximately \$12 million, including the following:

- Wages and salaries of operation, maintenance, and administrative personnel
- Procurement of goods and services
- Insurance
- Sales, property and other state and local taxes

Figures 2.3-1 and 2.3-2 present conceptual isometric diagrams of the proposed project (Phase I and Phases I and II, respectively). Figure 2.3-3 is a plant configuration diagram for Phase II, showing the major component systems for the plant. Figure 2.3-3 shows the major facilities/systems that will support the turbine trains, including the steam condensing/cooling system and the electrical interconnection system.

Process water will be purchased from the Grays Harbor Public Development Authority and supplied from the existing Ranney collectors via the existing Satsop Development Park water supply line that services Phase I facilities. This water is transported to Phase II through an existing water pipeline that passes adjacent to the site (see Figure 2.3-4). The existing outfall structure to the Chehalis River will be used for discharge of the Satsop CT Project's process effluent.

Potable water will be obtained from the existing Satsop Development Park raw water well. This system includes a supply tank and pump house located contiguous to the northeast corner of the site and will provide high-quality water that will be treated as necessary for potable uses. Sanitary wastewater will be discharged through an on-site septic system and leach field constructed for the plant.

Fuel for Phase II will be provided by the natural gas pipeline constructed as part of Phase I.

Power produced by Phase II will be routed through transmission lines that will connect to the BPA system at the Satsop substation. The lines will be constructed by BPA as part of Phase I.

2.3.2 POWER PLANT DESCRIPTION

2.3.2.1 Overview

The Certificate Holder is proposing to construct and operate Phase II to help supply growing regional electrical loads. This plant will be a combined cycle power plant with a nominal average output of 600 MW to be constructed on the site already certified for Phase I.

Like Phase I, Phase II will use the General Electric (GE) Frame 7FA combustion turbines in a 2-x-1 combined cycle configuration with a GE D11 steam turbine. Each GE 7FA combustion turbine generates a nominal gross power output of 175 MW, while the steam turbine generates approximately 300 MW gross with inlet chilling and maximum duct firing at annual average temperature. Phase II also features GE 7H2 hydrogen-cooled generators for the combustion turbine and steam turbine.

A basic description of Phase II is presented in Section 2.3.2.2. Detailed power plant design and specification information was provided as Appendix B to the original SCA application; as a convenience to the reader, that appendix is reproduced here as Appendix A to this amendment. A detailed description of the cooling systems is provided in Section 2.6 - System of Heat Dissipation, WAC 463-42-175. The basic building structures can be found on Figures 2.3-2, 2.3-3, and 2.3-4. Plant elevations are illustrated in Figure 2.3-5. The approximate heights of the major plant components are listed in Table 2.3-1.

2.3.2.2 Plant Components

Figure 2.3-3 shows the equipment configuration of the CT Project. The project is made up of the following components:

- Combustion turbine generator (CTG) (two)
- Heat recovery steam generator (HRSG) (two)
- Steam turbine generator (STG) (one)
- Fuel supply
- Process water and wastewater treatment
- Cooling system
- Electrical interconnection
- Fire protection

**TABLE 2.3-1
APPROXIMATE HEIGHTS OF MAJOR COMPONENTS**

Component ^a	Approximate Height (ft)
Gas Turbine (1)	57
HRSG (2)	80
Exhaust Stack (3)	200
Cooling Tower (4)	52

^a Numbers in parentheses refer to key on Figure 2.3-4, Site Plan.

The following is a summary description of the major components of each unit.

Combustion Turbine Generator (CTG)

The configuration incorporates two GE 7FA turbine generators, each with a gross capacity of approximately 175 MW. The GE 7FA is an industrial combustion gas turbine, including dry low-NO_x burners, that represents the state of the art in combustion turbine technology. This turbine has been specified as the basis for the heat and material balance, fuel use, and emissions calculations.

Heat Recovery Steam Generator (HRSG)

The high temperature exhaust produced by the combustion turbines will flow directly to an HRSG. The HRSG will produce output steam at three pressure levels, all of which will supply steam directly to the steam turbine.

Emissions control (air pollution control) equipment is integrated within the HRSG. The selective catalytic reduction (SCR) control equipment for removal of oxides of nitrogen (NO_x) and the oxidation catalyst for removal of carbon monoxide (CO) are located within the HRSG.

Steam Turbine Generator (STG)

Steam from the HRSG will be delivered to the STG which will have a gross capacity of approximately 300 MW (base load).

