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Project Title:	Willow Rock Energy Storage Center
TN #:	254812
Document Title:	Willow Rock Energy Storage Center SAFC Volume II-Appendix 1A-51F
Description:	N/A
Filer:	Amanda Cooey
Organization:	Ellison Schneider Harris & Donlan LLP
Submitter Role:	Applicant Representative
Submission Date:	3/1/2024 5:20:21 PM
Docketed Date:	3/4/2024

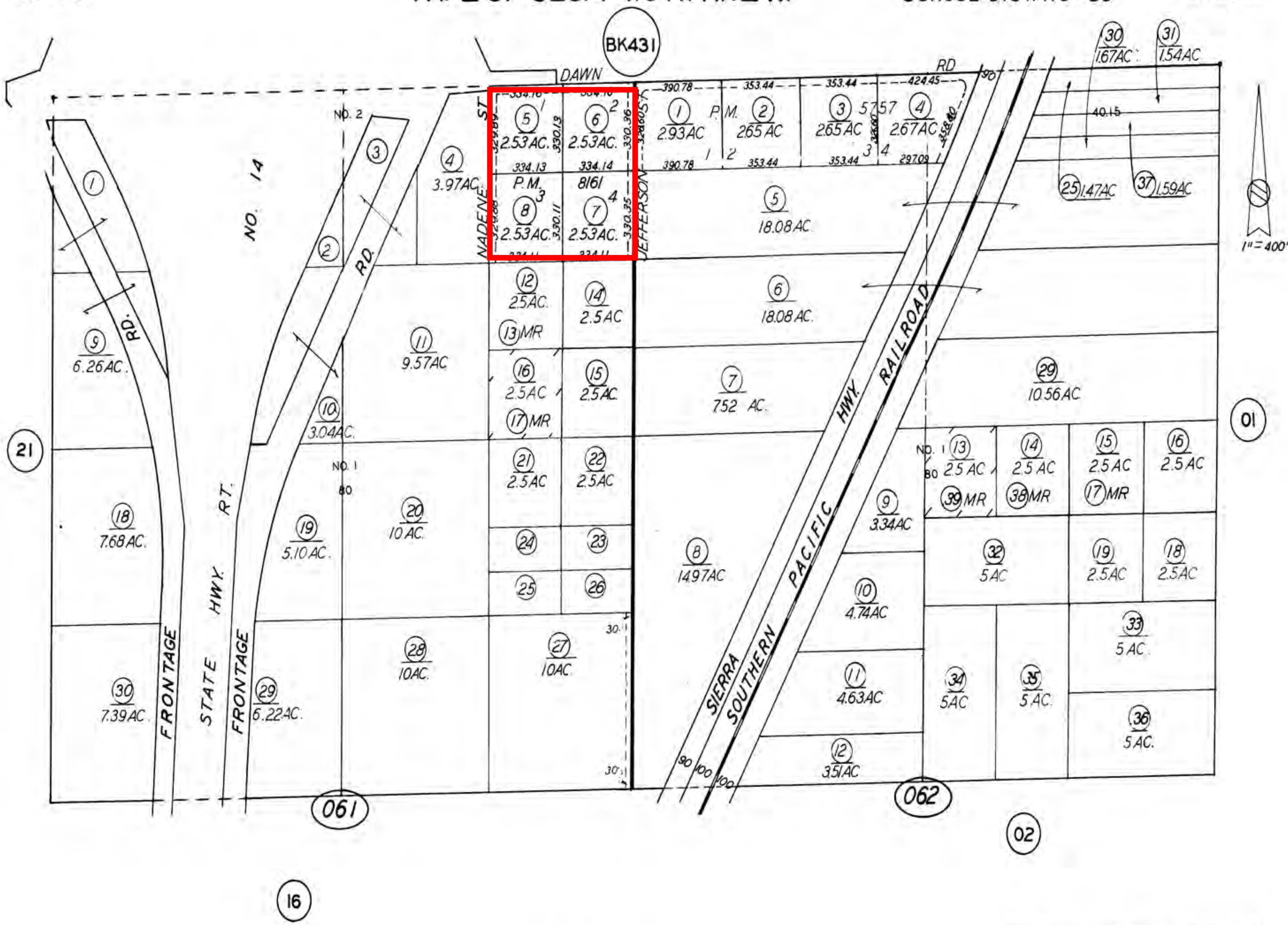
APPENDIX 1A

Assessor's Parcel Map

N1/2 OF SEC.4 T.9 N. R.12 W.

SCHOOL DIST. 119-85

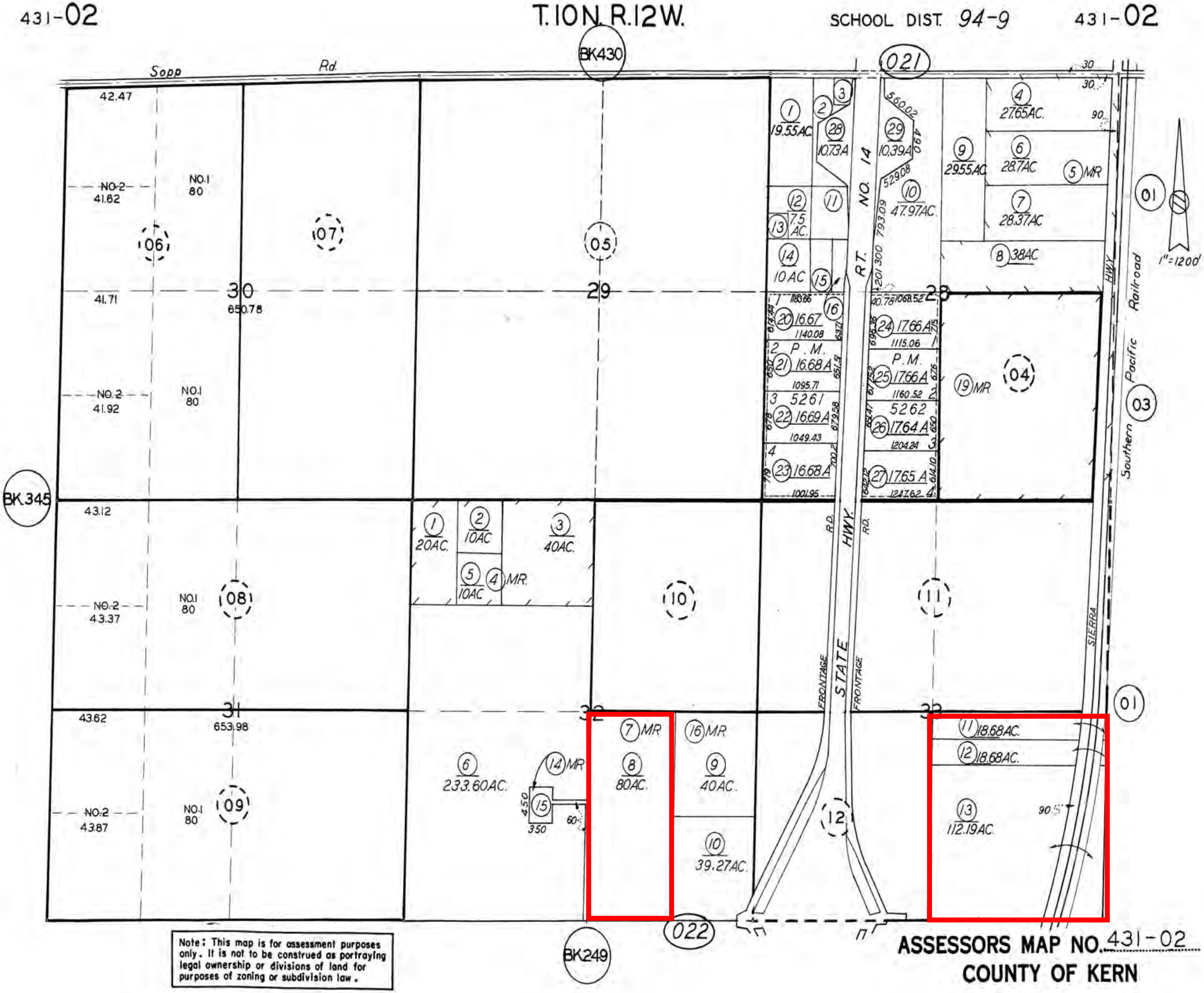
471-06



Revised: July 17, 2007

Note: This map is for assessment purposes only. It is not to be construed as portraying legal ownership or divisions of land for purposes of zoning or subdivision law.

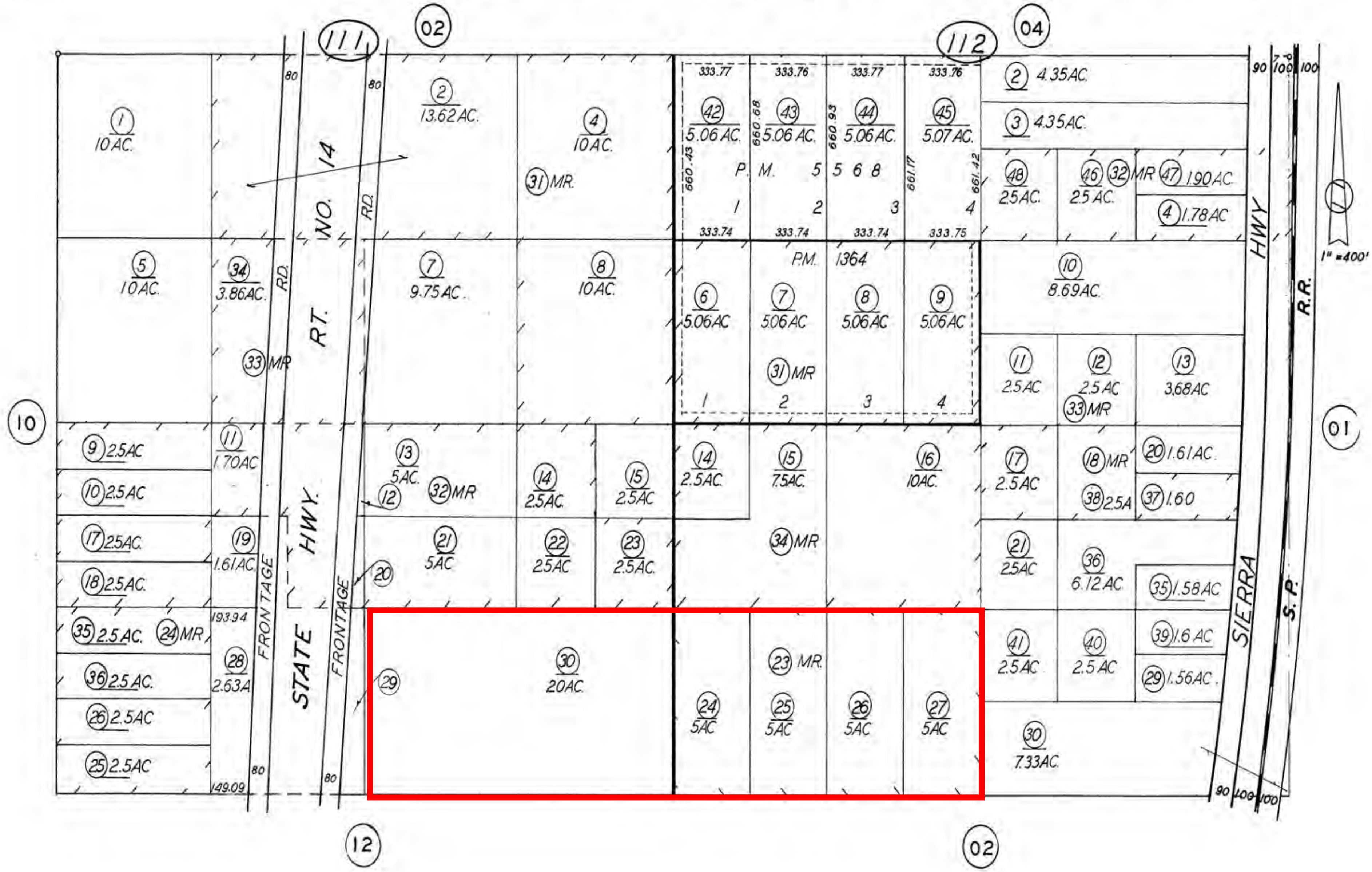
ASSESSORS MAP NO. 471-06
COUNTY OF KERN


431-02
T.10N. R.12W.
SCHOOL DIST. 94-9
431-02
Sopp Rd.
BK430
021
BK345
BK249
022
01
03
01
1"=1200'
Southern Pacific Railroad
SIERRA HWY.
STATE HWY.
RT. NO. 14
FRONTAGE RD.
FRONTAGE RD.
06
07
05
04
08
10
11
09
12
30
650.78
29
28
31
653.98
32
33
NO.2 41.62
NO.1 80
41.71
NO.2 41.92
NO.1 80
43.12
NO.2 43.37
NO.1 80
43.62
NO.2 43.87
NO.1 80
42.47
1 19.55AC.
2
3
28 10.73A
29 10.39A
4 27.65AC.
9 29.55AC.
6 28.7AC
5 MR
7 28.37AC
8 38AC
10 47.97AC.
11
12 7.5 AC.
13
14 10 AC
15
16
20 16.67
21 16.68 A
22 16.69 A
23 16.68 A
24 17.66 A
25 17.66 A
26 17.64 A
27 17.65 A
P.M. 5261
P.M. 5262
19 MR
1 20AC.
2 10AC
3 40AC.
5 10AC
4 MR.
6 233.60AC.
14 MR
15
7 MR
8 80AC.
16 MR
9 40AC.
10 39.27AC.
11 18.68AC.
12 18.68AC.
13 112.19AC.
Note: This map is for assessment purposes only. It is not to be construed as portraying legal ownership or divisions of land for purposes of zoning or subdivision law.
ASSESSORS MAP NO. 431-02
COUNTY OF KERN

N1/2 OF SEC.33 T. 10 N. R.12 W.

SCHOOL DIST. 94-9

431-11



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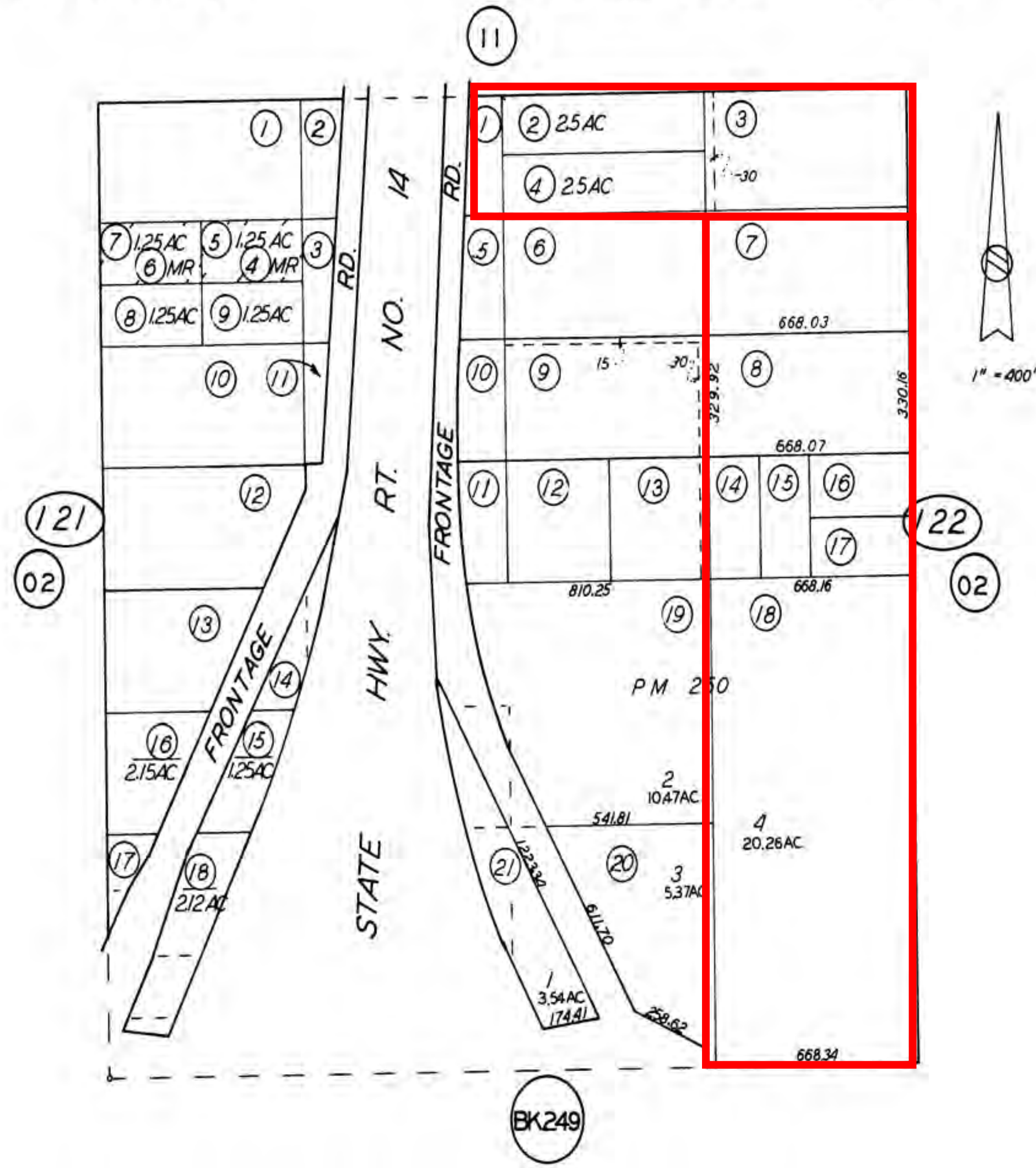
ASSESSORS MAP NO. 431-11
COUNTY OF KERN

SW.1/4 SEC. 33 T.10 N. R.12 W.

SCHOOL DIST. 94-9



Revised: Dec. 11, 2007

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ASSESSORS MAP NO. 431-12

COUNTY OF KERN

APPENDIX 1B

Property Owner's Addresses and Map

(*This Appendix Is Filed Under a Request for Confidential Designation*)

APPENDIX 1C

Persons Who Prepared the AFC

Appendix 1C

Persons Who Prepared the Application for Certification

Organization	Role	Name
Hydrostor, Inc.	Sr. Vice President, Development	Curt Hildebrand, PE
	Project Director	Victor Grille, PE, PMP
	Senior Director, Development	Laurel Lees
	Project Engineer	Nyree Grimes, P.Eng.
	Chief Development Officer	Tom Duckett
	Chief Commercial Officer	Jordan Cole
	President	Jon Norman
	Vice President, Commercialization	Duncan McEachern
	Sr. Vice President, Engineering	Andrew McGillis, PEng
	Sr. Project Engineer	Lucas Thexton
	Director, Business Development	Tri Luu
WSP	Project Director	David Stein, PE
	Project Manager	Sierra Harmening, MSc.
	AFC Technical Director	David Stein, PE
	Introduction	David Stein, PE
	Project Description	David Stein, PE
	Electric Transmission	David Stein, PE
	Natural Gas Supply	David Stein, PE
	Biological Resources	Scott Crawford
	Cultural Resources	Allegria Garcia, M.A., RPA; Michael Amorelli, B.A.; Kate Umlauf, M.A.
	Geologic Hazards	R.P. Erickson, PE
	Hazardous Materials Handling	Betsy Mitton, CPEA
	Land Use	Jeremy Paris, Kyralai Duppel

Appendix 1C

Persons Who Prepared the Application for Certification

Organization	Role	Name
	Noise and Vibration	Gage Miller
	Paleontological Resources	Matt Sauter
	Socioeconomics	Jeremy Paris; Kyralai Duppel
	Soils and Agriculture	R.P. Erickson, PE
	Traffic and Transportation	Vamshi Akkinepally, T.E.
	Visual Resources	Peter Williams; Peter Thiede
	Waste Management	Betsy Mitton, CPEA
	Water Resources	George Wegmann, PG
	Wildfire	Sierra Harmening, MSc.; Kyralai Duppel
	Worker Health and Safety	Betsy Mitton, CPEA
	Alternatives	David Stein, PE
	GIS	Mary Kristen; Jonathan Mata
Atmospheric Dynamics, Inc.	Air Quality	Gregory Darvin
	Public Health	Gregory Darvin
Kiewit	Project Description	Joel Lundquist
Lane	Project Description (mining and cavern works)	Stephen Cormier
Panorama Environmental, Inc	Transmission Line Mapping	Aaron Lui

APPENDIX 1D

Site-Related Property Owners and Relationship to Project Owner

(*This Appendix Is Filed Under a Request for Confidential Designation*)

APPENDIX 2A

Engineering Design Criteria

HYDROSTOR A-CAES PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
CIVIL & STRUCTURAL ENGINEERING DESIGN CRITERIA

00	23-Feb-2024	Issued for Information	SJ/DG	JTL	JTL
REV	DATE	DESCRIPTION	ORIG	CHK	APPR

KIEWIT ENGINEERING GROUP INC.

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Revision Control Sheet

REVISION	SECTION	CHANGE DESCRIPTION
0	All	Issued for AFC

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Table of Contents

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1.0 CIVIL ENGINEERING DESIGN CRITERIA

This document summarizes the design criteria, standards codes and practices which will be used for civil engineering for the Willow Rock Energy Storage Center. During the detail engineering phase, further specific project information will be developed to support the detailed design, engineering, material procurements, specifications, and construction specifications.

1.1 CODES AND STANDARDS

Civil design will be in accordance with the laws, ordinances, and regulations of the federal government, State of California, Kern County as well as applicable industry standards. The required part of the current issue or edition of the codes and standards at the time of filing this Application for Certification (AFC) will apply unless noted otherwise. In case of any conflict between codes and standards, the most stringent standard will govern.

