DOCKETED

Docket Number:	21-AFC-01
Project Title:	Pecho Energy Storage Center
TN #:	240712-2
Document Title:	Pecho Energy Center's Application for Certification - Project Description
Description:	N/A
Filer:	Chester Hong
Organization:	Golder/Kari Miller
Submitter Role:	Applicant Consultant
Submission Date:	11/23/2021 4:49:00 PM
Docketed Date:	11/23/2021

2.0 PROJECT DESCRIPTION AND SITE SELECTION

The Pecho Energy Storage Center (PESC or Pecho) will be a nominal 400-Megawatt (MW) 3,200 Megawatt-hour (MWh) advanced energy storage center capable of charging and discharging on a daily basis, deploying Hydrostor Inc. (Hydrostor) Advanced Compressed Air Energy Storage (A-CAES) technology. The facility will operate on a 24-hour basis, 365 days a year, with an approximate 50-year anticipated lifespan. The key elements of the Pecho project will consist of:

- Approximately 80-acre project site with security fencing and access gate
- Four electric motor-driven air compressor trains
- Four 100 MW air-powered turbine-generators with air exhaust stacks
- Heat extraction and recovery main process heat exchangers
- Thermal storage system consisting of water tanks
- Hydrostatically compensating approximately 500-acre-foot surface water reservoir with floating cover
- Underground compressed air storage cavern
- Related interconnecting conduits and facilities
- Fire detection and fire monitoring systems
- Two up to approximately 5 MW, 4.16 kilovolt (kV) emergency diesel-fired engines to maintain critical loads in the event of a loss of power
- 0.6-mile primary site access road and two access bridges
- Pecho will be designed to charge at up to 400 MW for up to 14 hours and deliver up to 3,200 MW-hours (MWh) over an 8-hour period when discharging at nameplate capacity
- Onsite 230 kV substation
- 3.4-mile 230 kV generator single-circuit tie-line interconnecting to the Pacific Gas and Electric Company's (PG&E) Morro Bay Switching Station.
- Stormwater retention ponds
- Turbine/compressor hall including maintenance shop and control room
- Gas Insulated Switchgear (GIS) building
- Utility Motor Control Center (MCC) building
- High voltage transformers
- Parking lot
- Cooling system: fin fan coolers
- Above-ground piping pipe racks and filter houses

- Process water treatment system inclusive of storage tanks
- Waste management storage facilities

The Pecho project does not require combustion of fossil fuel and will not produce combustion-related air emissions.[1] The Project Site is located at 2284 Adobe Road, Morro Bay, California.

The Project Site and related facilities were selected taking into consideration engineering constraints, site geology, environmental impacts, water, waste and fuel constraints, and electric transmission constraints, among other factors. The Project Site was selected in furtherance of the Basic Project Objectives.

The site selection criteria are discussed in detail in Sections 1, Introduction and 6, Alternatives.

2.1 Generating Facility Description, Design, and Operation

Pecho will be a 3200 MWh energy storage facility capable of charging and discharging daily. The overall facility will consist of four 100 MW (nominal) power blocks. Each power block will contain an electric motor-driven air compressor drivetrain, heat exchangers, an air turbine generator, air exhaust stacks, and ancillary equipment. Each power block will share a common set of thermal storage tanks (hot and cold) as well as the air storage cavern.

Pecho will be designed and constructed in accordance with the design criteria provided in Appendix 2A in accordance with applicable laws, ordinances, regulations, and standards (LORS).

2.1.1 General Site Arrangement and Layout

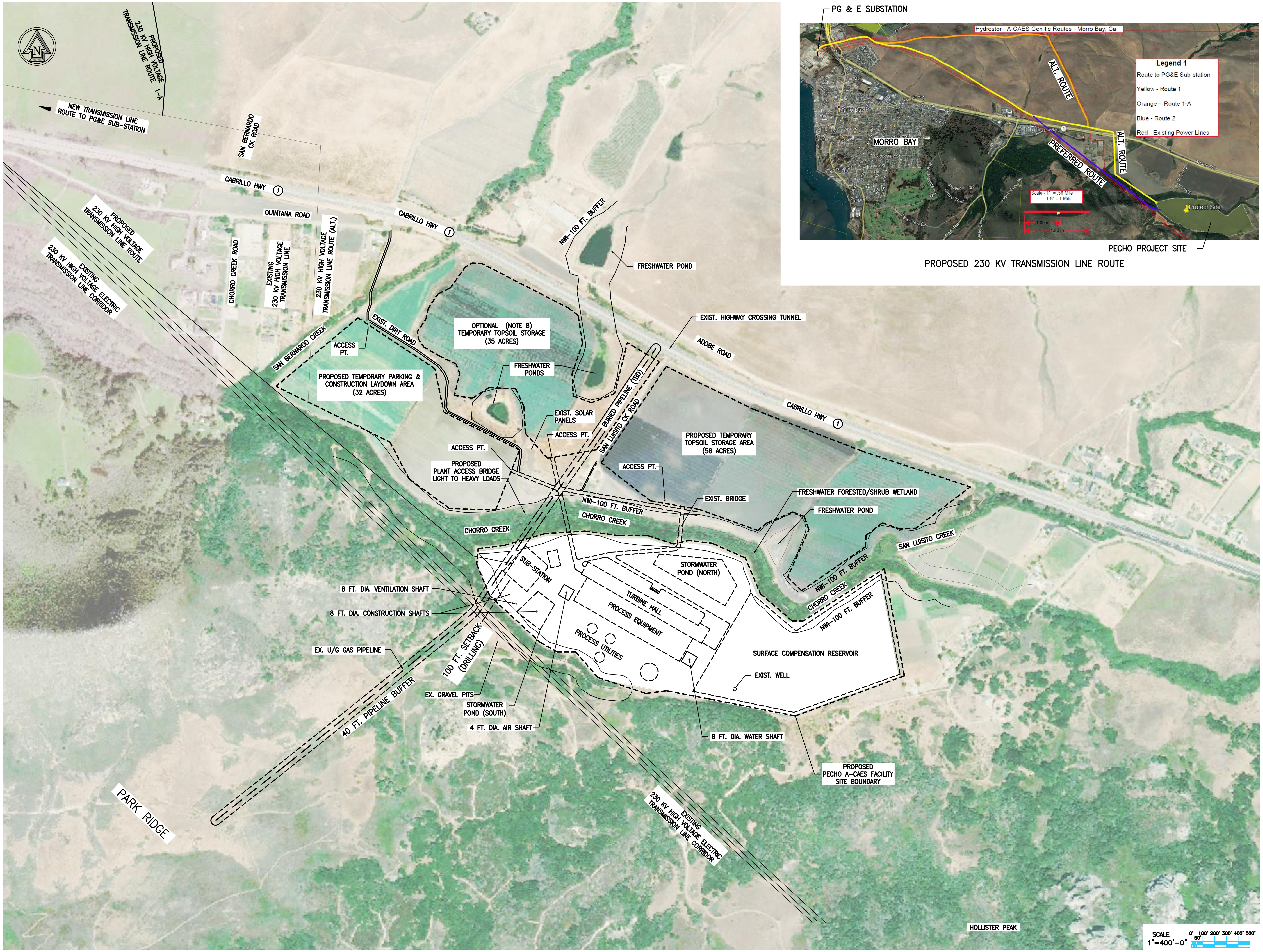
Figures 2-1 and 2-2 show Pecho's site plan and general arrangement, respectively. Figures 2-3, 2-4, 2-5 and 2-6 present elevation drawings showing the project profile. The main access to the Pecho site will be from California State Route (SR- 1) intersection at San Bernardo Creek Road in Morro Bay, California. Secondary access will be from Adobe Road and San Luisito Creek Road under SR-1. Plant roads will connect these access points and cross Chorro Creek with two separate bridges to access the main site. A portion of the site will be paved to provide internal access to all project facilities and onsite buildings. The areas around equipment will have gravel surfacing where not paved or concreted.

Table 2-1 summarizes the preliminary building square footage.

Table 2-1: Preliminary Building Square Footage

Building Structure	Area (sq. ft.)
Turbine Hall	141,650
Gas-Insulated Substation (GIS) Building	11,760
Main Substation, Protection & Control Building	820
Utility Motor Control Center (MCC)/Substation Building	2,500
Water Treatment Building	9,200

[1] The project will include two-emergency diesel-fired engines to maintain critical loads in the event of a loss of power. These engines are expected to operate less than 50 hours per year for reliability testing and maintenance and would not operate concurrently during testing. They would only otherwise operate in an emergency requiring operation of the fire pump or other critical facility loads when electric power is not available. This emergency backup equipment does not need to operate for the Pecho facility to function in normal operation.



NOTES:

1. PROPOSED A-CAES PLANT IS WITHIN THE 80 ACRE AREA 3 OF PROPERTY PARCEL APN 073-171-009 AS SHOWN ON GOOGLE EARTH.
2. FURTHER REFINEMENT OF PLOT IS SUBJECT TO A LEGAL SURVEY.
3. PROPOSED TEMPORARY CONSTRUCTION TRAILER AND LAYDOWN AREA IS SHOWN OFFSITE AT AREA 1 OF PROPERTY PARCEL APN 073-171-009.
4. GROUND CONTOUR ASSUMED FLAT.
5. ALL INFORMATION IS PRELIMINARY AND SUBJECT TO CHANGE.
6. REGULATED ACTIVITIES IN A WETLAND AND/OR ITS ASSOCIATED BUFFER ZONE INCLUDE CONSTRUCTION OR DEVELOPMENT THAT WILL RESULT IN SIGNIFICANT, ADVERSE CHANGES IN WATER TEMPERATURE, PHYSICAL OR CHEMICAL CHARACTERISTICS OF WETLAND WATER SOURCES, INCLUDING QUANTITY AND POLLUTANTS.
7. SITE ACCESS (CONSTRUCTIONS AND OPERATIONS) TO BE DETERMINED AFTER COMPLETION OF TRAFFIC STUDY.
8. AREA TO SUIT REQUIRED OVERBURDEN TO BE RELOCATED.

CONCEPTUAL

PRELIMINARY NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION
21-5375-00-3149-003	PROPOSED PLOT PLAN – OPTION 3

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
G	10/22/21	ISSUED FOR REVIEW	NZM	AW	AS	.
F	10/22/21	ISSUED FOR SQUAD CHECK	NZM	AW	AS	.
E	08/06/21	RE-ISSUED FOR PERMIT	NZM	KMG	GT	.
D	06/30/21	ISSUED FOR PERMIT	NZM	KMG	GT	.
C	06/23/21	RE-ISSUED FOR REVIEW	NZM	RJV	.	.
B	06/16/21	ISSUED FOR CLIENT REVIEW	NZM	RJV	.	.
H	10/25/21	RE-ISSUED FOR PERMIT	NZM	AW	AS	.

CLIENT

HYDROSTOR

TITLE

PECHO ENERGY STORAGE CENTER
400MW–8HR FACILITY
SITE PLAN

SCALE: 1"=400'
DRAWN BY NZM
CHECKED BY RJV
APPROVED .

EMPOWERING EPCM
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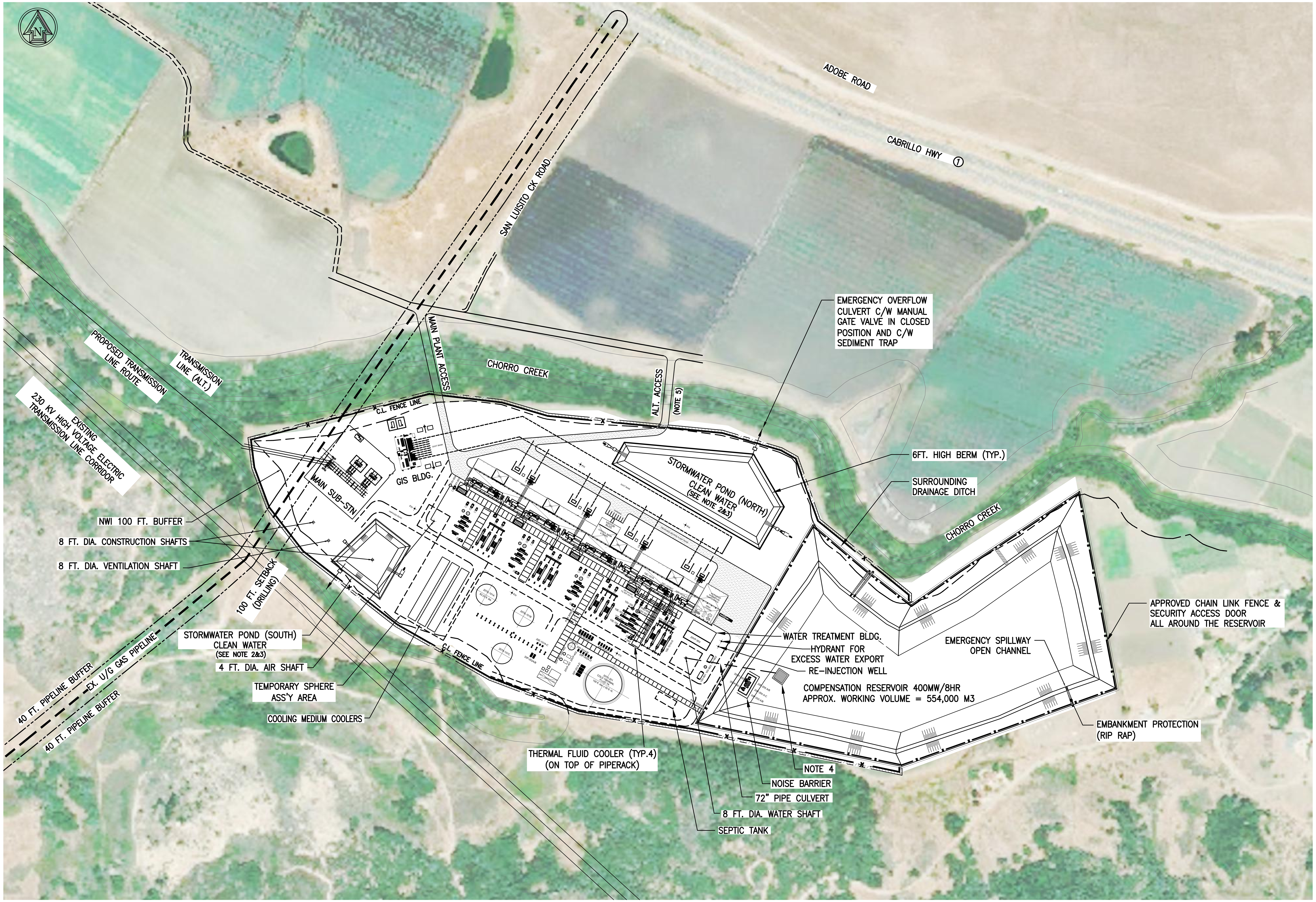
PROJECT NO.	DRAWING NO.	SHT.	REV.
21-5375	21-5375-00-3149-006	1/1	H