An auxiliary boiler will be installed with a low-NO_x burner to produce steam at approximately 25,000 pounds per hour to provide sealing steam to the STG. It can also be used to maintain temperature in the HRSG and STG during long idle time to reduce startup duration.

Fuel Supply

The fuel for Phase II fuel will be natural gas. The natural gas supply will connect at T-connections and to the metering station on site that is being constructed as part of Phase I. Fuel will be supplied at an average of 450 psig.

Process Water and Wastewater Discharge

Process water requirements will be purchased from the Grays Harbor Public Development Authority. The water will be obtained through the existing Ranney collectors, located west of the plant site (see Figure 2.3-6). Ranney well water will be delivered to the Satsop CT Project plant site via the existing supply water line. The Phase II Project will send its effluent back to the existing water pipeline via another connection downstream of the project intake, from where it will be transported and discharged to the Chehalis River through the existing outfall structure. The discharge will comply with the limitations of the existing National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit will, however, require amendments to reflect the increased wastewater flow and the new waste stream.

Cooling System

The proposed cooling system consists of two major components: (1) a circulating water system that will carry cold water from the cooling tower through the steam turbine condenser and back to the cooling tower, and (2) an auxiliary cooling water system that will be tied into the circulating water system to provide water for cooling major equipment within the combined cycle facility. The evaporative cooling tower will consist of a 10-cell structure approximately 276 feet long, 114 feet wide, and 52 feet high.

Electrical Interconnection

Power generated by Phase II will be delivered to the BPA's existing high-voltage transmission system at 230 kV at the breakers constructed on site. The power will be exported on lines constructed for Phase I from the project site to the BPA Satsop substation located approximately 4,000 feet to the east of the project site (see Figure 2.1-1).

A switchyard containing necessary breakers, switching and transformer equipment will be constructed for Phase II.

Fire Protection

The fire protection system, including the fire water system, fixed suppression systems, detection systems, and portable fire extinguishers, will provide the required fire protection for each plant and will consist of the following major components:

- Sprinkler systems
- Yard loop hydrant system
- Preaction spray/sprinkler system for the steam turbine generator bearings and lube oil equipment
- Independent smoke detection system
- Portable fire extinguishers
- Standpipes and fire hose stations at various locations throughout the buildings
- Instrumentation and control equipment for alarm, indication of equipment status, and actuation of fire protection equipment
- Combined raw/fire water storage tank
- Fire water pumps

Fire water will be stored in the on-site 1,000,000 gallon storage tank. This tank will also serve as a reservoir for raw water. This storage capacity will be sufficient to provide the maximum automatic system demand plus 500 gallons per minute (as recommended by NFPA 850) for a 2-hour period. The fire water pumping system will consist of a primary motor-driven pump, a diesel-driven backup pump with independent fuel supply, and a pressure-maintaining jockey pump.

2.3.2.3 Project Layout

Figure 2.3-4 presents the site plan layout for the project. Buildings located on the site are shown on Figure 2.3-2. The locations of key components of each plant are described below.

The combustion turbine and generator, the steam turbine and generator, and their associated support equipment will be located within standard GE enclosures. The HRSGs will be located outside of the generation building.

The CT-HRSG will be laid out in an in-line design parallel to the STG in a north-south orientation. Within the CTG-HRSG, the combustion turbine and the generator will be located at the north end within the generation building and adjacent to the electrical switchyard. The northernmost

structures will be the exhaust stacks, with the HRSG (and emission control equipment within the HRSG) located between the stack and the combustion turbine.

An electrical switchyard will be located adjacent to the generator ends of the combustion turbines on the southernmost end of the site. Transmission lines will extend from the switchyard to the Olympia-Aberdeen transmission line right-of-way that extends along the southern edge of the plant site (see Figure 2.3-3).

The natural gas pipeline will enter the center of the plant site from the east (see Figure 2.3-4).

2.3.3 POWER PLANT CONSTRUCTION

2.3.3.1 Construction Summary

The Phase II site was previously graded and a layer of gravel was placed to prepare the site for use as a construction storage area for the Phase I project.

After excavation, foundations will be installed, as will the drainage system for the construction stage. Materials to be used during construction are expected to be staged on the construction storage areas located adjacent to and west of the project site (see Figure 2.1-2), just west of Keys Road. During construction, the plant site will remain fenced to provide site security.