1.1.1 CIVIL ENGINEERING CODES AND STANDARDS

The following codes and standards will be applied in whole or in part:

- Occupational Safety and Health Administration (OSHA)
- International Building Code (IBC)
- California Building Code (CBC)
- American National Standards Institute (ANSI) – Standards
- American Concrete Institute (ACI) – Standards and Recommended Practices
- Concrete Reinforcing Steel Institute (CRSI) – Standards
- Precast Prestressed Concrete Institute (PCI)
- American Institute of Steel Construction (AISC) – Standards and Specifications
- American Association of State Highway and Transportation Officials (AASHTO) – Standards and Specifications
- American National Standards Institute (ANSI) – Standards
- American Society of Testing and Materials (ASTM) – Standards, Specifications, and Recommended Practices
- Process Industry Practices (PIP)
    - PIP CVC01015 Civil Design Criteria
- Asphalt Institute (AI) – Asphalt Handbook
- State of California Department of Transportation (Caltrans) Standard Specification
- California Energy Commission (CEC) – Recommended Seismic Design Criteria for Non-Nuclear Generating Facilities in California
- National Fire Protection Association (NFPA) and International Fire Code
- International Plumbing Code (IPC)

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Association of Dam Safety Officials (ASDSO)

- California Department of Water Resources, Division of Safety of Dams (DSOD)
- American Society for Civil Engineering (ASCE)
- U.S Department of Interior Bureau of Reclamation, Embankment Dams
- United States Society on Dams (USSD).
- U.S. Army Corps of Engineers. “Engineer Manuals.”
- American Water Works Association (AWWA)

2.0 STRUCTURAL ENGINEERING DESIGN CRITERIA

This document summarizes the design criteria, standards codes and practices which will be used for structural engineering for the Willow Rock Energy Storage Center. During the detail engineering phase, further specific project information will be developed to support the detailed design, engineering, material procurements, specifications, and construction specifications.

2.1 CODES AND STANDARDS

Structural design will be in accordance with the laws, ordinances, and regulations of the federal government, State of California, Kern County as well as applicable industry standards. The required part of the current issue or edition of the codes and standards at the time of filing this Application for Certification (AFC) will apply unless noted otherwise. In case of any conflict between codes and standards, the most stringent standard will govern.

2.1.1 STRUCTURAL ENGINEERING CODES AND STANDARDS

The following codes and standards will be applied in whole or in part:

- Occupational Safety and Health Administration (OSHA)
- International building Code (IBC)
- California Building Code (CBC)
- American Institute of Steel Construction (AISC):
  - Manual of Steel Construction
  - Specification for Structural Steel Buildings
  - Specification for Structural Joints Using High-Strength Bolts
  - Code of Standard Practice for Steel Buildings and Bridges
- American Concrete Institute (ACI)
  - ACI 351-18, Foundations for Dynamic Equipment

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- ACI 318-19, Building Code Requirements for Structural Concrete and Commentary
    - ACI 301-20, Specifications for Concrete Construction
    - ACI 530, Building Code Requirements and Specification for Masonry Structures and Related
    - 224, Control of Cracking in Concrete Structures
- Commentaries
- American Society of Civil Engineers (ASCE)
    - ASCE 7-16, Minimum Design Loads for Buildings and Other Structures
    - ASCE 37-14, Design Loads on Structures During Construction
    - Design of Blast Resistant Buildings in Petrochemical Facilities
    - Guidelines for Seismic Evaluation and Design of Petrochemical Facilities
    - Wind Loads on Petrochemical Facilities
    - ASCE 59-11, Blast Protection of Buildings
- American Petroleum Institute (API)
    - API 650/620 Welded Steel Tanks
    - API 686 Recommended Practice for Machinery Installation and Installation Design
- American Society of Mechanical Engineers (ASME)
    - STS-1-2016 Steel Stacks
    - A17 Safety Code for Elevators and Escalators
- American Welding Society (AWS)
    - D1.1-20—Structural Welding Code—Steel
    - D1.3-18—Structural Welding Code—Sheet Steel
    - D1.4-18—Structural Welding Code—Reinforcing Steel
- National Association of Architectural Metal Manufacturers (NAAMM)—Metal Bar Grating Manual
- Steel Deck Institute (SDI)—Design Manual for Floor Decks and Roof Decks
- American Association of State Highway and Transportation Officials (AASHTO) AASHTO LRFD Design Bridge Design Specifications, 9th Edition, 2020
- Precast Prestressed Concrete Institute (PCI), PCI Design Handbook, 8th Edition
- American Society for Testing and Materials (ASTM)
    - All applicable standards including but not limited to A36/A36M, A193/193M, A307, A500/A500M, A615/A615M, A992/A992M, F1554 and F3125/3125M
    - D7380 Standard Test Method for Soil Compaction
- Portland Cement Association (PCA)
    - EB075 Concrete Floors on Ground
- Crane Manufacturers Association of America, Inc. (CMAA)

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  - CMAA No.70 Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes
  - CMAA No. 74 Specifications for Top Running and Under Running Single Girder Electric Traveling Cranes Utilizing Under Running Trolley Hoist
- Process Industry Practices
  - PIP STC 01015 Structural Design Criteria
- Steel joist Institute (SJI)
  - SJI-CJ - Standard Specification for Composite Steel Joists CJ-Series
  - SJI-K - Standard Specification for Open Web Steel Joists, K-Series
  - SJI-LH/DLH - Standard Specification for Long Span Joists, LH-Series and Deep Long Span Joists, DLH-Series
  - SJI-JG - Standard Specification for Joist Girders

2.2 DATUM

A topographical survey will be provided for entire site. The existing ground elevations will be based on an elevation survey conducted using known elevation benchmarks.

2.3 FROST PENETRATION

Bottom of all foundations for the structures and equipment will be extended below the frost line of the locality. The frost depth will be determined by a Geotechnical Engineer.

3.0 DESIGN LOADS

Design loads for structures and foundations will comply with all the applicable building code requirements.

3.1 DEAD LOAD

The dead load for structures shall consist of the self-weight of the structure, the weight of all materials of construction permanently incorporated into the structure, including insulation, fireproofing, fixed partitions, and permanent fixtures.

The dead load for equipment shall consist of the weight of all machinery, equipment, and/or vessels permanently supported by the structure, including insulation, fireproofing, partitions, permanent fixtures, and attachments.

Unless more determinate load information is available and requires otherwise, dead loads for the following items shall be estimated as follows:

- Uniformly distributed loads for grating, checkered plate, and concrete decking:

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  - Grating: 9.1 psf for 1-1/4 inches x 3/16 inch plain grating
  - Checkered Plate: 10.23 psf for 1/4-inch checkered plate
  - Concrete Deck: based upon deck manufacturer's tables
- Guard systems and ladders and cages
  - Angle Guard Systems with Toe Plate: 15 lbs/ft of guard length (L 2 ½ x 2 ½ x ¼)
  - Pipe Guard Systems with Toe Plate: 11 lbs/ft of guard length for pipe guard (NPS 1 ½ STD or HSS 1.900 x 0.145)
  - Ladders with Cages: 30 lbs/ft of ladder length
  - Ladders without Cages: 11 lbs/ft of ladder length

3.2 LIVE LOAD

Live loads are loads produced by the use and occupancy of the building or structure. These include the weight of all movable loads (e.g., personnel, tools, miscellaneous equipment, movable partitions, wheel loads, parts of dismantled equipment, stored material).

Lateral earth pressures, hydrostatic pressures, and wheel loads from trucks will be considered as live loads.

The minimum uniform live loads will be in accordance with ASCE/SEI 7-16, Chapter 4; CBC 2019 Section 1607; IBC 2021 Section 1607; as applicable or other applicable codes and standards but will not be less than the following:

Table 1 - Minimum Live Loads

	Uniform (psf)	Concentrated (lbs) (1)
Stairs and Exitways	100	1000
Operating, Access Platforms and Walkways (3)	100 (framing design) 100 (grating Design)	1000 (Framing and Grating Design)
Platforms Used for Bundle/Equipment Repairs	150	1000
Control, I/O, HVAC Room Floor	100	1000
Manufacturing Floors and Storage Areas:		
Light	125	2000

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Heavy	250	3000
Elevator Machine room and control room grating	100	300
Control or Electrical Enclosure or Module Floor	150	-
Pipe Racks (4)	50 (Average)	As Identified by Engineer
Hand Railing	- (2)	200 applied at any point in any direction
Slab on Grade	250	-
Truck Loading Surcharge Adjacent to Structure	250	-
Truck Support Structure	AASHTO-HS-20-44	-
Laboratories	100	-
Roof	20	-
Fire Escapes	200	-
Office Buildings:		
Corridor above first floor	80	2000
Lobbies and First Floor Corridors	100	2000
Office – Ground and 1st floor	100	2000
Offices above first floor	50	2000

1. Uniform and concentrated live load listed in Table 1 shall not be applied simultaneously. Use of either uniform or concentrated live loads shall be based on whichever produces the greater load effect. Unless otherwise specified, the indicated concentration shall be assumed to be uniformly distributed over an area 2.5 ft by 2.5 ft and shall be located to produce the maximum load effects in the members.
2. Handrail and guardrail system shall also be designed to resist a load of 50 lb/ft (pound-force per linear foot) applied in any direction along the handrail or top rail and to transfer

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this load through the supports to the structure. This load need not be assumed to act concurrently with the concentrated load.

3. In addition, a uniform load of 50 psf will be used to account for piping and cable trays, except that where the piping and cable loads exceed 50 psf, the actual loads will be used.
4. Where the piping and cable tray loads exceed the design uniform load, the actual loads will be used. In addition, a concentrated load of 8 kips will be applied concurrently to the supporting beams for the walkways to maximize the stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.
5. Laydown loads from equipment components during maintenance and floor areas where trucks, forklifts, or other transports have access will be considered in the design of live loads.

3.3 WIND LOADS

Wind loads shall be computed and applied in accordance with ASCE/SEI 7-16, Chapters 26 through 30; IBC 2021, Section 1609; or CBC 2022 Section 1609 as applicable, and the recommended guidelines in ASCE Wind Loads for Petrochemical and Other Industrial Facilities.

3.4 SNOW LOAD

Snow Load will be calculated according to CBC Section 1603.1.3, Section 1608 and Chapter 7 of ASCE/SEI 7-16.

Rain Load will be applied if concentration on the roof is expected.

The design roof load shall not be less than that determined by CBC Section 1607.

3.5 SEISMIC LOADS

Structures and the reservoir will be designed and constructed to resist the effects of earthquake loads and possible liquefaction as determined in CBC 2022. Site class and liquefaction measures for susceptible soil will be determined by geotechnical investigation report. The risk category of the structure is III (per CBC Table 1604.5) and the corresponding important factor is 1.25.

3.6 EARTH PRESSURE

Earth passive and active pressures will be calculated based on geotechnical investigation report recommendations.

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3.7 GROUNDWATER PRESSURE

Based on the depth of groundwater, the hydrostatic pressure attributable to groundwater will be considered. Geotechnical investigation report will provide average depth of the groundwater within the site at the present and historical data.

3.8 TURBINE-GENERATOR/COMPRESSOR LOADS

The heavy equipment loads (for generators/compressors) for platform/foundation design will be furnished by their manufacturers and will be applied according to the equipment manufacturer's specifications, criteria, and recommendations.

3.9 STEEL STACKS

Steel stacks will be designed by manufacturer's Engineer to withstand normal and abnormal operating condition in combination with design wind loads and seismic loads and will include the along-wind and across-wind effects on the stacks. The design will meet the requirements of ASME/ANSI STS-1-2000, "Steel Stacks," using allowable stress design method, except that increased allowable stress for wind loads as permitted by AISC will not be used. Supporting foundation will be designed according to stack manufacturer's footprint and loads, specifications, criteria, and recommendations.

3.10 IMPACT LOADS

For structures carrying live loads which induce impact, the static live loads shall be increased sufficiently to cover the impact load.

Crane runways shall be designed for the crane stop forces provided by manufacturer's recommendations or specification.

Table 2 - Impact Loads

Category	Vertical Impact (%)	Lateral Impact (%) *
For Support of Elevators	100	-
For Support of Light Machinery, Shaft or Motor Driven	20	-

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For Support of Reciprocating Machinery or Power-Driven Units	50	-

*Lateral impact based on the manufacturer recommendation (e.g., lateral impact for cranes =20%)

4.0 DESIGN BASIS

Reinforced concrete structures shall be designed (strength design method) in accordance with the CBC 2022 and the ACI 318.

Allowable soil bearing pressure for foundation design will be in accordance with the geotechnical investigation report.

Steel structures will be designed by using strength design or allowable strength design methods according to CBC 2022 and AISC Specification for Structural Steel Buildings.

Earthen and rockfill structures will be designed in accordance with the recommendations provided in the geotechnical investigation report; where required, impermeable membranes will be installed on the wetted surface side of water retention structures. Reservoir structures that meet jurisdiction requirements under the Division of Safety of Dams (DSOD) will meet the applicable DSOD requirements.

Following items shall be considered during the design in accordance with CBC 2022:

4.1 CBC 2022 REQUIREMENTS

Following items shall be considered during the design in accordance with CBC 2022:

- Serviceability and Stability
- Deflection and Drift Criteria
- Load Factors and Load Combinations
- Important Factors
- Clearances

4.2 FACTOR OF SAFETY

- Against overturning: 1.50

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- Against sliding: 2.0 for wind loads, 1.10 for seismic loads
- Against uplift due to wind: 1.50
- Against buoyancy: 1.25

4.3 CONSTRUCTION MATERIALS

- Concrete (f'c as measured at 28 days):
  - Structural concrete (f'c) = 4,000 psi (min.), electrical duct bank encasement (f'c) = 2,500 psi and structural grout (f'c) = 5,000 psi
  - The concrete or grout classes to be determined by design drawings or design specifications
- Concrete Reinforcement
  - Reinforcing steel shall be deformed bars of billet steel conforming to ASTM A615, Grade 60 or A706, Grade 60
- Structural Steel
  - Structural steel shall conform to the standards listed in Table 3.

Table 3 - Structural Steel Standards

Category	Applicable Standard
Structural and Miscellaneous steel	ASTM A36, ASTM A572 or ASTM A992
High Strength Structural Bolts, Nuts and Washers	ASTM A325, ASTM A490 or ASTM F1554 As Applicable
Bolts other than high-strength structural bolts	ASTM A307, Grade A or As Indicated in Design Drawings

- Concrete Masonry
  - Concrete masonry units will be hollow, normal weight, non-load-bearing Type I, conforming to ASTM C90, lightweight. Mortar will conform to ASTM C270, Type S. Grout will conform to ASTM C476.

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HYDROSTOR A-CAES PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
CONTROL ENGINEERING DESIGN CRITERIA

00	23-Feb-2024	Issued for Information	RL/RSG	JTL	JTL
REV	DATE	DESCRIPTION	ORIG	CHK	APPR

KIEWIT ENGINEERING GROUP INC.

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Table of Contents

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1.0 CONTROL ENGINEERING DESIGN CRITERIA

This document summarizes the codes, standards, criteria, and practices that will be generally used in the design and installation of instrumentation and controls. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specifications, and construction specifications.

1.1 CODES AND STANDARDS

The design specification of all work will be in accordance with the laws and regulations of the federal government, the State of California, local County, and City, as well as applicable industry standards. A summary of general codes and industry standards applicable to design and control aspects of the power facility follows:

- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- The Institute of Electrical and Electronics Engineers (IEEE)
- International Society of Automation (ISA)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- American Society for Testing and Materials (ASTM)

2.0 DESIGN CRITERIA

2.1 GENERAL REQUIREMENTS

All signals to and from the Central Control Room shall be electric / electronic. The standard signal shall be analogue 4-20 mA using 2-wire system, standard thermocouple, RTD output, and / or suitable pulse signal.

Instruments located on control panels and central control room (CCR) shall be microprocessor based.

On platforms with processing facilities, a Distributed Control System (DCS) shall be provided for monitoring and controlling the process, and for generating alarms in case of process upsets.

2.2 PROCESS CONTROL SYSTEM

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

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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 has more time to analyse and identify short and medium-term plant performance, efficiency and imminent failures.

Adequate instrumentation shall 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 is entirely local, a package common alarm will be connected to the process control system to direct an operator to examine local indicators or panels to determine equipment status.

2.3 MONITORING AND CONTROLS

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

The use of electromechanical control relays shall be avoided, except when required for safety interlocks.

Communications between the PLC and HMI, and PLC to PCS shall be Ethernet TCP/IP or ProfiNet.

Communications to MCC’s and VFD’s to be Ethernet based. Communications to discrete field contacts to be AS-I complete with limit switch indications.

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

2.4 FIELD INSTRUMENTS

Electronic instruments rather than pneumatic are preferred for operation of the equipment. Electronic instruments shall use 4-20 mA, 24 V DC signals for transmission and control. Smart Transmitters with ‘Hart protocol’ or similar shall be used as much as possible. The remainder of the transmitters will preferably be of the two-wire type, and each transmitter shall be separately fused.

All instruments shall be rated for the hazardous environment in which they are located. When appropriately rated equipment is not available, intrinsically safe barriers must be

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provided and installed in the control panel.

Auxiliary power supplies for instruments shall in the first instant be 24 V DC, however where increased power consumption is required, 120 V AC shall be used. Each instrument shall have its own power disconnect device, and each motorized and solenoid actuated valve shall be separately fused.

2.5 PRESSURE INSTRUMENTS

In general, pressure instruments will have linear scales with units of measurement in pounds per square inch, gauge. Pressure gauges will have either a blowout disk or a blowout back and an acrylic or shatterproof glass face. Pressure gauges on process piping will be resistant to plant atmospheres. Pressure test points will have isolation valves and caps or plugs. Pressure devices on pulsating services will have pulsation dampers.

2.6 TEMPERATURE INSTRUMENTS

In general, temperature instruments will have scales with temperature units in degrees Fahrenheit. Exceptions to this are electrical machinery resistance temperature detectors and transformer winding temperatures, which are in degrees Celsius.

Bimetal-actuated dial thermometers will have 4.5- or 5-inch-diameter (minimum) dials and white faces with black scale markings and will consist of every angle-type. Dial thermometers will be resistant to plant atmospheres.

Temperature elements and dial thermometers will be protected by thermowells except when measuring gas or air temperatures at atmospheric pressure. Temperature test points will have thermowells and caps or plugs.

Resistance temperature detectors will be 100-ohm platinum, three-wire type. The element will be spring-loaded, mounted in a thermowell, and connected to a cast iron head assembly. Thermocouples will be Type J or K dual element, grounded, spring-loaded, for general service. Materials of construction will be dictated by service temperatures. Thermocouple heads will be the cast type with an internal grounding screw.

2.7 LEVEL INSTRUMENTS

Reflex-glass or magnetic level gauges will be used. Level gauges for high-pressure service will have suitable personnel protection. Gauge glasses used in conjunction with level instruments will cover a range that includes the highest and lowest trip/alarm set

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points. With the hot water thermal storage level measurement, alternative level monitoring may be used.

2.8 FLOW INSTRUMENTS

Flow transmitters will typically be of the differential pressure-type. Alternate type flow transmitters may be used where required to ensure high accuracy measurements. In general, linear scales will be used for flow indication and recording. Magnetic type flow transmitters may be used for liquid flow measurement below 200°F.

2.9 CONTROL VALVES

Control valves in throttling service will generally be the globe-body cage type with body materials, pressure rating, and valve trims suitable for the service involved. Other style valve bodies (e.g., butterfly, eccentric disk) may also be used when suitable for the intended service.

Valves will be designed to fail in a safe position.

Control valve body size will not be more than two sizes smaller than line size, unless the smaller size is specifically reviewed for stresses in the piping.

Control valves in 600-Class service and below will be flanged where economical.

Critical service valves will be defined as ANSI 900 Class and higher in valves of sizes larger than 2 inches.

Severe service valves will be defined as valves requiring anti-cavitation trim, low noise trim, or flashing service, with differential pressures greater than 100 pounds per square inch (psi).

In general, control valves will be specified for a noise level no greater than 85 decibels, A-rated (dBA) when measured 3 feet downstream and 3 feet away from the pipe surface.

Valve actuators will use positioners and the highest pressure, smallest size actuator, and will be the pneumatic-spring diaphragm or piston type. Actuators will be sized to shut off against at least 110 percent of the maximum shutoff pressure and designed to function with instrument air pressure ranging from 80 to 125 pounds per square inch gauge.

Hand wheels will be furnished only on those valves that can be manually set and controlled during system operation (to maintain plant operation) and do not have manual bypasses.

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Control valve accessories, excluding controllers, will be mounted on the valve actuator unless severe vibration is expected.

Solenoid valves supplied with the control valves will have Class H coils. The coil enclosure will normally be a minimum of NEMA 4 but will be suitable for the area of installation.

Valve position feedback (with input to the supervisory control system for display) will be provided for all control valves.

2.10 INSTRUMENT TUBING AND INSTALLATION

Tubing used to connect instruments to the process line will be seamless stainless steel for primary instruments and sampling systems.

Instrument tubing fittings will be the compression type.

Differential pressure (flow) instruments will be fitted with three-valve manifolds; two-valve manifolds will be specified for other instruments as appropriate.

Instrument installation will be designed to correctly sense the process variable. Taps on process lines will be located so that sensing lines do not trap air in liquid service or liquid in gas service. Taps on process lines will be fitted with a shutoff (root or gauge valve) close to the process line. Root and gauge valves will be main-line class valves.