Figure 2.1: Site Plan, Pecho Energy Storage Center 400MW-8-HR Facility



SCALE 1/128"=1'-0" 0' 50' 100' 200' 300'

NOTES:

1. ALL DIMENSIONS ARE IN FEET–INCHES.
2. ENTIRE SITE WILL BE SURROUNDED BY SOIL BERM AND DRAINAGE DITCH TO DRAIN TO THE STORMWATER MANAGEMENT PONDS. PONDS WILL NOT DISCHARGE TO EXISTING CREEK. PONDS WILL BE DESIGNED TO ACCOMMODATE ALL APPLICABLE REGULATIONS.
3. ALL DRAINAGE DITCHES AND PONDS WILL BE ENHANCED WITH REQUIRED EROSION AND SEDIMENT CONTROL TO SUIT BEST MANAGEMENT PRACTICE.
4. AREA OF COVER TO BE DESIGNED CONSIDERING DESIGN REQUIREMENTS FOR THE LINER, COVER AND FLOW REQUIRED FOR DISCHARGE OF THE RESERVOIR. GALVANIZED GRATING TO PREVENT LARGE OBJECT ENTERING INTO THE SHAFT.
5. EXISTING FOOT BRIDGE TO BE UPGRADED IF REQUIRED TO MEET NEW TRAFFIC LOAD.
6. FIRE HYDRANT LOCATION AND DISTRIBUTION IS CONCEPTUAL ONLY.

PRELIMINARY NOT FOR CONSTRUCTION

CONCEPTUAL

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION
21-5375-00-3149-006	SITE PLAN

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
G	10/22/21	ISSUED FOR REVIEW	NZM	AW	AS	.
F	10/22/21	ISSUED FOR SQUAD CHECK	NZM	AW	AS	.
E	09/27/21	ISSUED FOR PERMIT	NZM	SP	.	.
D	06/30/21	ISSUED FOR PERMIT	EGB	NZM	GMT	.
C	06/23/21	ADDED THERMAL COOLERS – ISSUED FOR REVIEW	NZM	RJV	.	.
B	05/17/21	REVISED – ISSUED FOR INFORMATION	NZM	RJV	.	.
H	10/25/21	RE-ISSUED FOR PERMIT	nzm NZM	AW	~~AS~~ J.S	

CLIENT

HYDROSTOR

TITLE

PECHO ENERGY STORAGE CENTER
400MW–8HR
PROPOSED PLOT PLAN

SCALE: 1/128"=1-0"
DRAWN BY NZM
CHECKED BY RJV
APPROVED .

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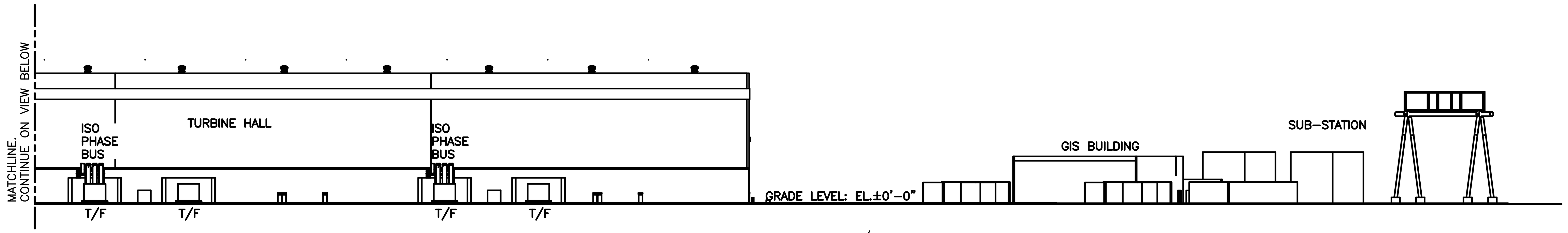
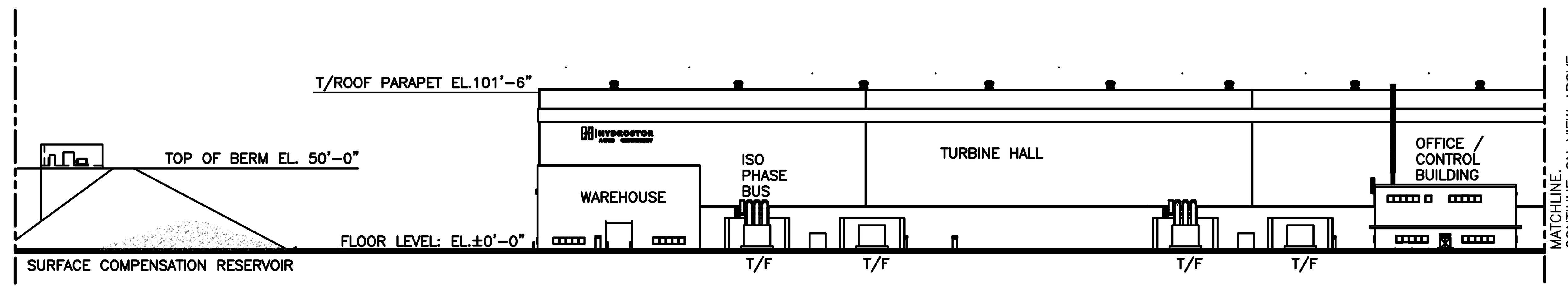
PROJECT NO. 21-5375
DRAWING NO. 21-5375-00-3149-003
SHT. 1/1
REV. H

Figure 2.2: Proposed Plot Plan, Pecho Energy Storage Center 400MW-8-HR Facility

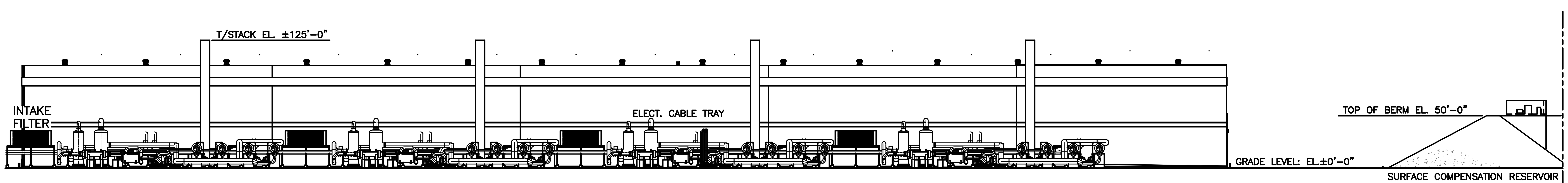
Filename: A:\21-5375 HYDROSTOR CALIFORNIA MORROW BAY\30 ENG\31 PIPING\42 GA - ORTHOGRAPHIC\WORKING FILE\21-5375-00-3149-003_OPTION 3.DWG
SHEET SIZE: D



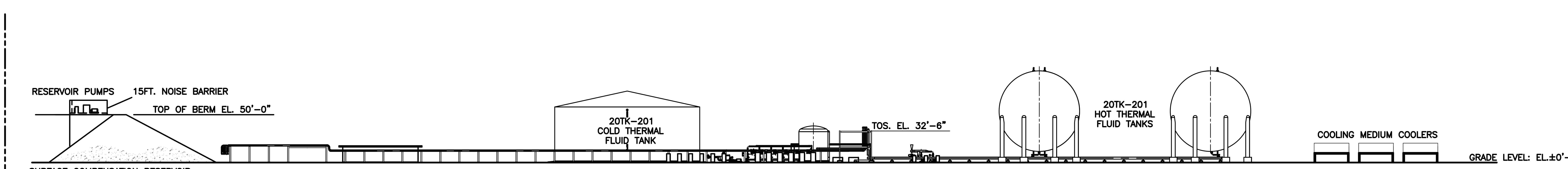
SECTION LOOKING SOUTH @ T/M BUILDING



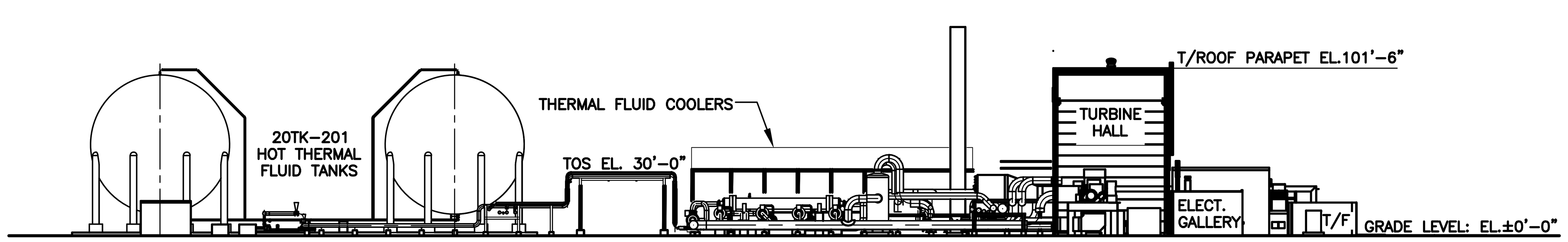
SECTION LOOKING SOUTH @ T/M BUILDING



SECTION LOOKING NORTH @ T/M BUILDING



SECTION LOOKING SOUTH @ UTILITY TANK AREA



SECTION LOOKING WEST @ UTILITY TANK AREA

CONCEPTUAL

PRELIMINARY NOT FOR CONSTRUCTION

Figure 2.3 Section Views, Pecho Energy Storage Center 400MW-8-HR Facility

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION
21-5375-00-3149-003	PLOT PLAN

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
			nzm		AJS	
F	10/25/21	RE-ISSUED FOR PERMIT	NZM	AW	AS	.
E	10/22/21	ISSUED FOR REVIEW	NZM	AW	AS	.
D	10/22/21	ISSUED FOR SQUAD CHECK	NZM	AW	AS	.
C	06/30/21	ISSUED FOR PERMIT	EGB	NZM	GT	.
B	06/24/21	ISSUED FOR REVIEW	EGB	RJV	.	.
A	06/22/21	ISSUED FOR SQUAD CHECK	EGB	RJV	.	.

CLIENT

HYDROSTOR

TITLE PECHO ENERGY STORAGE CENTER
400MW-8HR FACILITY
SECTION VIEWS

SCALE: AS NOTED
DRAWN BY EGB
CHECKED BY RJV
APPROVED .

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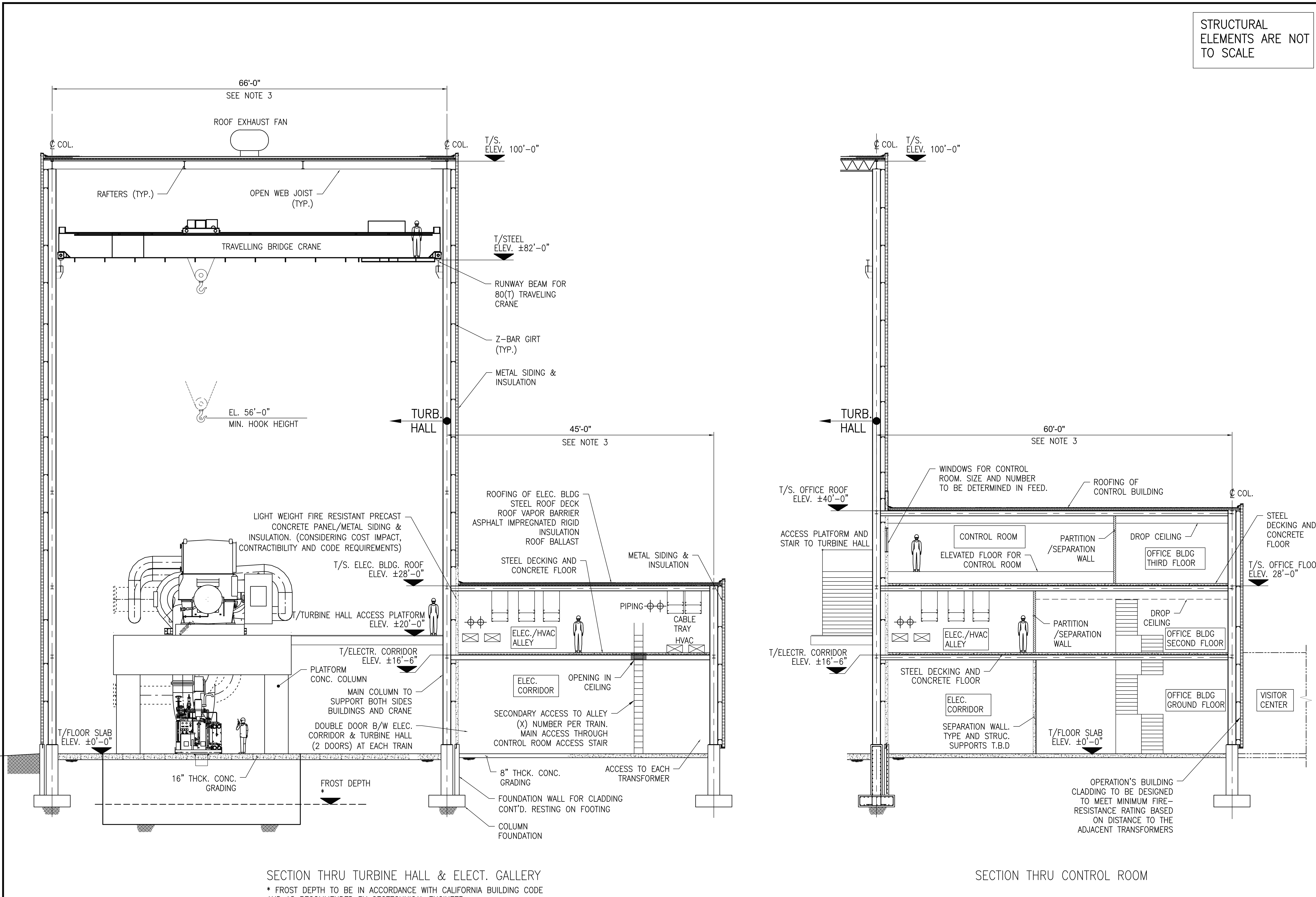
PROJECT NO.	DRAWING NO.	SHT.	REV.
21-5375	21-5375-00-3149-010	1/1	F



NOTES:
1. THIS SKETCH IS PROVIDED FOR BUILDING STUDY. NO CIVIL/STRUCTURAL DESIGN IS PERFORMED.
2. DIMENSIONS ARE IN FEET/INCHES.
3. UNTIL THICKNESS OF CLADDING AND STEEL MEMBERS ARE KNOWN, DIMENSIONS ARE FROM STEEL C.L. END ELEVATIONS ARE FROM T.O.S.