The Certificate Holder will purchase electricity needed for construction and startup. Approximately 1.5 megavolts (MVA) of 480-volt, 3-phase temporary power will be installed at a single location within the project site boundary. Startup power will be obtained by back-feeding from the 230-kilovolt (kV) utility system.

Conventional construction equipment, including bulldozers, front-end loaders, trucks, tractor-scrappers, and graders will be used to final grade the site. During construction, dust will be controlled as needed by spraying water on dry, exposed soil. Prior to leaving the site during construction, vehicles will be sprayed with water and required to drive over a gravel pad to remove mud from the tires.

Site clearing and grading has been completed during Phase I construction. Phase II construction erosion control measures will be used in accordance with the requirements of the Certificate Holder's existing Erosion and Sedimentation Control Plan. The Erosion and Sediment Control Plan was approved by EFSEC on September 19, 2001.

After site preparation is completed, the Phase II contractors will install the combustion turbine, steam turbine, generators, electrical and other equipment. Once these facilities are in place, the site landscaping will be initiated.

Field toilets and temporary holding tanks will be placed on site for use by construction personnel. During construction, potable water from the water supply system will supply the contractor's needs. Parking will be provided on the construction laydown area located west of Keys Road.

2.3.3.2 Site Preparation

There will be approximately 80,000 cubic yards of excavation for foundations, buried pipes (circulating water and fire loop), and the electrical duct banks. This material will be retained in the construction area west of Keys Road and later used for backfill.

A Phase I Environmental Site Assessment completed in April 1994 (Dames & Moore 1994) indicated that there is no evidence of contamination with hazardous materials at the site and that the likelihood of such contamination being present in subsurface soils is low. If contamination is encountered during excavation and grading, the Certificate Holder will notify EFSEC and take the appropriate remedial actions.

During site preparation, the Phase II contractor will install a storm drainage system. This system will consist of a series of swales that will convey surface water runoff into the existing Satsop Development Park storm drainage control system (see Section 2.10 - Surface-Water Runoff, WAC 463-42-215).

A 6-foot high enclosure (chain link fence) was constructed as part of Phase I surrounding the plant site to provide security, and will be maintained during construction of Phase II.

2.3.3.3 Foundations and Roadways

Foundations, including a pedestal for the steam turbine generator and foundations for the gas turbine generator and heat recovery steam generator equipment, will be installed. As a part of final design studies, geotechnical investigations will be conducted to determine the appropriate types of foundations for the facilities. Based on currently available data, the Certificate Holder anticipates that foundations will be Category 1 facilities (non-essential facilities) in accordance with ASCE document 7-88 (“Minimum Design Loads for Buildings and Other Structures”). Foundations and buildings will be designed for Seismic Zone 3.

Construction of the project foundations will require the use of a number of types of heavy equipment, including excavation equipment, concrete-pumping equipment, and concrete finishing equipment. In addition, light- and medium-duty trucks, air compressors, generators, and other internal combustion engine driven equipment are anticipated.

On-site roadways and parking areas will be constructed with asphaltic concrete over a compacted subbase.

An on-site concrete batch plant will not be required.

2.3.3.4 Equipment Installation

A number of the component systems of the Phase II facility will be fabricated and delivered to the site. This includes the combustion turbine, CTG, HRSG, STG, major pumps, and electrical equipment. Fabrication and delivery of these components will be scheduled to coincide with their

requirement in the construction sequence. Heavy and large equipment components will be delivered to the site by truck. Various sized cranes will be required to lift and place many of the pieces of component equipment into the required position.

In sequence with the installation of component equipment, support systems will be installed, including electrical equipment, control equipment, piping instrumentation, wiring cable, and conduits. Typical construction activities onsite will include mechanical fastening, welding, preparation, and painting.

Cathodic protection will be provided on all underground gas lines within the site boundary.

2.3.3.5 Startup Testing

At the completion of the construction sequence, the plant system will be energized and operational testing undertaken. This will include testing each of the major component systems in a predetermined sequence and completion of quality assurance and quality control checks to ensure that each system is ready for full operation. After the total plant is fully operational, emission compliance testing will be conducted. At the end of the startup testing phase, each unit will be separately certified for commercial operation. The quality assurance and quality control checks are described in detail in Section 2.12 - Construction and Operation Activities, WAC 463-42-235.



