ONTARIO POWER GENERATION

Plan

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PNGS-A Detailed Decommissioning Plan Volume 2 - Non-Nuclear Component Removal

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PNGS-A Detailed Decommissioning Plan Volume 2 - Non-Nuclear Component Removal

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Revision Summary

Revision Number	Date	Comments
R00	2024-12-02	Initial issue.

1.0 INTRODUCTION

This Detailed Decommissioning Plan (DDP) focuses on Planning Envelope B (PE-B) and includes the dismantling and removal of Systems, Structures and Components (SSCs) considered to be non-nuclear that are located within the Turbine Hall (TH) and Turbine Auxiliary Bay (TAB). Within 5 years of submission, the scope and contents of this volume will be reviewed and revised as required.

PE-B consists of systems and components that are designated for end-stating, abandonment, or retirement. While many of these systems will no longer support PNGS-A SWS or the planned refurbishment or extended operations of PNGS-B (U5 - U8), some components will remain operational until station separation is completed. Refer to the Program Overview DDP [R-1] for details on the separation strategy.

This PE has been preliminarily sub-categorized into two groups based on the location and type of systems to be decommissioned. The specific timing and sequence of decommissioning activities within PE-B will be coordinated with the station separation schedule to maintain required operational dependencies.

- Group B-1: SSCs such as the turbine and generator, located within the Turbine Hall of PNGS-A U1 – U4.

- Group B-2: SSCs such as the electrical supply and controls, located within PNGS-A U1 – U4 TAB.

The components included in this envelope are not anticipated to be radiologically contaminated. A general description of the SSCs is provided in Section 2.0.

NOTE

As decommissioning planning and execution progresses, some non-nuclear systems may be available earlier than originally contemplated in the preliminary sub-categorization. In these instances, approved OPG processes and procedures will be used to advance the work, including consultation with the CNSC as required.

In accordance with REGDOC-2.11.2 [R-16], any work activities that fall within PE-B, even if not explicitly detailed, will undergo all mandatory preparatory activities. This ensures comprehensive decommissioning planning and preparation as required by the regulatory framework.

2.0 GENERAL DESCRIPTION & BREAKDOWN OF PLANNING ENVELOPE SYSTEM, STRUCTURE & COMPONENTS

This section includes a description of all the non-nuclear components that have been included in the scope for decommissioning of PNGS-A.

2.1 Turbine Hall

The main components in the TH are the turbine and auxiliary equipment and the generator and auxiliary equipment.

Figure 1 Turbine Hall 294' Elevation

2.1.1 41100 Turbine

The Turbine System, located in the turbine hall, consists of high pressure and low-pressure turbine units, rotor assemblies, casings, bearings, and steam flow path components constructed mainly of high-grade steel alloys.

2.1.2 41120 Moisture Separation System

The Moisture Separation System consists of moisture separator vessels, drain tanks, piping, and associated valves constructed mainly of carbon steel.

2.1.3 41130 Live Steam Reheat System

The Live Steam Reheat System consists of reheater vessels, steam piping, isolation valves, and associated instrumentation constructed mainly of carbon steel.

2.1.4 41140 Turning Gear

The Turbine Generator Turning Gear System consists of an AC motor, self-shifting clutch mechanism, drive gearing, and associated control components constructed mainly of steel and copper electrical components.

2.1.5 41160 Turbine Lubricating Oil System

The Turbine Lubricating Oil System consists of oil storage tanks, pumps, filters, coolers, supply/return piping, and distribution headers constructed mainly of carbon steel with copper-alloy heat exchanger components.

2.1.6 41150 Turbine Gland Steam System

The Turbine Gland Steam System consists of steam supply headers, distribution piping, pressure control valves, and sealing components constructed mainly of carbon steel.

2.1.7 41170 Turbine Governing System

The Turbine Governing System consists of hydraulic actuators, control valves, speed sensors, electronic controllers, and associated instrumentation constructed mainly of steel and electronic components.

2.1.8 41180 Turbine Supervisory System

The Turbine Supervisory System consists of instrumentation and control equipment, constructed mainly of electronic components designed for turbine-generator protection service.

2.1.9 41190 LP Exhaust Cooling System

The LP Turbine Exhaust Cooling System consists of cooling equipment and monitoring instruments, constructed mainly of steel components designed for exhaust temperature control service.

2.1.10 43110 Extraction Steam System

The Extraction Steam System consists of steam piping and control equipment, constructed mainly of steel components designed for steam distribution service.

2.1.11 41200/41210 Generator

The Main Generator System consists of a large rotating electrical machine, constructed mainly of steel and copper components designed for electrical power generation service.

2.1.12 41220 Excitation

The Generator Excitation System consists of static pilot exciter, Automatic Voltage Regulator, a main exciter, and associated control equipment, constructed mainly of electrical and electronic components designed for generator field excitation control service.

2.1.13 41230 Hydrogen Cooling System

The Generator Hydrogen Cooling System consists of hydrogen coolers, seals, and auxiliary components, constructed mainly of steel and specialized materials designed for hydrogen gas cooling service.

2.1.14 41240 Stator Cooling System

The Stator Cooling System consists of a closed-loop demineralized water circulation system, constructed mainly of copper piping and heat exchange components designed for generator stator cooling service.

2.1.15 41250 Seal Oil System

The Generator Seal Oil System consists of oil pumps, filters, tanks, and regulating equipment, constructed mainly of steel components designed for hydrogen sealing and shaft lubrication service.

2.1.16 42110 Main Condenser

The Main Condenser System consists of shell and tube heat exchangers, constructed mainly of copper and stainless-steel components designed for steam condensing service. The system serves as the primary heat rejection component for the steam cycle, installed at the exhaust of the LP turbines.

2.1.17 42120 Extraction Air System

The Condenser Air Extraction System consists of three Condenser Air Extraction Pumps (CAEPs) and associated exhaust piping to the turbine hall roof, constructed mainly of steel components designed for vacuum service.

2.1.18 42130 Condenser Tube Cleaning System

The Condenser Tube Cleaning System (CTCS) consists of sponge rubber ball circulation equipment, ball collection and injection components, and associated piping, constructed mainly of stainless steel and rubber components designed for continuous mechanical tube cleaning service.

2.1.19 42140 Debris Filter Assembly

The Debris Filter System consists of filter assemblies installed upstream of the main condensers, constructed mainly of metal screening components designed for debris removal service.

2.1.20 71210 Condenser Cooling Water (CCW) Supply System

The Condenser Cooling Water (CCW) System consists of two parallel pumps per unit discharging into a 9 ft diameter common header, six 6 ft diameter inlet pipes to the condensers, three 9 ft diameter discharge pipes, and a concrete discharge duct (10 ft wide by 15 ft high), constructed mainly of large-diameter steel piping and concrete components designed for lake water cooling service. The system includes stop logs for isolation at the CCW pump intake and lake discharge points.

2.1.21 71240 Vacuum Priming System

The Vacuum Priming System consists of three vacuum priming pumps per unit, control tank, level controller, unloader valve, pressure relief valve, and shut-off valves, constructed mainly of steel components designed for air removal service. The system is mounted above the condenser water boxes with top and bottom tank connections, which facilitated air collection and removal through siphon action.

2.1.22 43100 Feedwater Heating System

The Feedwater Heating System consists of LP and HP feedwater heaters arranged in a regenerative heating cycle, extraction steam piping, drain cascading lines, and venting system components, constructed mainly of steel components designed for high-pressure feedwater and extraction steam service.

2.1.23 43200 Condensate and Boiler Feed System

The Condensate System consists of condensate pumps, deaerator storage tank, and associated piping to the Boiler Feed (BF) System, Main Boiler Feed (MBF) pump glands, and LP Cylinder Exhaust Cooling System, constructed mainly of mild steel components designed for treated water service. The Boiler Feed System consists of feed pumps and associated piping from the deaerator storage tank to the boilers, constructed mainly of steel components designed for high-pressure feedwater service.

2.1.24 71640 Chemical Feed System

The Boiler Chemical Feed System consists of three subsystems:

- Amine (Morpholine) Feed System consists of four sets (one per unit) of 250-gallon mixing tanks, portable motor-driven agitators, metering pumps, and associated piping, constructed mainly of chemical-resistant materials designed for pH control chemical service.

- Hydrazine Feed System consists of four sets (one per unit) of mixing tanks, portable motor-driven agitators, metering pumps, and associated piping, constructed mainly of chemical-resistant materials designed for oxygen scavenging chemical service.

- Phosphate Feed System (currently abandoned) consists of two sets of dual mixing tanks, portable motor-driven agitators, metering pumps, and associated piping,

constructed mainly of chemical-resistant materials designed for phosphate chemical service.

2.1.25 77000 Oil Services

The Turbine and Generator Oil System consists of oil storage tanks, oil purification equipment, pumps, and waste disposal components, constructed mainly of steel components designed for lubricating oil service. The system was designed to provide essential lubrication and cooling for turbine and generator bearings, with oil treatment capabilities to maintain oil quality and proper system function.

2.1.26 58200 Compressed Air

The compressed air system consists primarily of stainless-steel piping and provides pneumatic power to operate air blast circuit breakers located in the switchyard.

2.2 Turbine Auxiliary Bay

The TAB is where the Turbine & Generator (TG) Auxiliary Systems and Electrical Distribution Buses were used to support the operation of the turbine-generator system during reactor operation. The following sections will provide more details on the associated systems.

Figure 2 Turbine Auxiliary Bay

2.2.1 45110 Sampling Circuit

The Steam and Water Sampling (SAWS) System consists of stainless-steel sampling tubing from the reheater drains, reheater drain pumps, and main steam boiler headers, with service water heat exchangers for sample cooling, constructed mainly of stainless-steel components designed for high-temperature sampling service.

2.2.2 45200 Drain Systems

The Turbine & Extraction Steam Drain System consists of drain lines and steam traps located at the turbine casing, steam lines, and associated equipment, constructed mainly of steel piping and components designed for condensate collection and removal service.

2.2.3 75100 Service Air Systems

The Service Air (SA) System, common to U1 - U4, consists of two air-cooled rotary screw compressors, four air receivers, and a main distribution header with valves for pneumatic tool

connections, constructed mainly of galvanised steel piping and pressure vessels designed for compressed air service.

2.2.4 71000 Cooling Water Systems

2.2.4.1 71200 Condenser Cooling Water and 71240 Vacuum Priming System

The Condenser Cooling Water (CCW) System consists of dual parallel pumps per unit feeding a header, six condenser supply pipes, three discharge pipes, and a discharge duct, with associated vacuum priming system (three pumps, control tank and valves) constructed mainly of concrete and steel components designed for lake water service.

2.2.4.2 71310 Low Pressure Service Water System

The Low-Pressure Service Water (LPSW) System consists of three 30,000 USGPM (1,893 L/s) vertically mounted pumps, automatic backwashing strainers, distribution headers, and interconnecting piping constructed mainly of corrosion-resistant materials designed for lake water service.

2.2.4.3 71320 Recirculated Cooling Water

The Recirculated Cooling Water System consists of pumps, tanks and heat exchangers which provide cooling water to heat exchangers, pump bearings and continuous user equipment. The system is constructed primarily of steel components.

2.2.4.4 71340 High Pressure Service Water System

The High-Pressure Service Water (HPSW) System consists of two 100% capacity vertical centrifugal pumps (9,000 USGPM or 0.59L/s each), distribution headers, and associated piping constructed mainly of corrosion-resistant materials designed for lake water service.

2.2.4.5 71620 Demineralized Water Distribution System

The Demineralized Water Storage and Distribution System consists of storage tanks, centrifugal pumps, head tanks, and distribution piping constructed mainly of stainless steel and corrosion-resistant materials.