Instrument tubing will be supported in both horizontal and vertical runs as necessary. Expansion loops will be provided in tubing runs subject to high temperatures. The instrument tubing support design will allow for movement of the main process line.

2.11 PRESSURE AND TEMPERATURE SWITCHES

Field-mounted pressure and temperature switches will have either NEMA Type 4 housings or housings suitable for the environment.

In general, switches will be applied such that the actuation point is within the center one-third of the instrument range.

2.12 FIELD MOUNTED INSTRUMENTS

Field-mounted instruments will be of a design suitable for the area in which they are located. They will be mounted in areas accessible for maintenance and relatively free of vibration and will not block walkways or prevent maintenance of other equipment.

Field-mounted instruments will be grouped on racks. Supports for individual instruments will be prefabricated, off-the-shelf, 2-inch pipe stand type. Instrument racks and

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individual supports will be mounted to concrete floors, to platforms, or on support steel in locations not subject to excessive vibration.

Individual field instrument sensing lines will be sloped or pitched in such a manner and be of such length, routing, and configuration that signal response is not adversely affected.

Liquid level controllers will generally be the non-indicating, displacement-type with external cages.

2.13 INSTRUMENT AIR SYSTEM

Branch headers will have a shutoff valve at the takeoff from the main header. The branch headers will be sized for the air usage of the instruments served but will be no smaller than 3/8 inch. Each instrument air user will have a shutoff valve, filter, outlet gauge, and regulator at the instrument.

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HYDROSTOR A-CAES PROJECT
WILLOW ROCK ENERGY STORAGE CENTER

ELECTRICAL ENGINEERING DESIGN CRITERIA

00	23-Feb-2024	Issued for Information	RL	JTL	JTL
REV	DATE	DESCRIPTION	ORIG	CHK	APPR

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Revision Control Sheet

REVISION	SECTION	CHANGE DESCRIPTION
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Table of Contents

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1.0 ELECTRICAL ENGINEERING DESIGN CRITERIA

This document summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of electrical engineering systems. More specific project information will be developed prior to construction of the project to support detailed design, engineering, material procurement, and construction specifications as required by CEC.

1.1 CODES AND STANDARDS

The design specification of all work will be in accordance with the laws and regulations of the federal government, the State of California, local County, and City, as well as applicable industry standards. The current issue or revision of the documents at the time of the filing of this AFC will apply unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirement shall apply.

The following codes and standards are applicable to the electrical aspects of the power facility:

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- Insulated Cable Engineers Association (ICEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Illuminating Engineering Society (IES)
- California Electrical Code
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
    - NFPA 70 – National Electrical Code
- Occupational Safety and Health Administration (OSHA)

2.0 SUBSTATIONS AND TRANSFORMERS

2.1 SUBSTATION

The substation will be located on the eastern end of the Willow Rock site and will interconnect via a 230kV, primarily overhead line, to Whirlwind Substation. Underground

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segments may be required in certain areas along the route. The substation will be of the tubular IPS bus type with interconnecting conductors and will consist of high-voltage SF6-insulated dead-tank circuit breakers and no-load disconnect switches.

The high-voltage circuit breakers will be equipped with a no-load break, air-insulated, disconnect switches. Transformer circuit breakers and a unit disconnect will also be installed in each transformer/unit connection to allow for transformer protection and isolation when the corresponding transformer/unit is out of service. Tubular IPS bus type with interconnecting conductors will be used as the primary interconnection material within the switchyard. The IPS and conductors will be attached to post-insulator columns on structural steel supports. The main substation transforms power from/to 230kV to/from 13.8kV and to 4.16kV.

Current and voltage transformers will be located at points within the substation to provide for metering and relaying. Control, protection, and monitoring for the substation will be located in the substation protection and control building. Monitoring and alarms will be available to the supervisory control system operator workstations in the control module. All protection and circuit breaker control will be powered from the station battery-backed 125VDC system.

Each motor/generator substation will have transformers for the motors and generators. The HV (230kV) side will be fed to the MV (13.8kV) side connections for the generators and to 13.8kV switchgear for the motors.

The substation designs will meet the requirements of the National Electrical Safety Code—ANSI C2.

A grounding grid will be provided to control step and touch potentials in accordance with IEEE Standard 80, Safety in Substation Grounding. All equipment, structures, and fencing will be connected to the grounding grid of buried copper conductors and ground rods, as required. The substation ground grid will be tied to the main distribution and plant ground grid.

Lightning protection will be provided by shield wires and/or lightning masts for any overhead lines. The lightning protection system will be designed in accordance with IEEE 998 guidelines. All faults will be detected, isolated, and cleared in a safe and coordinated manner as soon as practicable for the safety of equipment, personnel, and the public. Protective relaying will meet IEEE requirements and will be coordinated with PG&E’s requirements.

There will be a 19-mile-long (approximately) tie-line to the utility substation 230-kilovolt

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(kV) bus for Willow Rock. The high-voltage circuit breaker will be provided with a breaker failure relay protection scheme. Breaker failure protection will be accomplished by protective and timing relays. The high-voltage breaker will have two redundant trip coils.

Interface with PG&E's supervisory control and data acquisition system will be provided. Interface will be at the interface terminal box and remote terminal unit. Communication between the facility switchyard and the control building to which it is connected will be included.

Revenue metering will be provided on the 230kV outgoing lines recording net power to or from the PG&E switchyard (bi-directional). The revenue meters will be located at the Whirlwind Substation.

2.2 TRANSFORMERS

All generators and motors will be rated for 13.8kV and connect to the 230kV switchyard through step-up/down transformers. The step-up/down transformers will be designed in accordance with ANSI/IEEE standards C57.12.00, C57.12.90, and C57.116. Grounding of the transformers will be suitable for generation and motor function as applicable.

Facility power will be supplied through unit auxiliary transformers. Two transformers with low impedance grounding resistors will be provided.

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HYDROSTOR A-CAES PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
MECHANICAL ENGINEERING DESIGN CRITERIA

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Table of Contents

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1.0 MECHANICAL ENGINEERING DESIGN CRITERIA

This document summarizes the codes, standards, design criteria, and practices that will be generally used in the design and construction of mechanical engineering systems for Willow Rock Energy Storage Centre. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement, and construction specifications.

1.1 CODES AND STANDARDS

The design of the mechanical systems and components will be in accordance with the laws, ordinances, and regulations of the federal government, State of California, Orange County, City of Stanton, and applicable industry standards. The current issue or revision of the documents at the time of the filing of this Application for Certification (AFC) will apply unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirements shall apply.

The following codes and standards are applicable to the mechanical aspects of the power facility:

- California Building Standards Code, 2016
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- American Society of Mechanical Engineers (ASME) Pressure Vessel Code
- ASME Performance Test Codes
- American National Standards Institute (ANSI)
- American Gear Manufacturers Association (AGMA)
- Air Moving and Conditioning Association (AMCA)
- American Petroleum Institute (API)
- American Society for Testing and Materials (ASTM)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- American Welding Society (AWS)
- Heat Exchange Institute (HEI)
- Manufacturing Standardization Society (MSS) of the Valve and Fitting Industry
- National Fire Protection Association (NFPA)
- Hydraulic Institute Standards (HIS)
- Tubular Exchanger Manufacturer's Association (TEMA)
- American Society for Testing and Materials (ASTM)

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2.0 DESIGN CRITERIA

This document summarizes the design criteria, standards codes and practices which will be used for structural engineering for the Willow Rock Energy Storage Center. During the detailed engineering design phase, further specific project information will be developed to support the detailed design, engineering, material procurements, specifications, and construction specifications.

2.1 GENERAL

The systems, equipment, materials, and their installation will be designed, procured, manufactured, or fabricated, quality controlled and tested in accordance with the applicable codes; industry standards; and local, state, and federal regulations, as well as the design criteria; manufacturing processes and procedures; and material selection, testing, welding, and finishing procedures specified in this section.

Detailed equipment design will be performed by the equipment vendors in accordance with the performance and general design requirements specified later by the owner's engineer. Equipment vendors will be responsible for all aspects of equipment design including construction materials suited for the intended use.

2.2 MATERIALS

Asbestos will not be used in the materials and equipment supplied. Where feasible, materials will be selected to withstand the design operating conditions, including expected exposure to ambient or process and environment conditions, for the design life of the plant. Pipe specifications will be developed during FEED. It is anticipated that some construction materials may undergo excessive deterioration due to prolonged exposure to single or combined environmental factors such as corrosion, erosion and the like and require replacement during the life of the plant. In such cases, suitable in-service monitoring and maintenance programs will be introduced into the operation management and policies of the plant.

2.3 PUMPS

Pumps will be sized in accordance with the equipment specific data sheets and specifications. Where feasible, pumps will be selected for maximum efficiency and reliability at the normal operating point. Pumps will be designed to be free from excessive vibration and cavitation throughout the operating range.

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2.4 TANKS

Large outdoor water or so-called cold water storage tanks will not be insulated except where required to maintain appropriate process temperatures or for personnel protection or there is an adverse environmental impact such as freezing. Overflow connections and lines will be provided. Maintenance drain connections will be provided for complete tank drainage. Manholes, where provided, will be at least 24 inches in diameter and hinged to facilitate tank maintenance and inspection. Storage tanks will have ladders and cleanout doors as required to facilitate access/maintenance. In general, access and entry systems will be as per latest edition of OSHA guidelines.

Provisions will be included for proper tank ventilation during internal maintenance. In the case of cylindrical atmospheric tanks, the dimensions will be chosen such that the material of construction usage is minimized.

2.5 HEAT EXCHANGERS

The heat exchangers will be provided as components of mechanical equipment packages and may be air-cooled, or water-cooled shell-and-tube or plate type. Shell and tube-type heat exchangers will be designed in accordance with TEMA Manufacturer's standards. Other appropriate standards may be used if they are above and beyond TEMA. Tube and shell integrity will be based on ASME Sec.VIII Div.I or Div. II. Fouling factors will be specified in accordance with TEMA standards or data provided from manufacturer's test rigs.

The heat exchanger tube materials will be selected to withstand the mechanical and pressure loads and long-term general corrosion while providing best possible coefficient of heat conduction. The design of the primary shell and tube heat exchangers will be bi-directional.

2.6 PRESSURE VESSELS

Pressure vessels will include the following features/appurtenances:

- Designed to ASME Boiler and Pressure Vessel Code Section VIII-Div.I, or Div.II where required. If process cannot be re-designed to accommodate a Div.1 vessel, then a Div.II design will be applied.
- Process, vent, and drain connections for startup, operation, and maintenance
- Materials compatible with the fluid being handled, process temperature, loading condition and environment.
- A minimum of one manhole and one air ventilation opening (e.g., hand hole) where required for maintenance or cleaning access

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- For vessels requiring insulation, shop-installed insulation clips spaced not greater than 18 inches on center
- Relief valves in accordance with the ASME Code (Sec. VIII – Div. I)

2.7 PIPING AND PIPING SUPPORTS

Pipe design will conform to ASME B31.1 Power Piping for turbine and compressor trains whereas ASME 31.3 may be followed for all other auxiliary equipment.

Underground water piping may be high-density polyethylene HDPE or a range of plastic lined materials such as carbon steel housing lined with polyvinyl chloride (PVC) where permitted by code, operating conditions, and fluid properties. Aboveground pipes are for compressed air, treated water as thermal fluid, or water for cooling circuits. The pipe materials will be selected based on ambient weather conditions (for above ground piping), design pressure, temperature, size, and corrosion properties.

Spools of large and medium size (above 2.0 inch) diameter shall be fabricated by butt welding. Then the spools of such pipe sizes shall be joined to one another or to an inline valve, nozzles of tanks, pressure vessels or equipment by flange and gasket with appropriate pressure class. Threaded piping joints may be used in small diameter piping where permitted by an applicable code of piping jurisdiction as defined in pipe specification to be developed during FEED. Victaulic type mechanical couplings may be used for low energy aboveground piping, where feasible.

Piping systems will have high point vents and low point drains. Hose and process tubing connections to portable components and systems will be compatible with the respective equipment suppliers' standard connections for each service.

During FEED, an economic analysis will be conducted to determine if pipe and supports should be designed and constructed to accommodate hydrotesting in place (liquid filled), or air filled with hydrotesting taking place on shop-fabricated spools prior to being shipped to site.

2.8 VALVES

2.8.1 GENERAL REQUIREMENTS

Valves will be arranged for convenient operation from ground or platform level where possible and, if required, will have extension spindles, chain operators, or with gearing and actuators. Hand-actuated valves will be designed to be operable by one person. Gear and actuator operated valves will be provided on 8 inches or larger line size. The valve actuators may be either electric or pneumatic.

Valve materials will be suitable for operation at the maximum allowable working pressure (MAWP) and temperature of the piping to which they are connected. Steel valves will be of cast or forged

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steel material. Seats and faces will be of low-friction, wear-resistant materials. Valves in throttling service will be selected with design characteristics and of materials that will resist erosion of the valve seats when the valves are operated partly closed.

Valves operating at less than atmospheric pressure will include means to prevent air in-leakage. No provision will be made to repack valve glands under pressure.

2.8.2 DRAIN AND VENT VALVES

Drains and vents in 900-pound class systems or higher service will be double block valved.

2.8.3 LOW PRESSURE WATER VALVES

Low pressure water valves may be of the butterfly type and of cast or ductile iron construction. Ductile iron valves will have ductile iron bodies, covers, gates (discs), and bridges; the spindles, seats, and faces will be bronze. No bronze or yellow metal shall be used in the thermal fluid or cooling water loops. Fire protection valves will be Underwriters Laboratories-approved butterfly valves meeting NFPA requirements.

2.8.4 INSTRUMENT AIR VALVES

Instrument air valves will use the ball type and stainless-steel construction, with valve face and seat made of approved wear-resistant alloy.

2.8.5 MOTOR ACTUATED VALVES

Electric motor actuators will be designed specifically for the operating speeds, differential and static pressures, process line flowrates, operating environment, and frequency of operations for the application. Electric actuators will have self-locking features. A hand wheel and declutching mechanism will be provided to allow hand wheel engagement at any time except when the motor is energized. Actuators will automatically revert back to motor operation, disengaging the hand wheel, upon energizing the motor. The motor actuator will be placed in a position relative to the valve that prevents leakage of liquid, steam, or corrosive gas from valve joints onto the motor or control equipment.

2.8.6 SAFETY AND RELIEF VALVES

Safety valves and/or relief valves will be provided as required by applicable code for pressure vessels, heaters, and boilers. Safety relief valves will be installed vertically. Piping systems that can be over-pressurized by a higher-pressure source will also be protected by pressure-relief valves. Equipment or parts of equipment that can be over-pressurized by thermal expansion of the contained liquid will have thermal relief valves. Venting of safety relief valves will be routed to

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a safe location for purging into atmosphere or into a suitably design closed containment for any fluid or gas unsuitable for releasing into atmosphere.

2.8.7 INSTRUMENT ROOT VALVES

Instrument root valves will be specified for operation at the maximum allowable working pressure and temperature of the piping to which they are connected. Test points and sample lines in systems that are 600-pound class or higher service will be double-valved.

2.9 HEATING, VENTILATING, AND AIR CONDITIONING

Heating, ventilating, and air conditioning (HVAC) system design will be based on site ambient conditions specified in AFC Section 2, Project Description.

HVAC systems are provided for equipment rooms where needed such as electric equipment / motor control center (MCC) rooms. These rooms are not designed for human comfort, but rather for the temperature / humidity needs of the equipment. HVAC equipment will typically include wall-mounted type air conditioning units.

Natural gas, where the utility source is available or electric radiant overhead heaters as well as ventilation draft fan with controlled louver system may be required for the turbine hall to avoid extreme high and low temperatures.

2.10 THERMAL INSULATION AND CLADDING

Parts of the facility will be thermally insulated to reduce heat loss or afford personnel safety. Minimum insulation thickness for hot surfaces near personnel will be designed to limit the outside lagging surface temperature to a maximum of 140°F.

Where personal safety is a primary concern and not the heat loss, some surface areas may be shielded by a mesh screen with a proper distance from the hot surface where possible and appropriate.

The thermal insulation will have as its main constituent calcium silicate, foam glass, fiber glass, or mineral wool, and will consist of preformed slabs or blankets, where feasible.

Asbestos-containing materials will not be used. An aluminum jacket or suitable coating will be provided on the outside surface of the insulation. Insulation system materials, including jacketing, will have a flame spread rating index of 25 or less when tested in accordance with ASTM E84.

Insulation at valves, pipe joints, or other points to which access may be required for maintenance will be specified to be removable with a minimum of disturbance to the pipe insulation. At each flanged joint, the molded material will terminate on the pipe at a distance from the flange equal to

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the overall length of the flange bolts to permit their removal without damaging the molded insulation. Outdoor aboveground insulated piping will be cladded with textured aluminum of not less than 30 mm thickness and will be frame reinforced. At the joints, the sheets will be sufficiently overlapped and caulked to prevent moisture from penetrating the insulation.

Design temperature limits for thermal insulation will be based on system operating temperature during normal operation.

Outdoor and underground insulation will be moisture resistant.

2.11 TESTING

Hydrostatic or pneumatic testing as required by the applicable code will be specified and performed for pressure boundary components where an in-service test is not feasible or permitted by code. Hydrotest water quality will be controlled by provisions of filtering of debris or insoluble solids and chemically suitable for the piping materials.

Valves and safety relief valves shall be procured with test certificates according to owner’s engineer’s data sheet. Piping spools may be hydro-tested without installation of inline valves or safety relief valves by insertion of blind flanges instead where possible to protect the sensitive valve trims from double exposure to higher hydro-test pressures. In case of hydro-testing with the safety relief valves, proper gagging will be required for such devices to be done by the safety relief valve manufacturer’s representative.

2.12 WELDING

Welders and welding procedures will be certified in accordance with the requirements of the applicable codes and standards before performing any welding. Records of welder qualifications, weld procedures, welding map for each spool indicating each weld joint accompanied by all relevant information such as, welder’s name, date and time, ambient temperature, and requirement for post weld heat treatment (PWHT) if any, will be maintained. Weld joint NDE records as per owner’s engineer’s instructions, piping isometric drawings and code requirements will be done by qualified personnel and maintained in conjunction with the weld map.

2.13 PAINTING

Except as otherwise specified, equipment will receive the respective manufacturer’s standard shop finish. Finish colors will be selected from among the paint manufacturer’s standard colors and a color code established as per plant process descriptions.

Finish painting of uninsulated piping will be limited to that required by OSHA for safety and for environmental protection of carbon steel piping due to external corrosion.

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Piping with insulation may also be painted by only a prime coat to protect from corrosion under insulation (CUI).

2.14 LUBRICATION

The types of lubrication specified for facility equipment will be suited to the operating conditions and will comply with the recommendations of the equipment manufacturers.

The initial startup charge of flushing oil will be the equipment manufacturer's standard lubricant for the intended service. Subsequently, such flushing oil will be sampled and analyzed to determine whether it can also be used for normal operation or must be replaced in accordance with the equipment supplier's recommendations.

Rotating equipment will be lubricated as designed by the individual equipment manufacturers. Where automatic lubricators are fitted to equipment, provision for emergency hand lubrication will also be specified. Where applicable, equipment will be designed to be manually lubricated while in operation without the removal of protective guards. Lubrication filling and drain points will be readily accessible.

2.15 FIRE FIGHTING SYSTEM

A proper fire study will be done for the plant to identify location, intensity, class and probability occurrence of fire events throughout the plant.

A suitable fire water system consisting of piping network, standpipes or hydrants, primary fire pump, secondary diesel engine driven pump and a water reservoir will be designed to make water available at specified pressure, flow and duration as per NFPA and California's building code for areas where class A fire may occur from the source. The fire water source will be from the hydrostatic compensation pond where there is water all year round. Additional water capacity will be included in the design of hydro-static compensation reservoir for fire water.

For class B firefighting events, dry chemicals such as foams or power will be supplied from designated stations near the high probability source of fire events.

For class C firefighting events, CO2 power will be supplied from designated stations near the high probability source of fire events.

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2.16 IN SERVICE MONITORING, RELIABILITY, AND RISK MANAGEMENT

A variety of in-service monitoring and maintenance programs will be introduced and integrated into the operational management of the plant to manage the overall plant reliability and risk of premature failures of material and systems. The top notable programs are, but not limited to:

- Vibration monitoring for rotating equipment.
- Temperature monitoring of rotating equipment bearings and balance of plant systems.
- Corrosion monitoring, loss of materials due to general and local corrosion and incipient crack monitoring and detection where the part of system is identified as high risk with calculated probability of failure (POF) and consequence of failure (COF).
- Treated water chemical monitoring

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BASES OF DESIGN:
COMPENSATED HARD ROCK CAVERNS
FOR COMPRESSED AIR ENERGY STORAGE (CAES)

Prepared for

HYDROSTOR

Project No.2014Q

LANE
POWER & ENERGY SOLUTIONS, INC.

Revision	Date	Description	Originated by	Approved by
0	2/12/24	Draft	TR	SC
1	2/26/24	Incorp client comments, for review	TR	SC
2	2/27/24	Final Draft	TR	SC

BASES OF DESIGN: COMPENSATED HARD ROCK CAVERNS FOR COMPRESSED AIR ENERGY STORAGE (CAES)

Table of Contents

BASES OF DESIGN:
COMPENSATED HARD ROCK CAVERNS
FOR COMPRESSED AIR ENERGY STORAGE (CAES)

1.0 INTRODUCTION

This document outlines the bases of design for compensated CAES caverns, shafts, and wells. In general, a compensated CAES cavern is at all times under pressure, either filled with water or air. The storage pressure is equal to the hydrostatic head imposed by the surface pond water elevation upon the cavern horizon at depth. The cavern is at all times filled with either water, compressed air, or a combination thereof.