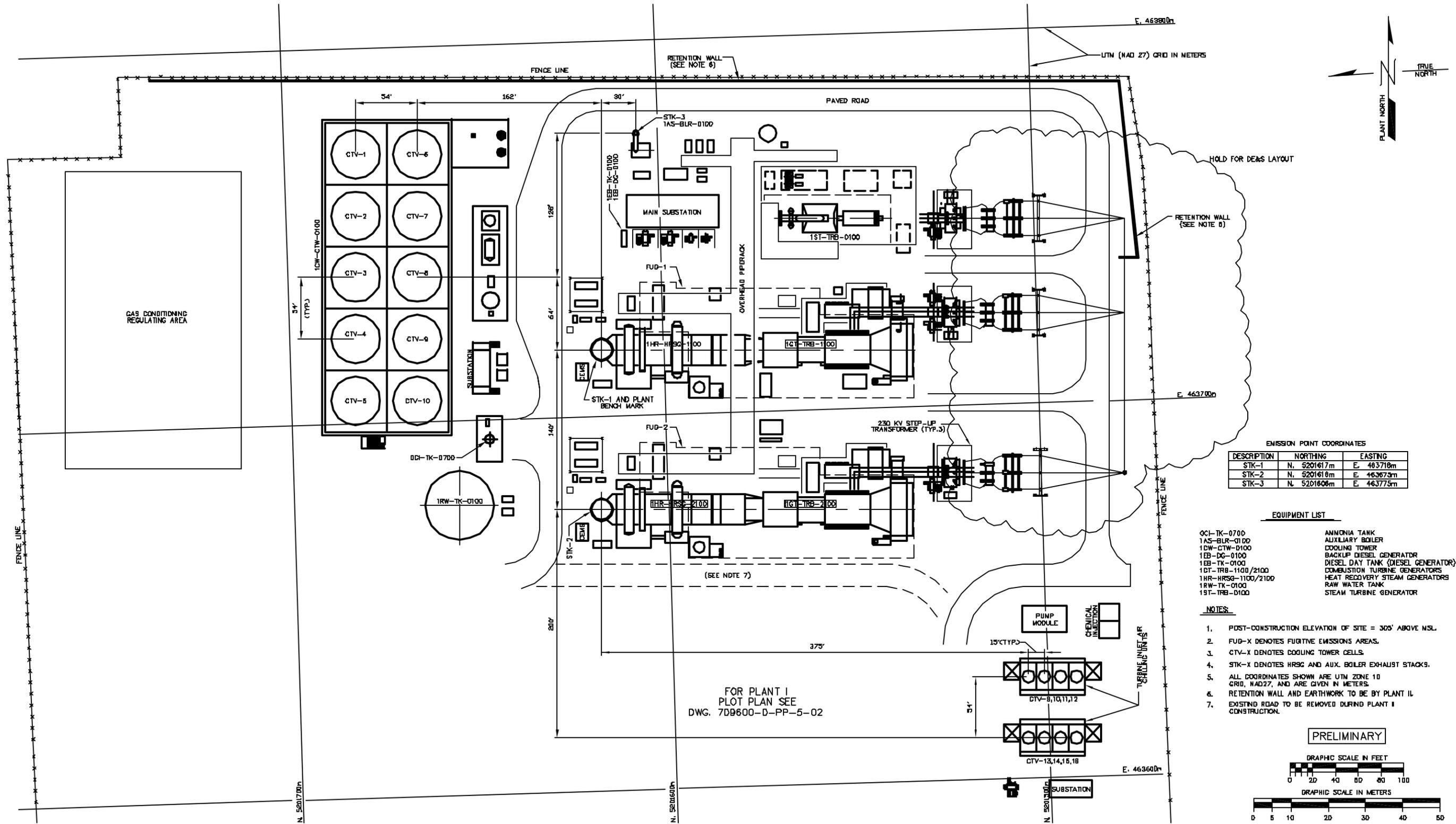
Source: 3DScape

Figure 2.3-1
Existing Phase I Isometric View



Source: 3DScape

Figure 2.3-2
Proposed Phase II Conceptual Isometric View



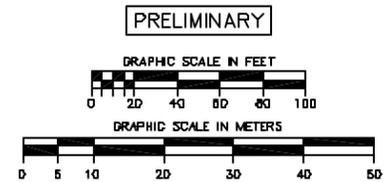
EMISSION POINT COORDINATES

DESCRIPTION	NORTHING	EASTING
STK-1	N. 5201617m	E. 463710m
STK-2	N. 5201618m	E. 463673m
STK-3	N. 5201606m	E. 463775m

EQUIPMENT LIST

QC1-TK-0700	AMMONIA TANK
1AS-BLR-0100	AUXILIARY BOILER
1CW-CTW-D100	COOLING TOWER
1EB-DG-0100	BACKUP DIESEL GENERATOR
1EB-TK-0100	DIESEL DAY TANK (DIESEL GENERATOR)
1CT-TRB-1100/2100	COMBUSTION TURBINE GENERATORS
1HR-HRSG-1100/2100	HEAT RECOVERY STEAM GENERATORS
1RW-TK-0100	RAW WATER TANK
1ST-TRB-D100	STEAM TURBINE GENERATOR