2.2.5 73010 Electric Boiler

The Electric Boiler System consists of boiler chemical feed pump, boiler recirc pumps, heating steam condensate and blowdown tanks and associated piping. The components in this system are constructed mainly of aluminum and copper.

2.2.6 64323 BFLP trip Instrumentation

The Boiler Feedline Low Pressure Instrumentation is used to monitor and detect the boiler level and pressure and is constructed mainly of steel.

2.2.7 34130 Biological Shield Cooling

The expansion tank is located in the TAB and is connected to a common point on the return lines close to the pump suction header. This tank is constructed mainly of steel.

2.2.8 34110 Calandria End Shield Cooling

The expansion tank is located in the TAB since it is the closest point to the reactor building that provides a mounting location at an elevation above the top of the end shield return headers. This tank is constructed mainly of steel.

3.0 CURRENT STATUS

Initial surveys and inventories have been completed, providing a detailed understanding of the structures, systems, and components within these buildings. This information forms the foundation for developing targeted decommissioning strategies.

This projected start date aligns with the decommissioning timeline discussed in the Program Overview DDP [R-1] and is contingent upon securing the necessary authorizations from regulatory bodies to ensure compliance with all applicable safety and environmental regulations. In preparation for the upcoming decommissioning activities, scoping surveys and Hazardous Building Material Assessments (HBMAs) are currently in progress.

4.0 DECOMMISSIONING WORK PACKAGES AND SAFETY ASSESSMENT

The PE-B scope is broken down into several work packages detailed below. Work package development is ongoing and will progress into work plans to support execution of the work. The development of work packages will follow the established procedures detailed in the Work Package Management section of the Program Overview [R-1].

The equipment and structures within the Turbine Hall (TH) and Turbine Auxiliary Bay (TAB) have been grouped into work packages based on location and elevation. The goal of each work package is to document the plan to remove all equipment from the work area and reach an interim end state. This includes any tanks, valves, pumps, motors, heat exchangers, instrumentation, and pipework. All material and equipment are planned to be processed and removed for recycling or disposal as waste. The interim and final-end state objectives are set out in the Program Overview DDP [R-1].

4.1 Occupational Dose Assessment

Anticipated occupational dose assessments have been conducted by Ontario Power Generation's (OPG) Responsible Health Physicist (RHP) for Planning Envelope B. Based on historical surveys and available data, the structures, systems, and components (SSCs) within this planning envelope are expected to present minimal radiological hazards.

4.2 Decommissioning Safety Assessment

A decommissioning safety assessment was performed in accordance with the methodology detailed in the Program Overview DDP [R-1] for each work package scope to systematically identify potential hazards and evaluate associated risks. The identified hazards and their corresponding mitigation measures have been discussed in the Safety Assessment Report [R-15]. The identified hazards and corresponding mitigation measures are summarized in the table below:

Hazard Category	Hazard/Events Description	Mitigation Measures
Radiological	Radiological hazard associated with tritium and contaminated crud in the tanks.	Compliance with OPG's Radiation Protection Program [R-3].
Environmental	None Identified	
Non-Radiological	Hot work hazards from cutting pipes and equipment	Compliance with OPG's Control of Ignition Sources And Hot Work Activities [R-17] and adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Asbestos in gaskets, tiles, and insulation	Compliance with OPG's Asbestos management procedure [R-6].

Hazard Category	Hazard/Events Description	Mitigation Measures
	Lead paint	Compliance with OPG's Management of Designated Substances procedure [R-7]
	Mercury in switches and sensors	Compliance with OPG's Management of Designated Substances procedure [R-7]
	Working at heights	Compliance with OPG's Working at Heights procedure [R-8] and adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Falling objects	Compliance with OPG's Falling Material Control procedure [R-9] and adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Heavy equipment traffic	Adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Overhead hazards	Adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Noise	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-5].
	Dust	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-5].
	Dangerous or faulty equipment	Adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Adjacent steam lines from building heating	Adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Algae, zebra mussels, decaying organic material	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-4] and adequate Safe Work Planning and Pre-Job Briefing [R-10]
	Adjacent sewage and mold	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-5] and adequate Safe Work Planning and Pre-Job Briefing [R-10]
	High voltages from working around live systems and cable trays	Adequate Safe Work Planning and Pre-Job Briefing [R-10].

Hazard Category	Hazard/Events Description	Mitigation Measures
	Pinch points	Adequate Safe Work Planning and Pre-Job Briefing [R-10].
	Flammable materials (e.g., residual oil in compressors and receivers)	Compliance with the Fire Protection Program [R-4].
Unexpected Event	Surveys find radiological material	Characterize the material as needed, cut out and remove following OPG Radiation Protection Program [R-3].

Table 1 Hazard Assessment with Mitigation Measures

4.3 Scoping and Characterization

A Historical Site Assessment (HSA) has been completed for PNGS. The HSA documents construction activities, historical operations, current use of the site, and potential, likely, and known sources of radioactive material and hazardous constituents. The HSA identifies the suspected or known contaminants, the site buildings and areas that are known or most likely to be impacted and the media most likely to be contaminated.

The turbine hall is divided into 3 elevations with a total of 108 Survey Units with a preliminary MARSSIM Classification of 1, and 19 Survey Units with a preliminary MARSSIM Classification of 2.

MARSSIM Class 1 indicates potential areas impacted with concentrations of residual radioactivity that may exceed the preliminary clearance levels.

MARSSIM Class 2 indicates potential impacted areas where concentrations of residual radioactivity are not expected to exceed the preliminary clearance levels.

The HSA identified that Pickering A leakage across the steam generator boundary has been slight and typically due to manufacturing defects. Additionally, the HSA concluded that it is unlikely to find fission products in the secondary side systems, due to their design.

Due to system classification and use, non-nuclear systems are assumed not to be contaminated, unless otherwise proven contaminated during scoping activities.

Radiological Scoping Survey: No scoping surveys have been completed for these systems.

Hazardous Materials Assessments: No hazardous materials assessments (HBMAs) have been completed for these systems. However, OPG's Hazardous Materials Information System (HMIS) lists all known hazardous materials for a given area/system and will be referred to when planning turbine system hazardous material assessments and for identifying outstanding information.

Outstanding Activities: Outstanding scoping surveys and HBMAs will be performed following the guidance discussed in the Program Overview DDP [R-1]. Any remaining gaps and

uncertainty observed will have tailored mitigation plans developed as required. These activities are deliberately scheduled to coincide with the timing of execution utilizing a graded approach based-on complexity of the Work Package. Once completed, the reports will be filed in accordance with the records retention arrangements detailed in the Program Overview DDP [R-1].

4.4 Pre-Req Activities

Before any equipment is removed from the TH and TAB, the following activities shall be completed:

- Verification that the equipment is not required to support PNGS-A stabilization, safe storage, or decommissioning.
- Verification that the equipment is not required to support PNGS operations, including PNGS-B, IFB, or D2O storage at the time of removal.
- Verification that equipment has been end stated/separated and abandoned/retired.
- Confirmation of the As-Left condition and the work area has been turned over for decommissioning.
- If applicable, construction islands are setup around equipment to be removed.

NOTE

A standardized nomenclature system has been developed to uniquely identify and organize work packages throughout the decommissioning project. This system ensures consistent identification of work locations, groups, and sequences across all planning envelopes. For example, a Work Package ID of PE-B-1-225-1 is interpreted as follows:

- PE: Planning Envelope – Indicates that the work package is associated with a specific planning envelope within the decommissioning project.
- B: Planning Envelope B – Specifies the planning envelope to which the work package belongs.
- 1: Group 1 – Denotes the group or subcategory within the planning envelope, organizing work packages into manageable segments.
- 225: Elevation 225 – Identifies the floor/elevation where the work is to be performed within the station.
- 1: Work Package 1 – Identifies the sequence number of the work package within the group.

So, *PE-B-1-225-1 means*: Planning Envelope: B, Group: 1, Elevation:225, Work Package: 1

4.5 Group B-1: Turbine Hall

Any SSC needed to support SWS activities are detailed in the SWS plan [R-2] and will not be removed at this time. Systems such as fire protection, service water, and electrical are needed to be in operations and will be retired when no longer required.

Table 2 summarizes the work packages in the TH and the associated equipment in each one.

Group	Elevation	ID	Work Package Description	List of Equipment
B-1	225	1	Service Air System Area	Switchyard Service Air Dryers
				Service Air Compressors
				Service Air Receivers
				Switchyard Service Air Compressors
				Switchyard Service Air Receivers
		2	CCW Lines	CCW Lines
		3	Reheat / Return Area	Emergency Hotwell Make-up Valves
				Transformer Oil Water Separator
		4	Heater Drains Pump Area	Reheat Return Pumps and Pipework
	254	1	Lube and Seal Oil Pump Area	Lube Oil HX and Filter
				Oil Purifier
				Seal Oil Heat Exchangers
				Condenser Air Extraction Accumulators
				Condenser Air Extraction Silencers/Separator
				Condenser Air Extraction Vacuum Pumps
				Vacuum Priming Pump

Group	Elevation	ID	Work Package Description	List of Equipment
				Vacuum Priming Pump Silencer
		2	Condensate Pump Area - Lower Half	Condensate Extraction Pumps Just below 254'
				Feed Train (Cond and Boiler Feed) Isolating Valves 254'
		3	Steam Release Valve Area	Feed Train (Cond and Boiler Feed) Isolating Valves 254'
				LP Feed Heaters 254'
				Release Valve
				Feed Train (Boiler Feed) Isolating Valves 254'
		4	Hydrogen and Stator Cooling	Generator H2 Cooling Dryer
				Jacking Oil Pump
				Feed Train (Condensate extraction) Isolating Valves 254'
				Stator Cooling Detraining Tank
				Stator Cooling Filters and Strainers
				Stator Cooling Heat Exchangers
				Stator Cooling Pumps
		5	Reheater Drain Tank Area	Reheater Drains Tank
				Feed Train (Cond and Boiler Feed) Isolating Valves 254'
		6	Boiler Feed Pump Area	Boiler Feed Pumps
				Instrument Air Compressors
				Instrument Air Dryers
				Instrument Air Receivers
		7	HP Feed Heaters	HP Feed Heaters 254

Group	Elevation	ID	Work Package Description	List of Equipment
				Feed Train (Cond and Boiler Feed) Isolating Valves 254'
	274	1	Isolate Phase Bus Cooling Area	Isolated Phase Bus cooling fan
				Isolated phase bus cooling HX/ACU
		2	Heater Withdrawal Area	Isolated phase Bus
				Vacuum Priming Tank
		3	LP Feed heaters	Feed Train (Cond and Boiler Feed) Isolating Valves 274'
				LP Feed heaters 274
				Shutdown Air Circulation Fans
		4	Boiler Feed Pump Valve Area	Boiler Stop Valves
		5	Separator Tank Area	No Major Equipment
		6	Steam Reheaters	Reheaters
		7	Condensate Pump Area - Upper half	Gland Condenser
		8	Moisture Separators	Moisture Separators
		9	Condensers	Turbine Condenser Tube Cleaning Tanks/feeder/soaker
				CCW Water Box Isolators
				Condensers (and water boxes)
				Turbine Condenser Tube Cleaning Tanks/feeder/soaker
	294	1	Lube and Seal Oil Pump Area	Shaft Driven Oil Pump
				Lube Oil AC, DC and booster Pump and Seal Oil Pumps
				Main Lube Oil Tank (In pit below floor level)

Group	Elevation	ID	Work Package Description	List of Equipment
		2	Exciter and Generator	Exciter (Including Brush Gear)
				Generator
		3	LP Turbines	LP Turbine
				Intercept Valves
				Steam Lines
		4	HP Turbine	HP Turbine
		5	Steam Chest	Steam Chest

Table 2 TH Work Packages and Associated Equipment

Building lighting, ventilation, firewater and communication systems and structural foundations will not be removed to support SWS activities as the TH building will not be demolished immediately.