2.0 GEOLOGY

Important geologic and hydrologic conditions for storage cavern development include the interrelated physical and chemical engineering properties and ground water conditions of the host rock. Suitable rock formations satisfy the following requirements:

1. Adequate structural strength to allow economical mining of reasonably large openings which will remain stable for decades with a minimum of artificial support.
2. Low permeability to prevent major ground water inflow into or outflow from the cavern, and potential leakage of compressed air.
3. The presence of favorable and stable ground water conditions will remain dependable throughout the planned lifetime of the cavern to ensure containment of the stored product.
4. Physical and chemical inertness of the host rock and ground water to the stored product.

2.1 Adequate Structural Strength

The compressive strength of a rock can be measured on core samples in the laboratory, but more important is the strength of the rock mass which cannot be directly measured. Following are the principal interrelated conditions that affect the rock's overall strength and how it will behave when intersected by cavern openings:

- Compressive strength
- Type, spacing, orientation, cohesion, width, filling material and surface character of structural discontinuities including faults, fractures, joints, shear zones, bedding and foliation planes, contacts, veins, dikes, and open cavities.
- In situ state of stress.

2.2 Low Permeability

The permeability of a rock is a measure of its ability to transmit fluid under a pressure gradient. Two types of permeability must be considered:

- Primary permeability: The permeability allowing fluid flow between mineral grains. Primary permeability in directions parallel and normal to bedding planes in sedimentary rocks is often quite different, with horizontal permeability generally greater than vertical permeability. Significant primary permeability can be negative because it cannot be remediated by pressure injection grouting.
- Secondary (or fracture) permeability: permeability due to fractures or dissolution features. Moderate fracture permeability can often be satisfactorily controlled by grouting during cavern construction. Larger, inter-connected dissolution features in dolomite or limestone could be catastrophic to cavern mining.

For hard rock storage caverns, a final effective hydraulic permeability of 10^{-7} cm/sec or as near thereto as is practically achievable is customarily regarded as a suitable target. Pressure injection grouting of fractured rock is often required to achieve manageable rates of groundwater infiltration.

2.3 Favorable and Stable Ground Water Conditions

Mined storage caverns have historically been developed under a basic hydrologic containment principle. Simply stated, the cavern must be placed at sufficient depth below the natural water table (or below the piezometric level, in the case of confined water-bearing rocks) to ensure that the ground water pressure surrounding the cavern is greater than the vapor pressure of the product stored within the cavern.

However, when the cavern is pressurized to a water head measured from the surface, the storage pressure will be slightly greater than the natural groundwater head, so there may be a slight water outflow from the cavern. Capillary water in closed fractures with an aperture width of 0.01 mm or less will provide gas containment. Wider fractures require a critical velocity of water flow to provide gas containment. A comprehensive hydrogeological study must be performed to assess the cavern’s water and gas containment properties.

3.0 GEOTECHNICAL SAMPLING AND TESTING

A comprehensive site investigation program is necessary to identify suitable geological conditions for cavern development. Exploratory boreholes to a depth of at least 100’ below the target cavern horizon shall be drilled, logged and tested. Boreholes shall be located outside of the prospective cavern footprint. Rock core shall be obtained from depths immediately above, through and below the target cavern depth and analyzed in a laboratory. Continuous coring is valuable for hydrogeological study and assessing methods and costs for drilling or sinking shafts.

For cavern volumes of less than about 1.5M Bbl, 4 - 6 holes are often sufficient to characterize subsurface conditions. Larger caverns may require up to eight or more core holes, the final number depending upon the cavern's areal extent and homogeneity of the rock encountered.

Rock cores shall be logged by a qualified geologist upon being brought to the surface. A group of samples that thoroughly represent all the various types of rock present in the core shall be selected for laboratory analysis. Sample selection shall be made by the onsite geologist with input from the geotechnical engineer. Particular attention will be paid to rocks within and adjacent to the preferred cavern horizon.

3.1 Geophysical Survey

The borehole geophysical logging program shall feature:

- Fluid Temperature
- Fluid Conductivity (Specific Conductance)
- Acoustic Televiewer (ATV)
- Caliper
- Natural Gamma Ray
- Spontaneous Potential (SP)
- Single Point Resistance (SPR)
- Normal Resistivity
- Borehole Deviation
- Borehole Fluid Sampling (BHFS)

3.2 Physical Property Testing

The customary suite of laboratory physical property tests shall include:

- UCS — Uniaxial compressive strength
- E — Young's modulus
- ν — Poisson's ratio
- S — Slake durability (second cycle, %)
- Tensile — Brazilian splitting strength
- PLT-D — Diametral point load Is(50) index
- Density — Density (as tested)
- Moisture — Water content (by weight)

3.3 Straddle Packer Testing

Straddle packer testing shall be performed to evaluate the hydraulic conductivity (tightness) of the rock interval. Two inflatable packers are lowered into the open hole after the core has been removed. The packers are separated by approximately 20’ of steel pipe – this is the injectivity test interval. The pipe is filled with water from the surface, thus applying a full hydrostatic head to the test interval. An overpressure of 80 psi is pneumatically superimposed onto the water column. The water that enters the rock (if any) is measured over time and these values are recorded.

4.0 GEOTECHNICAL DESIGN

4.1 General

The cavern volume shall be 104% of the calculated minimum volume of required energy storage capacity. Floors and roofs shall be level and free of larger, isolated trapped volumes which would be unusable for CAES. The direction and magnitude on in-situ stresses shall be considered in establishing the alignment of principal and secondary axes of excavations.

The desired excavation cross section shall have a flat floor, vertical ribs, and ellipsoid roof. The cavern design life shall be 50 years.

4.2 Pillars

To ensure a 50-year design life, pillar dimensions shall be analyzed via the methods and criteria below.

- CANMET method - minimum SF = 1.5
- Stacey-Page formula minimum SF = 1.8
- S-pillar method minimum SF = 1.8

4.3 Ground Support

Ground support systems shall be designed for ‘worse than average’ ground conditions, as assessed by the Q, RMR and the NIOSH ARBS systems.

5.0 PROCESS DESIGN

5.1 Preliminary Design Criteria (TBD)

- Depth to cavern roof: 2,000’ to 2,200’
- Cavern volume (incl 4% overbreak): 4.04 - 3.50M Bbl
- Air flow rate: 2.48 - 2.15 mmscfm

These preliminary values are ranges of expected final criteria that will evolve during front-end engineering design of surface and subsurface facilities.

5.2 Operations Shafts

At least one air and one water shaft are required.

5.2.1 Air shaft

- Diameter (Preliminary): 48” OD steel liner, cemented into a 60” borehole
- Maximum friction loss: 10 psi
- Maximum velocity: 100 fps, where Ce = 200
- Material: CRA-clad or internally lined carbon steel
- Optional lining: AWWA C222 Polyurethane Coatings for Interior and Exterior of Steel Water Pipe and Fittings or equal

5.2.2 Water Shaft

- Diameter (Preliminary): 96” OD steel liner, cemented into a 108” borehole
- Alternative: Convert concrete-line shaft for compensation water service
- Maximum friction loss: 10 psi
- Maximum velocity: 20 fps (USBR)
- Material: CRA-clad or internally lined carbon steel or concrete-lined conventional shaft
- Optional lining: AWWA C222 Polyurethane Coatings for Interior and Exterior of Steel Water Pipe and Fittings or equal

5.2.3 Instrumentation

The cavern shall be equipped with redundant level and pressure detection and display systems. Emergency shutdown shall be initiated automatically to prevent air overfill. Local, manual ESD stations shall be located at the surface pond, control room and exit gate.

6.0 CONSTRUCTION FEATURES

6.1 Construction Access

Caverns shall be accessed for construction via one or more shafts from the surface. Shafts may be sunk using mining drill-and-blast methods, or they may be blind-drilled from the surface. Blind-drilled shafts shall be lined with steel, while conventionally sunk shafts shall be lined with concrete. In any event, a secondary shaft shall be constructed to provide emergency egress during mining. This shaft may or may not be converted to operational CAES service.

6.2 Construction Ventilation

The quantity of air required for the construction of the cavern is a function of the number of personnel underground and the diesel horsepower (hp) of the construction equipment underground. Each person in the cavern requires 200 cubic feet per minute (CFM) and each operating unit of diesel horsepower requires 125 CFM. Preliminary estimates call for up to 300,000 cfm of fresh air flow during mining activities.

6.3 Silica Dust Exposure

See AAI Technical Memo on Silica Dust Exposure:

"Rock samples were collected throughout the anticipated cavern interval from three core holes drilled at the proposed cavern site. The average quartz content is 26%, which indicates it is likely exposure to respirable crystalline silica will occur and steps will need to be taken to limit worker exposure during construction."

Dust control measures may involve wet drilling, wetting faces before blasting, delaying re-entry into blast areas, water spray for crushers and haul roads, et. al.

7.0 MAINTENANCE

Once the cavern has been placed into service, it should not be practical nor necessary re-enter it for inspection.

The cavern shall be taken offline after five years to inspect and repair shaft linings, as necessary. The general shaft isolation process may follow the steps outlined below.

1. Fill the cavern with compensation water.
2. Overpressure the cavern by 1 – 2 psi to displace a prescribed volume of water from the cavern roof and water shaft into the pond. The pond must be designed to contain this surplus volume.
3. Isolate the water shaft from the pond, vent the shaft from a level about the pond.
4. Blowdown air pressure from the air shaft, allowing the level in the water shaft to fall into the cavern.
5. Enter each shaft to inspect/repair coatings.
6. Refill the water shaft and resume operations.
7. The subsequent frequency of shaft entry shall be based on the conditions observed during the first inspection.

Appendix A

Recommended Codes, Standards and Guidelines for Compensated Hard Rock Caverns for Compressed Air Energy Storage (CAES)

American Concrete Institute (ACI) Publications:

- 201.2R-77 – Guide to Durable Concrete
- 301-84 – Specifications for Structural Concrete for Buildings
- 506-66 – Recommended Practice for Shotcreting
- 506.2-77 – Specification for Materials, Proportioning, and Application to Shotcrete
- 506.3R-82 - Guide to Certification of Shotcrete Nozzleman

American Petroleum Institute (API)

- API Bulletin 5C3: Formulas and Calculations for Casing, Tubing, Drill Pipe, and Line Pipe Properties
- API Spec 10A/ISO 10426-1: Specification for Cements and Materials for Well Cementing
- API Std 1104: Welding of Pipelines and Related Facilities (includes radiographic inspection)

American Society of Mechanical Engineers (ASME)

- PTC 19.2 Pressure Measurement Instruments and Apparatus (Performance Test Codes).
- PTC 19.3 Temperature Measurement Instruments and Apparatus (Performance Test Codes), FEED report para 5.10.

American Society for Testing and Materials (ASTM)

- A820-90 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
- C33-86 Standard Specification for Concrete Aggregates
- C42-84 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- C87-83 Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
- C94-86 Standard Specification for Ready-Mixed Concrete
- C150-85 Standard Specification for Portland Cement
- C231-82 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- C260-86 Standard Specification for Air-Entraining Admixtures for Concrete
- C309-81 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- C330-85 Standard Specification for Lightweight Aggregates for Structural Concrete
- C494-86 Standard Specification for Chemical Admixtures for Concrete
- C595-86 Standard Specification for Blended Hydraulic Cements

- C618-85 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- C666-84 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- C685-86 Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
- C937-80 – Standard Specification for Grout Fluidifier for Preplaced Aggregate Concrete
- C938-80 – Standard Practice for Proportioning Grout Mixtures for Preplaced Aggregate Concrete
- C989-85 Standard Specification for Slag Cement for Use in Concrete and Mortars
- 4879-02 – Standard Guide for Geotechnical Mapping of Large Underground Openings in Rock.
- 4016-81 – Standard Test Method for Viscosity and Gel Time of Chemical Grouts by Rotational Viscometer (Laboratory Method)
- F432 – 13: Standard Specification for Roof and Rock Bolts and Accessories

American Water Works Association

- Polyurethane Coatings for Interior and Exterior of Steel Water Pipe and Fittings

Boiler and Pressure Vessel Code, and Interpretation:

- Section V, Article 7: Nondestructive Examination
- Section VIII, Division 1, Part UG-28: Rules for Construction of Unfired Pressure Vessels

Code of Federal Regulations

- 27 CFR Part 555 – Commerce in Explosives
- 29 CFR Part 1926 – Safety and Health Regulations for Construction
- 29 CFR Part 1926.800: Underground Construction (Tunneling)
- 30 CFR Part 57: Safety and Health Standards - Underground Metal and Nonmetal Mines

International Society of Measurement and Control (Instrument Society of America - ISA)

- ANSI/ISA-12.00.01-2002 (IEC 60079-0 Mod) -- Electrical Apparatus for Use in Class I, Zones 0, 1 & 2 Hazardous (Classified) Locations: General Requirements
- ANSI/ISA-12.02.01-2002 (IEC 60079-11 Mod) -- Electrical Apparatus for Use in Class I, Zones 0, 1, & 2 Hazardous (Classified) Locations - Intrinsic Safety

Mining Safety and Health Administration (MSHA):

- 30 CFR Part 75.204 – Roof Bolting

Norwegian Tunneling Society

- Publication 16 – Underground Constructions for the Norwegian Oil and Gas Industry

U. S. Army Corps of Engineers

- Manual EM 1110-1-1804 – Engineer Manual, Engineering and Design, Geotechnical Investigations, Appendix C, Geologic Mapping of Tunnels and Shafts.
- Manual EM 1110-2-2901 – Tunnels and Shafts in Rock
- Manual EM 1110-1-3500 – Chemical Grouting Technology
- Specification CE-1305.02 – Guide Specification for Tunnel Grouting or Equivalent

U. S. Bureau of Reclamation

- Engineering Geology Field Manual, Volume 1, Chapter 6, Geologic Mapping and Documentation.

U. S. Environmental Protection Agency Publication:

- EPA/600/4-89/034 -- Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells

APPENDIX 2B

Construction Manpower and Equipment Schedule

Manpower and Construction Equipment by Month

Project: Willow Rock Energy Storage Center

Manpower by Month FOR Option with Architectural Berm

	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26
	2025										2026											
																			Manpower by Month (see Note 1)			
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Cavern and Shafts Construction																						
Mining																						
Mechanic																						
Electrician																						
Hoistman																						
Miner																						
Eqpt Operator																						
Site Supervision																						
Project Mgmt																						
Shaft Sinking (24' conventionally sunk)																						
Miners											5.16	6	6	6	6	6	6	6	6	6	6	6
Nippers											6.88	8	8	8	8	8	8	8	8	8	8	8
Batch Plant operators											5.16	6	6	6	6	6	6	6	6	6	6	6
Superintendant											1.72	2	2	2	2	2	2	2	2	2	2	2
shift boss											1.72	2	2	2	2	2	2	2	2	2	2	2
mechanic											1.72	2	2	2	2	2	2	2	2	2	2	2
electrician											1.72	2	2	2	2	2	2	2	2	2	2	2
clerk											1.72	2	2	2	2	2	2	2	2	2	2	2
equipment operators											3.44	4	4	4	4	4	4	4	4	4	4	4
hoistman											1.72	2	2	2	2	2	2	2	2	2	2	2
rigger											1.72	2	2	2	2	2	2	2	2	2	2	2
safety professional											1.72	2	2	2	2	2	2	2	2	2	2	2
Drilling (Blind Bore Shafts)																						
Project Mgmt										2.34	3	3	3	3	3	3	3	3	3	3	3	3
Eqpt Operator										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Laborer										4.68	6	6	6	6	6	6	6	6	6	6	6	6
Welder										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Site Prep																						
Eqpt Operator							6	6	6	6	6								0.66	6	6	6
Laborer							6	6	6	6	6								0.66	6	6	6
PM							1	1	1	1	1								0.11	1	1	1
Power Block Construction																						
Staff	9	4	3	4	3	2	3	4	7	9	7	7	8	15	19	44	43	40	47	40	46	58
Craft Support	5	2	2	2	2	1	2	2	4	5	4	4	5	8	10	24	24	22	26	22	25	32
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	32	32	32	32
Insulation	-	-	-	-	-	-	-	-	1	4	3	4	4	4	6	19	25	25	33	35	11	5
Instrumentation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	5	1	5
Scaffold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	11
Pipe Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	5	10
Mechanical Crew	-	-	-	-	-	-	-	-	-	-	1	7	3	2	4	10	6	2	2	4	17	15
InEight Startup Resources	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-	-
Electrical Crew	14	-	-	-	-	-	-	-	-	-	-	-	0	0	-	0	0	0	1	0	0	33
Concrete Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	5	4	5	8	8	31	28
Civil Crew	7	7	7	7	10	13	17	17	17	17	17	17	17	37	44	97	91	84	93	65	68	68
Buildings	4	4	4	4	3	1	1	2	7	7	5	2	2	1	2	2	1	1	1	1	1	3
Off Site																						
Cavern Waste Rock Moving																						
Transmission Line - A/G Offsite																						
Transmission Line - U/G Offsite																						
Total	40	17	15	17	17	17	35	39	49	76	112	107	105	134	154	269	263	279	312	292	325	380

Manpower and Construction Equip

Project: Willow Rock Energy Storag

Manpower by Month FOR Option with Architectura

	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28
	2027												2028											
Month	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Cavern and Shafts Construction																								
Mining																								
Mechanic		2.24	8	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Electrician		0.84	3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Hoistman		1.12	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Miner		6.16	22	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
Eqpt Operator		0.56	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Site Supervision		0.56	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Project Mgmt		1.68	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Shaft Sinking (24' conventionally sunk)																								
Miners	0.66																							
Nippers	0.88																							
Batch Plant operators	0.66																							
Superintendant	0.22																							
shift boss	0.22																							
mechanic	0.22																							
electrician	0.22																							
clerk	0.22																							
equipment operators	0.44																							
hoistman	0.22																							
rigger	0.22																							
safety professional	0.22																							
Drilling (Blind Bore Shafts)																								
Project Mgmt	3	3	1	1	1	1	1	1	1	1	1	1	0.16											
Eqpt Operator	9	9	3	3	3	3	3	3	3	3	3	3	0.48											
Laborer	6	6	2	2	2	2	2	2	2	2	2	2	0.32											
Welder	9	9	3	3	3	3	3	3	3	3	3	3	0.48											
Site Prep																								
Eqpt Operator	6																							
Laborer	6																							
PM	1																							
Power Block Construction																								
Staff	38	34	35	30	43	55	68	60	87	121	121	125	102	107	94	103	93	90	89	100	86	82	61	51
Craft Support	21	19	19	17	24	30	37	33	48	66	67	69	56	58	52	57	51	49	49	55	47	45	33	28
Tanks	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	-
Insulation	1	-	-	-	-	-	-	-	3	4	4	4	3	4	0	-	-	-	3	15	12	11	5	4
Instrumentation	-	2	1	1	1	1	1	-	-	1	-	3	1	2	4	6	10	12	12	18	13	20	10	14
Steel Crew	4	3	3	3	3	16	22	29	35	35	47	41	43	29	27	17	12	7	-	-	-	-	-	-
Scaffold	10	12	12	7	3	3	2	5	5	7	6	6	2	-	-	-	-	1	5	5	5	8	7	7
Pipe Crew	6	10	8	9	11	11	7	9	34	47	58	75	70	107	110	126	137	117	112	101	91	67	50	33
Mechanical Crew	5	6	5	4	2	17	27	38	50	81	92	108	104	104	90	72	84	64	58	34	25	21	13	11
InEight Startup Resources	-	5	4	1	1	2	0	-	3	8	3	3	1	1	1	1	5	5	12	7	3	6	10	6
Electrical Crew	26	16	6	4	1	41	63	48	52	93	78	78	38	42	26	53	66	84	81	114	108	106	82	73
Concrete Crew	11	4	24	24	76	51	65	48	64	56	53	40	34	15	4	6	3	6	3	7	1	3	1	1
Civil Crew	47	49	49	43	37	34	31	28	10	9	9	9	9	9	9	9	9	10	16	16	16	16	16	7
Buildings	3	4	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Off Site																								
Cavern Waste Rock Moving		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Transmission Line - A/G Offsite								20	20	20	20	20	20	20	20	20	20							
Transmission Line - U/G Offsite		19	19	18	17	9	9	12	13	17	17	17	17											
Total	248	259	278	297	354	407	468	465	559	700	708	731	628	624	563	596	615	570	532	566	500	479	382	325

Manpower and Construction Equipı
Project: Willow Rock Energy Storaç
Manpower by Month FOR Option with Architectura