ABBREVIATIONS:

FND.	FOUNDATION
N.T.S	NOT TO SCALE
BLDG.	BUILDING
ELEC.	ELECTRICAL
AUX.	AUXILIARY
TURB.	TURBINE
OPS.	OPERATIONS
T.B.D	TO BE DETERMINED

PRELIMINARY NOT FOR CONSTRUCTION

CONCEPTUAL

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION
21-5375-00-3149-003	PLOT PLAN

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
C	06/30/21	ISSUED FOR PERMIT	NZM	KMG	GMT	.
B	06/24/21	ISSUED FOR REVIEW	NZM	KMG	.	.
A	06/18/21	ISSUED FOR SQUAD CHECK	NZM	KMG	.	.

CLIENT

HYDROSTOR

TITLE PECHO ENERGY STORAGE CENTER
BUILDING STUDY SKETCH
TURBINE HALL, ELECTRICAL CORRIDOR & CONTROL ROOM SECTIONS

SCALE: 1/8"=1'-0"
DRAWN BY NZM
CHECKED BY KMG
APPROVED .

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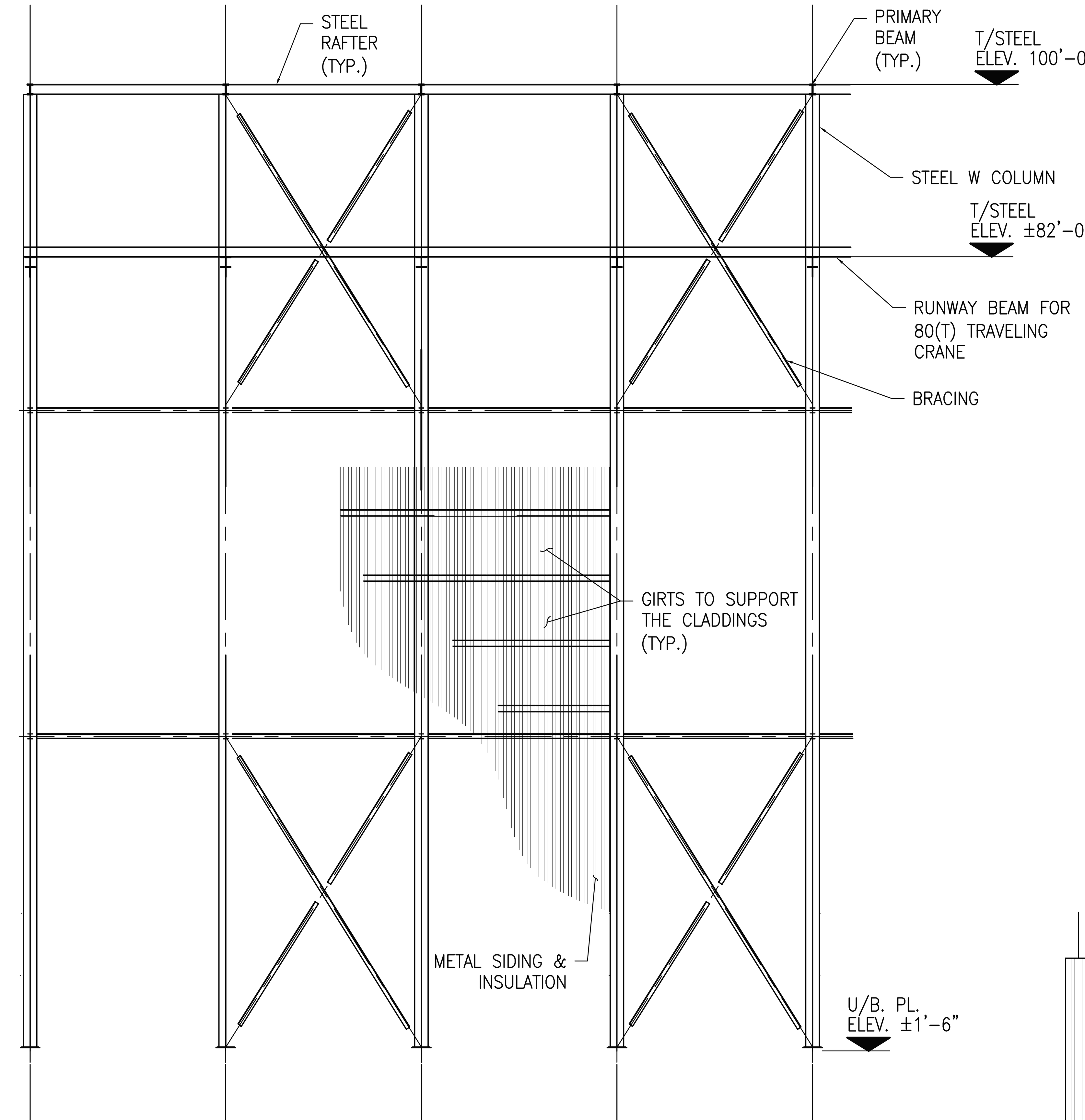
PROJECT NO. 21-5375
DRAWING NO. 21-5375-00-3149-007
SHT. 1/1
REV. C

FileName: J:\21-5375 HYDROSTOR CALIFORNIA MORROW BAY\30 ENG\31 PIPING\42 GA - ORTHOGRAPHIC\WORKING FILE\21-5375-00-3149-007.DWG
SHEET SIZE: D

Figure 2-4 Building Elevation 1 Pecho Energy Storage Center

PRELIMINARY NOT FOR CONSTRUCTION

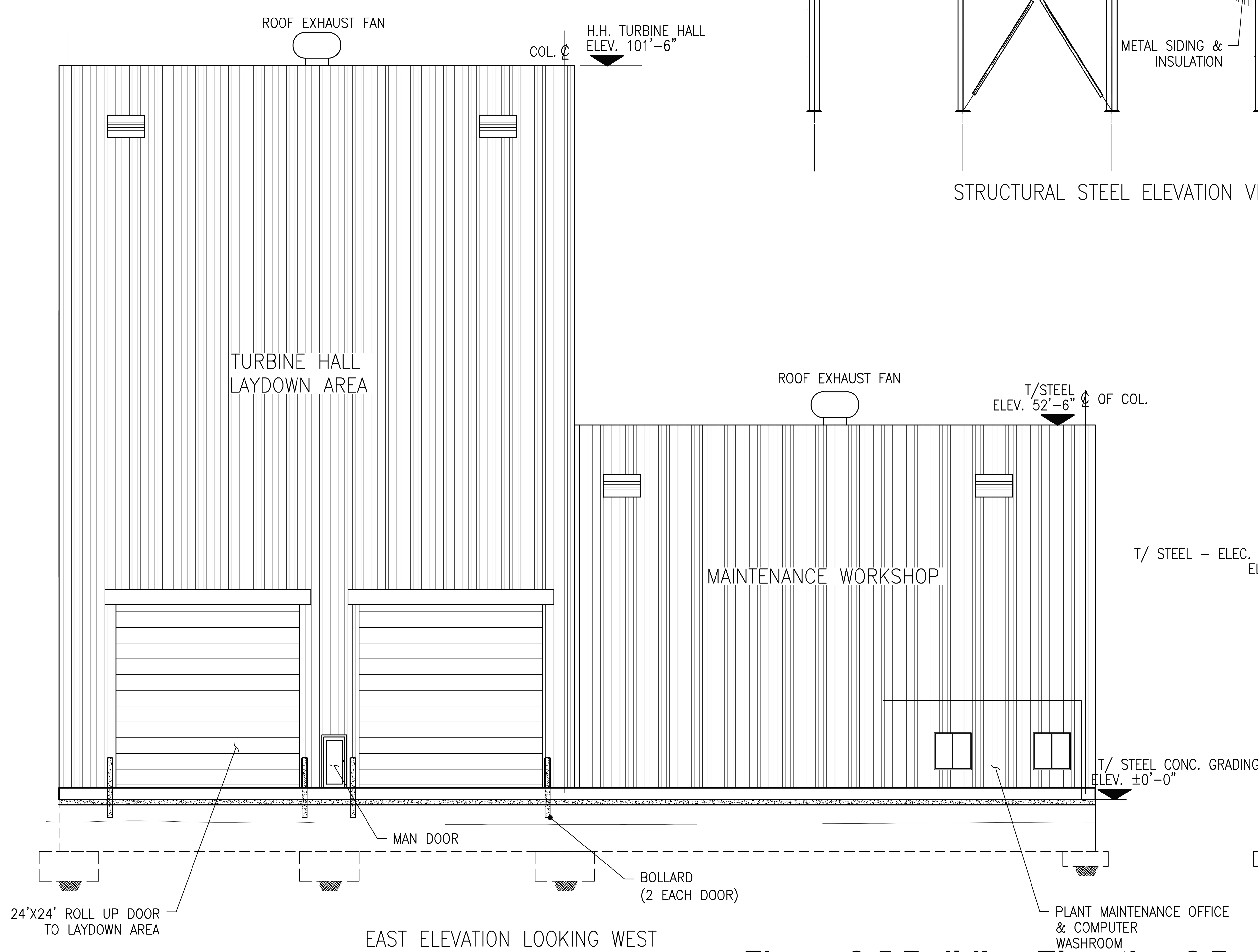
CONCEPTUAL



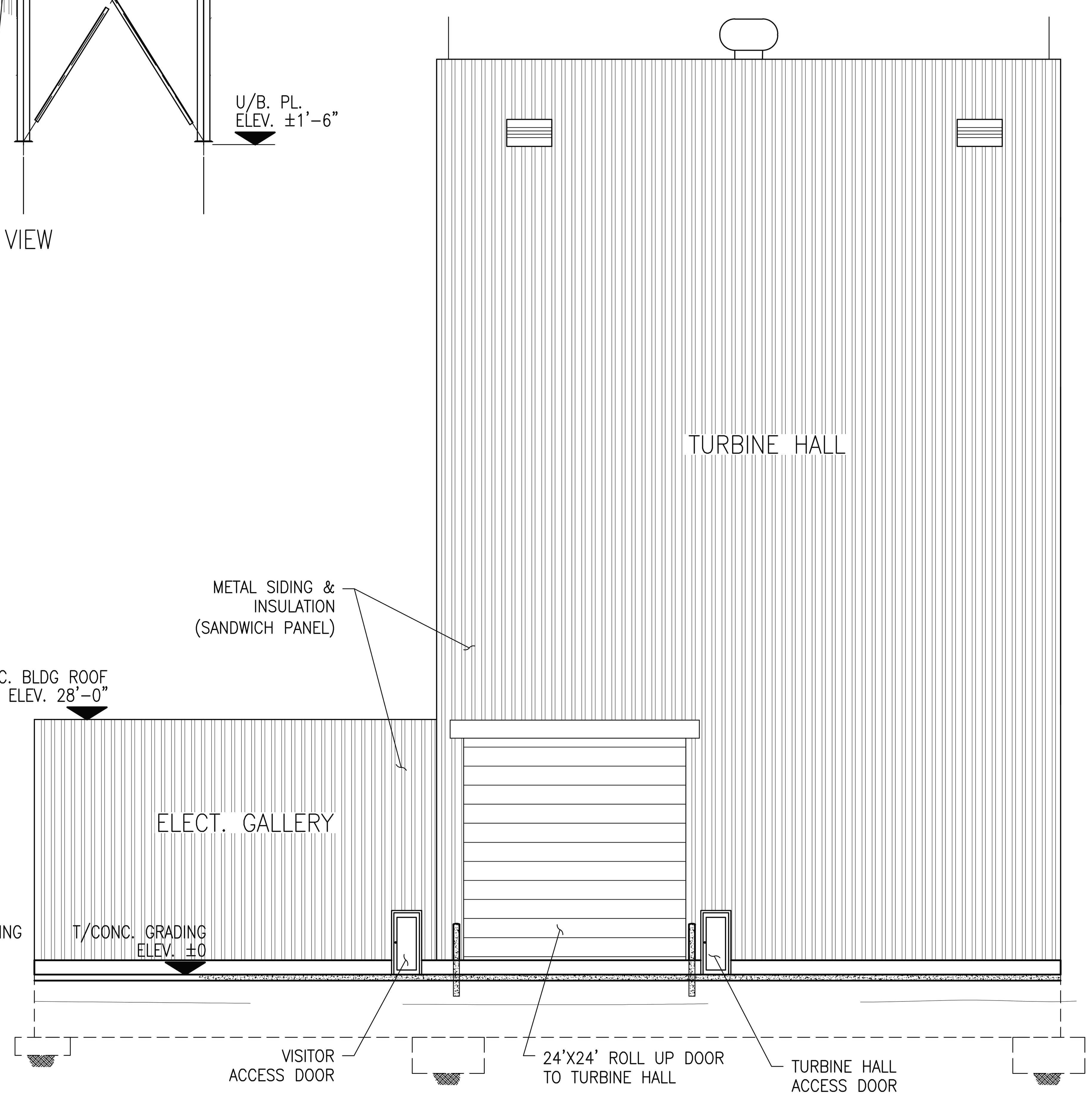
STRUCTURAL STEEL ELEVATION VIEW

ITEMS TO BE DETERMINED:

1. ALL DIMENSIONS INCLUDING BLDG. HEIGHTS
2. NUMBER AND WIDTH OF LAYDOWN AREA.
3. FIREPROOFING REQUIREMENTS FOR MAIN LOAD BEARING BEAMS AND COLUMNS.
4. FIRE RATING FOR SEPARATION WALLS B/W TURBINE HALL AND ELEC. BLDG.
5. FIREPROOFING OF GRADING SLAB.
6. BLAST REQUIREMENTS FOR ALL WALL PANELS.
7. ANY CONTAMINATED AREA INSIDE TURBINE HALL WHICH REQUIRE TRENCHES AND OIL INTERCEPTOR.
8. BLAST WALLS



EAST ELEVATION LOOKING WEST



WEST ELEVATION LOOKING EAST

Figure 2-5 Building Elevation 2 Pecho Energy Storage Center

NOTES:

1. THIS SKETCH IS PROVIDED FOR BUILDING STUDY. NO CIVIL/STRUCTURAL DESIGN IS PERFORMED.
2. DIMENSIONS ARE IN MILLIMETERS.
3. OPERATIONS BUILDING CLADDING TO BE DESIGNED TO MEET MINIMUM FIRE–RESISTANCE RATING BASED ON DISTANCE TO THE ADJACENT TRANSFORMERS.