Cable trays were not included in the scope of work due to the extensive effort required to separate inactive and active cables. These cable trays will be addressed during the demolition of the powerhouse structure as part of Planning Envelope E (PE-E).

4.5.1 Elevation 225 Work Package Details

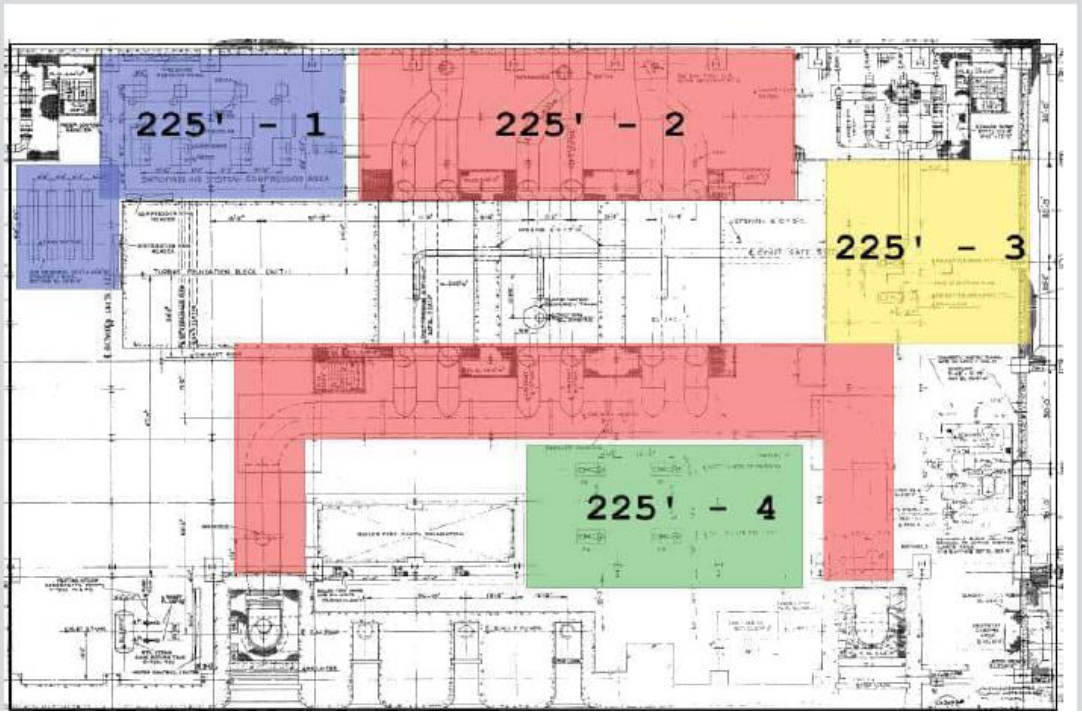

Figure 3 TH 225 Elevation

4.5.1.1 PE-B-1-225-1 Work Package #1 Switch Yard Air System

This work package details the steps needed to remove 58200 Compressed Air equipment from the 225 ft elevation. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Complete characterization of the work area to identify and document any hazards.
- Remediate any identified hazards.
- Disconnect all equipment.
- Transport equipment to the loading bay at the 254 ft elevation.
- Survey equipment and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Electrical connections will be cut and removed back to the nearest cable tray or access point and abandoned in place, ensuring all electrical isolations are performed safely per the interim end state described for PE-B [R-1].

4.5.1.2 PE-B-1-225-2 Work Package #2 Condenser Cooling Water Lines

This work package details the steps needed to remove cooling water lines from the 71210 Condenser Cooling Water (CCW) Supply System at 225 ft elevation. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Complete characterization of the work area to identify and document any hazards.
- Remediate any identified hazards.
- Support CCW lines from the existing structure.
- Segment CCW lines and lower to the floor.
- Further segment into smaller pieces for transport to the hatchway.
- Lift segmented pieces to the 254 ft elevation.
- Survey equipment and place into appropriate waste containers or load onto trucks for disposal.

Work Package Closeout

CCW pipework removed to access points and capped per interim end state described for PE-B [R-1].

4.5.1.3 PE-B-1-225-3 Work Package #3 Reheat Return Pumps and Pipework

This work package details the steps needed to remove components of the 41130 Live Steam Reheat System, including reheat return pumps, drain tanks, and associated pipework from the east side of the 225 ft elevation, including disconnection, transport, and disposal. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Complete characterization of the work area to identify and document any hazards.
- Remediate any identified hazards.
- Remove temporary scaffolding surrounding the equipment.
- Disconnect pumps from existing connections.
- Load pumps onto an interim cart for transportation to the 225 ft access hatchway.
- Lift pumps to the 254 ft elevation.
- Survey equipment and place into appropriate waste containers or load onto trucks for disposal.

Work Package Closeout

Remove any remaining pipework and existing electrical supply to the access point per the interim end state described for PE-B [R-1].

4.5.1.4 PE-B-1-225-4 Work Package #4 Heater Drains Pumps

The heater drains pumps, which are part of the 43100 Feedwater Heating System, are located south of the condenser inlet pipes on the 225 ft elevation.

Equipment Removal

- Complete characterization of the work area to identify and document any hazards.
- Remediate any identified hazards.
- Disconnect pumps from existing connections.
- Load pumps onto an interim cart for transportation to the 225 ft access hatchway.
- Lift pumps to the 254 ft elevation.
- Survey equipment and place into appropriate waste containers or load onto trucks for disposal.

Work Package Closeout

Remove any remaining pipework and existing electrical supply to the access point per the interim end state described for PE-B [R-1].

4.5.2 Elevation 254 Work Package Details

Figure 4 TH 254 Elevation

4.5.2.1 PE-B-1-254-1 Work Package #1 Lube and Seal Oil Pump Area

This work package details the steps needed to remove equipment from the 77000 Oil Services and 41250 Seal Oil System pump area. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Complete characterization of the work area to identify and document any hazards.

(b) Remediate any identified hazards.

(c) Seal Oil Heat Exchangers:

- Clear work area by removing miscellaneous piping and access platforms.
- Hoist heat exchangers using temporary lifting equipment (e.g., grove crane).
- Disconnect heat exchangers from remaining connections.
- Transport heat exchangers to loading bay for final survey and disposal.

(d) Vacuum Priming Pumps:

- Remove connections to pumps and silencers via segmentation.
- Disconnect pumps and silencers from floor mounts.
- Hoist equipment onto interim cart/buggy for transport to loading bay doors.
- Survey equipment and place onto truck bed for disposal.

(e) Lube Oil Heat Exchangers/Filters:

- Remove connections and surrounding pipework from heat exchangers.
- Remove interfering steel work.
- Hoist and remove heat exchangers one at a time, placing on cart for transport to turbine loading bay.
- Survey equipment and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Clear work area of peripheral piping via segmentation per the interim end state described for PE-B [R-1].

4.5.2.2 PE-B-1-254-2 Work Package #2 Condensate Extraction Pump Area

This work package details the steps needed to remove condensate extraction pumps and associated equipment from the 43200 Condensate and Boiler Feed System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Condensate Extraction Pumps

- Clear work area by removing miscellaneous piping (e.g., common service cooling lines) via segmentation.
- Disconnect/segment pipework and valves from remaining connections.
- Hoist or lift equipment onto carts for transport.
- Transport valves and pipework to loading bay for final survey and disposal.

(b) Equipment Below Grating

- Remove equipment above grating.
- Create removal area by increasing existing access points, removing grating above pumps at 254 ft elevation.
- Isolate connection points via segmentation.
- Hoist equipment with temporary lifting equipment or portable crane.
- Separate motor from pump (5000lbs each) and lift to 254 ft elevation, place on cart for transport.
- Lift motor pump bowl out of well (large 4-stage pumps) and place on cart.
- Segment pipework and remaining equipment around pumps and hoist to 254 ft elevation for transport.
- Transport equipment to loading bay doors on interim cart/buggy.
- Survey equipment and place onto truck bed for disposal.

Work Package Closeout

Segment and remove any remaining pipework and peripheral equipment per the interim end state described for PE-B [R-1].

4.5.2.3 PE-B-1-254-3 Work Package #3 Steam Release Valve Area

This work package details the steps needed to remove steam release valves and associated equipment from the 43110 Extraction Steam System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Clear work area by removing miscellaneous piping (e.g., common service cooling lines) via segmentation.
- Disconnect valves from remaining connections.
- Set up scaffolding to begin segmentation of pipework.
- Provide temporary support for extraction steam lines during segmentation and lower to floor level.
- Transport valves and segmented pipework on cart/buggy to loading bay doors.
- Disconnect pipework from LP feed heaters.
- Lift feed heaters from pedestals and attach wheels or place on cart for transport to turbine loading bay.

Work Package Closeout

Survey all removed equipment per the interim end state described for PE-B [R-1].

4.5.2.4 PE-B-1-254-4 Work Package #4 Hydrogen Cooling and Stator Cooling

This work package details the steps needed to remove 41230 Hydrogen Cooling System and 41240 Stator Cooling System equipment. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Disconnect major equipment from remaining instrumentation.
- Systematically remove larger equipment such as valves, instrumentation, control panels, etc.
- Remove remaining pipework in segments to the access point to the next elevation.
- Roll back any electrical supplies or signals to the nearest cable tray.

Work Package Closeout

Transport waste to the loading bay for final survey and disposal and clean up work area per the interim end state described for PE-B [R-1].

4.5.2.5 PE-B-1-254-5 Work Package #5 Re-heater Drain Tank

This work package details the steps needed to remove the re-heater drain tank and associated equipment from the 41130 Live Steam Reheat System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Clear work area by removing miscellaneous piping via segmentation.
- Disconnect tank from any remaining connections.
- Set up scaffolding to begin segmentation of pipework.
- Transport tank and segmented pipework on cart/buggy to loading bay doors.

Work Package Closeout

Survey all removed equipment per the interim end state described for PE-B [R-1].

4.5.2.6 PE-B-1-254-6 Work Package #6 Boiler Feed Pumps Area

Location

This work package details the steps needed to remove boiler feed pumps and associated equipment from the 43200 Condensate and Boiler Feed System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Clear work area by removing miscellaneous piping via segmentation.
- Disconnect pumps from any remaining connections.
- Set up scaffolding to begin segmentation of pipework.
- Disassemble Boiler Feed Pumps into components:
    - Top casing (approximately 2000 lb)
    - Rotating element (approximately 1400 lb)
    - Bottom casing (estimated 3000 lb due to pipework connections)
    - Transport disassembled pump components and segmented pipework on cart/buggy to loading bay doors.

Work Package Closeout

Survey all removed equipment per the interim end state described for PE-B [R-1].

4.5.2.7 PE-B-1-254-7 Work Package #7 High Pressure Feed Heaters

This work package details the steps needed to remove HP heat exchangers and associated equipment from the 43100 Feedwater Heating System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(c) Heat Exchangers

- Clear work area of existing scaffolding or obstructions.
- Sever all connections from the heat exchangers.
- Hoist heat exchangers from existing mounting pedestals using floor jacks.
- Push or tow heat exchangers to the main corridor for internal transport to the TH loading bay.
- Survey heat exchangers for surface/internal contamination.
- Survey equipment and place into appropriate waste containers or load onto truck beds for disposal.

(d) Piping and Miscellaneous Equipment

- Rig, lift, and segment existing piping into pieces.
- Transport segmented piping using interim cart, dolly, or forklift to the loading bay.
- Remove pipework up to the point where it can no longer be accessed via the 254 ft elevation.
- Roll back existing cables to originating cable trays (cable trays to be left abandoned in place).
- Remove miscellaneous instrumentation lines, smaller valves, and pumps in bulk.
- Remove non-structural scaffolding or temporary platforms.
- Survey piping and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Remove miscellaneous inactive equipment, cover floor openings, and temporarily cap open pipework per the interim end state described for PE-B [R-1].