	Jan-29	Feb-29	Mar-29	Apr-29	May-29	Jun-29	Jul-29	Aug-29	Sep-29	Oct-29	Nov-29	Dec-29	Jan-30	Feb-30
	2029												2030	
Month	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Cavern and Shafts Construction														
Mining														
Mechanic	16	16	2	2										
Electrician	6	6	2	2										
Hoistman	8	8												
Miner	44	44												
Eqpt Operator	4	4	6	6										
Site Supervision	4	4	2	2										
Project Mgmt	8	8	2	2										
Shaft Sinking (24' conventionally sunk)														
Miners														
Nippers														
Batch Plant operators														
Superintendant														
shift boss														
mechanic														
electrician														
clerk														
equipment operators														
hoistman														
rigger														
safety professional														
Drilling (Blind Bore Shafts)														
Project Mgmt														
Eqpt Operator														
Laborer														
Welder														
Site Prep														
Eqpt Operator														
Laborer														
PM														
Power Block Construction														
Staff	35	46	39	23	24	17	6	5	5	12	9	5	4	0
Craft Support	19	25	21	12	13	9	3	3	3	7	5	3	2	0
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insulation	7	18	20	11	10	7	-	-	-	-	-	-	-	-
Instrumentation	5	7	3	3	1	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scaffold	7	9	10	8	6	2	1	3	3	3	3	1	-	-
Pipe Crew	22	17	4	1	1	-	-	-	-	-	-	-	-	-
Mechanical Crew	6	7	4	2	-	-	-	-	1	9	-	-	-	-
InEight Startup Resources	3	40	48	33	43	32	8	4	6	20	15	11	12	1
Electrical Crew	47	31	18	2	1	1	1	0	-	-	-	-	-	-
Concrete Crew	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Civil Crew	7	7	7	7	8	7	8	7	7	8	7	3	-	-
Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Off Site														
Cavern Waste Rock Moving														
Transmission Line - A/G Offsite														
Transmission Line - U/G Offsite														
Total	248	298	190	116	107	75	27	22	25	58	39	22	18	1

Construction Equipment by Month

Categories	Avg HP	1		2		3		4		5		6		7		8		9		10		11	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																							
Pick-up trucks (for entire site)	150							25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100							12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																							
Wheel Loader	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120							12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160							7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270							9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120							16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100							11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210							1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																							
Cranes	200																						
JLG	75																						
Cranes	200																						
ManLift	75																						
Welding machine	50																						
Structural (5 days/week)																							
Cranes	200																						
Welding machine	50																						
Piping (5 days/week)																							
Welding machine	50																						
ManLift	75																						
Cranes	200																						
Mechanical (5 days/week)																							
Welding machines	50																						
Crane	200																						
Cavern Rock Moving and Berming																							
Dump Truck (21-ton)	400																						
Front End Loader	320																						
Dozer	475																						
Water Truck	210																						
Off-Site Transmission (5 days/week)																							
Various Equipment	600																						
Cavern Works																							
Underground Equipment (7 days/week)																							
Mercury 1B Bolter	55																						
Boomer 282 Jumbo	125																						
Scissor Lift	138																						
Welder	19																						
Buggy	47																						
LHD	201																						
Getman Boom Lift	147																						
Skid Steer	61																						
Surface Equipment (7 days/week)																							
wheel loader	260																						
20 Tn Off Road Dump Truck	320																						
Site Prep (5 days/week)																							
Dozers	215													2	10	2	10	2	10	2	10	2	10
Track hoe	172													1	10	1	10	1	10	1	10	1	10
Back hoe	172													1	10	1	10	1	10	1	10	1	10
Dumptruck (20Ton)	400													1	10	1	10	1	10	1	10	1	10
Water Truck	210													1	10	1	10	1	10	1	10	1	10
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	110																						
Articulating wheel loader	320																						
25-ton articulating dump truck	320																						

Categories	Avg HP	12		13		14		15		16		17		18		19		20		21		22	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																							
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																							
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210	1	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																							
Cranes	200																						
JLG	75																						
Cranes	200											2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75											12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50											4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																							
Cranes	200															2	4	2	4	4	4	4	4
Welding machine	50															2	8	2	8	4	8	4	8
Piping (5 days/week)																							
Welding machine	50									10	4	10	4	10	4	10	4	10	4	12	4	12	4
ManLift	75									2	4	2	4	3	4	3	4	6	4	6	4	10	4
Cranes	200									2	8	2	8	2	8	2	8	2	8	2	8	2	8
Mechanical (5 days/week)																							
Welding machines	50									2	4	2	4	2	4	2	4	2	4	4	4	4	4
Crane	200									1	4	1	4	1	4	1	4	1	4	2	4	2	4
Cavern Rock Moving and Berming																							
Dump Truck (21-ton)	400																						
Front End Loader	320																						
Dozer	475																						
Water Truck	210																						
Off-Site Transmission (5 days/week)																							
Various Equipment	600																						
Cavern Works																							
Underground Equipment (7 days/week)																							
Mercury 1B Bolter	55																						
Boomer 282 Jumbo	125																						
Scissor Lift	138																						
Welder	19																						
Buggy	47																						
LHD	201																						
Getman Boom Lift	147																						
Skid Steer	61																						
Surface Equipment (7 days/week)																							
wheel loader	260																						
20 Tn Off Road Dump Truck	320																						
Site Prep (5 days/week)																							
Dozers	215																						
Track hoe	172																						
Back hoe	172																						
Dumptruck (20Ton)	400																						
Water Truck	210																						
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	110	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
Articulating wheel loader	320	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
25-ton articulating dump truck	320	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18

Construction Equipment by Month

Categories																																																	
	Avg HP	23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																																																	
Pick-up trucks (for entire site)	150	25	4	40	4	40	4	40	4	40	4	40	4	60	4	60	4	60	4	60	4	60	4	60	4	60	4	60	4	50	4	40	4	40	4	40	4	40	4	40	4	40	4	40	4	40	4	25	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8																				
Civil & Fdns (5 days/week)																																																	
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4																										
Crawler Loader	120	12	4																																														
Grader	160	7	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Crawler dozer	120	2	4																																														
Scraper	270	9	4																																														
Backhoe	120	16	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	1	4	1	4	1	4	1	.	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Roller	100	11	4																																														
Pile driver hammer	250	4	4																																														
Water Truck	210	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																																																	
Cranes	200							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG	75							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8														
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4														
Welding machine	50	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6														
Structural (5 days/week)																																																	
Cranes	200	2	4																																														
Welding machine	50	2	8																																														
Piping (5 days/week)																																																	
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	10	4	10	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																																																
Mechanical (5 days/week)																																																	
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Berming																																																	
Dump Truck (21-ton)	400			4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10
Front End Loader	320			1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Dozer	475			1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Water Truck	210			1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)																																																	
Various Equipment	600			1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4														
Cavern Works																																																	
Underground Equipment (7 days/week)																																																	
Mercury 1B Bolter	55			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	201			1.12	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																																																	
wheel loader	260			1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
20 Tn Off Road Dump Truck	320			1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
Site Prep (5 days/week)																																																	
Dozers	215																																																
Track hoe	172																																																
Back hoe	172																																																
Dumptruck (20Ton)	400																																																
Water Truck	210																																																
Drilling - Conventionally Sunk Shaft (7 days/week)																																																	
Telehandler	110	1	18	1	18																																												
Articulating wheel loader	320	1	18	1	18																																												
25-ton articulating dump truck	320	1	18	1	18																																												

Construction Equipment by Month

Categories	Avg HP	47		48		49		50		51		52		53		54		55		56		57		58		59		60	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																													
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																												
Civil & Fdns (5 days/week)																													
Wheel Loader	120																												
Crawler Loader	120																												
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Crawler dozer	120																												
Scraper	270																												
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Roller	100																												
Pile driver hammer	250																												
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																													
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
JLG	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Cranes	200																												
ManLift	75																												
Welding machine	50																												
Structural (5 days/week)																													
Cranes	200																												
Welding machine	50																												
Piping (5 days/week)																													
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4						
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	8	4	8	4						
Cranes	200																												
Mechanical (5 days/week)																													
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
Cavern Rock Moving and Berming																													
Dump Truck (21-ton)	400	4	10	4	10																								
Front End Loader	320	1	10	1	10																								
Dozer	475	1	10	1	10																								
Water Truck	210	1	10	1	10																								
Off-Site Transmission (5 days/week)																													
Various Equipment	600																												
Cavern Works																													
Underground Equipment (7 days/week)																													
Mercury 1B Bolter	55	2	9.6	2	9.6																								
Boomer 282 Jumbo	125	2	9.6	2	9.6																								
Scissor Lift	138	1	9.6	1	9.6																								
Welder	19	1	9.6	1	9.6																								
Buggy	47	2	9.6	2	9.6																								
LHD	201	4	19.2	4	19.2																								
Getman Boom Lift	147	1	9.6	1	9.6																								
Skid Steer	61	1	9.6	1	9.6																								
Surface Equipment (7 days/week)																													
wheel loader	260																												
20 Tn Off Road Dump Truck	320																												
Site Prep (5 days/week)																													
Dozers	215																												
Track hoe	172																												
Back hoe	172																												
Dumptruck (20Ton)	400																												
Water Truck	210																												
Drilling - Conventionally Sunk Shaft (7 days/week)																													
Telehandler	110																												
Articulating wheel loader	320																												
25-ton articulating dump truck	320																												

Manpower and Construction Equipment by Month
Project: Willow Rock Energy Storage Center

ManPower by month for option without Architectural Berm

	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26
	2025										2026											
																			Manpower by Month (see Note 1)			
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Cavern and Shaft works																						
Mining																						
Mechanic																						
Electrician																						
Hoistman																						
Miner																						
Eqpt Operator																						
Site Supervision																						
Project Mgmt																						
Shaft Sinking (24' conventionally sunk)																						
Miners											5.16	6	6	6	6	6	6	6	6	6	6	6
Nippers											6.88	8	8	8	8	8	8	8	8	8	8	8
Batch Plant operators											5.16	6	6	6	6	6	6	6	6	6	6	6
Superintendant											1.72	2	2	2	2	2	2	2	2	2	2	2
shift boss											1.72	2	2	2	2	2	2	2	2	2	2	2
mechanic											1.72	2	2	2	2	2	2	2	2	2	2	2
electrician											1.72	2	2	2	2	2	2	2	2	2	2	2
clerk											1.72	2	2	2	2	2	2	2	2	2	2	2
equipment operators											3.44	4	4	4	4	4	4	4	4	4	4	4
hoistman											1.72	2	2	2	2	2	2	2	2	2	2	2
rigger											1.72	2	2	2	2	2	2	2	2	2	2	2
safety professional											1.72	2	2	2	2	2	2	2	2	2	2	2
Drilling (Blind Bore Shafts)																						
Project Mgmt										2.34	3	3	3	3	3	3	3	3	3	3	3	3
Eqpt Operator										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Laborer										4.68	6	6	6	6	6	6	6	6	6	6	6	6
Welder										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Site Prep																						
Eqpt Operator							6	6	6	6	6								0.66	6	6	6
Laborer							6	6	6	6	6								0.66	6	6	6
PM							1	1	1	1	1								0.11	1	1	1
Topside (Power Block)																						
Staff	9	4	3	4	3	2	3	4	7	9	7	7	8	15	19	44	43	40	47	40	46	58
Craft Support	5	2	2	2	2	1	2	2	4	5	4	4	5	8	10	24	24	22	26	22	25	32
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	32	32	32	32
Insulation	-	-	-	-	-	-	-	-	1	4	3	4	4	4	6	19	25	25	33	35	11	5
Instrumentation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	5	1	5
Scaffold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	11
Pipe Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	5	10
Mechanical Crew	-	-	-	-	-	-	-	-	-	-	1	7	3	2	4	10	6	2	2	4	17	15
InEight Startup Resources	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-	-
Electrical Crew	14	-	-	-	-	-	-	-	-	-	-	-	0	0	-	0	0	0	1	0	0	33
Concrete Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	5	4	5	8	8	31	28
Civil Crew	7	7	7	7	10	13	17	17	17	17	17	17	17	37	44	97	91	84	93	65	68	68
Buildings	4	4	4	4	3	1	1	2	7	7	5	2	2	1	2	2	1	1	1	1	1	3
Offsite																						
Cavern Waste Rock Hauling																						
Transmission line - A/G Offsite																						
Transmission line - U/G Offsite																						
Total	40	17	15	17	17	17	35	39	49	76	112	107	105	134	154	269	263	279	312	292	325	380

Manpower and Construction Equipm
Project: Willow Rock Energy Storage

ManPower by month for option without Architectural Berm

	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28
	2027												2028											
Month	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Cavern and Shaft works																								
Mining																								
Mechanic		2.24	8	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Electrician		0.84	3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Hoistman		1.12	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Miner		6.16	22	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
Eqpt Operator		0.56	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Site Supervision		0.56	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Project Mgmt		1.68	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Shaft Sinking (24' conventionally sunk)																								
Miners	0.66																							
Nippers	0.88																							
Batch Plant operators	0.66																							
Superintendant	0.22																							
shift boss	0.22																							
mechanic	0.22																							
electrician	0.22																							
clerk	0.22																							
equipment operators	0.44																							
hoistman	0.22																							
rigger	0.22																							
safety professional	0.22																							
Drilling (Blind Bore Shafts)																								
Project Mgmt	3	3	1	1	1	1	1	1	1	1	1	1	0.16											
Eqpt Operator	9	9	3	3	3	3	3	3	3	3	3	3	0.48											
Laborer	6	6	2	2	2	2	2	2	2	2	2	2	0.32											
Welder	9	9	3	3	3	3	3	3	3	3	3	3	0.48											
Site Prep																								
Eqpt Operator	6																							
Laborer	6																							
PM	1																							
Topside (Power Block)																								
Staff	38	34	35	30	43	55	68	60	87	121	121	125	102	107	94	103	93	90	89	100	86	82	61	51
Craft Support	21	19	19	17	24	30	37	33	48	66	67	69	56	58	52	57	51	49	49	55	47	45	33	28
Tanks	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	-
Insulation	1	-	-	-	-	-	-	-	3	4	4	4	3	4	0	-	-	-	3	15	12	11	5	4
Instrumentation	-	2	1	1	1	1	1	-	-	1	-	3	1	2	4	6	10	12	12	18	13	20	10	14
Steel Crew	4	3	3	3	3	16	22	29	35	35	47	41	43	29	27	17	12	7	-	-	-	-	-	-
Scaffold	10	12	12	7	3	3	2	5	5	7	6	6	2	-	-	-	-	1	5	5	5	8	7	7
Pipe Crew	6	10	8	9	11	11	7	9	34	47	58	75	70	107	110	126	137	117	112	101	91	67	50	33
Mechanical Crew	5	6	5	4	2	17	27	38	50	81	92	108	104	104	90	72	84	64	58	34	25	21	13	11
InEight Startup Resources	-	5	4	1	1	2	0	-	3	8	3	3	1	1	1	1	5	5	12	7	3	6	10	6
Electrical Crew	26	16	6	4	1	41	63	48	52	93	78	78	38	42	26	53	66	84	81	114	108	106	82	73
Concrete Crew	11	4	24	24	76	51	65	48	64	56	53	40	34	15	4	6	3	6	3	7	1	3	1	1
Civil Crew	47	40	40	36	28	25	24	19	1	-	-	-	-	-	-	-	-	1	7	7	7	7	7	7
Buildings	3	4	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Offsite																								
Cavern Waste Rock Hauling		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission line - A/G Offsite								20	20	20	20	20	20	20	20	20	20							
Transmission line - U/G Offsite		19	19	18	17	9	9	12	13	17	17	17	17											
Total	248	245	265	286	342	393	457	452	546	687	695	718	615	611	550	583	602	557	519	553	487	466	369	325

Manpower and Construction Equipm
Project: Willow Rock Energy Storage

ManPower by month for option without Architectural Berm

	Jan-29	Feb-29	Mar-29	Apr-29	May-29	Jun-29	Jul-29	Aug-29	Sep-29	Oct-29	Nov-29	Dec-29	Jan-30	Feb-30
	2029												2030	
Month	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Cavern and Shaft works														
Mining														
Mechanic	16	16	2	2										
Electrician	6	6	2	2										
Hoistman	8	8												
Miner	44	44												
Eqpt Operator	4	4	6	6										
Site Supervision	4	4	2	2										
Project Mgmt	8	8	2	2										
Shaft Sinking (24' conventionally sunk)														
Miners														
Nippers														
Batch Plant operators														
Superintendant														
shift boss														
mechanic														
electrician														
clerk														
equipment operators														
hoistman														
rigger														
safety professional														
Drilling (Blind Bore Shafts)														
Project Mgmt														
Eqpt Operator														
Laborer														
Welder														
Site Prep														
Eqpt Operator														
Laborer														
PM														
Topside (Power Block)														
Staff	35	46	39	23	24	17	6	5	5	12	9	5	4	0
Craft Support	19	25	21	12	13	9	3	3	3	7	5	3	2	0
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insulation	7	18	20	11	10	7	-	-	-	-	-	-	-	-
Instrumentation	5	7	3	3	1	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scaffold	7	9	10	8	6	2	1	3	3	3	3	1	-	-
Pipe Crew	22	17	4	1	1	-	-	-	-	-	-	-	-	-
Mechanical Crew	6	7	4	2	-	-	-	-	1	9	-	-	-	-
InEight Startup Resources	3	40	48	33	43	32	8	4	6	20	15	11	12	1
Electrical Crew	47	31	18	2	1	1	1	0	-	-	-	-	-	-
Concrete Crew	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Civil Crew	7	7	7	7	8	7	8	7	7	8	7	3	-	-
Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Offsite														
Cavern Waste Rock Hauling														
Transmission line - A/G Offsite														
Transmission line - U/G Offsite														
Total	248	298	190	116	107	75	27	22	25	58	39	22	18	1

Construction Equipment by Month

Categories	Avg HP	1		2		3		4		5		6		7		8		9		10		11	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																							
Pick-up trucks (for entire site)	150							25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100							12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																							
Wheel Loader	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120							12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160							7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270							9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120							16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100							11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210							1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																							
Cranes	200																						
JLG	75																						
Cranes	200																						
ManLift	75																						
Welding machine	50																						
Structural (5 days/week)																							
Cranes	200																						
Welding machine	50																						
Piping (5 days/week)																							
Welding machine	50																						
ManLift	75																						
Cranes	200																						
Mechanical (5 days/week)																							
Welding machines	50																						
Crane	200																						
Cavern Rock Moving and Hauling (7 days/week)																							
Dump Truck (21-ton)	400																						
Front End Loader	320																						
Off-Site Transmission (5 days/week)																							
Various Equipment	600																						
Cavern Works																							
Underground Equipment (7 days/week)																							
Mercury 1B Bolter	55																						
Boomer 282 Jumbo	125																						
Scissor Lift	138																						
Welder	19																						
Buggy	47																						
LHD	201																						
Getman Boom Lift	147																						
Skid Steer	61																						
Surface Equipment (7 days/week)																							
wheel loader	260																						
20 Tn Off Road Dump Truck	320																						
Site Prep (5 days/week)																							
Dozers	215													2	10	2	10	2	10	2	10	2	10
Track hoe	172													1	10	1	10	1	10	1	10	1	10
Back hoe	172													1	10	1	10	1	10	1	10	1	10
Dumptruck (20Ton)	400													1	10	1	10	1	10	1	10	1	10
Water Truck	210													1	10	1	10	1	10	1	10	1	10
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	110																						
Articulating wheel loader	320																						
25-ton articulating dump truck	320																						

Categories	Avg HP	12		13		14		15		16		17		18		19		20		21		22	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																							
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																							
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210	1	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																							
Cranes	200																						
JLG	75																						
Cranes	200											2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75											12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50											4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																							
Cranes	200															2	4	2	4	4	4	4	4
Welding machine	50															2	8	2	8	4	8	4	8
Piping (5 days/week)																							
Welding machine	50									10	4	10	4	10	4	10	4	10	4	12	4	12	4
ManLift	75									2	4	2	4	3	4	3	4	6	4	6	4	10	4
Cranes	200									2	8	2	8	2	8	2	8	2	8	2	8	2	8
Mechanical (5 days/week)																							
Welding machines	50									2	4	2	4	2	4	2	4	2	4	4	4	4	4
Crane	200									1	4	1	4	1	4	1	4	1	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																							
Dump Truck (21-ton)	400																						
Front End Loader	320																						
Off-Site Transmission (5 days/week)																							
Various Equipment	600																						
Cavern Works																							
Underground Equipment (7 days/week)																							
Mercury 1B Bolter	55																						
Boomer 282 Jumbo	125																						
Scissor Lift	138																						
Welder	19																						
Buggy	47																						
LHD	201																						
Getman Boom Lift	147																						
Skid Steer	61																						
Surface Equipment (7 days/week)																							
wheel loader	260																						
20 Tn Off Road Dump Truck	320																						
Site Prep (5 days/week)																							
Dozers	215																						
Track hoe	172																						
Back hoe	172																						
Dumptruck (20Ton)	400																						
Water Truck	210																						
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	110	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
Articulating wheel loader	320	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
25-ton articulating dump truck	320	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18

Construction Equipment by Month

Categories	Avg HP	23		24		25		26		27		28		29		30		31		32		33		34	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																									
Pick-up trucks (for entire site)	150	25	4	40	4	40	4	40	4	40	4	40	4	60	4	60	4	60	4	60	4	60	4	60	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																									
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4		
Crawler Loader	120	12	4																						
Grader	160	7	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	1	4
Crawler dozer	120	2	4																						
Scraper	270	9	4																						
Backhoe	120	16	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4
Roller	100	11	4																						
Pile driver hammer	250	4	4																						
Water Truck	210	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																									
Cranes	200							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG	75							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																									
Cranes	200	2	4																						
Welding machine	50	2	8																						
Piping (5 days/week)																									
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	10	4	10	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																								
Mechanical (5 days/week)																									
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																									
Dump Truck (21-ton)	400			0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10
Front End Loader	320			1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)																									
Various Equipment	600			1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Cavern Works																									
Underground Equipment (7 days/week)																									
Mercury 1B Bolter	55			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	201			1.12	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																									
wheel loader	260			1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	320			1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
Site Prep (5 days/week)																									
Dozers	215																								
Track hoe	172																								
Back hoe	172																								
Dumptruck (20Ton)	400																								
Water Truck	210																								
Drilling - Conventionally Sunk Shaft (7 days/week)																									
Telehandler	110	1	18	1	18																				
Articulating wheel loader	320	1	18	1	18																				
25-ton articulating dump truck	320	1	18	1	18																				