BUILDING TO BE DESIGNED ACCORDING TO NFPA–68

STRUCTURAL ELEMENTS ARE NOT TO SCALE

ABBREVIATIONS:

FND.	FOUNDATION
N.T.S	NOT TO SCALE
BLDG.	BUILDING
ELEC.	ELECTRICAL
S/G	SWITCHGEAR
T/F	TRANSFORMER

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION
21–5375–00–3149–003	PLOT PLAN

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
C	06/30/21	ISSUED FOR PERMIT	NZM	KMG	GT	.
B	06/24/21	ISSUED FOR REVIEW	NZM	KMG	.	.
A	06/18/21	ISSUED FOR SQUAD CHECK	NZM	KMG	.	.

CLIENT

HYDROSTOR

TITLE PECHO ENERGY STORAGE CENTER BUILDING STUDY SKETCH TURBINE HALL, ELECTRICAL CORRIDOR & CONTROL BUILDING ELEVATIONS

SCALE: 3/32"=1'–0"
DRAWN BY NZM
CHECKED BY KMG
APPROVED .

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PROJECT NO.	DRAWING NO.	SHT.	REV.
21–5375	21–5375–00–3149–008	1/1	C

Filename: J:\21–5375 HYDROSTOR CALIFORNIA MORROW BAY\30 ENG\31 PIPING\42 GA – ORTHOGRAPHIC\WORKING FILE\21–5375–00–3149–008.DWG

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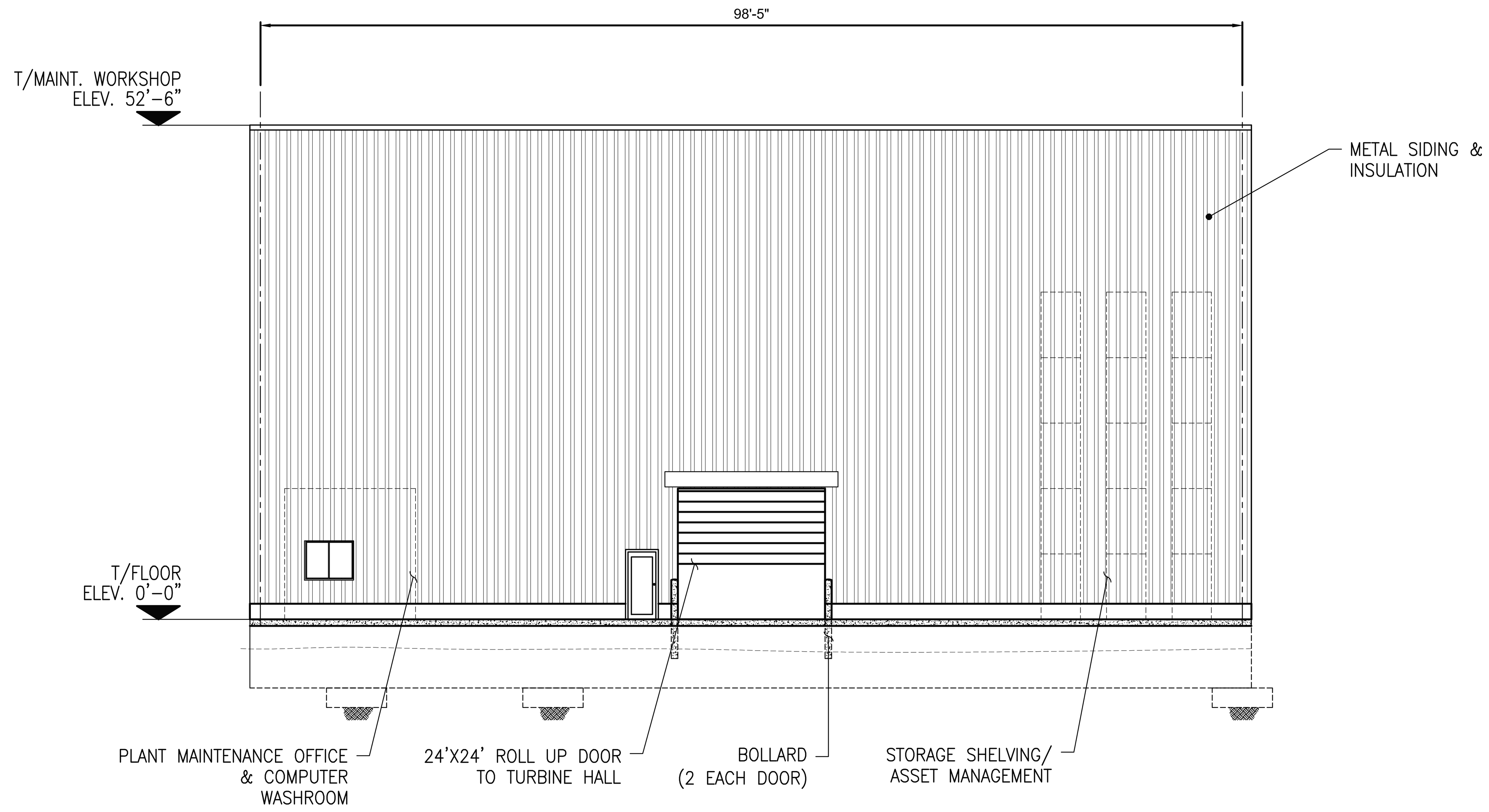
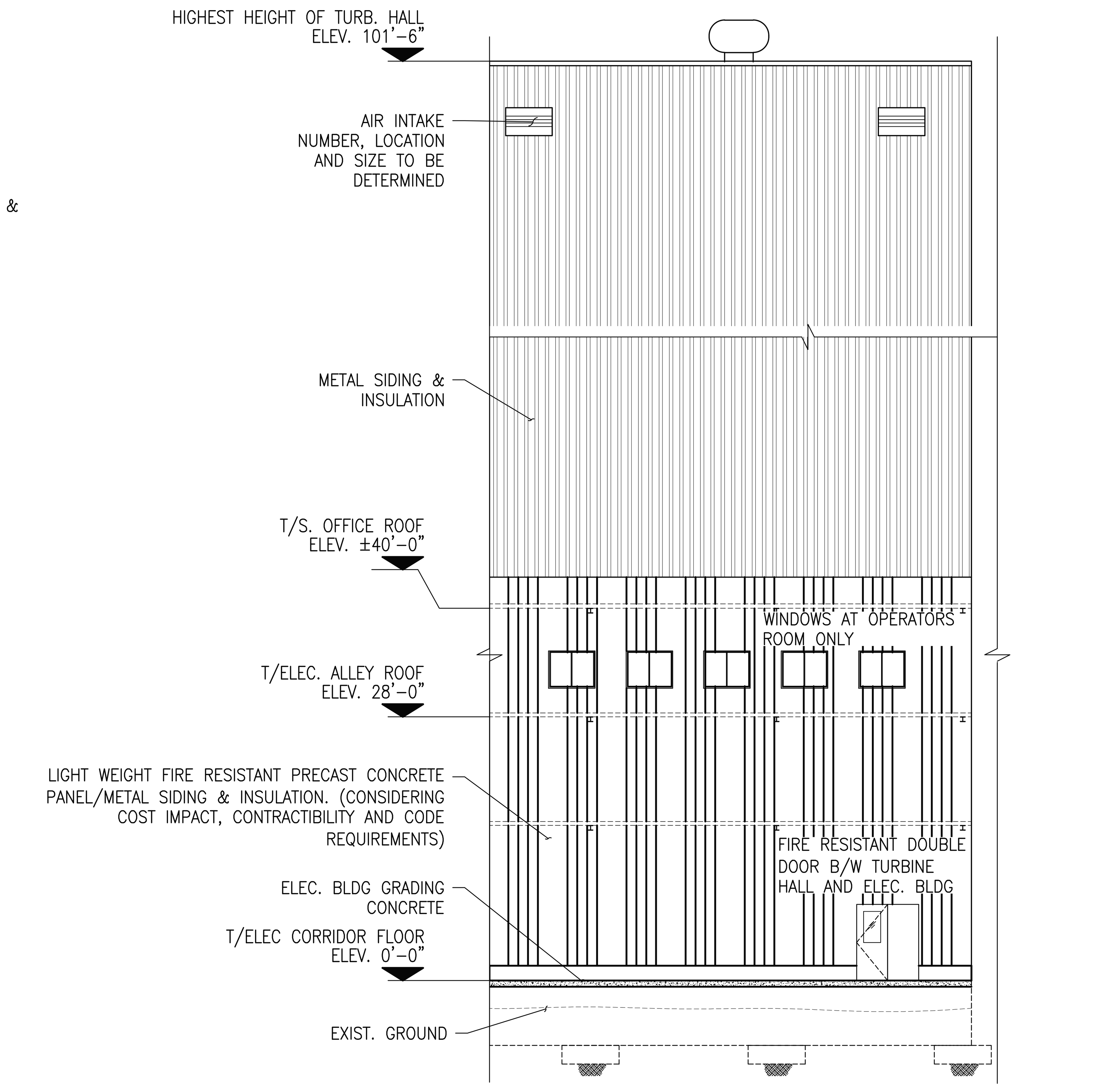
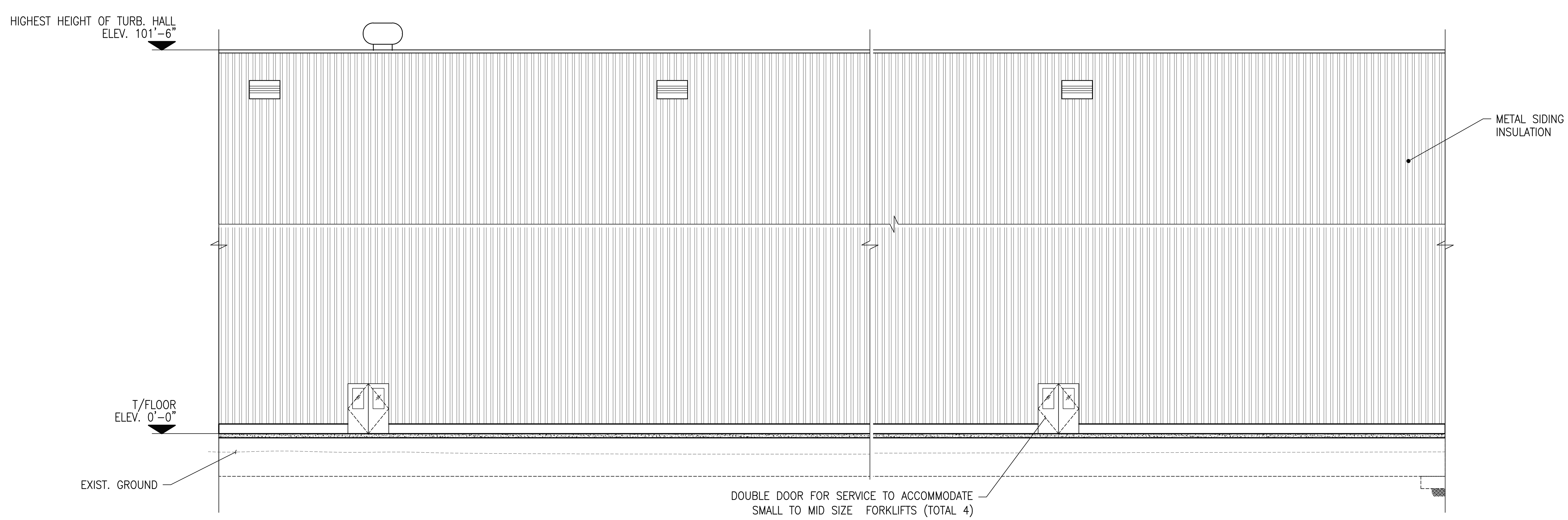


MAINTENANCE WORKSHOP – NORTH ELEVATION LOOKING SOUTH



ELEC. CORRIDOR NORTH ELEVATION (INSIDE BLDG. LOOKING SOUTH)



TURBINE HALL SOUTH ELEVATION LOOKING NORTH

NOTES:
1. THIS SKETCH IS PROVIDED FOR BUILDING STUDY. NO CIVIL/STRUCTURAL DESIGN IS PERFORMED.
2. DIMENSIONS ARE IN INCHES.