4.5.3 Elevation 274 Work Package Details

Figure 5 TH 274 Elevation

4.5.3.1 PE-B-1-274-1 Work Package #1 Isolated Phase Bus Cooling Area

This work package details the steps needed to remove fans and cooling units that support the Isolated Phase Bus (IPB), which in turn links the 41200/41210 Generator to both the main and generator service transformers. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Disconnect fans and heaters from dampers and MCC connections.
- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Remove connections to common service water and other peripheral pipework up to access point and temporarily cap.
- Disconnect and lift equipment located below the generator on the turbine pedestal to the 274 ft elevation.
- Lower equipment through opened hatchway to the 254 ft elevation for transport to turbine loading bay.
- Survey equipment and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Clean work area per the interim end state described for PE-B [R-1].

4.5.3.2 PE-B-1-274-2 Work Package #2 Heater Withdrawal Area

This work package details the steps needed to remove the 71240 Vacuum Priming System tank, IPBs and associated equipment. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(e) Vacuum Priming Tank

- Segment and remove insulation from the tank.
- Isolate and disconnect all connections to valves and the main connection between the tank and Condenser (CD1).
- Disconnect and remove all pump connections and associated piping.
- Suspend the tank (weight: 3419 lbs) and remove supports.
- Lower the tank through 274 ft elevation to 254 ft elevation using a crane.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(f) Isolated Phase Buses:

- Segment and remove isolated phase buses extending through this zone.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(g) Miscellaneous Equipment

- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Transport all disconnected equipment through the hatchway to the 254 ft loading bay and clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.3.3 PE-B-1-274-3 Work Package #3 LP Feed Heaters Area

This work package details the steps needed to remove LP feed heaters and steam equipment from the 43100 Feedwater Heating System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) LP Feed Heaters

- Disconnect connections to extraction steam, condensate/feed water, drains, and instrumentation.
- Move feed heaters on wheels along the track to the removable floor area.
- Lower feed heaters to 254 ft elevation for transport to the turbine loading bay.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(b) Extraction Steam Headers

- Segment extraction steam headers.
- Lower segmented parts to 254 ft elevation.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(c) Steam Supply to LP Turbine

- Support and segment steam supply from the re-heater.
- Lower segmented parts to 254 ft elevation for transport to the turbine loading bay.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(d) Miscellaneous Equipment

- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Remove and temporarily cap connections to common service water and other peripheral pipework.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Transport all disconnected equipment through the hatchway to the 254 ft loading bay and clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.3.4 PE-B-1-274-4 Work Package #4 Boiler feed Pump Valve Area

This work package details the steps needed to remove boiler feed pump valves and associated equipment from the 43200 Condensate and Boiler Feed System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Boiler Feed Pump Discharge Pipework

- Segment connections to valves and lines as required.
- Remove sufficient grating and lower components.
- Lower segmented parts to 254 ft elevation for transport to the turbine loading bay.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(b) Motorized Valves and Suction Pipework

- Disconnect and segment as necessary.
- Lower to 254 ft elevation through openings in the grating.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(c) Miscellaneous Equipment

- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Transport all disconnected equipment through the hatchway to the 254 ft loading bay and clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.3.5 PE-B-1-274-5 Work Package #5 Ladder Area between Separators

This work package details the steps needed to remove boiler stop valves and steam header equipment located between the separators, part of the 41120 Moisture Separation System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Boiler Stop Valves and Other Valves

- Support the equipment.
- Perform disconnections.
- Lower equipment to cart on 254 ft elevation for transport.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(b) Main Steam Balance Header and Connecting Pipework

- Support the equipment.
- Disconnect and segment as necessary.
- Lower to 254 ft elevation through the hatchway.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(c) Miscellaneous Equipment

- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Transport all disconnected equipment through the hatchway to the 254 ft loading bay and clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.3.6 PE-B-1-274-6 Work Package #6 Re-heaters Area

This work package details the steps needed to remove re-heaters and associated equipment from the 41120 Moisture Separation System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Reheaters and Separators

- Disconnect all connections to valves and separators.
- Remove flooring up to the reheaters.
- Lift reheaters through the opening in 294 ft elevation for transport to loading bay.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(b) Steam Lines and Associated Pipework

- Cut steam line connections, providing temporary support as needed.
- Segment associated pipework prior to transfer to the hatchway.
- Lift steam lines from reheater to separators through the same opening as reheaters.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(c) Miscellaneous Equipment

- Remove miscellaneous instrumentation as bulk waste.
- Lower smaller equipment to 254 ft elevation for transport to the loading bay.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Survey smaller equipment and place into waste containers or load onto truck bed for disposal per the interim end state described for PE-B [R-1].

4.5.3.7 PE-B-1-274-7 Work Package #7 Condenser Area

This work package details the steps needed to remove condenser equipment from 42110 Main Condenser The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Gland Condenser and Large Equipment

- Disconnect all connections.
- Segment equipment into smaller pieces for transportation.
- Lower segmented pieces through the hatchway to the 254 ft elevation.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(b) Condensate Pumps

- Remove floor sections to access the condensate pumps.
- Disconnect and remove pumps, potentially using the floor openings for removal.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(c) Miscellaneous Equipment

- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Remove and temporarily cap connections to common service water and other peripheral pipework up to the access point.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Transport all disconnected equipment through the hatchway to the 254 ft loading bay and clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.3.8 PE-B-1-274-8 Work Package #8 Moisture Separator Area

This work package details the steps needed to remove moisture separators and associated equipment from the 41120 Moisture Separation System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Moisture Separators (4)

- Remove floor gratings to access the moisture separators.
- Support and disconnect steam lines in and out of the moisture separators.
- Lift separators (approximately 54,000 lbs each) using the TH crane.
- Transport separators to the loading bay via crane and place on trailer for offsite transport.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(b) Large Steam Lines

- Lift large steam lines through the opening used for the separators.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

(c) Miscellaneous Equipment

- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Remove and temporarily cap connections to common service water and other peripheral pipework up to the access point.
- Perform surveys and place into appropriate waste containers or load onto truck beds for disposal.

Work Package Closeout

Survey tanks and place into waste containers or load onto truck bed for disposal and clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.3.9 PE-B-1-274-9 Work Package #9 Condensers

This work package details the steps needed to remove 42110 Main Condenser. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Remove instrumentation.
- Disconnect and remove peripheral piping (CCW Lines, Boiler Steam Lines, Steam Release Lines).
- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove and temporarily cap peripheral pipework up to the access point.

(a) Condenser Removal Options

(1) Large Section Removal

- Cut condensers into 4 sections (as originally installed).
- Use the main crane to lift out sections.
- Transport sections to loading bay for final survey and disposal.

(2) Piece-by-Piece Removal

- Cut out inside supports for the condensers.
- Cut condensers into smaller pieces, allowing them to drop into the center of the hot-well.
- Use portable crane or forklift from 254 ft elevation to lift pieces onto a cart.
- Transport sections to loading bay for final survey and disposal.

(b) Water Boxes, Condenser Components, and Cleaning Ball Collector/Tanks

- Hoist equipment using overhead lifting rail.
- Disconnect from remaining supports and connections.
- Lift components for final survey and disposal.

Work Package Closeout

Clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.4 Elevation 294 Work Package Details

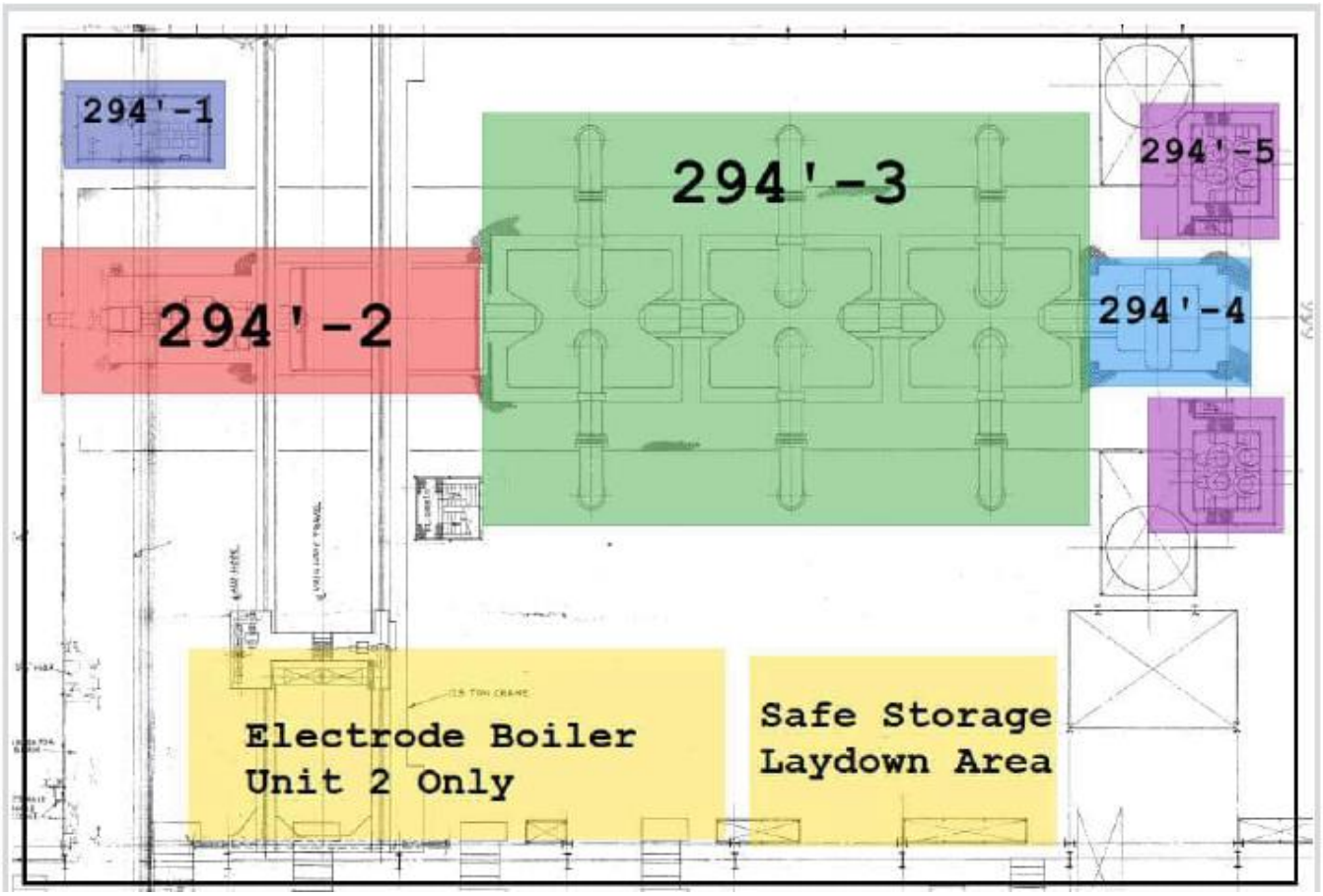

Figure 6 TH 294 Elevation

4.5.4.1 PE-B-1-294-1 Work Package #1 Lube and Seal Oil Pump Area

This work package details the steps needed to remove lube and seal oil pump equipment from the 77000 Oil Services and 41250 Seal Oil System respectively. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Separate work area from electrical equipment and ventilation units on the north side of the station.
- Roll back inactive electrical connections to nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Remove and temporarily cap peripheral pipework up to the access point.
- Hoist pumps from the pit using the TH Crane or a portable crane.
- Disconnect pumps from mountings on top of the turbine lube oil tank.
- Lower equipment to the 254 ft loading bay using the appropriate crane.
- Disconnect connections to the main lube oil tank.
- Use the TH crane to lift out the tank.
- Lower the tank to the turbine loading bay for transport.
- Move smaller equipment via trolley to the access hatchway, perform final surveys.