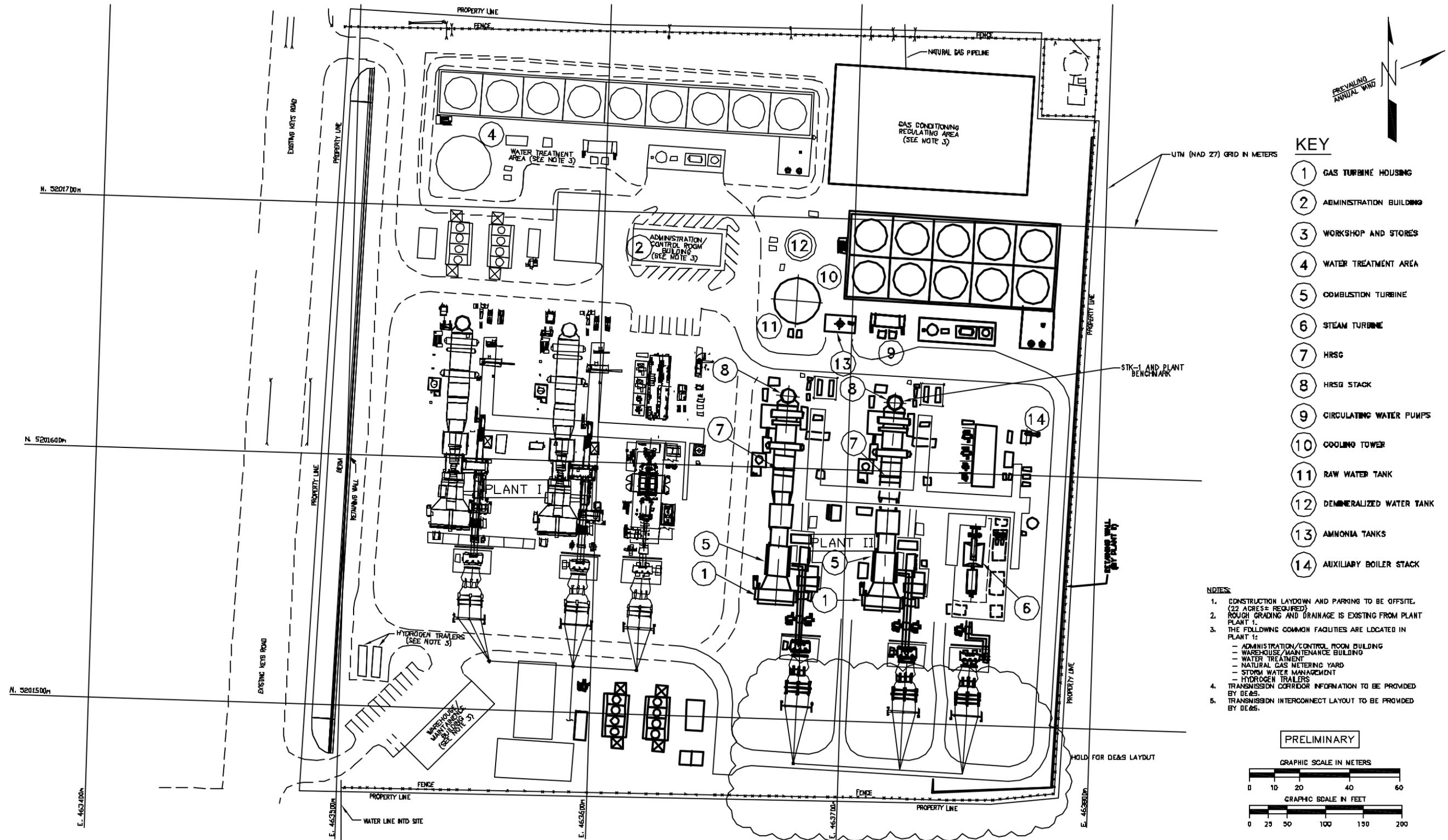
- NOTES:
1. POST-CONSTRUCTION ELEVATION OF SITE = 305' ABOVE MSL.
 2. FUD-X DENOTES FUGITIVE EMISSIONS AREAS.
 3. CTV-X DENOTES COOLING TOWER CELLS.
 4. STK-X DENOTES HRSG AND AUX. BOILER EXHAUST STACKS.
 5. ALL COORDINATES SHOWN ARE UTM ZONE 10 GRID, NAD27, AND ARE GIVEN IN METERS.
 6. RETENTION WALL AND EARTHWORK TO BE BY PLANT II.
 7. EXISTING ROAD TO BE REMOVED DURING PLANT II CONSTRUCTION.