ABBREVIATIONS:

FND.	FOUNDATION
N.T.S	NOT TO SCALE
BLDG.	BUILDING
ELEC.	ELECTRICAL
AUX.	AUXILIARY
TURB.	TURBINE
OPS.	OPERATIONS
T.B.D	TO BE DETERMINED

PRELIMINARY NOT FOR CONSTRUCTION

CONCEPTUAL

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION
21-5375-00-3149-003	PLOT PLAN

REV.	MM/DD/YY DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
C	06/30/21	ISSUED FOR PERMIT	NZM	KMG	GT	.
B	06/24/21	ISSUED FOR REVIEW	NZM	KMG	.	.
A	06/18/21	ISSUED FOR SQUAD CHECK	NZM	RJV	.	.

CLIENT
HYDROSTOR

TITLE PECHO ENERGY STORAGE CENTER
BUILDING STUDY SKETCH
TURBINE HALL BUILDING
ELEVATIONS

SCALE: 3/32"=1'-0"
DRAWN BY EGB
CHECKED BY KMG
APPROVED .

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PROJECT NO. 21-5375
DRAWING NO. 21-5375-00-3149-009
SHT. 1/1
REV. C

SHEET SIZE: D

Figure 2-6 Building Elevation 3 Pecho Energy Storage Center

2.1.2 Process Description

Hydrostor's A-CAES technology is a low-cost, bulk-scale energy storage solution. It provides long-duration, emission-free storage, providing multi-hundred megawatts of generation capacity and a suite of ancillary services with up to a fifty (50) year facility life. This is enabled by combining industry-proven technologies with two key innovations: the use of hydrostatically compensated air storage caverns and a thermal management system.

The system stores compressed air in a purpose-built underground storage cavern, analogous to those used worldwide for hydrocarbon storage. The storage cavern is flooded with water through a hydraulic conduit from a water storage compensation reservoir at the ground surface level. The weight of the water in this compensation reservoir maintains a near-constant air-pressure in the cavern throughout both the charging and discharging cycles, supporting efficient operation, and significantly reducing the cavern volume requirements.

The thermal management system captures the heat developed during air compression, stores it, and re-uses it when generating electricity, making the process 'adiabatic'. This increases the system's efficiency and eliminates the need for burning of fossil fuels.

When the Hydrostor energy storage system is charging (known as "Charge Cycle"), electricity from the grid is used to drive air compressors, converting the electrical energy into potential energy in the compressed air and heat energy stored by the thermal energy management system. At multiple points in the compression process, the heat generated during air compression is transferred to a thermal fluid of boiler-grade water by a set of heat exchangers and stored separately for later use during the discharge cycle.

The air stream exits the compression process at the same pressure as is maintained in the air storage cavern, which is governed by the vertical distance between the cavern and the connected hydrostatic compensation reservoir located at the surface. As air is charged into the storage cavern, water is displaced up the hydraulic conduit and into the surface reservoir. This maintains a near-constant pressure of the air within the cavern and stores substantial potential energy in the elevated water. Once in the cavern, the air can be stored until electricity is required.

To generate electricity (known as the "Discharge Cycle"), compressed air is discharged from the cavern, which allows the compensation water to re-flood the cavern. Similar to the charge cycle, the compensation water from the reservoir maintains a near-constant air pressure in the cavern during discharging. The cool high-pressure air exiting the cavern is re-heated using the heat stored by the thermal management system and the same set of heat exchangers that were initially used to extract it. The reheated compressed air is then used to drive air-expansion turbine-generators which efficiently convert the stored potential energy back into electricity for the grid.

This energy storage system uses non-toxic materials, is constructed with minimal environmental disturbances, and does not use fossil fuels during operation. The technology uses established components and underground storage cavern designs with a track record of performance in other industries/applications, including mining and natural gas storage. A video summarizing Hydrostor's energy storage technology can be found at the following link: https://www.youtube.com/watch?v=cN39gCh9PWg. Table 2-2 summarizes the main energy storage process steps.

Table 2- 2: Energy Storage Process Steps

STEP 1 Air Compression Using Electricity	STEP 2 Heat Capture in a Thermal Management System	STEP 3 Compressed Air Storage	STEP 4 Compressed Air Conversion to Electricity
Electricity from the grid is used to operate air compressors that produce high-pressure heated compressed air.	Heat is extracted from the compressed air and stored in a thermal management system. This adiabatic process increases overall cycle efficiency and eliminates the subsequent need for burning fossil fuels.	Air is stored in a purpose-built storage cavern where hydrostatic compensation is used to maintain the system at a near constant air pressure during operation.	Hydrostatic pressure forces air back to the surface where it is recombined with the stored heat and expanded through turbine-generators to generate electricity on demand.

The Pecho heat and mass balance block flow diagrams are provided in Appendix 2C. These balances are based on an ambient dry bulb temperature of 55- and 97-degrees Fahrenheit (°F) (annual average and annual maximum) and relative humidity (RH) of 100 and 36 percent, respectively (based on mean coincident for the annual average and maximum dry bulb temperatures).

The actual net electrical output of the energy storage system will vary in response to ambient air temperature conditions, grid operating requirements such as volt-ampere reactive or VAR support and other operating factors. Operational modes will be driven by good operating practices, market conditions, and grid dispatch requirements.

As a reliability plant, Pecho is expected to provide power during periods of increased need on the grid such as times of high electrical load, during periods when intermittent renewable source generation fluctuates, when baseload plants are not operating or are being brought online, or during grid emergency conditions and/or local reliability needs. Conversely, the facility is expected to charge during times of low demand on the grid such as times of low electrical load, during periods when renewable source generation is high, etc.

2.1.3 Facility Operating States

Hydrostor's facility is an electrical energy storage technology with unique operating characteristics that must be considered across its operating states (charge, discharge, standby) including startup (cold start, hot start, and warm start) and shutdown. Cold start, warm start and are hot start discussed briefly below:

Cold Start: This will occur only when the facility has not been operated for several days and all equipment has cooled to ambient temperatures. A cold start will require a gradual warmup and safe expansion of blading, impellors, rotors, gearboxes, motors, etc., and as a result will be slower than either warm or hot starts.

Warm Start: Most plant start-ups will be warm starts, meaning the system has not had enough time from the last shut down to cool completely to ambient temperatures (indoor for turbomachinery and outdoor for heat exchangers). Typically, based upon the anticipated operating / dispatch regime, after a discharge (power generation) cycle, Pecho will commence the next charge cycle. Since turbomachinery has not yet been selected warm start initial metal-temperature criteria and speed-ramp / loading-ramp criteria will be finalized following completion of engineering design.

Hot Start: These will be relatively rare occurrence for Pecho, since charge-cycle equipment or discharge-cycle equipment will probably not be required to (re)start “hot” unless there has been a failure during the start sequence. Since turbomachinery has not yet been selected hot start initial metal-temperature criteria and speed-ramp / loading-ramp criteria will be finalized following completion of the engineering design.

2.1.4 Energy Storage Facility Charge Mode Cycle

The facility is designed for 400 MW rated capacity on both charge and discharge with an 8-hour discharge duration at full rated capacity. The facility will be designed to achieve an average Round Trip Efficiency (RTE) target of 60 percent. This means that the facility will return 60 percent of the electric energy used to complete the charge cycle as useful power output during the discharge cycle, and that a complete charge of the cavern will require about 13.5 hours at full rated capacity (8 hours divided by 60 percent RTE).

The frequency of charging the system is dependent on the electrical grid operator’s requirement to discharge the system. At its most frequent, the system could be charged, or partially charged, daily. The system could feasibly remain charged for long durations before discharging, but the hot thermal fluid stored in the spherical tanks must be maintained by heaters for very long standby periods (exceeding a few days).

When electricity from the electrical grid is available, the system will enter the charge mode. While charging, electricity is drawn from the electrical grid to operate multi-stage, electrically driven air compressors. Air at atmospheric pressure and ambient temperature is compressed to approximately 870 pounds per square inch gauge (psig) across three (3) sequential pressure sections of compression, low pressure, intermediate pressure, and high pressure (LP, IP, and HP), to allow storage in an underground hydrostatically compensated rock cavern with a floor depth of approximately 2,000 feet below ground level.

As the compressed air enters the storage cavern, the air pressure will overcome the hydrostatic head of the compensation water system, forcing an equivalent volume of water out of the cavern and up the compensation shaft (water conduit), increasing the water level of the surface reservoir.

The hot air exiting each section of compression is cooled using a thermal fluid (boiler-grade water) in the LP, IP, and HP heat exchangers. The thermal fluid will exit each heat exchanger and combine into a common stream. The heated thermal fluid will flow to the hot thermal fluid spherical tanks where it will be stored at its vapor pressure to avoid vaporization. This will be achieved through a system of self-pressurization whereby water vapor generated inside the tank will act as the head gas to maintain positive pressure.

2.1.5 Energy Storage Facility Generation / Discharge Mode

When the plant is sufficiently charged and is called to operate as power generation facility, a discharge cycle will commence. A grid signal will initiate the operation of the appropriate electrical breakers and transformers, heat exchangers, balance-of-plant equipment and commence operation of the turbine-generators. With the air flowing from the storage cavern, the turbine generator machines will start receiving re-heated high-pressure air, which will allow the turbine generators to ramp up to synchronous speed, whereupon they can be electrically synchronized to the grid. Thereafter the turbine generators will commence loading (increasing electrical output) until they reach the required plant electrical output.

While discharging, the high-pressure air from the cavern will pass through three turbine sections (HP, IP, and LP) to expand the gas from the cavern down to atmospheric pressure at which point the air will exhaust through the turbine silencer stack. The power produced by the turbine will drive a synchronous electrical generator. The turbine sections are pressure-grouped into the same number of pressure sections as the compressors, and just as in the case with the compressor, air will flow though the turbine sections sequentially. As the air exits the cavern, the surface water reservoir level will decrease as an equivalent volume of compensation water flows into the cavern, maintaining a near constant pressure throughout discharge.

For the discharge cycle the same heat exchangers (LP, IP, and HP) that were used to remove heat-of-compression for storage will be used with the flow reversed. The stored hot thermal fluid increases the temperature of the air before each expansion through each turbine section. This is necessary to avoid low temperatures and liquid condensation from the air as it is expanded and naturally cooled through the turbine's blade path. As the thermal fluid passes through the heat exchangers, it will be cooled by the air, but will not reach a low enough temperature for the next charge cycle. Accordingly, a secondary cooling system is used to reduce the thermal fluid temperature as required.

2.1.6 Energy Storage Facility Standby / Idle Mode

When the plant is not actively charging or discharging, the facility will be maintained in standby/idle mode. Standby/idle mode may occur either at the end of a charge cycle (e.g., the energy storage plant is ready and waiting to be called to operate as a power generator) or at the end of a discharge cycle (e.g., the need for power generation has ceased and there is no immediate need to (re)charge the facility with potential energy (high-pressure air and hot thermal fluid)). The electrical power draw of the facility during Standby/Idle primarily consists of relatively small pumps, heaters, and coolers in various sections of the plant.

If the Standby/Idle mode follows a complete Charge Cycle, the stored air contained in the cavern will be at the maximum level and maintained at a high pressure by the hydrostatic compensation system, and the stored thermal energy (heat) will be maintained in the insulated hot thermal fluid spherical tanks. Both the motor-driven air compressors and the air expansion turbine-generators will be idle, with the lube oil systems heated and lube oil circulating through them to keep them warm and ready-to-start, slow-speed turning gears operating if required, and with the generators or motors internally heated to keep them at an optimum temperature.

If the Standby/Idle Mode follows a full Discharge Cycle, the stored air contained in the cavern will be at the minimum level and the cavern will be mostly filled with compensation water, leaving the water level in the surface-level compensation reservoir at its minimum level, while the remaining air in the cavern stays at a constant hydrostatic pressure. Very little thermal fluid will remain in the hot thermal fluid spherical tanks, and the cooled thermal fluid will be held in the cold thermal storage tank. Both the motor-driven air-compression equipment and the air-expansion turbine-generators will be idle, with heated lubricating oil circulating, and motor and generator heaters maintaining them at optimum temperatures, all to keep them ready to start. With the hot thermal storage tanks at a low liquid level, temperature will reduce most quickly due to the small amount of water in the tank. Therefore, supplementary heating via tank immersion heaters will be operated to counteract any temperature and pressure drop.

In very exceptional circumstances (e.g., a complete plant shutdown for major maintenance), the complete energy storage plant could be in a wholly de-pressurized and potentially a wholly cooled state, with potentially all piping and tanks in a de-watered state (except for the cavern and the compensation reservoir), and all turbomachines allowed to cool as major work is conducted.

2.1.7 Energy Storage Air Compression Equipment Drivetrain

There will be four (4) air-compression drivetrains in the system, one (1) LP and one (1) IP/HP compressor for each 100 MW train, totaling a 400 MW load during Charge Mode.

The compression/charge portion of the basic facility design will consist of a two-part compression drivetrain, each part using a dedicated electrical motor. The basic framework for the charge / compression-equipment consists of:

- **LP compressor:** A dedicated Low-Pressure compressor drawing filtered ambient air, driven by a synchronous electrical motor (operating at synchronous speed), with capacity flow and surge control managed by inlet flow mechanisms combined with discharge piping blow-off valves (BOV). Filtration and moisture knockout provisions are fitted as required. A non-return valve (NRV) will be fitted in the LP compressor discharge to prevent air backflow. The anticipated power demand for the LP compression section will be about 50 MW at design conditions.

The "low-pressure" air discharge from the LP compressor, after being cooled by the downstream heat exchanger, will then be piped to the inlet of the IP/HP compressor (described below).

- **IP/HP compressor:** A separate compressor with a combined Intermediate Pressure compressor and High-Pressure compressor, all driven by a single, separate, synchronous electrical motor (also operating at synchronous speed). Cooled and filtered inlet air for both pressure groups in this combined compressor will be delivered from the upstream main process heat exchanger. The anticipated power demand for the IP/HP compression section at design conditions will be about 50 MW.