Work Package Closeout

Clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.4.2 PE-B-1-294-2 Work Package #2 Generator and Exciter

This work package details the steps needed to remove the 41200/41210 Generator and 41220 Excitation equipment. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Exciter Removal

- Remove main exciter coolers and associated piping (approx. 5000 lbs each).
- Remove turning gear cover (approx. 4000 lbs, offset center of gravity).
- Remove top half of bearing and exciter brush gear.
- Disassemble and remove main exciter (rotor approx. 7 tons, stator casing + rotor approx. 17 tons).

(b) Generator Rotor Removal

- Remove generator rotor (approx. 143 tons) following the established procedure for generator rotor removal [R-14].

(c) Generator Stator and Casing Removal

- Remove hydrogen coolers from generator casing.
- Remove hold down bolts, covering steel floor plates, and resistance columns (12).
- Remove all electrical and mechanical connections.
- Lift generator using series of alternating lifts (max 1" offset at any point).
- Install support stools onto stator core.
- Jack out stator core approx. 4 ft.
- Hoist stator core (approx. 225 tons) using both TH cranes and transport to laydown area.
- Hoist and transport generator casing to laydown area and perform surveys.

Work Package Closeout

Clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.4.3 PE-B-1-294-3 Work Package #3 Lower Pressure Turbines and Steam Lines

This work package details the steps needed to remove LP turbines and steam lines from the 41100 Turbine. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) Main Intercept Valves

- Remove insulation and instrumentation.
- Hoist valves using TH crane.
- Segment valves from main steam lines.
- Lift and lower valves to 254 ft loading bay for final survey and disposal.

(b) Main Steam Lines

- Systematically hoist, segment, and lift main steam lines.
- Use TH crane to lower segments to 254 ft loading bay for survey and disposal.

(c) LP Turbine

- Remove instrumentation and obstructions.
- Remove LP top half outer shell (exhaust hood in 3 pieces) and miscellaneous housing and turbine casings.
- Remove LP Rotor.
- Remove LP lower half turbine casing, outer shell remaining housing, and deck plates.
- Separate the lower half of the turbine exhaust cover from the condensers.
- Use TH crane to lower segments to 254 ft loading bay for survey and disposal.

Work Package Closeout

Clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.4.4 PE-B-1-294-4 Work Package #4 High Pressure Turbine

This work package details the steps needed to remove the HP turbine from the 41100 Turbine system. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

(a) HP Turbine Outer Cylinder Removal

- Remove HP turbine cladding.
- Remove HP joint insulation.
- Remove inlet pipe support.
- Remove HP four outer covers access doors.
- Remove HP half joints.
- Lift HP outer cylinder using TH crane.

(b) HP Turbine Internal Components

- Systematically remove internal components.
- Transport removed components to the loading bay for disposal.

(c) HP Turbine Bottom Half

- Remove remaining bottom half of the HP turbine casing.
- Transport to loading bay for disposal.

Work Package Closeout

Clean work area and clearly mark any identified hazards per the interim end state described for PE-B [R-1].

4.5.4.5 PE-B-1-294-5 Work Package #5 Steam Chest

This work package details the steps needed to remove the steam chest and associated equipment from 41150 Turbine Gland Steam System. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Remove any steel work that will interfere with removal.
- Remove instrumentation and isolation components.
- Hoist main valves using TH Crane.
- Disconnect valves from main steam lines.
- Lift valves using TH Crane and transport to the loading bay for survey and disposal.
- Disconnect steam chest from remaining connections.
- Lift steam chest using TH Crane and transport to the loading bay for survey and disposal.

Work Package Closeout

Clean up area and make safe per the interim end state described for PE-B [R-1].

4.6 Group B-2: Turbine Auxiliary Bay

The layout of the SSCs contained in group B-2 varies slightly from group B-1 as illustrated in Figure 8 - Figure 12 below and Table 3 summarizes the work packages and the associated equipment in each one.

Group	Elevation	ID	Work Package Description	List of Equipment
B-2	254	1	Service Water Pumps	LP Service Water Pumps including strainers, valves, and discharge headers
	278	1	Piping from Electric Boiler Condensate Pumps	Piping Electric Boiler Condensate Pumps
	294	1	Condensate and steam equipment	Electric Boiler air compressors
				Electric Boiler chemical feed pump
				Electric Boiler recirc pump
				Service water to Heating Steam Condensate tank
				Misc. Piping
				Heat Exchanger Relief Valve
				Heater Drains
				Cascade drains
		2	Heating steam tanks	Heating Steam Boiler Condensate tank
				Heating Steam Boiler Blowdown tank
	317	1	Heat exchangers, piping, and tanks	Feedwater Sampling Station
				Stator Cooling Head tank
				LP Heaters including piping and vent lines
				Misc. Piping
		2	Head Tanks (potentially contaminated)	Biological Shield Head Tank
				End Shield Cooling Head tank

Group	Elevation	ID	Work Package Description	List of Equipment
		3	Chemical Addition Tanks	Chemical Addition Tanks
	339	1	Deaerator and associated equipment	Condensate Storage tank including all inlet and outlet piping reject and make up valves, de-aerator, DA storage tank, and associated piping
				Recirc Cooling Head Tank
				Boiler Feed Lines and valve station
		2	Instrumentation	BFLP Trip Instrumentation