FOR PLANT I
PLOT PLAN SEE
DWG. 7D9600-D-PP-5-02

Figure 2.3-3
Plant Configuration
Phase II Expansion
Satsop CT Project





KEY

- ① GAS TURBINE HOUSING
- ② ADMINISTRATION BUILDING
- ③ WORKSHOP AND STORES
- ④ WATER TREATMENT AREA
- ⑤ COMBUSTION TURBINE
- ⑥ STEAM TURBINE
- ⑦ HRSG
- ⑧ HRSG STACK
- ⑨ CIRCULATING WATER PUMPS
- ⑩ COOLING TOWER
- ⑪ RAW WATER TANK
- ⑫ DEMINERALIZED WATER TANK
- ⑬ AMMONIA TANKS
- ⑭ AUXILIARY BOILER STACK

- NOTES:**
1. CONSTRUCTION LAYDOWN AND PARKING TO BE OFFSITE. (22 ACRES± REQUIRED)
 2. ROUGH GRADING AND DRAINAGE IS EXISTING FROM PLANT I.
 3. THE FOLLOWING COMMON FACILITIES ARE LOCATED IN PLANT I:
 - ADMINISTRATION/CONTROL ROOM BUILDING
 - WAREHOUSE/MAINTENANCE BUILDING
 - WATER TREATMENT
 - NATURAL GAS METERING YARD
 - STORM WATER MANAGEMENT
 - HYDROGEN TRAILERS
 4. TRANSMISSION CORRIDOR INFORMATION TO BE PROVIDED BY DE&S.
 5. TRANSMISSION INTERCONNECT LAYOUT TO BE PROVIDED BY DE&S.