The high-pressure discharge from the HP compressor section will be directed to a final air-to-water heat exchanger and the resulting cooled air will thereafter be directed to the air storage cavern at a near constant pressure. All compressors will utilize heavy process-industry quality synchronous motors with brushless excitation. Each of the two individual compressors will be fitted with a dedicated lubricating / control oil system and with dedicated synchronous motor controllers and protective relaying. The compressor surge controller will be integrated to monitor and manage both compressors together.

2.1.8 Energy Storage Air-Expansion Turbine Generators

There will be four (4) air-expansion turbine generators in the Pecho system, one (1) generator for each 100 MW train.

All turbine generators will be single-casing axial-bladed machines with multiple air inlets and outlets, driving a synchronous generator with brushless excitation and will be complete with power-generation industry quality speed/load controls, generator protective relaying, voltage regulators and synchronizing equipment. Each unit will have a dedicated lubricating / control oil system, dedicated turbine and generator control and protection systems.

Each air-expansion turbine consists of 3 sections or pressure groups. The high-pressure air produced from the Charge Cycle that has been stored in the underground cavern, will be utilized to power the turbine. The discharge air will first be piped to the HP heat exchangers where it will be heated, using hot water from the hot thermal fluid (spherical) tanks. The heated air will be used to power the HP heated turbine sections.

After the HP turbine section, the exiting air will have cooled due to the expansion process and will be routed to the IP heat exchangers, where it will be reheated using the hot thermal fluid. After the IP turbine section, the cooled air will be routed to the LP heat exchangers. This reheated air will be admitted to the low-pressure expansion section of the turbine machine, whereafter it will exit to atmosphere via an exhaust stack.

2.1.9 Thermal Management System

The thermal management system will be comprised of thermal fluid, main process heat exchangers, fin fan coolers, and both hot and cold thermal storage tanks. During charging, the system will use water to extract heat from the air in the compression process. This heated water will be stored separately in a dense and insulated environment. During discharging, the heat from the heated water will be re-injected back into the air during the expansion process. The thermal management system is key to an ‘adiabatic’ and fuel/emission-free process.

The thermal fluid for this facility will be boiler-grade water. The thermal fluid system is a closed system whereby the thermal fluid will be passed between the hot and cold thermal storage tanks during the charge and discharge cycles (as described above). The stored volume within each of the tanks will fluctuate as part of normal operations. Make-up water for the thermal fluid system will be taken from the reservoir and treated prior to sending to the cold thermal fluid tank.

Cold thermal fluid will be stored outdoors in a large cylindrical tank (approximately 150 ft diameter x 50 ft high). The cold thermal fluid tank will be fitted with a nitrogen blanketing system, operated at low pressure to prevent air ingress and oxygenation of the treated water.

Hot thermal fluid will be stored outdoors in three spherical storage tanks, each with a diameter of approximately 85 ft. The head gas in the hot thermal fluid tank is steam in liquid vapor equilibrium with the stored thermal water. The hot thermal fluid tank will be outfitted with an immersion fluid electrical heater which will counteract any thermal losses. Each sphere will be insulated for heat conservation.

The LP, IP, and HP heat exchangers will be designed to both heat the air on discharge and cool the air on charge. They are standard industrial shell and tube heat exchangers and are insulated to retain heat on standby periods.

Table 2-3 summarizes the number of shells of the heat exchangers per 100MW train.

Table 2-3: Heat Exchangers[1]

Stage	LP	IP	HP
Type	Shell & Tube	Shell & Tube	Shell & Tube
No of Shells	16	8	4

Refer to Appendix 2B for the heat balances

2.1.10 Cavern Air and Water Conduits

Two flow conduits connected to the cavern will be necessary to operate the A-CAES facility: one for the conveyance of air and another for water.

<u>Water shaft</u>

Upon the completion of mining, one of the construction shafts will be converted into a water conduit, approximately 8 feet in diameter. The water shaft will be designed for a maximum flow rate of 18 feet per second (fps), a typical velocity criterion for penstocks. The lower end of the water shaft will extend into a sump which will be constructed below the cavern floor to ensure that a water seal will be maintained at all times during operation.

Air shaft

The smaller compressed air shaft will be completed for A-CAES service upon completion of mining, approximately 4 feet in diameter. A thin wall stainless steel liner will be suspended in the air shaft and the annulus will be purged with a sweep of dry air to prevent corrosion of the carbon steel well casing. The compressed air flow liner will be sized to limit the flowing air velocity up to 110 feet per minute (fpm). The lower end of the air shaft will be located at a high point in the roof of the cavern, such that it is never submerged during operation.

2.1.11 Hydrostatically Compensating Surface Reservoir

An approximately 500-acre-foot surface reservoir will be constructed utilizing earthen berms. The reservoir will cover a surface area of approximately 722,000 square feet and have an average depth of approximately 40 feet. The berms will be constructed from a combination of excavated soil and mined rock from the construction of the underground storage cavern. The berms will have an approximate height of 50 feet from the exterior toe to the top of the berm. The water level in the reservoir will fluctuate to maintain constant underground air storage pressure and be designed to operate with a minimum freeboard of approximately 4 feet. The surface reservoir will be equipped with an engineering liner and a floating cover to minimize evaporative water loss.

2.1.12 Underground Storage Caverns

The A-CAES facility will utilize one cavern for the storage of compressed air. The storage cavern will be constructed in the bedrock below the site at target a depth of approximately 2000 feet below ground level. The cavern construction will be facilitated by three or four construction shafts connecting the surface to the construction horizon. One of the shafts will be used for the hoisting of excavated materials, one for the conveyance of mine personnel and hoisting excavated materials, and one or two for ventilation. The cavern will be constructed by conventional drill-and-blast mining methods and may be excavated using room and pillar or parallel gallery methods. The size and shape of mined openings will be dependent upon the strength of the host rock and will be designed as host geology data becomes available.

For gallery construction, a top heading will be initially driven, and roof support will be installed as the excavation advances. One or more successive benches will then be excavated to develop the cavern to full height. Mining waste will be crushed and brought to the surface via shaft skip. The cavern floors are graded to drain towards water sump and shaft. Where geology and ground conditions permit, roof are sloped up to naturally vent into the air shaft to avoid the possibility for trapped air pockets. Most caverns are completed with unlined, bare rock surfaces, though some are lined with a thin layer of shotcrete for worker safety and geotechnical ‘skin control’ integrity. Grouting may also be used to seal large fractures as required to reduce water inflow during cavern construction. Upon completion of cavern excavation, the cavern will be commissioned into operations which will require the sealing of the construction shafts.

During operation, the cavern is flooded with water through a hydraulic conduit connected to a water compensation reservoir at the ground surface level. The weight of the water in this compensation reservoir and hydraulic conduit maintains a near-constant air-pressure in the cavern throughout both the charging and discharging cycles, supporting efficient operation, and significantly reducing the cavern volume requirements. The dimensions, material, and design of the cavern are presented in Table 2-4.

Table 2-4: Cavern Design

Design Element	Value
Depth	Approximately 2,000 feet
Pressure	870 psig
Volume	630,000 cubic yards
Material	Rock with ground support

2.1.13 Black Start Generator

The facility will be designed to be black start capable using the emergency generators described in Section 2.1.14.6.

2.1.14 Major Electrical Equipment and Systems

The net electric power generated at the PESC will be transmitted to the electrical grid. Transmission and auxiliary uses are discussed in the following subsections. The electric power required for charging the system will be drawn from the electrical grid with additional power for the auxiliaries. Refer to the preliminary single line diagrams provided in Section 3.0, Electric Transmission (Figures 3-2, 3-3, and 3-4) depicting the onsite Pecho main substation including applicable ratings of key equipment.

For metering of the import and export of power, a power quality meter suitable for revenue metering of megawatt-hours (MWh) and megavolt ampere reactive-hours (MVARh) will be located at the site substation. The power revenue metering will be constructed according to PG&E standards.

A Power Management System will interface with PG&E to coordinate power export/import and voltage regulation.

2.1.14.1 *Generators and Motors*

Turbine Generators

Generators shall generate at medium voltage (13.8 kV). This power will be transformed via unit transformers to 69 kV for site distribution to the site substation and transformed to 230 kV for the electrical grid connection.

Generators are preliminarily rated 125 megavolt amperes (MVA) at 0.9 to 0.95 power factor (pf) in order to supply 100 MW to the electrical grid plus 100 percent of auxiliary load. This allows maximum turndown of plant where a single generator can operate while other generators are down for maintenance.

Synchronous motors

Full charging capacity requires eight synchronous motors running to supply the four air compressor trains. The power to the synchronous motors shall be supplied via unit transformers.

The synchronous motors shall normally run at unity or slightly leading power factor in order to mitigate the volt ampere reactive (VAR) import requirements of induction motors within the auxiliary power system.

The synchronous motors shall be started using a variable frequency drive (VFD) soft start system. One soft start unit shall be utilized for each of the four sets of motors (one per compressor power train) if required.

2.1.14.2 Alternating Current Power—Transmission

Power will be generated by the four generators at 13.8 kV and transformed to 69 kV via unit transformers for site distribution to be further stepped up to 230 kV for the grid interconnection. Two 230/69 kV main transformers in the main switchyard support connection to the local 230 kV network at the Morro Bay Switching Station. For motor operation, four additional 69/13.8 kV unit transformers provide power to the compressor motors. Surge arrestors protect the system from disturbances in the 230kV or 69 kV system caused by lightning strikes or other system disruptions.

The transformers will be set on concrete foundations and the design will include a secondary oil containment reservoir to contain the transformer oil in the event of a leak or spill. There will be differential protection on transformers rated 5 MVA and greater. The high-voltage side of the 230/69 kV transformer will be connected to a single-circuit, three-phase, 230 kV line, which will be connected to the Morro Bay Switching Station via overhead transmission lines.

A detailed discussion of the electric transmission system is provided in Section 3, Electric Transmission.

2.1.14.3 Alternating Current Power—Distribution to Auxiliaries

The distribution voltages for plant auxiliary systems and lighting will include: 4.16 kV, 480 V and 208/120 V.

Auxiliary power supplies for instruments will be 24 volts direct current (VDC), however, where increased power consumption is required, 120 volts alternating current (VAC) will be used.

2.1.14.4 DC Power Supply System

Turbine/generator and compressor/motor auxiliaries will be supplied by 250 VDC.

Process control systems will be supplied from 24 VDC power supply modules within system cabinets. Control power for the switchgear will be 125 VDC supplied from a dedicated direct current (DC) battery system. The 125 VDC battery system will be independent of the 120 VAC (uninterruptible power system (UPS) battery system.

All DC systems will have eight-hour battery duration.

The system will be designed to provide continuous rated power in the event of main power failure. The DC Systems will be on the emergency generator bus. The DC System's health will be monitored by the DCS.

2.1.14.5 Uninterruptible Power Supply System

An independent UPS shall be dedicated to supply power to the following loads:

- Critical instruments, emergency lighting and valves
- Control panel fans and other ancillaries
- DCS control racks including programmable logic controllers (PLCs), flow computers, vibration monitoring system etc.
- Telecommunications system
- Building cameras and security access system
- Smoke and building heat detectors

UPS includes:

- 20 kilovolt amperes (kVA) or less:
  - Input voltage: 208 V
  - Output voltage: 208 V
- Greater than 30 kVA:
  - Input voltage: 480 V
  - Output voltage: 480 V

The system will be designed to provide continuous rated power in the event of main power failure. The UPS will be on the emergency generator bus. The UPS and generators health will be monitored by the DCS.

2.1.14.6 Emergency Power

Two self-contained 4.16 kV diesel generators, up to approximately 5 MW each, will supply emergency power for all critical loads via double sided 5 kV emergency switchgear.

2.1.15 Water Supply and Use

During construction and during the initial filling of the surface compensation reservoir, PESC will require approximately 735 acre-feet (AF) of water. Construction water requirements are discussed further in Section 5.15, Water Resources. The project is expected to have an annual surplus volume that correlates to approximately 53 acre-feet per year of water once in operation. This is due predominantly to the strategy that the rainwater from the roofs will be collected and stored in the reservoir and that the water produced through the compression sequence will be collected and directed to the reservoir storage for potential use. Additionally, water savings will be achieved by the utilization of a cover on the reservoir and optimization of water use strategies throughout the base design. Since there will be a seasonal variation associated with the production of water as well as evaporation losses, the reservoir will be designed to allow for the management of inventory of water to minimize high levels of discharge. Surplus water will be used for beneficial uses by one of the following strategies: (i) supplemental irrigation water in adjacent agriculture fields, (ii) groundwater recharge by reinjecting into the aquifer, or (iii) piped to potential end users. Once the facility commences operation.

2.1.15.1 Construction Water

2.1.15.1.1 Cavern Works

<u>Non-Potable Water</u>

For non-potable water, the site clearing phase of the cavern works (Months 1-4) will require roughly two (2) 2,000-gallon water (non-potable) trucks per day for general use.

Cavern shaft drilling (Months 5 thru 18) will require roughly three times the volume of the shafts, or approximately 26 acre-feet of water, which will be required at Month 5 of construction and delivered over a 1-month period. This water will be used continuously in a closed loop arrangement for the duration of the drilling phase, and due to high total suspended solids, will need to be recycled once finished.

Cavern mining (Months 19 thru 51) will require a peak flow of 50 gallons per minute (gpm) over the entire duration, with an average of 35 gpm over the period (24 hours per day, 7 days per week).

Potable Water

Workers are assumed to use 20 gallons of potable water per person per day during all stages of cavern construction, including drinking and wash water. Wash water will be collected and trucked offsite to an approved disposal site.

Refer to Appendix 2D for the estimated water consumption required through construction for the cavern by month.