Table 3 TAB Work Packages and Associated Equipment

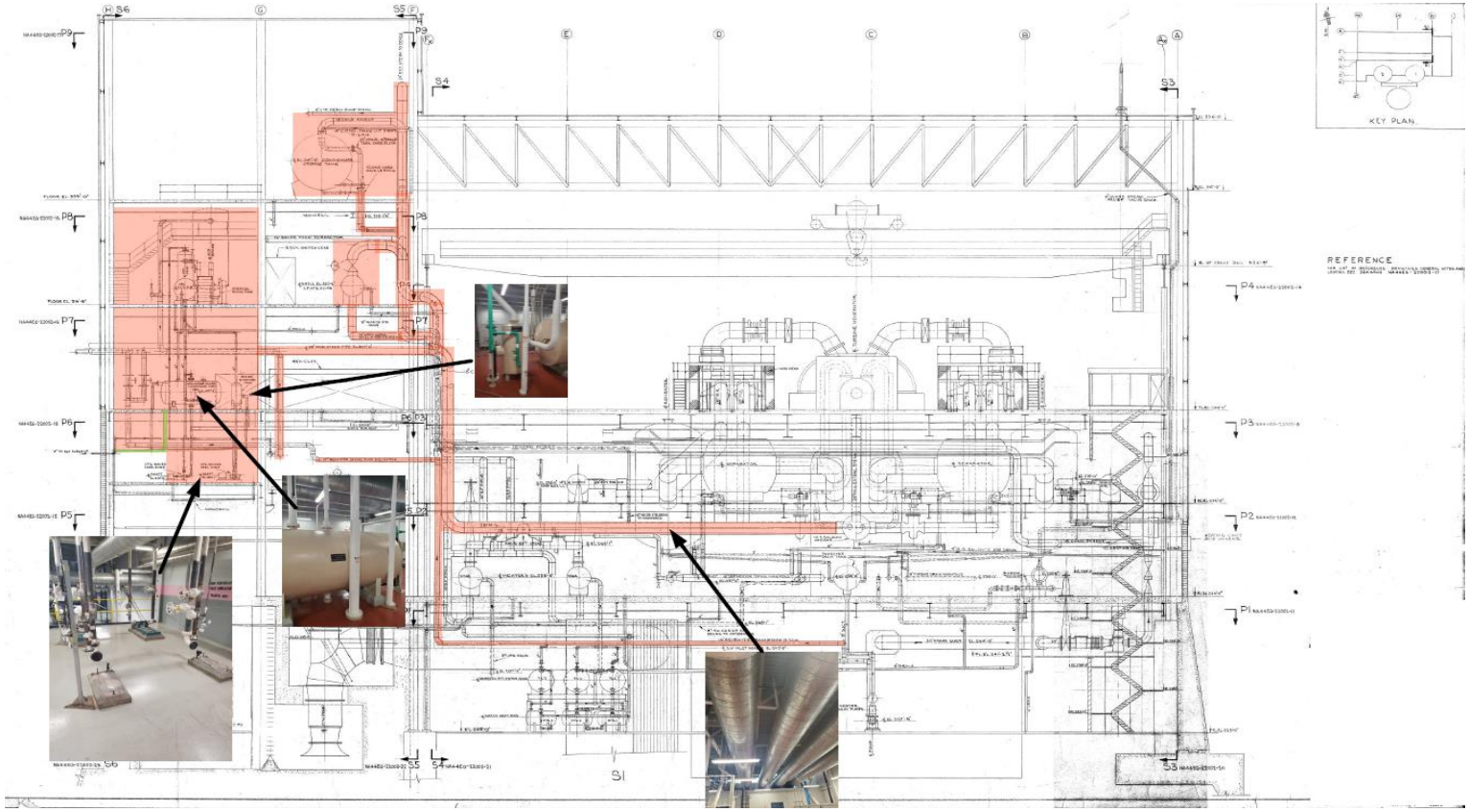

Figure 7 TAB Unit 1 Plant Arrangement - Elevations 254 to 339

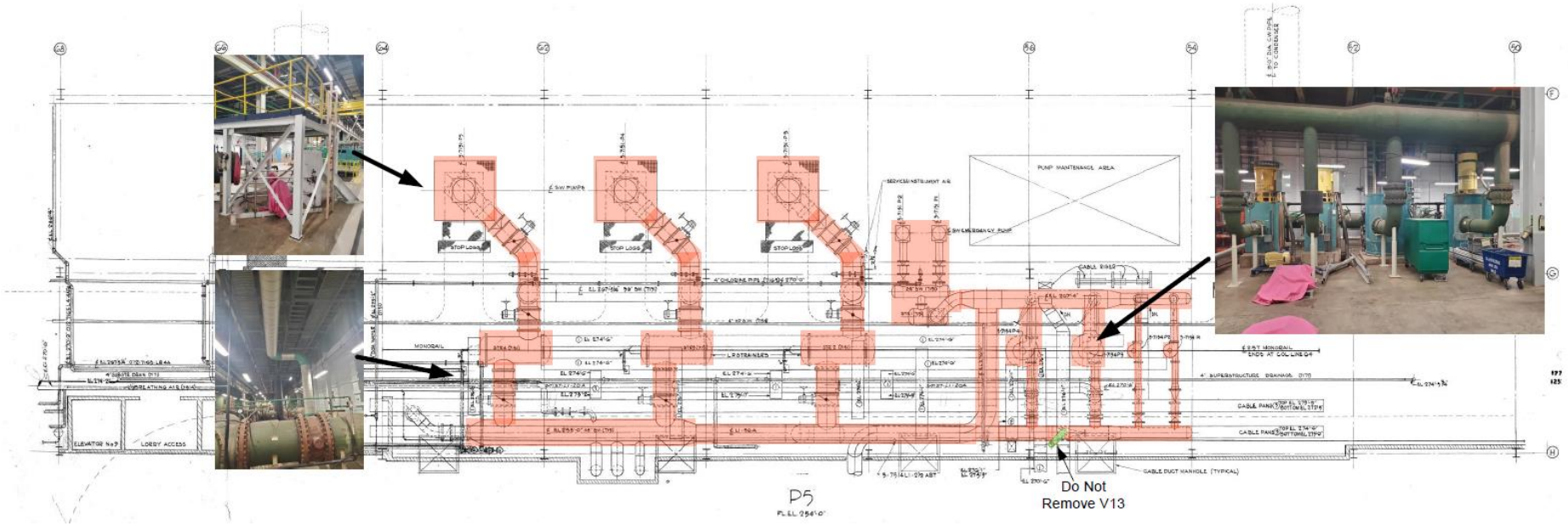

Figure 8 TAB Elevations 254 and 278

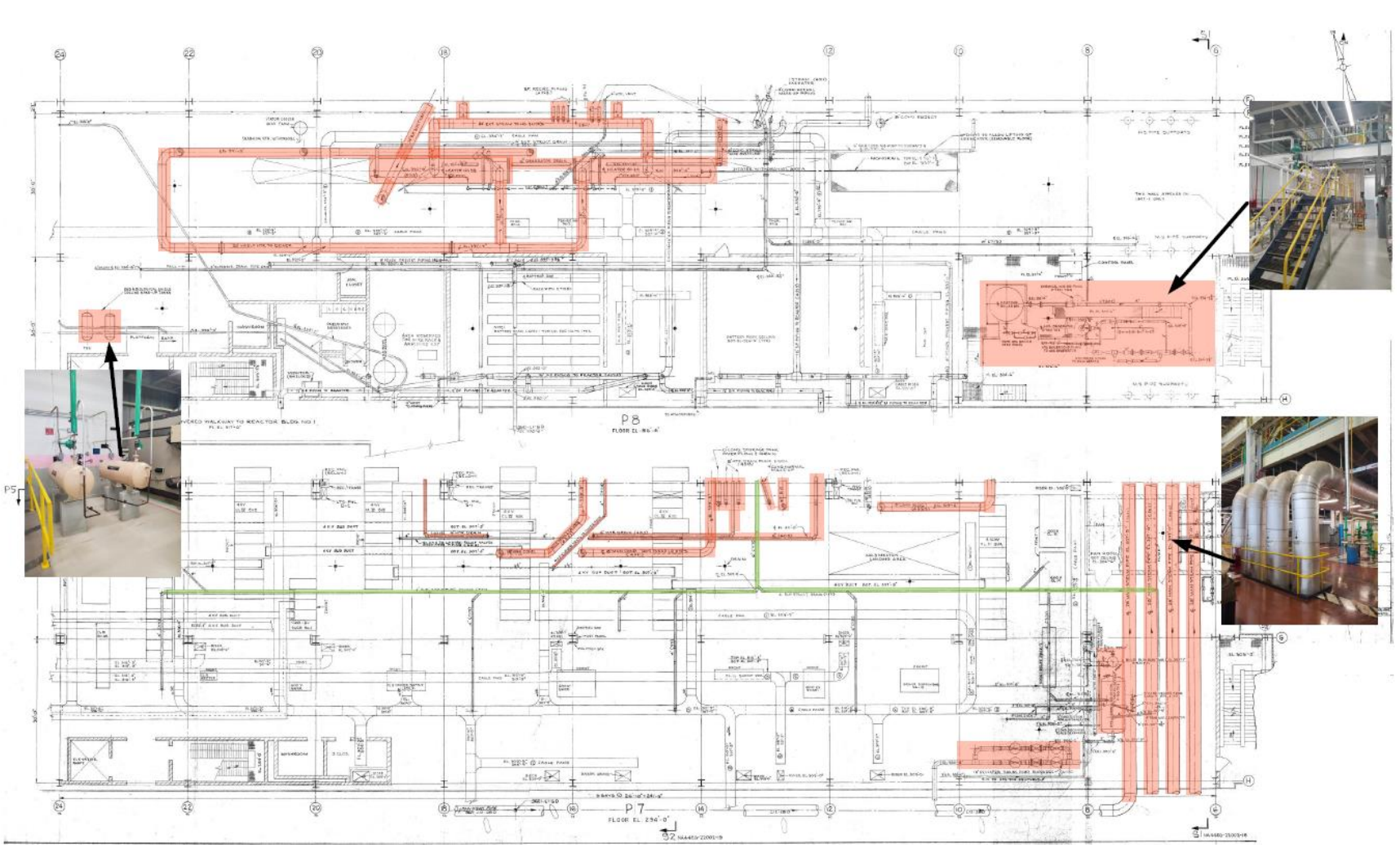

Figure 9 TAB Elevation 294 and 317

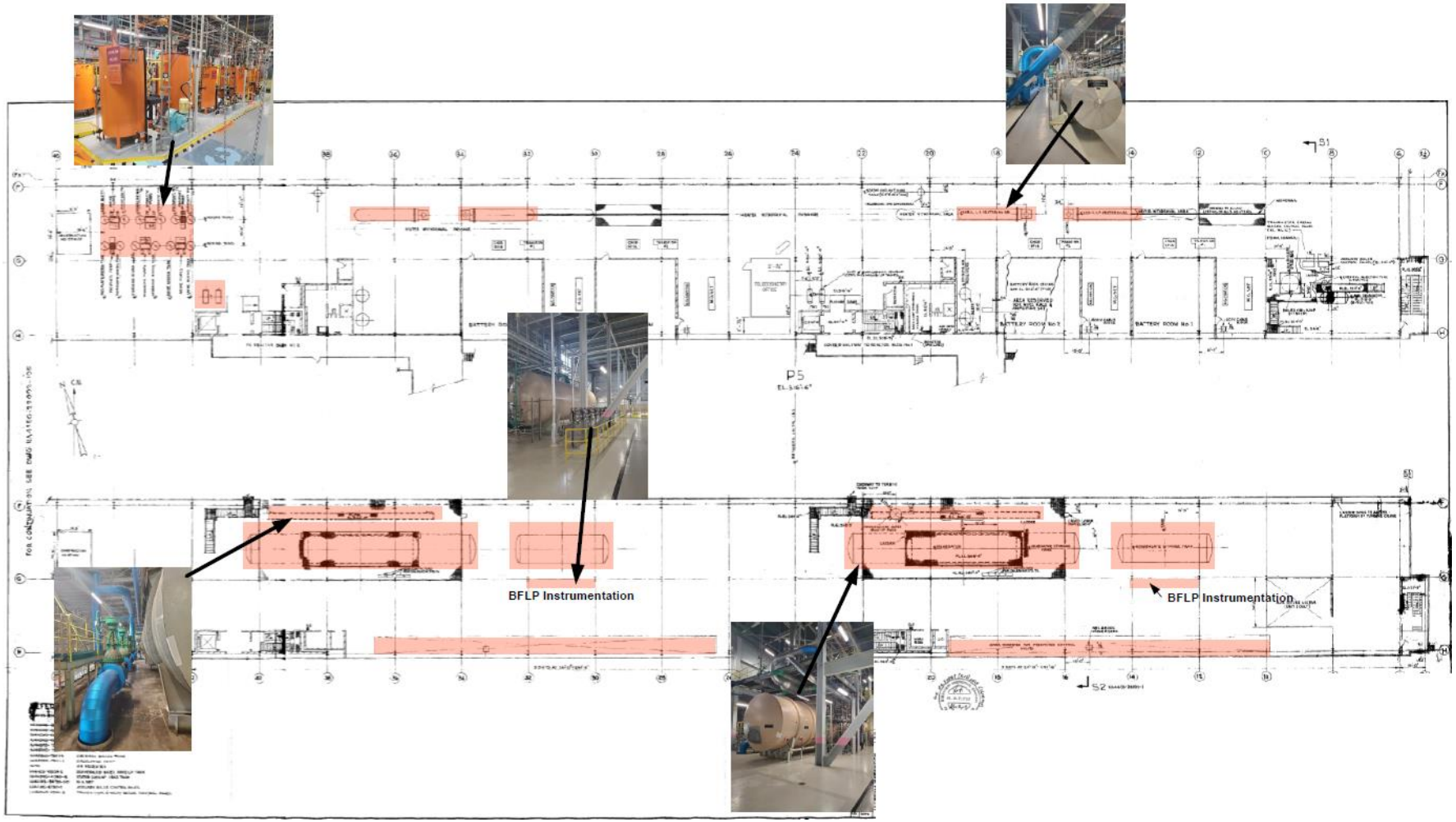

Figure 10 TAB Elevation 317 and 339

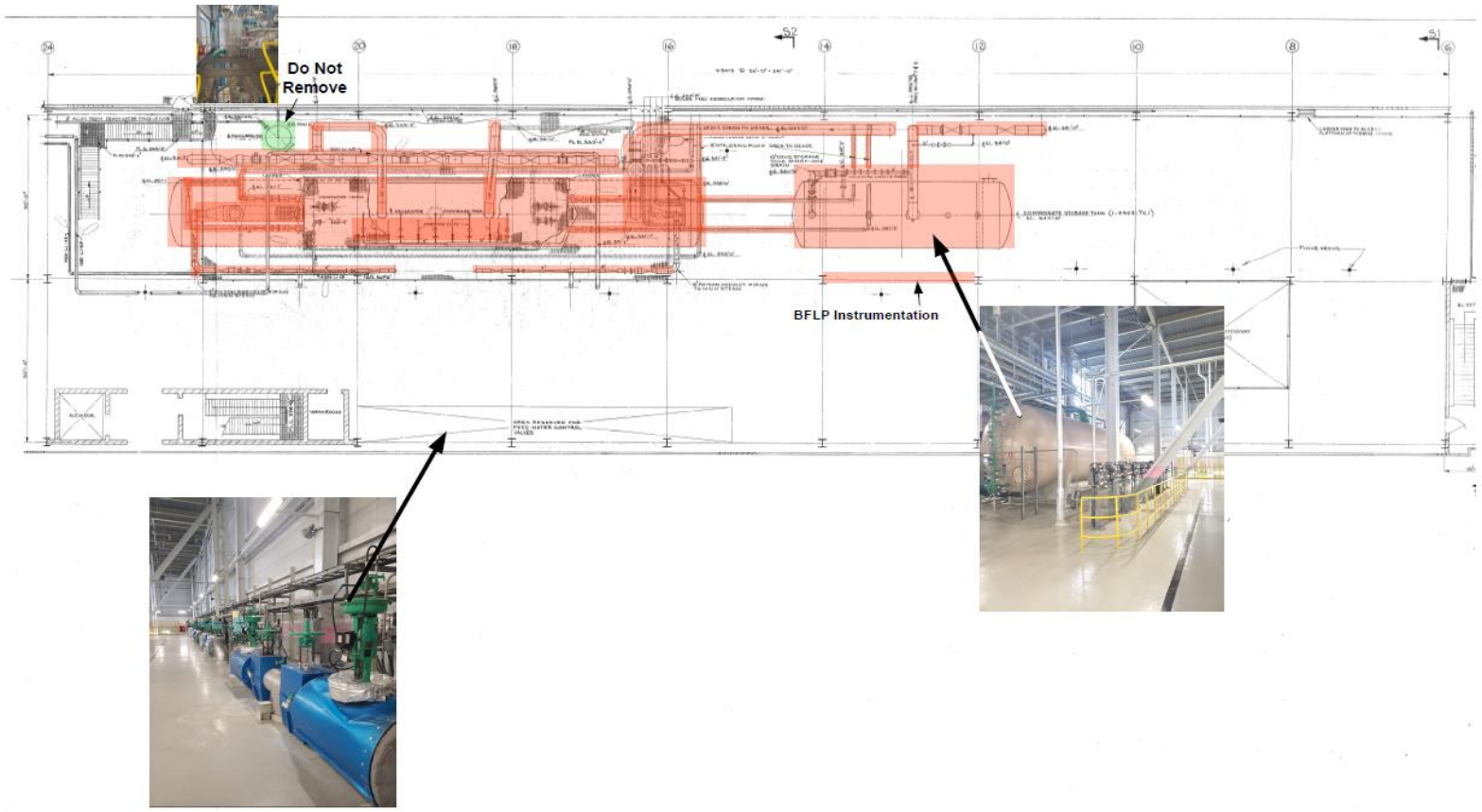

Figure 11 TAB Unit 1 Elevation 339

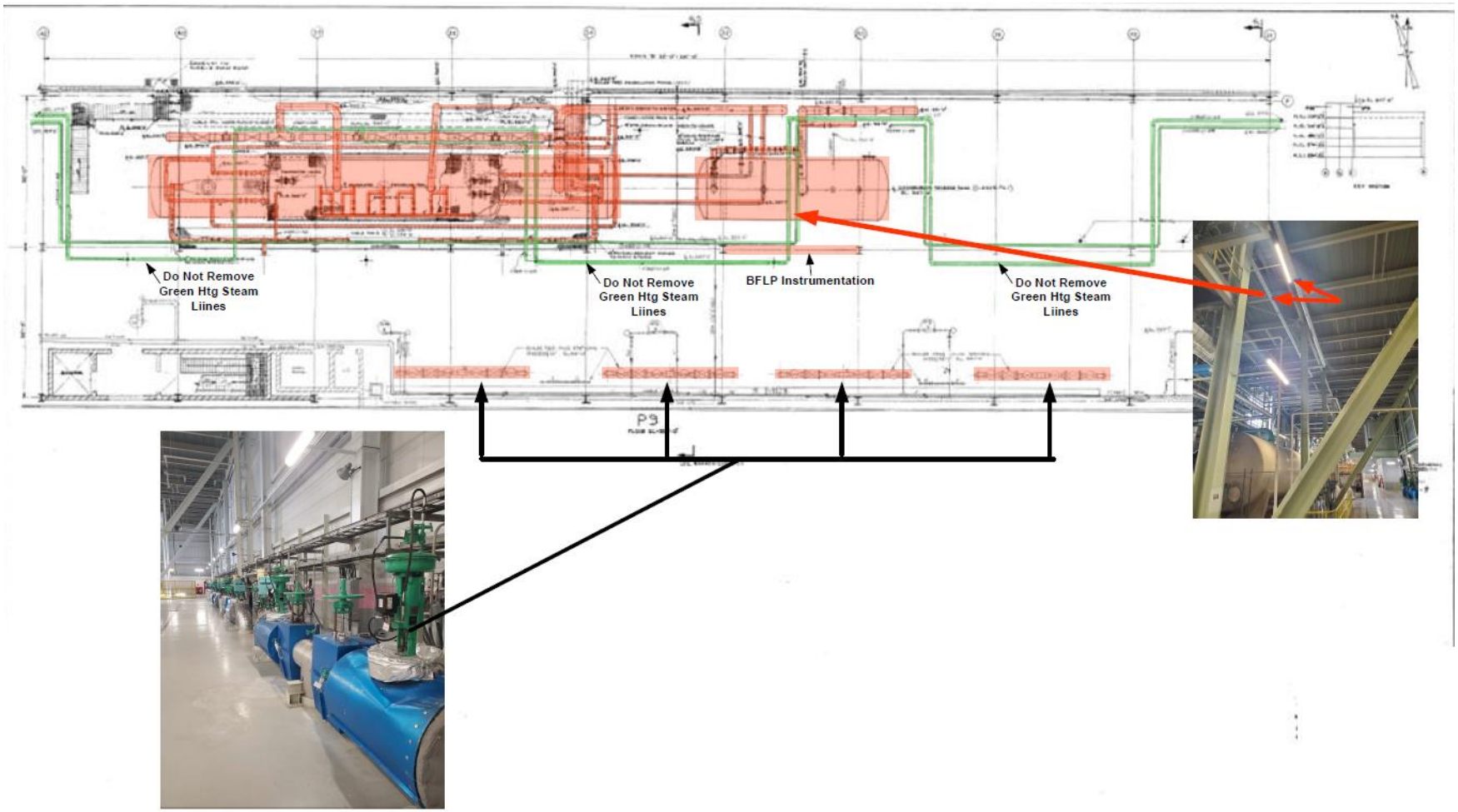

Figure 12 TAB Unit 2 Elevation 339

Building lighting, ventilation, firewater and communication systems and structural foundations will not be removed to support day-to-day operations as the TH building will not be demolished. Cable trays were not included in the scope of work and thus will not be removed due to the extensive effort required to separate inactive and active cables.

4.6.1 Elevation 278 Work Package Details

4.6.1.1 PE-B-2-278-1 Work Package #1 Piping from Electric Boiler Condensate Pumps

This work package details the steps needed to remove components of the 73010 Electric Boiler System, including pipework and valves from the electric boiler condensate pumps. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Disconnect and segment pipework and valves from all remaining connections, ensuring all systems are properly isolated and de-energized.
- Transport valves and pipework to the loading bay for final survey and disposal.
- Survey equipment in accordance with established procedures to confirm the absence of radiological contamination.
- Place equipment onto truck beds for disposal, following all waste management protocols and transportation regulations.

Work Package Closeout

- Electrical connections will be cut and removed back to the nearest cable tray or access point and abandoned in place, ensuring compliance with electrical safety procedures per the interim end state described for PE-B [R-1].
- Temporarily cap all open pipe ends as necessary to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

4.6.2 Elevation 294 Work Package Details

4.6.2.1 PE-B-2-294-1 Work Package #1 Condensate and Steam Equipment

This work package details the steps needed to remove components of the 43200 Condensate and Boiler Feed System, including pumps, compressors, and associated pipework from the 294 ft elevation. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Clear the work area to access the pumps and compressors by removing any obstructing miscellaneous piping.
- Disconnect and segment pipework and valves from any remaining connections, ensuring all systems are properly isolated.
- Hoist or lift equipment onto carts or buggies for transport using appropriate lifting equipment and techniques.
- Transport valves and pipework to the loading bay for final survey and disposal.
- Hoist pumps and compressors onto interim carts or buggies for transport to the loading bay doors.
- Survey equipment in accordance with established procedures to confirm the absence of radiological contamination.
- Place equipment onto truck beds for disposal, following all waste management protocols and transportation regulations.

Work Package Closeout

Temporarily cap all open pipe ends as necessary to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

4.6.2.2 PE-B-2-294-2 Work Package #2 Heating Steam Tanks

This work package details the steps needed to remove components of the 73010 Electric Boiler System, including heating steam tanks and associated pipework from the 294 ft elevation. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Clear the work area to access the tanks by removing any obstructing miscellaneous piping.
- Disconnect and segment pipework and valves from any remaining connections, ensuring all systems are properly isolated.
- Roll back existing inactive electrical connections to the nearest cable tray or access point.
- Segment the tanks into manageable pieces suitable for transport.
- Transport tank segments to the TH floor using carts.
- Crane down the tank segments from the TH floor to the loading bay utilizing appropriate lifting equipment and techniques.
- Survey the equipment in accordance with established procedures to confirm the absence of radiological contamination.
- Place equipment into waste containers or load onto truck beds for disposal, following all waste management protocols and transportation regulations.

Work Package Closeout

Temporarily cap all open pipe ends as necessary to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

4.6.3 Elevation 317 Work Package Details

4.6.3.1 PE-B-2-317-1 Work Package #1 Heat Exchangers, Piping, And Tanks

This work package details the steps needed to remove components of the 43100 Feedwater Heating System, including LP feed heaters, tanks, and associated pipework from the 317 ft elevation. Equipment removal will utilize the existing hatchway for systematic lowering of large equipment to lower elevations. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Disconnect connections to extraction steam, condensate/feed water, drains, and instrumentation from the LP feed heaters.
- Roll back existing inactive electrical connections to the nearest cable tray or access point.
- Remove miscellaneous instrumentation as bulk waste.