PRELIMINARY

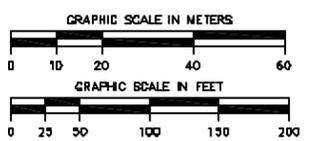
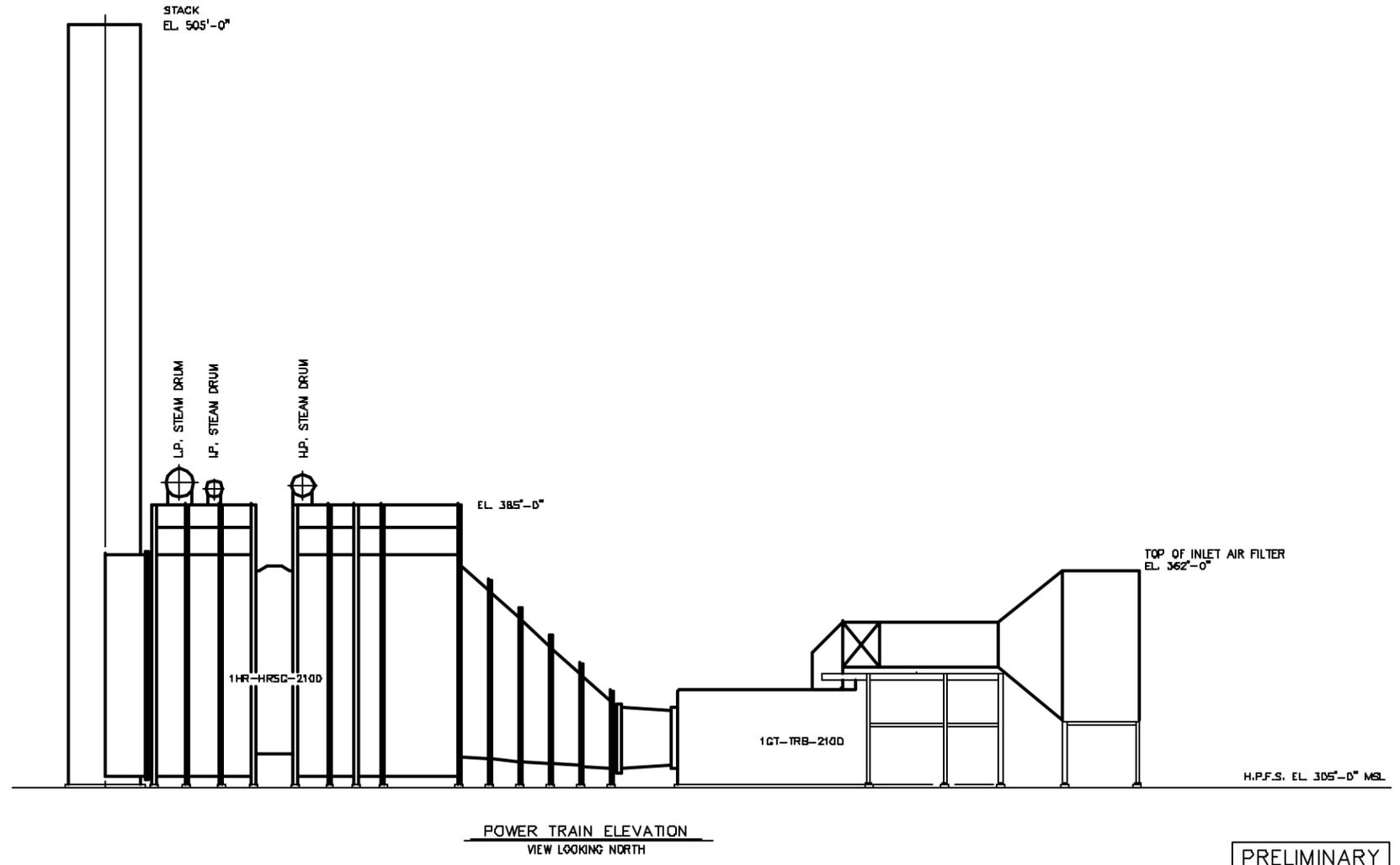
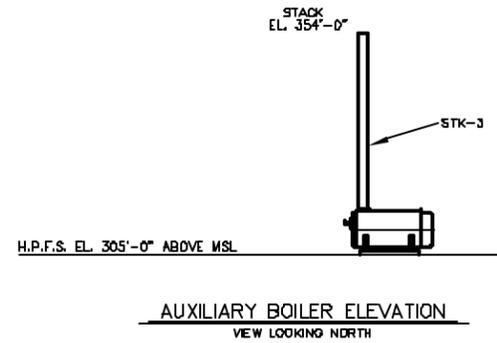
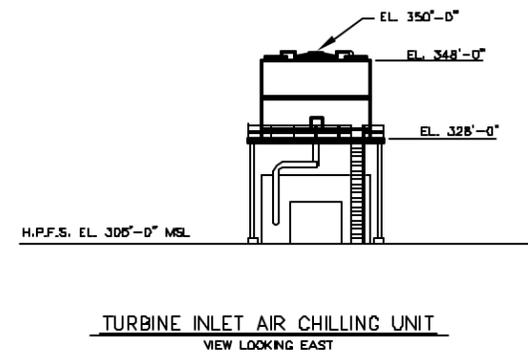
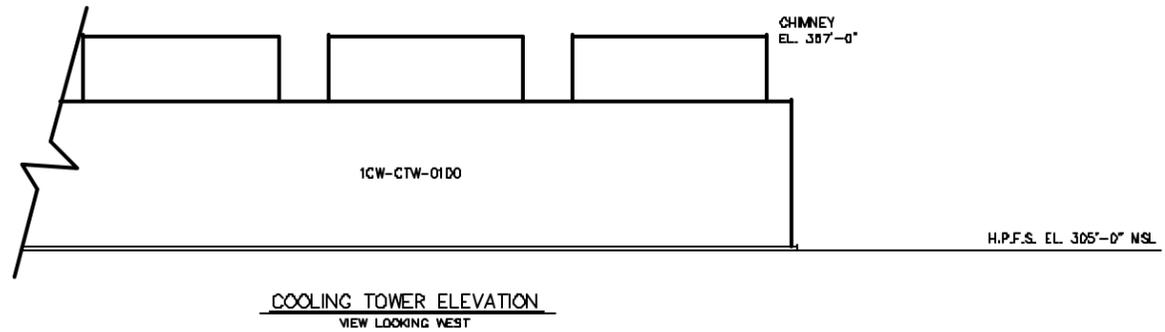