Categories	Avg HP	35		36		37		38		39		40		41		42		43		44		45		46	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																									
Pick-up trucks (for entire site)	150	60	4	60	4	50	4	40	4	40	4	40	4	40	4	40	4	40	4	40	4	40	4	25	4
60 kW Diesel Gensets	100	12	8	12	8																				
Civil & Fdns (5 days/week)																									
Wheel Loader	120																								
Crawler Loader	120																								
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Crawler dozer	120																								
Scraper	270																								
Backhoe	120	1	4	1	4	1	4	1	.	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Roller	100																								
Pile driver hammer	250																								
Water Truck	210	2	10	2	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																									
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8														
ManLift	75	12	4	12	4	12	4	12	4	12	4														
Welding machine	50	4	6	4	6	4	6	4	6	4	6														
Structural (5 days/week)																									
Cranes	200																								
Welding machine	50																								
Piping (5 days/week)																									
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																								
Mechanical (5 days/week)																									
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																									
Dump Truck (21-ton)	400	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10		
Front End Loader	320	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10		
Off-Site Transmission (5 days/week)																									
Various Equipment	600	1	4	1	4	1	4	1	4	1	4														
Cavern Works																									
Underground Equipment (7 days/week)																									
Mercury 1B Bolter	55	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	201	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																									
wheel loader	260	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
20 Tn Off Road Dump Truck	320	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
Site Prep (5 days/week)																									
Dozers	215																								
Track hoe	172																								
Back hoe	172																								
Dumptruck (20Ton)	400																								
Water Truck	210																								
Drilling - Conventionally Sunk Shaft (7 days/week)																									
Telehandler	110																								
Articulating wheel loader	320																								
25-ton articulating dump truck	320																								

Construction Equipment by Month

Categories	Avg HP	47		48		49		50		51		52		53		54		55		56		57		58		59		60	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																													
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																												
Civil & Fdns (5 days/week)																													
Wheel Loader	120																												
Crawler Loader	120																												
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Crawler dozer	120																												
Scraper	270																												
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Roller	100																												
Pile driver hammer	250																												
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																													
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
JLG	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Cranes	200																												
ManLift	75																												
Welding machine	50																												
Structural (5 days/week)																													
Cranes	200																												
Welding machine	50																												
Piping (5 days/week)																													
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4						
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	8	4	8	4						
Cranes	200																												
Mechanical (5 days/week)																													
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
Cavern Rock Moving and Hauling (7 days/week)																													
Dump Truck (21-ton)	400																												
Front End Loader	320																												
Off-Site Transmission (5 days/week)																													
Various Equipment	600																												
Cavern Works																													
Underground Equipment (7 days/week)																													
Mercury 1B Bolter	55	2	9.6	2	9.6																								
Boomer 282 Jumbo	125	2	9.6	2	9.6																								
Scissor Lift	138	1	9.6	1	9.6																								
Welder	19	1	9.6	1	9.6																								
Buggy	47	2	9.6	2	9.6																								
LHD	201	4	19.2	4	19.2																								
Getman Boom Lift	147	1	9.6	1	9.6																								
Skid Steer	61	1	9.6	1	9.6																								
Surface Equipment (7 days/week)																													
wheel loader	260																												
20 Tn Off Road Dump Truck	320																												
Site Prep (5 days/week)																													
Dozers	215																												
Track hoe	172																												
Back hoe	172																												
Dumptruck (20Ton)	400																												
Water Truck	210																												
Drilling - Conventionally Sunk Shaft (7 days/week)																													
Telehandler	110																												
Articulating wheel loader	320																												
25-ton articulating dump truck	320																												

APPENDIX 2C

Heat and Mass Balance Diagrams

(This Appendix Is Filed Under a Request for Confidential Designation)

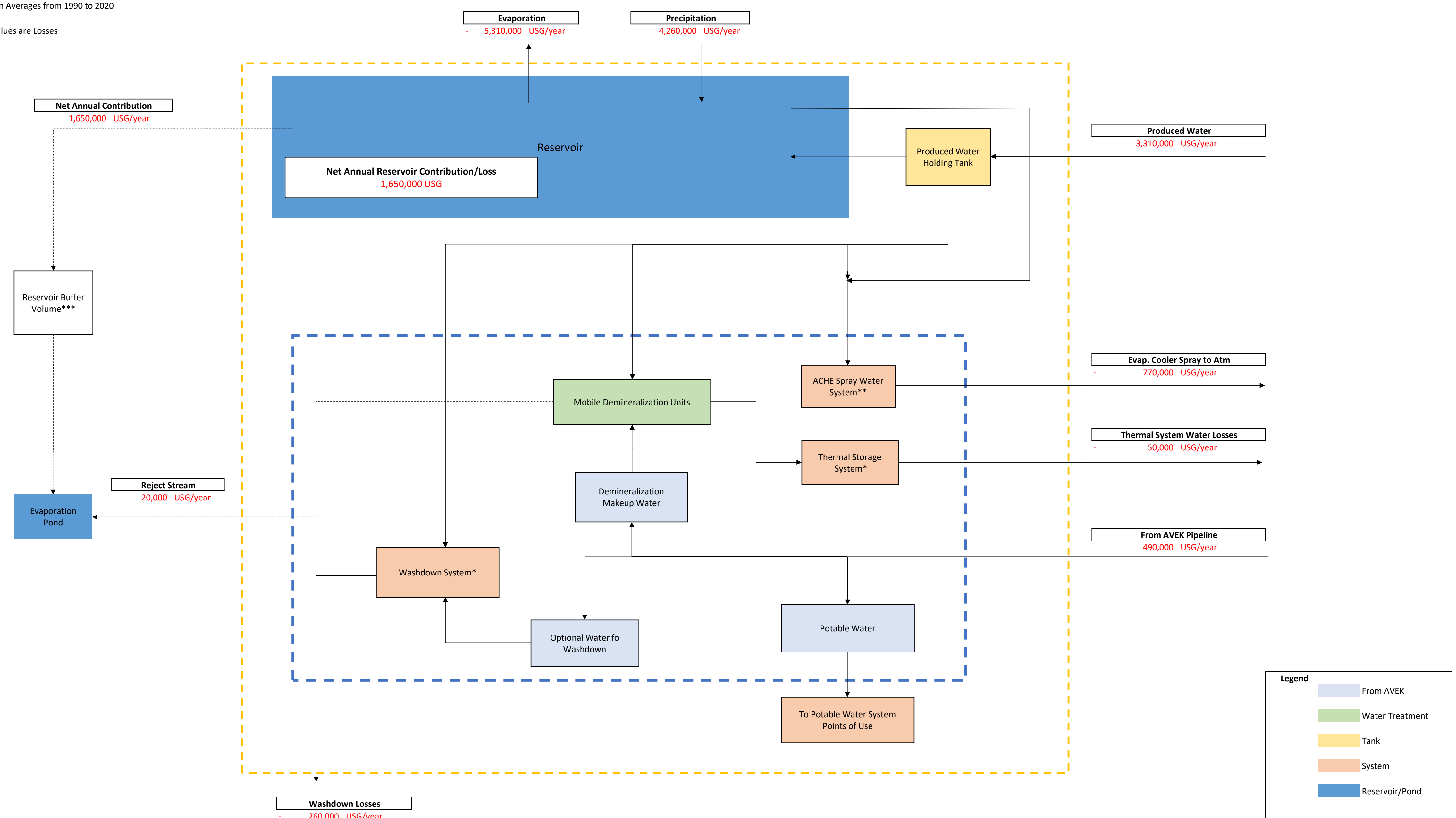
APPENDIX 2D

Water Balance Diagrams and Construction Water Use

Overall BFD for Willow Rock Water Balance

High Precipitation Case
90% Evaporation Reduction from Cover
Precipitation Averages from 1990 to 2020

Negative Values are Losses



Notes:

*Water can come from produced water (condensate) or from AVEK. Current numerical water balance assumes water is coming from produced water.

**Water can come from produced water (condensate) or the reservoir. Current numerical water balance assumes water is coming from reservoir.

***The reservoir buffer volume may used when there is an excess of water in the reservoir.

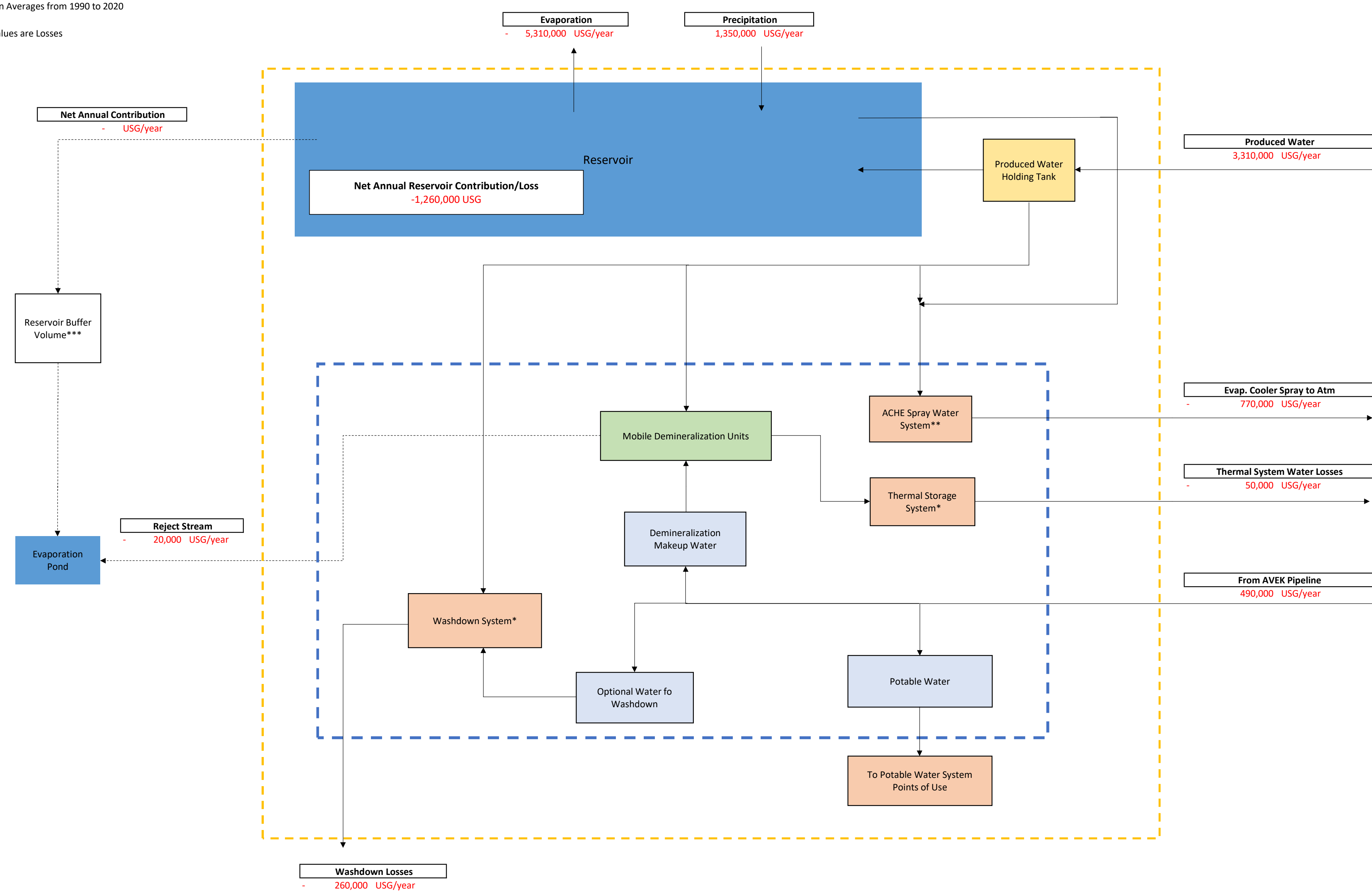
Equations:

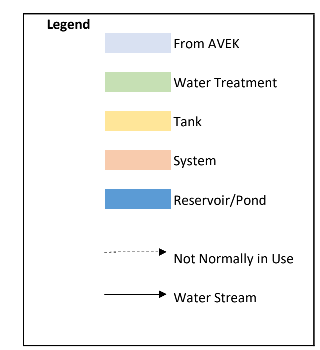
1. Evaporation + Precipitation + Produced Water + Evap. Cooler Spray to Atm. + Thermal System Water Losses + Washdown Losses + Reject Stream = Net Reservoir Contribution/Loss

Overall BFD for Willow Rock Water Balance

Low Precipitation Case
90% Evaporation Reduction from Cover
Precipitation Averages from 1990 to 2020

Negative Values are Losses





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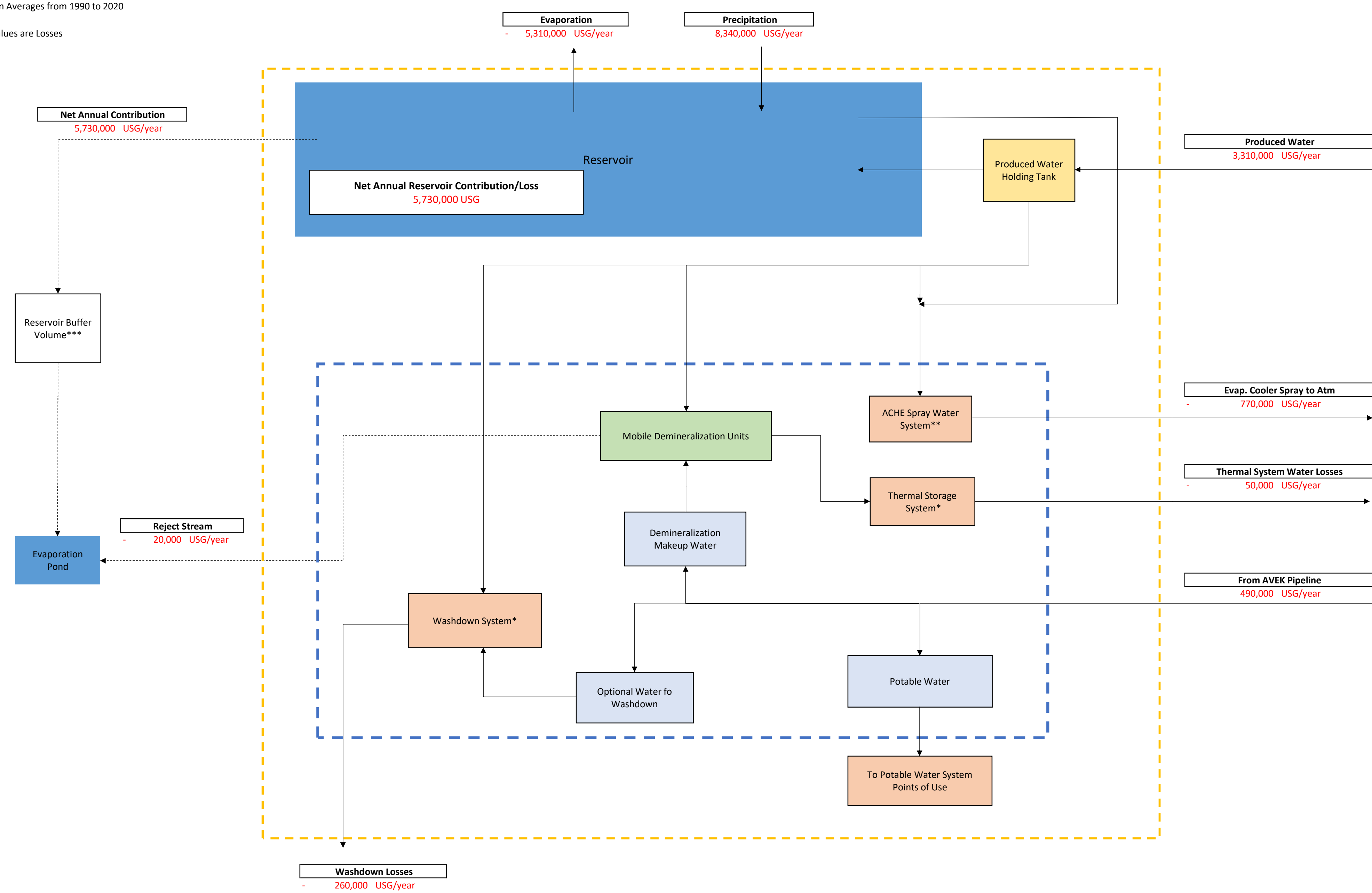

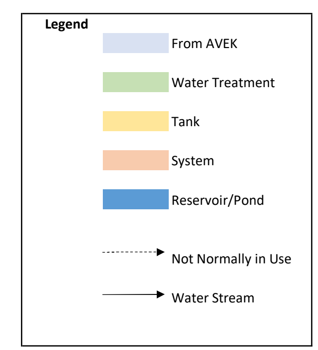

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***The reservoir buffer volume may used when there is an excess of water in the reservoir.

Equations:

1. Evaporation + Precipitation + Produced Water + Evap. Cooler Spray to Atm. + Thermal System Water Losses + Washdown Losses + Reject Stream = Net Reservoir Contribution/Loss

Construction Water by Month

HYDROSTOR

		Estimated Water Consumption by Month															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Potable Water																	
Worker use, wash/drinking																	
Surface Works, Transmission, and Cavern																	
Assumed 20 gal/day/worker	20 US gal/worker																
	20																
	Estimated # of workers	40	17	15	17	17	17	35	39	49	76	112	107	105	134	154	269
	Water Per month	15,920	6,680	6,680	6,040	6,040	6,920	6,800	6,800	14,000	15,600	19,600	30,400	42,000	53,600	61,600	107,600
	# months/period	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Total period (US gal)	15,920	6,680	6,680	6,040	6,040	6,920	6,800	6,800	14,000	15,600	19,600	30,400	42,000	53,600	61,600	107,600
Total Estimated Potable Water Demand by Month		15,920	6,680	6,680	6,040	6,040	6,920	6,800	6,800	14,000	15,600	19,600	30,400	42,000	53,600	61,600	107,600
Average flow (if piped from source(s))																	
Gal/month		15,920	6,680	6,680	6,040	6,040	6,920	6,800	6,800	14,000	15,600	19,600	30,400	42,000	53,600	61,600	107,600
Average flow, gpm																	
40 hours/week		1.66	0.70	0.70	0.63	0.63	0.72	0.71	0.71	1.46	1.63	2.04	3.17	4.38	5.58	6.42	11.21
Total Hours		160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00
Total Minutes		9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00
Flow, gpm, based on 40 hours/week		1.66	0.70	0.70	0.63	0.63	0.72	0.71	0.71	1.46	1.63	2.04	3.17	4.38	5.58	6.42	11.21
Flow, gpm, based on 24/7		0.39	0.17	0.17	0.15	0.15	0.17	0.17	0.17	0.35	0.39	0.49	0.75	1.04	1.33	1.53	2.67
Estimated Quantity of Truck Loads																	
Water truck volume (US gal)	9000																
Total # of truck loads		1.8	0.7	0.7	0.7	0.7	0.8	0.8	0.8	1.6	1.7	2.2	3.4	4.7	6.0	6.8	12.0
per month		1.8	0.7	0.7	0.7	0.7	0.8	0.8	0.8	1.6	1.7	2.2	3.4	4.7	6.0	6.8	12.0
2. Non-potable Water																	
Surface Works																	
General Use	2x2000 gal trucks/day				17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	80,000	80,000	80,000	80,000
Road de-dusting, washdown, etc	# months/period				1	1	1	1	1	1	1	1	1	1	1	1	1
	Total period				17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	80,000	80,000	80,000	80,000
Hydrotest	Cold Tank, 6.6M US gal																
	Piping Systems																
	Spheres																
Fire/sprinkler test	Test building fire system																
Excluded	Cement water (assumed at cement plant)																
Transmission Infrastructure																	
General use	1x1000 gal trucks/day																

		Estimated Water Consumption by Month															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Cavern Works																	
Site Prep								121,667	121,667	121,667	17,033	121,667					
Conventional Shaft Sinking (gpm)	25											941,700	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000
4' Egress/Air Shaft #1 (cuft)	47,517								355,424	355,424	355,424						
4' Egress/Air Shaft #2 (cuft)	47,517								355,424	355,424	355,424						
4' Egress/Air Shaft #3 (cuft)	47,517																
4' Egress/Air Shaft #4 (cuft)	47,517																
8' water/ventilation shaft #1 (cuft)	141,764								1,060,397	1,060,397	1,060,397						
8' water/ventilation shaft #2 (cuft)	141,764																
Mining Crew A (gpm)	35																
Mining Crew B (gpm)	35																
Water Fill	Assume completed with reservoir fill water																
Reservoir Fill																	
Volume/day																	
m3																	
gal																	
Average gpm, 24x7																	
Volume/month (24X7)	US gal																
Total Estimated Non-Potable Water Demand by Month		0	0	0	17,333	17,333	17,333	139,000	1,910,246	1,910,246	1,805,612	1,080,700	1,112,333	1,175,000	1,175,000	1,175,000	1,175,000
3. Combined Potable and Non-Potable Water																	
	Total Estimated Water Demand by Month	15,920	6,680	6,680	23,373	23,373	24,253	145,800	1,917,046	1,924,246	1,821,212	1,100,300	1,142,733	1,217,000	1,228,600	1,236,600	1,282,600
Average flow (if piped from source(s))																	
Gal/month		15,920	6,680	6,680	23,373	23,373	24,253	145,800	1,917,046	1,924,246	1,821,212	1,100,300	1,142,733	1,217,000	1,228,600	1,236,600	1,282,600
Average flow, gpm																	
40 hours/week		1.7	0.7	0.7	2.4	2.4	2.5	15.2	199.7	200.4	189.7	114.6	119.0	126.8	128.0	128.8	133.6
Total Hours		160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0
Total Minutes		9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0
Flow, gpm, based on 40 hours/week		1.7	0.7	0.7	2.4	2.4	2.5	15.2	199.7	200.4	189.7	114.6	119.0	126.8	128.0	128.8	133.6
Flow, gpm, based on 24/7		0.4	0.2	0.2	0.6	0.6	0.6	3.6	47.5	47.7	45.2	27.3	28.3	30.2	30.5	30.7	31.8
Estimated Quantity of Truck Loads																	
Water truck volume (US gal) assumed	9000																
Total # of truck loads		0.0	0.0	0.0	1.9	1.9	1.9	15.4	212.2	212.2	200.6	120.1	123.6	130.6	130.6	130.6	130.6
per month		0.0	0.0	0.0	1.9	1.9	1.9	15.4	212.2	212.2	200.6	120.1	123.6	130.6	130.6	130.6	130.6
per day (24x7)		0.0	0.0	0.0	0.1	0.1	0.1	0.5	7.1	7.1	6.7	4.0	4.1	4.4	4.4	4.4	4.4
per hour (24x7)		0.00	0.00	0.00	0.00	0.0	0.003	0.021	0.295	0.295	0.279	0.167	0.172	0.181	0.181	0.181	0.181
Assumed % volume trucked vs pipeliine wells		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
# trucks per month (for AFC input)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

1. Quantity of trucks required:

Calculates equivalent # of trucks based on volume capacity. Fill times, unload times, traffic, travel distance from source to site would need to still be accounted for to estimate total # of trucks required for operation.