- Move the feed heaters along their tracks in either an east or west direction to align with the removable floor area adjacent to the hatchway.
- Lower the feed heaters through the hatchway to elevation 254 using appropriate lifting equipment.
- Transport the feed heaters to the TH loading bay for final survey and disposal.
- Segment and place tanks on carts, lower them through the hatchway, and transport them to the loading bay.
- Segment and support large piping, then remove it via carts and the hatchway.

Work Package Closeout

Temporarily cap all open pipe ends as necessary to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

4.6.3.2 PE-B-2-317-2 Work Package #2 Head Tanks

This work package details the steps needed to remove contaminated head tanks associated with systems 34110 Calandria End Shield Cooling and 34130 Biological Shield Cooling from the 317 ft elevation. Due to potential contamination, special characterization and handling procedures will be implemented. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- The head tanks will be characterized, and the radiological hazard quantified prior to removal.
- Existing inactive electrical connections will be rolled back to the nearest cable tray or access point.
- Miscellaneous instrumentation will be removed as bulk waste.
- Connections to common service water and other peripheral pipework will be removed up to the access point and temporarily capped.
- The tanks will be segmented, placed on a cart, lowered through the hatchway to the 254 ft elevation, and brought to the loading bay.
- The work area will be cleaned, and any hazards identified and clearly marked.
- The equipment will be surveyed and placed into a waste container or loaded onto a truck bed for disposal.

Work Package Closeout

Remove any remaining connections and services associated with the tanks and ensure all open pipe ends are capped to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

4.6.3.3 PE-B-2-317-3 Work Package #3 Chemical Addition Tanks

This work package details the steps needed to remove components of the 71640 Chemical Feed System, including tanks and associated equipment from the 317 ft elevation. Equipment removal will utilize the existing hatchway for systematic lowering to lower elevations. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Existing inactive electrical connections will be rolled back to the nearest cable tray or access point.
- Miscellaneous instrumentation will be removed as bulk waste.
- Connections to common service water and other peripheral pipework will be removed up to the access point and temporarily capped.
- The tanks will be segmented, placed on a cart, lowered through the hatchway to the 254 ft elevation, and brought to the loading bay.
- The work area will be cleaned, and any hazards identified and clearly marked.
- The equipment will be surveyed and placed into a waste container or loaded onto a truck bed for disposal.

Work Package Closeout

Remove any remaining connections and services associated with the tanks and ensure all open pipe ends are temporarily capped to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

4.6.4 Elevation 339 Work Package Details

4.6.4.1 PE-B-2-339-1 Work Package #1 Deaerator and Associated Equipment

This work package details the steps needed to remove the deaerator and associated components from multiple systems (43100 Feedwater Heating System, 71320 Recirculated Cooling Water, and 43200 Condensate and Boiler Feed System) from the 339 ft elevation. The deaerator is used for removing dissolved gases from the feedwater for steam-generating boilers. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Existing inactive electrical connections will be rolled back to the nearest cable tray or access point.
- Miscellaneous instrumentation will be removed as bulk waste.
- Connections to common service water and other pipework will be removed up to the access point and temporarily capped.
- The tanks will be segmented, placed on a cart, lowered through the hatchway to the 254 ft elevation and brought to the loading bay.
- Work area will be cleaned, and any hazards identified and clearly marked.
- The equipment will be surveyed and placed into a waste container or loaded onto a truck bed for disposal.

Work Package Closeout

Remove any remaining connections and services associated with the tanks and ensure all open pipe ends are temporarily capped to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

4.6.4.2 PE-B-2-339-2 Work Package #2 Instrumentation

This work package details the steps needed to remove components of the 64323 BFLP trip Instrumentation from the 339 ft elevation. The following is a listing of all work to be completed as part of this work package:

Equipment Removal

- Existing inactive electrical connections will be rolled back to the nearest cable tray or access point.
- Miscellaneous instrumentation will be removed as bulk waste.
- Connections to common service water and other pipework will be removed up to the access point and temporarily capped.
- Work area will be cleaned, and any hazards identified and clearly marked.
- The equipment will be surveyed and placed into a waste container or loaded onto a truck bed for disposal.