Figure 2.3-4
Site Plan





PRELIMINARY



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Figure 2.3-5
Plant Elevation

Phase II Expansion
Satsop CT Project

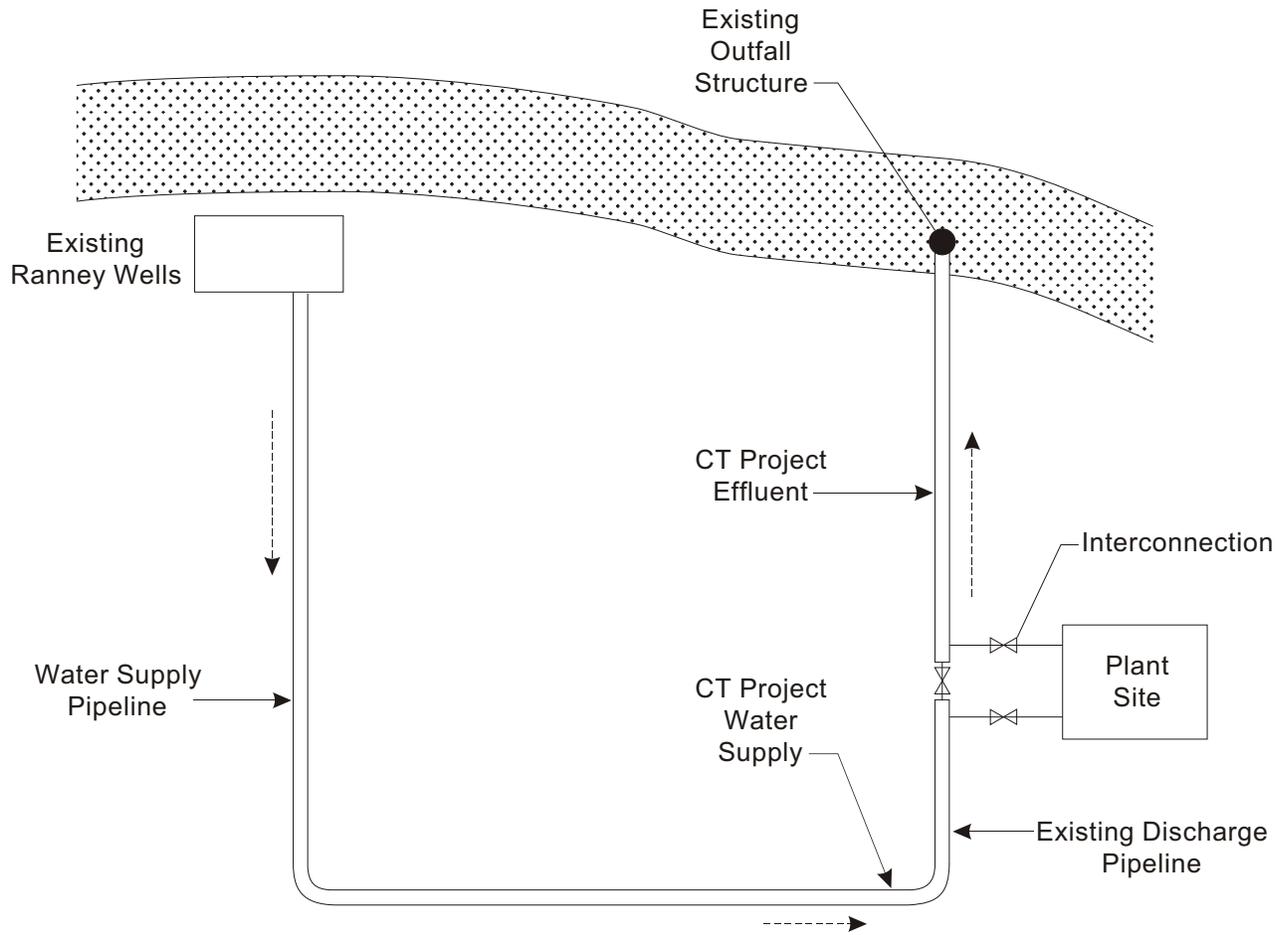


Figure 2.3-6
**Process Water
Conceptual Flow Diagram**