Estimated Water Consumption by Month																	
		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1. Potable Water																	
Worker use, wash/drinking																	
Surface Works, Transmission, and Cavern																	
Assumed 20 gal/day/worker	20 US gal/worker																
	20																
	Estimated # of workers	263	279	312	292	325	380	248	259	278	297	354	407	468	465	559	700
	Water Per month	105,040	111,760	124,800	116,800	130,000	152,000	99,200	103,600	111,200	118,800	141,600	162,800	187,200	186,000	223,600	280,000
	# months/period	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Total period (US gal)	105,040	111,760	124,800	116,800	130,000	152,000	99,200	103,600	111,200	118,800	141,600	162,800	187,200	186,000	223,600	280,000
Total Estimated Potable Water Demand by Month		105,040	111,760	124,800	116,800	130,000	152,000	99,200	103,600	111,200	118,800	141,600	162,800	187,200	186,000	223,600	280,000
Average flow (if piped from source(s))																	
Gal/month		105,040	111,760	124,800	116,800	130,000	152,000	99,200	103,600	111,200	118,800	141,600	162,800	187,200	186,000	223,600	280,000
Average flow, gpm																	
40 hours/week		10.94	11.64	13.00	12.17	13.54	15.83	10.33	10.79	11.58	12.38	14.75	16.96	19.50	19.38	23.29	29.17
Total Hours		160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00
Total Minutes		9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00
Flow, gpm, based on 40 hours/week		10.94	11.64	13.00	12.17	13.54	15.83	10.33	10.79	11.58	12.38	14.75	16.96	19.50	19.38	23.29	29.17
Flow, gpm, based on 24/7		2.61	2.77	3.10	2.90	3.22	3.77	2.46	2.57	2.76	2.95	3.51	4.04	4.64	4.61	5.55	6.94
Estimated Quantity of Truck Loads																	
Water truck volume (US gal)	9000																
Total # of truck loads		11.7	12.4	13.9	13.0	14.4	16.9	11.0	11.5	12.4	13.2	15.7	18.1	20.8	20.7	24.8	31.1
per month		11.7	12.4	13.9	13.0	14.4	16.9	11.0	11.5	12.4	13.2	15.7	18.1	20.8	20.7	24.8	31.1
2. Non-potable Water																	
Surface Works																	
General Use	2x2000 gal trucks/day	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Road de-dusting, washdown, etc	# months/period	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Total period	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Hydrotest	Cold Tank, 6.6M US gal														6,600,000		
	Piping Systems														Re-use cold Tank Hydrotest		
	Spheres														Re-use cold Tank Hydrotest		
Fire/sprinkler test	Test building fire system														Re-use cold Tank Hydrotest		
Excluded	Cement water (assumed at cement plant)																
Transmission Infrastructure																	
General use	1x1000 gal trucks/day			20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
				1	1	1	1	1	1	1	1	1	1	1	1	1	1
				20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000

		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
		Estimated Water Consumption by Month															
Cavern Works																	
Site Prep																	
Conventional Shaft Sinking (gpm)	25	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	153,300									
4' Egress/Air Shaft #1 (cuft)	47,517																
4' Egress/Air Shaft #2 (cuft)	47,517																
4' Egress/Air Shaft #3 (cuft)	47,517	319,882															
4' Egress/Air Shaft #4 (cuft)	47,517	319,882															
8' water/ventilation shaft #1 (cuft)	141,764																
8' water/ventilation shaft #2 (cuft)	141,764						954,358										
Mining Crew A (gpm)	35								429,240	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000
Mining Crew B (gpm)	35										1,379,700	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000
Water Fill	Assume completed with reservoir fill water																
Reservoir Fill																	
Volume/day																	
m3								2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
gal								554,820	554,820	554,820	554,820	554,820	554,820	554,820	554,820	554,820	554,820
Average gpm, 24x7								385.3	385.3	385.3	385.3	385.3	385.3	385.3	385.3	385.3	385.3
Volume/month (24X7)	US gal							16,644,600	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600
Total Estimated Non-Potable Water Demand by Month		1,814,763	1,175,000	1,195,000	1,195,000	1,195,000	2,149,358	16,897,900	17,173,840	18,277,600	19,657,300	19,810,600	19,810,600	19,810,600	26,410,600	19,810,600	19,810,600
3. Combined Potable and Non-Potable Water																	
	Total Estimated Water Demand by Month	1,919,803	1,286,760	1,319,800	1,311,800	1,325,000	2,301,358	16,997,100	17,277,440	18,388,800	19,776,100	19,952,200	19,973,400	19,997,800	26,596,600	20,034,200	20,090,600
Average flow (if piped from source(s))																	
Gal/month		1,919,803	1,286,760	1,319,800	1,311,800	1,325,000	2,301,358	16,997,100	17,277,440	18,388,800	19,776,100	19,952,200	19,973,400	19,997,800	26,596,600	20,034,200	20,090,600
Average flow, gpm																	
40 hours/week		200.0	134.0	137.5	136.6	138.0	239.7	1,770.5	1,799.7	1,915.5	2,060.0	2,078.4	2,080.6	2,083.1	2,770.5	2,086.9	2,092.8
Total Hours		160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0
Total Minutes		9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0
Flow, gpm, based on 40 hours/week		200.0	134.0	137.5	136.6	138.0	239.7	1,770.5	1,799.7	1,915.5	2,060.0	2,078.4	2,080.6	2,083.1	2,770.5	2,086.9	2,092.8
Flow, gpm, based on 24/7		47.6	31.9	32.7	32.5	32.9	57.1	421.6	428.5	456.1	490.5	494.8	495.4	496.0	659.6	496.9	498.3
Estimated Quantity of Truck Loads																	
Water truck volume (US gal) assumed	9000																
Total # of truck loads		201.6	130.6	132.8	132.8	132.8	238.8	1877.5	1908.2	2030.8	2184.1	2201.2	2201.2	2201.2	2934.5	2201.2	2201.2
per month		201.6	130.6	132.8	132.8	132.8	238.8	1877.5	1908.2	2030.8	2184.1	2201.2	2201.2	2201.2	2934.5	2201.2	2201.2
per day (24x7)		6.7	4.4	4.4	4.4	4.4	8.0	62.6	63.6	67.7	72.8	73.4	73.4	73.4	97.8	73.4	73.4
per hour (24x7)		0.280	0.181	0.2	0.2	0.2	0.3	2.6	2.7	2.8	3.0	3.1	3.1	3.1	4.1	3.1	3.1
Assumed % volume trucked vs pipeliine wells		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
# trucks per month (for AFC input)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Estimated Water Consumption by Month																	
		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1. Potable Water																	
Worker use, wash/drinking																	
Surface Works, Transmission, and Cavern																	
Assumed 20 gal/day/worker	20 US gal/worker																
	20																
	Estimated # of workers	708	731	628	624	563	596	615	570	532	566	500	479	382	325	248	298
	Water Per month	283,200	292,400	251,200	249,600	200,000	200,000	200,000	200,000	200,000	200,000	200,000	191,600	152,800	130,000	99,200	119,200
	# months/period	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Total period (US gal)	283,200	292,400	251,200	249,600	200,000	200,000	200,000	200,000	200,000	200,000	200,000	191,600	152,800	130,000	99,200	119,200
Total Estimated Potable Water Demand by Month		283,200	292,400	251,200	249,600	200,000	200,000	200,000	200,000	200,000	200,000	200,000	191,600	152,800	130,000	99,200	119,200
Average flow (if piped from source(s))																	
Gal/month		283,200	292,400	251,200	249,600	200,000	200,000	200,000	200,000	200,000	200,000	200,000	191,600	152,800	130,000	99,200	119,200
Average flow, gpm																	
40 hours/week		29.50	30.46	26.17	26.00							20.83	19.96	15.92	13.54	10.33	12.42
Total Hours		160.00	160.00	160.00	160.00							160.00	160.00	160.00	160.00	160.00	160.00
Total Minutes		9,600.00	9,600.00	9,600.00	9,600.00							9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00
Flow, gpm, based on 40 hours/week		29.50	30.46	26.17	26.00	20.83	20.83	20.83	20.83	20.83	20.83	20.83	19.96	15.92	13.54	10.33	12.42
Flow, gpm, based on 24/7		7.02	7.25	6.23	6.19	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.75	3.79	3.22	2.46	2.96
Estimated Quantity of Truck Loads																	
Water truck volume (US gal)	9000																
Total # of truck loads		31.5	32.5	27.9	27.7	22.2	22.2	22.2	22.2	22.2	22.2	22.2	21.3	17.0	14.4	11.0	13.2
per month		31.5	32.5	27.9	27.7	22.2	22.2	22.2	22.2	22.2	22.2	22.2	21.3	17.0	14.4	11.0	13.2
2. Non-potable Water																	
Surface Works																	
General Use	2x2000 gal trucks/day	80,000	80,000	80,000	80,000	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333
Road de-dusting, washdown, etc	# months/period	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Total period	80,000	80,000	80,000	80,000	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333
Hydrotest	Cold Tank, 6.6M US gal																
	Piping Systems																
	Spheres																
Fire/sprinkler test	Test building fire system																
Excluded	Cement water (assumed at cement plant)																
Transmission Infrastructure																	
General use	1x1000 gal trucks/day	20,000	20,000														
		1	1														
		20,000	20,000														

Estimated Water Consumption by Month																	
		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Cavern Works																	
Site Prep																	
Conventional Shaft Sinking (gpm)	25																
4' Egress/Air Shaft #1 (cuft)	47,517																
4' Egress/Air Shaft #2 (cuft)	47,517																
4' Egress/Air Shaft #3 (cuft)	47,517																
4' Egress/Air Shaft #4 (cuft)	47,517																
8' water/ventilation shaft #1 (cuft)	141,764																
8' water/ventilation shaft #2 (cuft)	141,764																
Mining Crew A (gpm)	35	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,011,780	153,300	153,300	153,300
Mining Crew B (gpm)	35	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,533,000	1,011,780	153,300	153,300	153,300
Water Fill	Assume completed with reservoir fill water																
Reservoir Fill																	
Volume/day																	
m3		2100	2100	2100	2100	2100	2100	2100									
gal		554,820	554,820	554,820	554,820	554,820	554,820	554,820									
Average gpm, 24x7		385.3	385.3	385.3	385.3	385.3	385.3	385.3									
Volume/month (24X7)	US gal	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600	16,644,600									
Total Estimated Non-Potable Water Demand by Month		19,810,600	19,810,600	19,790,600	19,790,600	19,727,933	19,727,933	19,727,933	3,083,333	3,083,333	3,083,333	3,083,333	3,083,333	2,040,893	323,933	323,933	323,933
3. Combined Potable and Non-Potable Water																	
	Total Estimated Water Demand by Month	20,093,800	20,103,000	20,041,800	20,040,200	19,927,933	19,927,933	19,927,933	3,283,333	3,283,333	3,283,333	3,283,333	3,274,933	2,193,693	453,933	423,133	443,133
Average flow (if piped from source(s))																	
Gal/month		20,093,800	20,103,000	20,041,800	20,040,200	19,927,933	19,927,933	19,927,933	3,283,333	3,283,333	3,283,333	3,283,333	3,274,933	2,193,693	453,933	423,133	443,133
Average flow, gpm																	
40 hours/week		2,093.1	2,094.1	2,087.7	2,087.5	2,075.8	2,075.8	2,075.8	342.0	342.0	342.0	342.0	341.1	228.5	47.3	44.1	46.2
Total Hours		160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0
Total Minutes		9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0
Flow, gpm, based on 40 hours/week		2,093.1	2,094.1	2,087.7	2,087.5	2,075.8	2,075.8	2,075.8	342.0	342.0	342.0	342.0	341.1	228.5	47.3	44.1	46.2
Flow, gpm, based on 24/7		498.4	498.6	497.1	497.0	494.2	494.2	494.2	81.4	81.4	81.4	81.4	81.2	54.4	11.3	10.5	11.0
Estimated Quantity of Truck Loads																	
Water truck volume (US gal) assumed	9000																
Total # of truck loads		2201.2	2201.2	2199.0	2199.0	2192.0	2192.0	2192.0	342.6	342.6	342.6	342.6	342.6	226.8	36.0	36.0	36.0
per month		2201.2	2201.2	2199.0	2199.0	2192.0	2192.0	2192.0	342.6	342.6	342.6	342.6	342.6	226.8	36.0	36.0	36.0
per day (24x7)		73.4	73.4	73.3	73.3	73.1	73.1	73.1	11.4	11.4	11.4	11.4	11.4	7.6	1.2	1.2	1.2
per hour (24x7)		3.1	3.1	3.1	3.1	3.0	3.0	3.0	0.5	0.5	0.5	0.5	0.5	0.3	0.0	0.0	0.0
Assumed % volume trucked vs pipeliine wells		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
# trucks per month (for AFC input)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Estimated Water Consumption by Month

		49	50	51	52	53	54	55	56	57	58	59	60
1. Potable Water													
Worker use, wash/drinking													
Surface Works, Transmission, and Cavern													
Assumed 20 gal/day/worker	20 US gal/worker												
	20												
	Estimated # of workers	190	116	107	75	27	22	25	58	39	22	18	1
	Water Per month	76,000	46,400	42,800	30,000	10,800	8,800	10,000	23,200	15,600	8,800	7,200	560
	# months/period	1	1	1	1	1	1	1	1	1	1	1	1
	Total period (US gal)	76,000	46,400	42,800	30,000	10,800	8,800	10,000	23,200	15,600	8,800	7,200	560
	Total Estimated Potable Water Demand by Month	76,000	46,400	42,800	30,000	10,800	8,800	10,000	23,200	15,600	8,800	7,200	560
Average flow (if piped from source(s))													
Gal/month		76,000	46,400	42,800	30,000	10,800	8,800	10,000	23,200	15,600	8,800	7,200	560
Average flow, gpm													
40 hours/week		7.92	4.83	4.46	3.13	1.13	0.92	1.04	2.42	1.63	0.92	0.75	0.06
Total Hours		160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00
Total Minutes		9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00	9,600.00
Flow, gpm, based on 40 hours/week		7.92	4.83	4.46	3.13	1.13	0.92	1.04	2.42	1.63	0.92	0.75	0.06
Flow, gpm, based on 24/7		1.88	1.15	1.06	0.74	0.27	0.22	0.25	0.58	0.39	0.22	0.18	0.01
Estimated Quantity of Truck Loads													
Water truck volume (US gal)	9000												
Total # of truck loads		8.4	5.2	4.8	3.3	1.2	1.0	1.1	2.6	1.7	1.0	0.8	0.1
per month		8.4	5.2	4.8	3.3	1.2	1.0	1.1	2.6	1.7	1.0	0.8	0.1
2. Non-potable Water													
Surface Works													
General Use	2x2000 gal trucks/day	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333
Road de-dusting, washdown, etc	# months/period	1	1	1	1	1	1	1	1	1	1	1	1
	Total period	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333
Hydrotest	Cold Tank, 6.6M US gal												
	Piping Systems												
	Spheres												
Fire/sprinkler test	Test building fire system												
Excluded	Cement water (assumed at cement plant)												
Transmission Infrastructure													
General use	1x1000 gal trucks/day												

Estimated Water Consumption by Month													
		49	50	51	52	53	54	55	56	57	58	59	60
Cavern Works													
Site Prep													
Conventional Shaft Sinking (gpm)	25												
4' Egress/Air Shaft #1 (cuft)	47,517												
4' Egress/Air Shaft #2 (cuft)	47,517												
4' Egress/Air Shaft #3 (cuft)	47,517												
4' Egress/Air Shaft #4 (cuft)	47,517												
8' water/ventilation shaft #1 (cuft)	141,764												
8' water/ventilation shaft #2 (cuft)	141,764												
Mining Crew A (gpm)	35												
Mining Crew B (gpm)	35												
Water Fill	Assume completed with reservoir fill water												
Reservoir Fill													
Volume/day													
m3													
gal													
Average gpm, 24x7													
Volume/month (24X7)	US gal												
Total Estimated Non-Potable Water Demand by Month		17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333	17,333
													(without contingency)
3. Combined Potable and Non-Potable Water													
Total Estimated Water Demand by Month		93,333	63,733	60,133	47,333	28,133	26,133	27,333	40,533	32,933	26,133	24,533	17,893
Average flow (if piped from source(s))													
Gal/month		93,333	63,733	60,133	47,333	28,133	26,133	27,333	40,533	32,933	26,133	24,533	17,893
Average flow, gpm													
40 hours/week		9.7	6.6	6.3	4.9	2.9	2.7	2.8	4.2	3.4	2.7	2.6	1.9
Total Hours		160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0
Total Minutes		9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0	9,600.0
Flow, gpm, based on 40 hours/week		9.7	6.6	6.3	4.9	2.9	2.7	2.8	4.2	3.4	2.7	2.6	1.9
Flow, gpm, based on 24/7		2.3	1.6	1.5	1.2	0.7	0.6	0.7	1.0	0.8	0.6	0.6	0.4
Estimated Quantity of Truck Loads													
Water truck volume (US gal) assumed	9000												
Total # of truck loads		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
per month		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
per day (24x7)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
per hour (24x7)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Assumed % volume trucked vs pipeliine wells		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
# trucks per month (for AFC input)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 2E

Construction Traffic Volume Estimate

HYDROSTOR

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333 Bay Street, Suite 520,
Toronto, ON, M5H 2R2, Canada

07-31-2023

Based on the Hydrostor Materials Management Plan (dated June 6, 2023), the hauling of rock from cavern construction is expected to be performed 10 hours (7AM to 5PM) per day, seven days per week, using 21-ton capacity trucks. See summary table below. It is expected that a truck cycle will take one hour. This equates to about 180 loads per day to meet the estimated 3,778 tons per day capacity. So, 18 trucks each day will make ten trips to the quarry. Mining operations are expected to begin in September 2027, continuing for 15 months, and will be performed 24/7. During off-hours the material from the mine will be stockpiled at the surface in a location that is near the entrance to allow for limited resistance to the hauling operation.

Total Rock Quantity (tons)	1,700,000
Ton per Day	3,778
Total Loads per Day	180
Cycle Time (hours)	1
Truck Size (tons)	21
# of trucks per day	18
# of project days	450
Trucking hours	81,000

01-11-2024

Refer to the Manpower and Construction Equipment Spreadsheet (without berm) for monthly rock production, haul truck loads per day, and truck quantities.

Rock hauling is based on 7 days per week operation and the following:

1.7	tons/m3
21	tons (truck size)
30.417	days/month
2	hr (cycle time)
10	hr per day per truck

APPENDIX 5.1A

Emission Estimates for Operations Phase

Appendix 5.1A
Operations Emissions Data

Appendix 5.1A - TABLE 1

Emissions Calculations for Criteria Pollutants and Greenhouse Gases from Diesel Emergency Generators

Operation Phase

Hydrostor - Ansel Site

Criteria and Regulated Pollutants	CAS	Engine Size (bkW)[a]	Engine Size (bhp)	Emission Factors [b]		Annual Hours of Operation [c]	Hourly Emissions (lb/hr)	Annual Emissions (tons/yr) One Diesel Generator	Annual Emissions (tons/yr) Three Diesel Generators
				Value	Unit				
PM_{10}	85101	2500	3621	0.020	g/bhp-hr	200	0.1597	0.0160	0.0479
$PM_{2.5}$ [d]	88101	2500	3621	0.020	g/bhp-hr	200	0.1597	0.0160	0.0479
NO_X	42603	2500	3621	0.500	g/bhp-hr	200	3.9915	0.3991	1.1974
CO	42101	2500	3621	2.600	g/bhp-hr	200	20.7557	2.0756	6.2267
SO_2 [e]	42401	2500	3621	0.00500	g/bhp-hr	200	0.0399	0.0040	0.0120
VOC	43104	2500	3621	0.140	g/bhp-hr	200	1.1176	0.1118	0.3353

Greenhouse Gases (GHGs)	Fuel Consumption (gal/hr) [a]	Fuel Density (btu/gal) [a]	Hourly Heat Rate (MMBtu/hr) [f]	Emission Factor (lb/MMBtu) [g]	Global Warming Potential (GWP)	Emission Rate (lb/hr)	Annual Operating Hours	Emission Rate (lb/hr CO_2e)	Annual Emissions (TPY CO_2e) One Diesel Generator	Annual Emissions (TPY CO_2e) Three Diesel Generators
Carbon dioxide (CO_2)	174.5	137000	23.920	163.05	1	3,900.156	200	3,900	390	1,170
Methane (CH_4)	174.5	137000	23.920	0.006614	25	0.158	200	3.96	0.40	1
Nitrous oxide (N_20)	174.5	137000	23.920	0.001323	298	0.032	200	9.43	0.94	3
							Total	3,914	391	1,174

Notes:

[a] Based on the Kohler KD2500-4 specifications for a diesel generator set. See engine specification brochure in Appendix.