Work Package Closeout

Remove any remaining connections and services associated with the tanks and ensure all open pipe ends are temporarily capped to maintain safety and environmental controls per the interim end state described for PE-B [R-1].

5.0 WASTE MANAGEMENT

5.1 Waste Management Plan

The TH is located inside the protected area however, it is on the conventional side of PNGS-A and the majority of SSCs are not expected to be contaminated apart from head tanks associated with systems 34110 Calandria End Shield Cooling and 34130 Biological Shield Cooling.

Most of the systems in the TH have not come into contact with contamination and will generate conventional wastes, however, the head tanks associated with work package PE-B-2-317-2 Work Package #2 Head Tanks will be considered contaminated due to interactions with End Shield Cooling, Biological Shield Cooling and past system history, generating Low Level Waste (LLW).

Further planned characterizations and surveying completed during the work planning and dismantling activities will be used to further verify the classification, as discussed in the characterization strategy section of the Program Overview DDP [R-1].

Table 4 shows the estimated waste volumes associated with the decommissioning activities of PE-B.

Waste Stream	Conventional (m^3)	LLW (m^3)
Metal	16,353	5
Hazardous	1,970	

Table 4 Planning Envelope B Waste Volume Estimates

5.1.1 Waste Pathways

5.1.1.1 Conventional Waste

As can be seen in the table above, much of the waste generated is expected to be conventional waste and as such, dedicated in-situ laydown areas will be setup for PE-B activities. Refer to the Program Overview DDP [R-1] for further pathway details.

5.1.1.2 Conventional Hazardous Waste

Hazardous Waste is expected to be generated during decommissioning activities. Most of the hazardous waste will be asbestos with the potential for some equipment to contain mercury. Hazardous Building Material Assessments will verify hazards prior to any dismantling activities. Refer to the Program Overview DDP [R-1] for further pathway details.

5.1.1.3 Radiological Waste

A relatively small amount of LLW is expected to be generated during the dismantling activities related to PE-B-2-317-2 Work Package #2 Head Tanks. Radiological Waste is not expected

during the dismantling of remaining TH systems, however, due to the location of the systems it is possible small amounts of contamination will be discovered during scoping or demolition activities. Refer to the Program Overview DDP [R-1] for further pathway details.

6.0 REFERENCES

[R-1] OPG, Detailed Decommissioning Plan – Program Overview, NA44-PLAN-00960-00004

[R-2] OPG, PNGS-A Storage with Surveillance Plan, NA44-PLAN-00960-00001

[R-3] OPG, Radiation Protection Program, N-PROG-RA-0013

[R-4] OPG, Fire Protection, N-PROG-RA-00012

[R-5] OPG, Environment Health and Safety Managed Systems Program, OPG-PROG-0005

[R-6] OPG, Management of Asbestos-Containing Material, OPG-PROC-0124

[R-7] OPG, Management of Designated Substances Other Than Asbestos, OPG-PROC-0125

[R-8] OPG, Working at Heights, OPG-PROC-0137

[R-9] OPG, Falling Material Control, OPG-PROC-0136

[R-10] OPG, Safe Work Planning and Pre-Job Briefing, OPG-PROC-0129

[R-11] OPG, Confined Space Management, OPG-PROC-0122

[R-12] OPG, Spill management, OPG-STD-0152

[R-13] OPG, Maintenance of Equipment Containing Hydrogen, N-STD-RA-0022

[R-14] OPG, Generator Rotor Removal, P-AB-MMP-41200.11

[R-15] OPG, Integrated Decommissioning Safety Assessment, NA44-REP-00960-00431

[R-16] OPG, Decommissioning, REGDOC-2.11.2

[R-17] OPG, Control of Ignition Sources And Hot Work Activities, N-PROC-RA-0057

7.0 ACRONYMS

Acronym	Definition
AIFB	Auxiliary Irradiated Fuel Bay
ALARA	As Low As Reasonably Achievable
BF	Boiler Feed
CAEP's	Condenser Air Extraction Pumps
CCW	Circulating Cooling Water
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
CTCS	Condenser Tube Cleaning System
DDP	Detailed Decommissioning Plan
FP	Full Power
GV	Governor Valve
HP	High Pressure
HT	Heat Transport
I&C	Instrumentation and Control
ILW	Intermediate Level Waste
IPB	Isolated Phase Bus
IV	Intercept Valve
LLW	Low Level Waste
LP	Low Pressure
MBF	Main Boiler Feed
MW	Mega Watt
NMS	Nuclear Management System
OGMS	Off Gas Management System
OPG	Ontario Power Generation

Acronym	Definition
PDP	Preliminary Decommissioning Plan
PE	Planning Envelope
PNGS	Pickering Nuclear Generating Station
PNGS-A	Pickering Nuclear Generating Station A
PNGS-B	Pickering Nuclear Generating Station B
REGDOC	Regulatory Document
RHP	Responsible Health Physicist
RP	Radiation Protection
RTD	Resistance Temperature Detector
RV	Release Valve
SAWS	Steam and Water Sampling
SSC	System, Structure, or Component
SWS	Storage with Surveillance
TAB	Turbine Auxiliary Bay
TH	Turbine Hall
U1	Unit 1
U2	Unit 2
U3	Unit 3
U4	Unit 4
U5	Unit 5
U8	Unit 8
USI	Uniform Subject Index
WMP	Waste Management Plan

Appendix A: Verification Matrix

REG DOC 2.11.2 Section 7.1.1	Requirement Description	CSA N294:19 App C.1	CSA Requirement Description	DDP Section Reference
Bullet 1	A description of, and diagram showing, the areas, components and structures to be decommissioned, grouped, where appropriate, into logical decommissioning planning envelopes	A)	A description of, and diagram showing, the areas, components, and structures to be decommissioned, grouped where appropriate into logical decommissioning planning envelopes	Section 2.0
Bullet 2	The operational history, including incidents or accidents that could affect decommissioning	B)	The operational history, including incidents or accidents that could affect decommissioning	See the Program Overview DDP [R-1]
Bullet 3	The storage with surveillance stage, as applicable, and requirements of the: functional building services monitoring and surveillance activities inspection activities usage boundaries during storage with surveillance	C)	The SWS stage and requirements: functional building services; monitoring and surveillance activities; inspection activities; and usage boundaries during SWS;	See the Program Overview DDP [R-1]
Bullet 4	The final radiological, physical and chemical end-state objectives, and interim end-state objectives, as applicable	D)	The final radiological, physical, and chemical end-state objectives. Where more than one DDP is required in a phased program, interim end-state objectives and monitoring programs for deferral periods shall be provided for each detailed plan.	See the Program Overview DDP [R-1]
Bullet 5	A description of the requirements for any institutional controls	E)	A description of the requirements for long-term institutional controls	See the Program Overview DDP [R-1]

REG DOC 2.11.2 Section 7.1.1	Requirement Description	CSA N294:19 App C.1	CSA Requirement Description	DDP Section Reference
Bullet 6	Comprehensive and systematic survey results of radiological and other potentially hazardous conditions, including identification and description of the remaining significant gaps or uncertainties in the measurement or prediction of such conditions	F)	Comprehensive and systematic survey results of radiological and other potentially hazardous conditions, including identification and description of the remaining significant gaps or uncertainties in the measurement or prediction of such conditions	Section 4.3
Bullet 7	A decommissioning strategy for each planning envelope that highlights any significant changes from the strategy identified in the PDP	G)	A decommissioning strategy for each planning envelope that highlights any significant changes from the strategy in the PDP	Section 2.0 and the Program Overview DDP [R-1]
Bullet 8	A description of the decommissioning work packages, including: a step-wise technical approach the nature and source of potential significant risks to workers, the public and the environment (including estimates of doses), as well as species at risk, the procedures or technologies proposed to mitigate risks the quantities, characteristics and disposition methods of waste.	H)	A description of the decommissioning work packages, including: a step-wise technical approach; the nature and source of potential significant risks to workers, the public, and the environment (including estimates of doses) as well as species at risk; procedures or technologies proposed to mitigate risks; and quantities, characteristics, and disposition methods of all wastes;	Section 4.5 and 4.6

REG DOC 2.11.2 Section 7.1.1	Requirement Description	CSA N294:19 App C.1	CSA Requirement Description	DDP Section Reference
Bullet 9	A schedule of the execution of decommissioning activities showing: the start date of the proposed execution of decommissioning activities the approximate duration and sequence of work packages (and periods of storage with surveillance, if applicable) the anticipated date of completion of decommissioning activities	I)	A schedule showing the proposed start date; the approximate duration and sequence of work packages (and periods of SWS, if applicable); and the anticipated completion date;	See the Program Overview DDP [R-1]
Bullet 10	A waste management plan	J)	A waste management plan	Section 5.0
Bullet 11	A characterization of potential environmental effects and the measures to be employed to mitigate and monitor these effects	K)	A characterization of potential environmental effects and the measures that will be employed to mitigate and monitor the effects	See the Program Overview DDP [R-1]
Bullet 12	A conservative cost estimate (based on the work packages), as described in REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, for labour, materials, equipment, waste management, environmental assessment, monitoring and administration (e.g., training, safety, licensing, project management, government and public liaison)	L)	An itemized conservative cost estimate	See the Program Overview DDP [R-1]
Bullet 13	Financial guarantee arrangements	M)	Financial guarantee arrangements	See the Program Overview DDP [R-1]

REG DOC 2.11.2 Section 7.1.1	Requirement Description	CSA N294:19 App C.1	CSA Requirement Description	DDP Section Reference
Bullet 14	A summary report of any public and Indigenous consultations undertaken in preparing the plan, including issues raised and how they were considered and dispositioned	N)	A summary report of any public and Indigenous engagement undertaken in preparing the plan, including issues raised and how they were considered and dispositioned	See the Program Overview DDP [R-1]
Bullet 15	The project management structure	O)	The project management structure	See the Program Overview DDP [R-1]
Bullet 16	Applicable programs (e.g., management system, emergency response, site security, radiation protection, environmental protection, fire, and personnel training) (Note: this includes programs applicable during storage with surveillance and decommissioning)	P)	Applicable programs (e.g., management system, emergency response, site security, radiation protection, environmental protection and monitoring, fire protection, personnel training)	See the Program Overview DDP [R-1]
Bullet 17	A human factors program that includes: human factors analysis training provisions use of contractors procedural development ergonomic issues	Q)	A human factors program that includes human factors analysis; training provisions; use of contractors; procedural development; and ergonomic issues;	See the Program Overview DDP [R-1]
Bullet 18	Conventional occupational health and safety issues and associated training and protection programs	R)	Conventional occupational health and safety issues and associated training and protection programs;	See the Program Overview DDP [R-1]
Bullet 19	A list of federal and provincial regulatory agencies involved in the project	S)	AHJs involved in the project;	See the Program Overview DDP [R-1]

REG DOC 2.11.2 Section 7.1.1	Requirement Description	CSA N294:19 App C.1	CSA Requirement Description	DDP Section Reference
Bullet 20	The final survey program with interpretation criteria	T)	The final survey program with interpretation criteria	See the Program Overview DDP [R-1]
Bullet 21	The operating and decommissioning records that will be retained, and the method of retention	U)	The operating and decommissioning records required for long-term retention and the method of retention	See the Program Overview DDP [R-1]
Bullet 22	A table of contents for the final end-state report, outlining the topics to be covered	V)	A table of contents for the final end-state report that outlines the topics to be covered	See the Program Overview DDP [R-1]
Bullet 23	Operational experience and lessons learned from the decommissioning of similar nuclear facilities	W)	Operational experience and lessons learned of the decommissioning of similar nuclear facilities.	See the Program Overview DDP [R-1]
Bullet 24	Criticality safety assessment, as required, and planned actions involving fissile material	N/A	N/A	See the Program Overview DDP [R-1]