2.1.15.1.2 Surface Works

Non-Potable Water

The surface construction requires non-potable water for several purposes over the 24-month period:

- General purpose (de-dusting roads, daily washdown, etc.)
- Tank and sphere hydrotest
- Piping and vessel hydrotest
- Fire system testing

Water used for hydrotesting will be reused for hydrotesting other systems including the spheres, pipe circuits and initial fill. A temporary pumping sub-system with screening and filtering capabilities will be utilized to reuse this water. After all testing, the volume of hydrotest water (losses at flange breaks, nozzle spray tests, etc.) will be screened and filtered to a suitable cleanliness tolerance to supplement the initial fill volume of the Cold Thermal Fluid Tanks and/or reservoir.

Potable Water

Surface workers are assumed to use 20 gallons of potable water per person per day during all stages of construction, including drinking and wash water.

Refer to Appendix 2D for the estimated water consumption required through surface construction by month.

2.1.15.1.3 Compensation Reservoir Fill

Water demand for the compensation system fill will be approximately 525 acre-feet. The reservoir fill will occur over approximately 20 months with monthly fill requirements as shown in Appendix 2D. The required fill amount accounts for both precipitation and evaporation. The compensation reservoir will be equipped with a cover estimated to be above 90 percent effective in reducing evaporation.

2.1.15.2 Water and Wastewater Requirements

The PESC will use treated non-potable water for compensation water. A percentage of the non-potable treated water will be treated further to boiler feedwater quality and used for the thermal fluid and cooling medium loops. Appendix 2D includes water balance diagrams reflecting annual average and peak flow conditions. Because the system utilizes a large surface compensation reservoir to manage water inventory, the internal process flowrates shown in the Appendix 2D water balance diagram do not fluctuate. The only difference between the peak and average case are changes in the precipitation, evaporation, produced water and excess water flowrates, reflecting the minimum excess water production case. Water requirements are further discussed in Section 5.15, Water Resources, subsection 5.15.1.5.

2.1.15.3 Water Quality

Section 5.15, Water Resources, includes a projection of the water quality based on available testing data.

2.1.15.4 Water Treatment

The supply water will be used for makeup to the plant water system, fire protection, and general (non-potable) needs such as equipment and surface washdown.

The water treatment equipment, including ultrafiltration and reverse osmosis (RO), will treat the supply water and supply it as RO water to the reservoir. A percentage of the RO water will be treated further to boiler feedwater quality to be used for thermal fluid and cooling medium system requirements. Table 2-5 presents the purity requirements for RO and boiler quality water.

Table 2-5: Reverse Osmosis and Boiler Feedwater Purity Requirements

Parameter		Units of Measure	RO	RO Permeate	Boiler
Alkalinity	HCO_3	mg/L	600	30	30
Ammonia	NH_3	mg/L	55	3.8	3.8
Barium	Ba	mg/L	4	0.04	0.04
Calcium	Ca	mg/L	210	0.20	0.04
Chloride	Cl	mg/L	28	28	28
Copper	Cu	mg/L	0.003	0.003	0.003
Fluoride	F	mg/L	0.5	0.034	0.03
Hardness	$CaCO_3$	mg/L	1078	1.0	0.20
Iron	Fe	mg/L	0.01	0.01	0.01
Magnesium	Mg	mg/L	135	0.13	0.03
Nitrate	NO_3	mg/L	55	11	11
pH			6.3-8.5	5.3-6.3	10
Potassium	K	mg/L	10	0.56	0.56
Silica	SiO_2	mg/L	15	0.37	0.37
Sodium	Na	mg/L	610	30	30
Sulfate	SO_4	mg/L	600	4	4
Total Dissolved Solids	TDS	mg/L	1300	28	28
Turbidity		NTU	0.2	0.2	0.2
Zinc	Zn	mg/L	0.9	0.9	0.9

mg/L = milligram(s) per liter

Source: Vendor supplied through simulation

The product water from the RO system will be stored in a 15,000-gallon water storage tank in which make-up water for both the thermal and cooling medium loops will be stored for batch treatment.

Potable water will be trucked in and stored and used for drinking, kitchen use, showers, safety showers, and eye-wash stations.

2.1.15.5 Water Availability

Non-potable water used for general construction needs and the initial filling of the compensation reservoir will be provided from a combination of two new onsite groundwater wells and reclaimed water trucked from the City of Morro Bay Water Reclamation Plant located nearby. Once the facility commences operation, it is expected to generate surplus water which would be returned to the compensation reservoir or provided for beneficial use such as irrigation of adjacent agricultural property or injection into to the aquifer for recharge. These sources will also provide water for fire protection and service water.

Potable water will be delivered to site by a local water purveyor from a potable source in bottles or stored in a tank. The availability of water to meet PESC needs is discussed in Section 5.15, Water Resources.

2.1.16 Waste Management

Waste management is the process whereby all wastes produced at PESC will be properly collected, treated if necessary, and disposed of. Wastes include process wastewater as well as nonhazardous waste and hazardous waste, both liquid and solid. Waste management is discussed below and in more detail in Section 5.14, Waste Management.

2.1.16.1 Wastewater Collection, Treatment, and Disposal

Project wastewater, principally RO system reject, will be diverted to a zero-discharge stormwater pond for evaporation. The remaining waste will be hauled off site by an approved waste disposal company to an approved disposal facility. The septic waste will be trucked off-site to an approved disposal facility. The water balance diagrams in Appendix 2D show the expected Pecho wastewater stream and flow rate under operating conditions.

The wastewater treatment equipment will be enclosed in a building. Wastewater (or other wastes) from occasional small equipment leaks within the building will be retained in the building and collected for testing and disposal.

Pecho will not have a practice of washing down any equipment with oily residues. Equipment that has oily residues will be cleaned with rags and sorbents, and appropriate cleaning solutions will be applied to the rags and sorbents. After the cleaning, the oily rags and sorbents will be properly stored, manifested, and disposed of by licensed disposal companies in the regulatory-required time frames.

2.1.16.2 Excavated Material

PESC will produce excavated material associated with typical mining techniques to create the underground compressed air storage cavern. Excavated material generally includes soil and rock. The cavern has an equivalent volume of excavated material 880,000 cubic yards based on an expected swell by a factor of 1.4. The swell factor accommodates the volumetric expansion from solid rock at depth to crushed rock at the surface. This material is anticipated to be re-used around the site during construction to the extent possible. Waste management is discussed further in Section 5.14, Waste Management.

Based on preliminary design assumptions, 50 percent of cavern waste rock will be stored on site and used for surface construction (reservoir berm buildup, light foundations, grading, etc.). The remaining 50 percent of waste rock will be either hauled to an offsite location or alternatively to a quarry located immediately to the south of the site.

2.1.16.3 Solid Nonhazardous Waste

PESC will produce construction, operation, and maintenance nonhazardous solid wastes typical of power generation and energy storage operations. Surface construction wastes generally include soil, scrap wood, excess concrete, empty containers, scrap metal, insulation, and sanitary waste. Cavern construction wastes include some of the same type of materials, with the addition of explosives packaging and wastewater pumped to the surface (which typically contains suspended solids and minor amounts of petroleum products from broken hydraulic lines etc.).

Generation plant wastes include oily rags, scrap metal and plastic, insulation material, defective or broken electrical materials, empty containers, and other solid wastes, including the typical refuse generated by workers. Solid wastes will be trucked offsite for recycling or disposal. Waste management is discussed further in Section 5.14, Waste Management.

2.1.16.4 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by the PESC. Waste lubricating oil will be recovered and recycled by a waste oil recycling contractor. Spent lubrication oil filters will either be recycled or disposed of in a Class I landfill. Workers will be trained to handle hazardous wastes generated at the site. Chemical cleaning wastes will be temporarily stored onsite in portable tanks or sumps and disposed of offsite by an appropriate contractor in accordance with applicable regulatory requirements. Hazardous materials management is further discussed in Section 5.5, Hazardous Materials Handling.

2.1.17 Management of Hazardous Materials

A variety of chemicals will be stored and used during the construction and operation of Pecho. The storage, handling, and use of all chemicals will be conducted in accordance with applicable LORS. Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and most other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks and spills. Containment pits and drain piping design will allow a full-tank capacity spill without overflowing the containment area. For multiple tanks located within the same containment area, the capacity of the largest single tank will determine the volume of the containment area and drain piping with an allowance for rainwater if applicable. Drain piping for reactive chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors.

Safety showers and eyewashes will be provided adjacent to, or in the vicinity of, chemical use and storage areas. Plant personnel will use approved personal protective equipment during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and will be instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of emergency response equipment including absorbent material will be stored onsite for spill cleanup.

A list of the chemicals anticipated to be used at PESC and their storage locations is provided in Section 5.5, Hazardous Materials Handling.

2.1.18 Fire Protection

The fire protection system will be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The system will include a fire protection water network system consisting of hydrants or standpipes as well as CO_2 fire suppression systems, where required, and portable fire extinguishers. An electric fire protection pump and piping network system will be designed to protect PESC which will be designed in accordance with the following:

- Federal, state, and local fire codes, and occupational health and safety regulations in concert with Authority Having Jurisdiction (AHJ)

- California Building Code (CBC) where applicable
- Applicable, mandatory National Fire Protection Association (NFPA) standards

Two (2), up to 5 MW onsite emergency generators will provide backup power in the event of loss of electric grid power. Water supply from the compensation system will provide firefighting water to standpipes. The system is capable of supplying maximum water demand for any fire suppression requirements, as well as water for fire hydrants or standpipes.

Separation criteria will be evaluated in a fire protection study during further engineering.

The carbon dioxide (CO_2) fire-suppression system for the turbomachinery hall will include an array of CO_2 storage cylinders, CO_2 piping and nozzles, fire detection sensors, and a control system. The firefighting control system will automatically shut down the affected compressors and turbines, turn off ventilation, close ventilation openings, and release CO_2 upon detection of a fire near or at the fire source such that every fire source will be covered without wasting CO_2 where not needed. The CO_2 fire suppression systems will cover the turbomachinery hall in its entirety.

Portable and wheeled fire extinguishers shall be provided at strategic locations around the facility. They shall be located based on the guidelines of NFPA 10 or relevant local requirements.

The following types of portable fire extinguishers will be used as appropriate to the type of risk:

- For areas where there are ordinary combustibles, such as wood, cloth, paper, plastic, etc., extinguishers will be suitable for Class A Fires. These will be water, foam, or dry powder.
- For areas where there are flammable liquids, oils, greases, paints etc., extinguishers will be suitable for Class B fires. These will be CO_2 dry powder, or foam or any other suitable film forming foams.
- For areas where there will be energized electrical equipment, extinguishers will be suitable for Class C fires. These will be CO_2 or other suitable dry chemicals.

Portable fire extinguishers, where applicable, will be installed at a suitable distance above the floor for ease of deployment and to minimize the potential for corrosion. Fire extinguishers will be fixed to walls, columns, or structural supports as appropriate. Weatherproof storage cabinets will be provided for extinguishers located in open areas. Wheeled extinguishers located in external areas will be provided with a weatherproof cover.

A secondary fire water pump will be installed at the hydrostatic compensation pond for use when there is not sufficient water in the storm water pond at the time of a fire event to sustain the required water flow and pressure for the minimum required time.

Section 5.5, Hazardous Materials Handling, provides additional information on fire and explosion risk; and Section 5.10, Socioeconomics, provides information on local fire protection capabilities.

2.1.19 Plant Auxiliaries

The following systems will support, protect, and control the PESC.

2.1.19.1 Process Systems

A 5 kV substation will be required in the process area to supply power to the area loads. The 69/5 kV transformers will be located at the GIS building to prohibit 69 kV being routed through the process area. Large motors in the process area (above 300 horsepower) will be fed from the 5 kV system with many of the motors on emergency power for operation during a power outage.

Smaller motors will be fed from the 480 V system, and some will be on emergency back-up power.

2.1.19.2 Heating, Ventilation and Air Conditioning (HVAC) Systems

All buildings, control rooms etc. will be equipped with suitable HVAC systems and critical systems will operate on emergency power as required.

2.1.19.3 Lighting

Indoor building lighting will be designed consistent with building code requirements to provide adequate indoor space illumination with consideration for human factors. Exterior lighting will be hooded and downward facing to provide adequate space lighting while minimizing offsite glare.

The emergency lighting will be sufficient to illuminate the exit path from process areas and inside the buildings and shall be supplied from 120 V UPS located indoors. Exit signs will be self-illuminating. In outdoor areas, emergency light fixtures will be equipped with rechargeable battery packs with minimum 1-hour battery back-up. These emergency lighting fixtures will not normally be switched on and will be identical to the fixtures used throughout the plant.

Process plant lighting and convenience outlets will be supplied from a 208 V/120 V, 3-phase, 4 wire, 60 hertz (Hz) system.

Section 5.11, Visual Resources provides additional information regarding the potential for offsite lighting impacts.

2.1.19.4 Grounding

All systems will be grounded and bonded as per the National Electric Code (NEC) and local municipal Codes and Standards.

All equipment containing flammable liquids or gases and liable to static discharge ignition will be grounded by having one or more anchor bolts connected to the reinforcing bar of the equipment foundation.

The grounding system design will be as per Institute for Electrical and Electronics Engineers (IEEE)-80 and IEEE-142 guidelines. A detailed step / touch potential including ground potential rise (GPR) calculation will be performed. The substation grounding systems will be designed to limit the overall resistance to earth to safe step and touch voltage conditions.

Prior to detail design execution sufficient site soil data will be obtained for performing grounding studies and calculations. In the case of complete rock conditions concrete encased rods, special rod beds, angle installation etc. will be investigated. Soil characteristics and seasonal changes will be fully documented.

All equipment will be connected to the ground, through a minimum of 2 paths, except small equipment which will be safely connected to a single source.

A dedicated, clean, instrument grounding system will be provided to connect all process control systems, in addition to a standard equipment grounding system.

The instrumentation grounding system will be bonded to the electrical system ground below grade.

2.1.19.5 Control System

Process Control System (PCS)

The process control system will provide all monitoring and control of the facility. The process control system configuration will be justified with the plant engineering contractor based on the facility complexity.

The facility will function automatically with minimum operator intervention. Emphasis will be given to automating routine actions so that the operator will have more time to analyze and identify short and medium-term plant performance, efficiency, and imminent failures.

Adequate instrumentation will be installed to enable operations personnel to monitor plant performance from the central control room with minimum field intervention. Field operators will only assist in visual surveillance and intervene only when critical equipment and systems warrant immediate attention. All field functions will require a permissive signal from the control system.

For standalone control packages within the facility where operator action will be entirely local, a packaged common alarm will be connected to the process control system to direct an operator to examine local indicators or panels in order to determine equipment status.

Operator Interface System

Under normal conditions, the facility will be operated from the central control room with operator displays with mouse and operator keyboards, radio, and telephone panels, monitors for internet protocol (IP) camera access.

The process control system operator workstations will provide the following functions as a minimum:

- Presentation of process information to the operator
- Facilities to enable the operator to adjust and control the process
- Monitoring and control of packaged equipment
- Monitoring and control of utility systems
- Short-term logging of process conditions and operator actions
- Diagnostic of the process control system and its component parts
- Site security

Monitoring and Controls

The Process Control System will use solid-state equipment and PLC or Distributed Control Systems (DCS) to increase reliability and flexibility.

The use of electromechanical control relays will be avoided, except when required for safety interlocks. The plant DCS will meet cyber-security standards as required by the California Independent System Operator (CAISO).

If the control system involves electromechanical timing sequences or interlocks, auxiliary dry contacts will be provided for indication of steps or conditions. These contacts will be used to interface with plant Process Control System to monitor the operational status.

All failure and alarm switches will be 'Fail Safe,' i.e., an abnormal condition will cause a loss in output signal. Upon loss of power, control circuits and alarms will go to the 'fail safe' condition. Solenoid valves and actuating relays will be normally energized and will de-energize on protective action or alarm. All alarm contacts will open to alarm. When contacts are controlled by a pneumatically loaded device, the device will be normally loaded and will vent to create the alarm or shutdown condition.

In general, interlock system circuits will be activated from separate primary instruments. Each interlock signal initiating a shutdown will also activate a separate pre-alarm point to indicate that an abnormal condition exists, and failure to take corrective action will result in a shutdown of the affected equipment. Pre-alarms may be actuated by a 'normal' instrumentation system signal.

Communications between the PLC and human machine interface (HMI), and PLC to PCS will be Ethernet transmission control protocol (TCP)/IP or ProfiNet.

Communications to MCCs and VFDs will be Ethernet based. Communications to discrete field contacts will be automated with limit switch indications.

Wireless communication devices shall be used for communication between control room and operators in the plant.

2.1.19.6 Cathodic Protection

The cathodic protection system will be designed to control the corrosion of metallic piping where buried in the soil. Depending on the corrosion potential, PESC site soils, ease of isolation of buried pipe from the above ground facilities, and proximity to ground grid and foundations, either a passive or Impressed Current Cathodic Protection (ICCP) will be provided.

2.1.19.7 Freeze Protection System

Freeze protection for above- and below-grade piping and instrumentation lines will be evaluated and installed, as necessary, based on the expected minimum ambient temperature at the plant. Given the record minimum temperature near the site of 24°F, freeze protection is not expected to be required for large piping, but may be required for small piping and air tubing. Below grade piping will be installed below freezing depth according to the site's climate and soil data. Where found necessary, the above grade piping will be protected with electrical heat tracing system and/or continuous circulation in rare instances of freezing temperatures. The foundation of above ground pipe support will be rooted below the freezing depth.

2.1.19.8 Service Air

The service air system will supply compressed air to hose connections for general plant use. Service air headers will be routed to hose connections located at various points throughout the facility.

2.1.19.9 Instrument Air

The instrument air system will provide dry, filtered air to pneumatic operators and devices. Air from the service air system will be dried, filtered, and pressure-regulated before delivery to the instrument air piping network. An instrument air header will be routed to locations within the facility equipment areas and within the water treatment facility where pneumatic operators and devices will be located.

2.1.20 Interconnect to Electrical Grid

The PESC will interconnect to the PG&E electrical grid via a 230 kV overhead transmission line that will run from the PG&E Morro Bay TS to site (see Section 3, Electric Transmission). The 230kV line will terminate at a dead-end tower before the main power transformers which will step down the voltage to 69 kV, suitable for distribution within the Pecho. The electrical grid connection shall be capable of power import and export, rated to suit all operating scenarios. Preliminary single line diagrams (depicting the on-site Pecho main substation including applicable ratings of key equipment are included in Section 3, Electrical Transmission.

2.1.21 Project Construction

2.1.21.1 Construction Schedule

The construction of the generating facility from site preparation and grading to commercial operation will require approximately 54 months. Major milestones are listed in Table 2-6. A more detailed construction schedule is provided in in Appendix 2B, Construction Schedule.

Table 2-6: Major Project Milestones

Activity	Date
Begin Construction	2nd Quarter 2023
Startup and Test	3rd Quarter 2027
Commercial Operation	4th Quarter 2027

2.1.21.2 Construction Workforce

During construction, there will be an average and peak workforce of 200 and 450, respectively, of construction craft people and supervisory, support, and construction management personnel onsite (see Section 5.10, Socioeconomics, Table 5.10-8 for a more detailed breakdown of expected labor requirements).

Surface work will normally occur in 8-hour shifts, 5 days a week.

Cavern work is planned as follows:

- Site Preparation (Months 1 through 4) – 10 hours/day x 5 days
- Shaft Drilling (Months 5 through 18) – 12 hours/day x 10 days, 4 days off
- Mining (Months 19 until completion) – 24 hours/day x 7 days/week, 12-hour shifts

Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities (e.g., pouring concrete at night during hot weather, and working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some project activities may occur 24 hours per day, 7 days per week.

2.1.21.3 Construction Laydown and Traffic

The construction laydown area will be located on site as depicted in the site plan (Figure 2-1).

Construction traffic generation and distribution are discussed in detail in Section 5.12, Traffic and Transportation, Sections 5.12.2.1.2 and 5.12.2.1.3 including an estimate of the average and peak construction traffic during the 54-month construction/commissioning period for Pecho.

A more complete breakdown of estimated construction truck traffic volume is provided in Appendix 2E.

2.1.22 PESC Facility Operation

The PESC facility will be operated and monitored continuously 24 hours per day, 7 days per week (24/7) by qualified and licensed on-site operations staff and will not be remotely operated (other than potential grid regulation-required operations such as generator transfer trips or Special Protection Schemes (SPS).

The operations staff will include control room operators (24/7) and roving operators in the field.

Additional field checks will be done as needed for maintenance activity, upsets, or other general operations requirements.

2.2 Engineering

In accordance with California Energy Commission (CEC) regulations, this section together with the engineering appendix (Appendix 2A, Design Criteria) and Section 3, Electrical Transmission and Section 4, Natural Gas Supply present information concerning the design and engineering of Pecho. The LORS applicable to PESC engineering are provided along with a list of agencies that have jurisdiction, the contacts within those agencies, and a list of the permits that will be required.

2.2.1 Facility Design

Summary descriptions of the design criteria for all the major engineering disciplines are included in Appendix 2A, Design Criteria.

Design and engineering information and data for the following systems are found in the related subsections of this AFC:

- **Power Generation—**See Section 2.1.8, Power Turbine Generators. Also see Appendix 2A and Section 2.1.19 which describe the various plant auxiliaries.
- **Power Consumption –** See Sections 2.1.7 (Compressors) and 2.1.6 (Standby/Idle).
- **Water Supply System—**See Section 2.1.15, Water Supply and Use. Also see Appendix 2A.
- **Waste Disposal System—**See Section 2.1.16 and Section 5.14, Waste Management.
- **Noise Abatement System—**See Section 5.7, Noise.
- **Switchyards/Transformer Systems—**See Section 2.1.14, Major Electrical Equipment and Systems; Section 2.1.19.4, Grounding; Section 2.1.14.2, AC Power—Transmission; Section 2.1.20, Interconnect to Electrical Grid; and Section 3, Electric Transmission. Additional information is provided in Appendix 2A.

2.2.1.1 Facility Safety Design

The PESC will be designed to maximize safe operation. Potential hazards that could affect the facility include earthquake, flood, and fire. Facility operators will be trained in safe operation, maintenance, and emergency response procedures to minimize the risk of personal injury and damage to the plant.

2.2.2 Facility Reliability

This section discusses the expected facility availability, equipment redundancy, fuel availability, water availability, and project quality control measures.

2.2.2.1 Facility Availability

PESC will be designed to be available to operate at its full load at least 95 percent of the time.

Availability is the duration of time that the entire plant will be able to perform its intended task. It is calculated as a ratio expressed in percentage where the numerator is the number of hours when the system as a whole is either (1) ready to either charge or discharge (during idle/standby periods), or (2) is charging or discharging, all divided by the total number of hours in the period.

Typically, both planned and unplanned outages are subtracted from the availability calculation numerator to calculate actual availability for a period. The availability calculation denominator can be the total amount of time in the day, week, month or, most commonly, year where availability is being calculated.

For further clarity, availability is not the same as a typical generating plant's capacity factor, which accounts for annual criteria such as the plant's actual energy MWh output (numerator) versus the plant's nameplate capability to produce MWh over a full year (denominator), and which is usually based on the general assumption that the relevant plant will always operate at baseload. The facility is expected to have an annual capacity factor of up to 85 percent.

PESC is intended to operate for approximately 50 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life of plant components.

2.2.3 Redundancy of Critical Components

The following subsections identify equipment redundancy as it applies to project availability. Sparing of equipment must take into consideration the requirement to provide the targeted overall system availability of 95 percent. A Reliability, Availability and Maintainability (RAM) study will be performed during final engineering design to further refine this preliminary redundancy information.

2.2.3.1 Turbomachinery

Turbomachinery is un-spared to minimize capital expenditure (CAPEX). Routine minor inspection and maintenance will be performed between charge and discharge cycles during pre-planned outages. Major inspections and overhauls will require shutdowns for removal of the turbomachinery casings, rotors, and other major components.

2.2.3.2 Pumps

All types of pumps are considered susceptible to mechanical breakdown and generally have an installed spare. The decision not to install a spare will depend upon the criticality of the service. In general, pumps shall be spared in an N+1 arrangement as an early front end engineering design (FEED) assumption until either more accurate input is available, or the RAM analysis has completed.

2.2.3.3 Heat Exchangers

Shell and Tube (S&T) Heat Exchangers are less susceptible to mechanical breakdown although appropriate protection will be provided to safeguard equipment against tube failures and cross contamination of fluids. S&T Heat Exchangers will not be spared; however, the parallel nature of the heat exchanger system will allow the plant to remain available when individual exchanger units are under service. Appropriate filtration will be included to prevent corrosion and increase reliability. Tube inspection and maintenance allowances will be made in the layout design and procurement.

2.2.3.4 Storage Tanks

Multiple spherical tanks are required due to size constraints on the technology at the required operating condition, effectively resulting in sparing. They are not spared beyond the minimum number of spherical tanks required to store the hot water. That is, the plant will still be able to operate with a spherical tank rendered unusable, but at a reduced charge/discharge duration.

The low pressure (atmospheric) tank will not be susceptible to mechanical breakdown and as such will not require frequent shutdowns for maintenance purposes.

Inspection and maintenance on both types of tanks will be performed during pre-planned outages with major inspections coordinated with major work on the turbomachinery.

2.2.4 Fuel Availability

This project does not use fuel for the process. However, propane may be used for building heat and during construction. California ultra-low sulfur diesel will be used for the emergency backup generators.

2.2.5 Water Availability

Potable water for drinking and safety showers will be delivered by a local water purveyor by truck. Non-potable process water will be provided by two new onsite groundwater injection wells or reclaimed water by truck from Morro Bay Water Reclamation plant. The availability of water to meet PESC needs is discussed in more detail in Section 5.15, Water Resources.

2.2.6 Project Quality Control

The project has established a Quality and CSR policy and program that will ensure the highest level of oversight meeting the desired project outcomes to ensure the appropriate license and social license for ongoing operations.

2.2.7 Quality Control Records

The following quality control records will be maintained for review and reference:

- Project instructions manual
- Design calculations
- Project design manual
- Quality assurance audit reports
- Conformance to construction records drawings
- Procurement specifications (contract issue and change orders)
- Purchase orders and change orders
- Project correspondence
- Any other records as required by LORS

During construction, field activities are accomplished during the last four stages of the project: receipt inspection, construction/installation, system/component testing, and plant operations. The construction contractor will be contractually responsible for performing the work in accordance with the quality requirements specified by contract.

The subcontractors' quality compliance will be surveyed through inspections, audits, and administration of independent testing contracts.

A plant operation and maintenance program, typical of a project this size, will be implemented at the Pecho site to control operation and maintenance quality. A specific program for this project will be defined and implemented prior to initial plant startup.

2.3 Facility Closure

PESC closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, with an intent to restart in the future. Causes for temporary closure may include damage to the plant from earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations. Section 2.3.1 discusses temporary facility closure, and Section 2.3.2 discusses permanent facility closure.

2.3.1 Temporary Closure

For a temporary closure where there is no release of hazardous materials, Pecho LD Energy Storage, LLC will maintain security of Pecho and will notify the CEC and other responsible agencies as required by law. Where the temporary closure includes damage to the Pecho facilities, and where there is a release, or threatened release of regulated substances or other hazardous materials into the environment, procedures will be followed set forth in an Emergency Management Plan in accordance with the Hazardous Materials Plan as part of Section 5.5, Hazardous Materials Handling. Procedures will include methods to control releases, notification of applicable authorities and the public, emergency response, and training for plant personnel in responding to and controlling releases of hazardous materials. Once the immediate problem is solved and the regulated substance/hazardous material release is contained and cleaned up, temporary closure will proceed as described above for a closure where there is no release of hazardous materials.

2.3.2 Permanent Closure

When the PESC is permanently closed, the closure procedure will follow a plan that will be developed. At the time of decommissioning, all decommissioning related activities will follow the then-applicable laws, ordinances, regulations, and standards.