[b] Emissions factors (g/bhp-hr) based on compliance with the EPA Tier 4 standards with add-on controls for Nox, CO, VOC, and PM10/2.5 (DPF).

[c] Emergency engines are limited to 200 hours of operation according to Kern County APCD. Nominal fuel use rate is 174.6 gals/hr = 23.92 mmbtu/hr.

[d] PM2.5 assumed equal to PM10. PM10 = DPF for purposes of the HRA operations analysis.

[e] SO_2 emission factor was calculated based on ULSD with a maximum of 15 ppm sulfur content (0.0015%) default to 0.005 g/hp-hr for all loads.

[f] Heating value for diesel fuel is based on the Typical parameters of various fuels, AP-42 - Appendix A. (7.05 lbs/gal and 137,000 btu/gal)

[g] Emission factors from 40 CFR 98 Table C-1 and C-2

Appendix 5.1A - TABLE 2

Emissions Calculations for Criteria Pollutants and Greenhouse Gases from Diesel Emergency Fire Pump

Operation Phase

Hydrostor - Ansel Site

Criteria and Regulated Pollutants	CAS	Engine Size (bkW)[a]	Engine Size (bhp)[a]	Emission Factors [b]		Annual Hours of Operation [c]	Hourly Emissions (lb/hr)	Annual Emissions (tons/yr) One Diesel Fire Pump
				Value	Unit			
PM_{10}	85101	343	460	0.150	g/bhp-hr	200	0.1521	0.0152
$PM_{2.5}$ [d]	88101	343	460	0.150	g/bhp-hr	200	0.1521	0.0152
NO_X	42603	343	460	2.850	g/bhp-hr	200	2.8903	0.2890
CO	42101	343	460	2.600	g/bhp-hr	200	2.6367	0.2637
SO_2 [e]	42401	343	460	0.00500	g/bhp-hr	200	0.0051	0.0005
VOC	43104	343	460	0.150	g/bhp-hr	200	0.1521	0.0152

Greenhouse Gases (GHGs)	Fuel Consumption (gal/hr) [a]	Fuel (btu/gal) [a]	Hourly Fuel Rate (MMBtu/hr) [f]	Emission Factor (lb/MMBtu) [g]	Global Warming Potential (GWP)	Emission Rate (lb/hr)	Annual Operating Hours	Emission Rate (lb/hr CO_2e)	Annual Emissions (TPY CO_2e) One Diesel Fire Pump
Carbon dioxide (CO_2)	22.5	137000	3.083	163.05	1	502.68	200	503	50
Methane (CH_4)	22.5	137000	3.083	0.006614	25	0.020	200	0.51	0.05
Nitrous oxide (N_20)	22.5	137000	3.083	0.001323	298	0.004	200	1.22	0.12
							Total	504.4	50.4

Notes:

[a] Based on the Cummins QST15 specifications for a diesel fire pump. See engine specification brochure in Appendix.

[b] Emissions factors (g/bhp-hr) based on compliance with the EPA Tier 3 standards.CARB procedure used to derive separate Nox and VOC values from combined ATCM values.

[c] Emergency engines are limited to 200 hours of operation according to Kern County APCD. Nominal fuel use rate is 22.5 gals/hr or 3.083 mmbtu/hr.

[d] PM2.5 assumed equal to PM10. PM10 = DPF for purposes of the HRA operations analysis.

[e] SO_2 emission factor was calculated based on ULSD with a maximum of 15 ppm sulfur content (0.0015%) default to 0.005 g/hp-hr for all loads.

[f] Heating value for diesel fuel is based on the Typical parameters of various fuels, AP-42 - Appendix A. (7.05 lbs/gal and 137,000 btu/gal)

[g] Emission factors from 40 CFR 98 Table C-1 and C-2

Appendix 5.1A - TABLE 3
Sources Location, Stack and Operating Parameters
Operation Phase
Hydrostor - Ansel Site

Source Description	Model ID	UTM Location [a]		Stack Parameters [b]				Operating Parameters [c]				
		Easting	Northing	Height		Diameter		Flowrate	Velocity		Temperature	
		(m)	(m)	(ft)	(m)	(ft)	(m)	(acfm)	(ft/s)	(m/s)	(°F)	(°K)
Emergency Diesel Generator 2.5MW	EGEN 1	394,612.1	3,863,819.9	22.93	6.989	1.033	0.315	9734	193.5	58.960	914	763
Emergency Diesel Generator 2.5MW	EGEN 2	394,611.3	3,863,816.8	22.93	6.989	1.033	0.315	9734	193.5	58.960	914	763
Emergency Diesel Generator 2.5MW	EGEN 3	394,632.4	3,863,813.7	22.93	6.989	1.033	0.315	9734	193.5	58.960	914	763
Fire Pump Engine	FP	394606.40	3864004.40	15	4.57	0.5	0.152	2881	245	74.67	1025	825

[a] Locations are based on UTM Zone 11, NAD83 Datum.

EGEN 1,2,3 Ops parameters apply to each stack (2 stacks per engine).

[b] Stack parameters are based on Applicant supplied design data.

[c] Operating parameters are based on the Kohler KD2500-4 and Cummins QST15 engines. See Appendix for engine brochures and specifications.

Table 5.1A-4 Fixed Roof Tank Emissions Estimates

Hydrostor-WRESC Operations

Kohler Engine Tanks

Ref: AP-42, Section 7.1, 11/2006

Tanks converted from rectangular to horizontal cylindrical for purposes of these calculations.

		indicates input		
Standing Storage Losses			***Comments***	**Note**
Type of organic liquid:	#2 ULS Diesel		~3740 gal tank for each Kohler engine	
Vapor molecular weight:	Mw	130	AP-42	
Vapor density, lbs/ft3:	Vd	0.00014664		
Liquid density, lbs/gal	Dl	7.1	AP-42	
TVP, psia @ 60F	Vp	0.0065	AP-42 (consistent with Ta below)	
~ Tank diameter, ft.	D	8		
~ Tank height or length, ft.	H	11		
~ Tank capacity, gals	Tc	3800		
Avg vapor space height, ft.	Hv	2	annual avg value based on use versus tank refills	
Vapor space volume, ft3	Vv	100.53		
~Total tank volume, ft3	Tv	508	Based on actual tank dimensions	
Avg Annual Temp, F	Ta	77	Lancaster, Ca. www.usclimatedata.com	
Avg diurnal temp change, F	Tc	30	Avg max minus avg min.	
Paint factor	Pf	0.05	AP-42, Table 7.1-6, solar absorbance value	1
Product factor	Pd	1	Crude = 0.75, all others = 1	
Turnover factor	Kn	1	If turnover <36/year, the factor = 1. If >36 then calculate Kn. Per AP-42.	
Annual throughput, gals/yr	At	8730		
Vapor space expansion factor	Ke	0.04	AP-42, default value	
Vapor saturation factor	Ks	0.9993		
# of similar tanks		3		2
Standing Loss	**Ls**	**0.22**	**lbs/yr (breathing and standing losses)**	
Working Losses				
Vapor molecular weight:	Mw	130		
Vapor pressure, psia @ 70F	Vp	0.0065		
Throughput, bbl/yr	Q	207.9		
Turnover factor	Kn	1		
Working loss product factor	Kp	1		
Working Loss	**Lw**	**0.18**	**lbs/yr (tank filling and withdrawal losses)**	
	Ls+Lw	**0.39**		
Engineering Uncertainty Factor		1.2		
Uncontrolled Total Tank Losses		**0.47**	**lbs/yr each tank**	
		1.41	**lbs/yr all tanks**	
Control System ?	No	0	control fraction	
System type, etc.	NA, no controls are required on #2 fuel oil storage tanks or delivery systems			
Controlled Total Tank Losses		**0.47**	**lbs/yr each tank**	
		1.41	**lbs/yr all tanks**	
		0.001	**TPY all tanks**	

Note 1 - paint factor reduced due to tanks being inside the bldg on the ground floor not subject to ambient sunlight exposure.

Note 2 - based on Applicant supplied data

Note 3 - consult agency regulations for permitting requirements

Air Toxics Emissions - Source: SJVUAPCD AB2588 Air Toxics Profiles (Profile 23 Diesel Fuel Storage)

Toxic Pollutant	EF, lb/lb VOC	Emissions, lbs/yr (all tanks)	lbs/hr
Benzene	0.00088	0.0012	1.413E-07
Toluene	0.00482	0.0068	7.73941E-07
Xylenes	0.0042	0.0059	6.74388E-07

Table 5.1A-5 Fixed Roof Tank Emissions Estimates

Hydrostor-WRESC Operations

Cummins Engine Tank

Ref: AP-42, Section 7.1, 11/2006

Tanks converted from rectangular to horizontal cylindrical for purposes of these calculations.

(highlighted cell) indicates input

Standing Storage Losses			***Comments***	**Note**
Type of organic liquid:	#2 ULS Diesel		~550 gal tank for Cummins engine	
Vapor molecular weight:	Mw	130	AP-42	
Vapor density, lbs/ft3:	Vd	0.00014664		
Liquid density, lbs/gal	Dl	7.1	AP-42	
TVP, psia @ 60F	Vp	0.0065	AP-42 (consistent with Ta below)	
~ Tank diameter, ft.	D	4		
~ Tank height or length, ft.	H	6		
~ Tank capacity, gals	Tc	550		
Avg vapor space height, ft.	Hv	1	annual avg value based on use versus tank refills	
Vapor space volume, ft3	Vv	12.57		
~Total tank volume, ft3	Tv	74	Based on actual tank dimensions	
Avg Annual Temp, F	Ta	77	Lancaster, CA. www.usclimatedata.com	
Avg diurnal temp change, F	Tc	30	Avg max minus avg min.	
Paint factor	Pf	0.05	AP-42, Table 7.1-6, solar absorbance value	1
Product factor	Pd	1	Crude = 0.75, all others = 1	
Turnover factor	Kn	1	If turnover <36/year, the factor = 1. If >36 then calculate Kn. Per AP-42.	
Annual throughput, gals/yr	At	1125		
Vapor space expansion factor	Ke	0.04	AP-42, default value	
Vapor saturation factor	Ks	0.9997		
# of similar tanks		1		2
Standing Loss	**Ls**	**0.03**	**lbs/yr (breathing and standing losses)**	
Working Losses				
Vapor molecular weight:	Mw	130		
Vapor pressure, psia @ 70F	Vp	0.0065		
Throughput, bbl/yr	Q	26.8		
Turnover factor	Kn	1		
Working loss product factor	Kp	1		
Working Loss	**Lw**	**0.02**	**lbs/yr (tank filling and withdrawal losses)**	
	Ls+Lw	**0.05**		
Engineering Uncertainty Factor		1.2		
Uncontrolled Total Tank Losses		**0.06**	**lbs/yr each tank**	
		0.06	**lbs/yr all tanks**	
Control System ?	No	0	control fraction	
System type, etc.	NA, no controls are required on #2 fuel oil storage tanks or delivery systems			3
Controlled Total Tank Losses		**0.06**	**lbs/yr each tank**	
		0.06	**lbs/yr all tanks**	
		0.000	**TPY all tanks**	

Note 1 - paint factor reduced due to tanks being inside the bldg on the ground floor not subject to ambient sunlight exposure.

Note 2 - based on Applicant supplied data

Note 3 - consult agency regulations for permitting requirements

Air Toxics Emissions - Source: SJVUAPCD AB2588 Air Toxics Profiles (Profile 23 Diesel Fuel Storage)

Toxic Pollutant	EF, lb/lb VOC	Emissions, lbs/yr (all tanks)	lbs/hr
Benzene	0.00088	0.0001	5.97049E-09
Toluene	0.00482	0.0003	3.2702E-08
Xylenes	0.0042	0.0002	2.84955E-08

APPENDIX 5.1B

Emissions Estimates for Construction Phase

Appendix 5.1B

Construction Emissions Data

Offsite Construction Emissions
Berm Option

TABLE 1
OFF-SITE EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCION PHASE-High 12 Month Period
Hydrostor WRESC

ID	Activity	Description	PM_{10} Annual (tons/yr)	$PM_{2.5}$ Annual (tons/yr)	Nox Annual (tons/yr)	VOC Annual (tons/yr)	CO Annual (tons/yr)	SO_2 Annual (tons/yr)
Non-Stationary Sources								
Offsite Unpaved Roads Fugitives ***(Category does not apply to Offsite Emissions)***								
UP1	Cavern Works		0.0	0.0	-	-	-	-
UP2	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.0	0.0	-	-	-	-
UP3	Cavern Works	Equipment mobilization - Cavern Works	0.0	0.0	-	-	-	-
UP4	Cavern Works	Equipment demobilization - Cavern Works	0.0	0.0	-	-	-	-
UP5	Cavern Works	Fuel delivery - Cavern Works	0.0	0.0	-	-	-	-
UP6	Cavern Works	Fencing delivery - Cavern Works	0.0	0.0	-	-	-	-
UP7	Cavern Works	Concrete trucks - Cavern Works	0.0	0.0	-	-	-	-
UP8	Cavern Works	Gravel delivery - Cavern Works	0.0	0.0	-	-	-	-
UP9	Cavern Works	Trailer delivery - Cavern Works	0.0	0.0	-	-	-	-
UP10	Cavern Works	Workforce (Shaft) - Cavern Works	0.0	0.0	-	-	-	-
UP11	Cavern Works	Shaft cuttings for disposal - Cavern Works	0.0	0.0	-	-	-	-
UP12	Cavern Works	Workforce (Mining) - Cavern Works	0.0	0.0	-	-	-	-
UP13	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.0	0.0	-	-	-	-
UP14	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.0	0.0	-	-	-	-
UP15	Cavern Works	Ground support - Cavern Works	0.0	0.0	-	-	-	-
UP16	Cavern Works	Explosives - Cavern Works	0.0	0.0	-	-	-	-
UP17	Surface Works	Transportation of waste rock - Cavern Works	0.0	0.0	-	-	-	-
UP18	Surface Works	Workforce - Surface Works	0.0	0.0	-	-	-	-
UP19	Surface Works	Site clearing (overburden) - Surface Works	0.0	0.0	-	-	-	-
UP20	Surface Works	Civil foundation excavation Surface Works	0.0	0.0	-	-	-	-
UP21	Surface Works	Cement Trucks Surface Works	0.0	0.0	-	-	-	-
UP22	Surface and Cavern Works	Equipment and material delivery Surface Works	0.0	0.0	-	-	-	-
UP23	Surface and Cavern Works	Potable Water - Surface and Cavern	0.0	0.0	-	-	-	-
UP24	Reservoir Fill	Non Potable Water - Surface and Cavern	0.0	0.0	-	-	-	-
		Total Unpaved Fugitives	0.00	0.00	0.00	0.00	0.00	0.00
Exhaust Emissions from Non-Road Engines								
EXH-12	Transmission Line Construction	Civil works - Typical equipment	0.02	0.02	0.41	0.05	0.53	0.00
		T-Line Construction Exhaust Emissions	0.02	0.02	0.41	0.05	0.53	0.00

T-Line Const Sites and Paved Roads Fugitive Emissions								
Road 1	Workforce	From Rosamond CDP, CA to Site	0.03	0.00	-	-	-	-
Road 2	Workforce	From Lancaster City, CA to Site	0.18	0.00	-	-	-	-
Road 3	Workforce	From Palmdale City, CA to Site	0.18	0.00	-	-	-	-
Road 4	Workforce	From Los Angeles City, CA to Site	0.02	0.00	-	-	-	-
Road 5	Workforce	From Mojave CDP, CA to Site	0.00	0.00	-	-	-	-
Road 6	Workforce	From Tehachapi City, CA to Site	0.00	0.00	-	-	-	-
Road 7	Workforce	From California City, CA to Site	0.00	0.00	-	-	-	-
Road 8	Workforce	From Santa Clarita City, CA to Site	0.00	0.00	-	-	-	-
Road 9	Workforce	From Sun Village CDP, CA to Site	0.00	0.00	-	-	-	-
Road 10	Workforce	From Quartz Hill CDP, CA to Site	0.00	0.00	-	-	-	-
Road 11	Trucks	From Port of Los Angeles to Site	0.11	0.00	-	-	-	-
Road 12	Trucks	From Port of Oakland to Site	0.11	0.00	-	-	-	-
Road 13	Trucks	Waste Rock Haulage - Option 2	0.00	0.00	-	-	-	-
Road 14	Trucks	Misc Deliveries from Local Area/Region	0.30	0.00	-	-	-	-
	Fugitive Dust	T-Line Construction Sites, Laydown Areas, etc.	1.70	0.36				
		Total Paved	2.66	0.37	0.00	0.00	0.00	0.00
Exhaust Emissions from Haul Truck Traffic on Paved Roads								
Road 1	Workforce	From Rosamond CDP, CA to Site	0.0091	0.0031	0.0360	0.0346	0.4695	0.0019
Road 2	Workforce	From Lancaster City, CA to Site	0.0565	0.0194	0.2222	0.2135	2.9012	0.0116
Road 3	Workforce	From Palmdale City, CA to Site	0.0562	0.0193	0.2208	0.2122	2.8837	0.0115
Road 4	Workforce	From Los Angeles City, CA to Site	0.0058	0.0020	0.0230	0.0221	0.3002	0.0012
Road 5	Workforce	From Mojave CDP, CA to Site	0.0004	0.0001	0.0017	0.0016	0.0223	0.0001
Road 6	Workforce	From Tehachapi City, CA to Site	0.0013	0.0004	0.0050	0.0048	0.0648	0.0003
Road 7	Workforce	From California City, CA to Site	0.0007	0.0002	0.0026	0.0025	0.0337	0.0001
Road 8	Workforce	From Santa Clarita City, CA to Site	0.0015	0.0005	0.0061	0.0059	0.0796	0.0003
Road 9	Workforce	From Sun Village CDP, CA to Site	0.0009	0.0003	0.0037	0.0036	0.0486	0.0002
Road 10	Workforce	From Quartz Hill CDP, CA to Site	0.0003	0.0001	0.0012	0.0011	0.0155	0.0001
Road 11	Trucks	From Port of Los Angeles to Site	0.0195	0.0088	0.2170	0.0258	0.0084	0.0020
Road 12	Trucks	From Port of Oakland to Site	0.0195	0.0088	0.2170	0.0258	0.0084	0.0020
Road 13	Trucks	Waste Rock Haulage - Option 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Road 14	Trucks	Misc Deliveries from Local Area/Region	0.0002	0.0001	0.0018	0.0002	0.0001	0.0000
		Total Non-Road Exhaust on Paved Roads	0.17	0.06	0.96	0.55	6.84	0.03
		Total Emissions, tons (12 month period)	**2.9**	**0.5**	**1.4**	**0.6**	**7.4**	**0.03**
		Average Monthly Emissions, lbs	**475.6**	**76.0**	**227.6**	**100.2**	**1,227.5**	**5.4**
		Average Daily Emissions, lbs	**15.9**	**2.5**	**7.6**	**3.3**	**40.9**	**0.2**

TABLE 2
OFF-SITE EMISSIONS SUMMARY - GREENHOUSE GASES
CONSTRUCION PHASE -High 12 Month Period
Hydrostor WRESC

ID	Activity	Description	CO_2 Annual (tons/yr)	CH_4 Annual (tons/yr)	N_2O Annual (tons/yr)
Non-Stationary Sources					
Exhaust Emissions from Non-Road Engines					
EXH-12	Transmission Line Construction	Civil works - Typical equipment	129.98	-	-
		Total Non-Road Exhaust	129.98	0.00	0.00
Exhaust Emissions from Haul Truck Traffic on Paved Roads					
Road 1	Workforce	From Rosamond CDP, CA to Site	189.75	0.00	0.00
Road 2	Workforce	From Lancaster City, CA to Site	1,172.59	0.01	0.02
Road 3	Workforce	From Palmdale City, CA to Site	1,165.51	0.01	0.02
Road 4	Workforce	From Los Angeles City, CA to Site	121.32	0.00	0.00
Road 5	Workforce	From Mojave CDP, CA to Site	9.00	0.00	0.00
Road 6	Workforce	From Tehachapi City, CA to Site	26.17	0.00	0.00
Road 7	Workforce	From California City, CA to Site	13.63	0.00	0.00
Road 8	Workforce	From Santa Clarita City, CA to Site	32.17	0.00	0.00
Road 9	Workforce	From Sun Village CDP, CA to Site	19.63	0.00	0.00
Road 10	Workforce	From Quartz Hill CDP, CA to Site	6.27	0.00	0.00
Road 11	Trucks	From Port of Los Angeles to Site	212.38	0.00	0.03
Road 12	Trucks	From Port of Oakland to Site	212.38	0.00	0.03
Road 13	Trucks	Waste Rock Haulage - Option 2	0.00	0.00	0.00
Road 14	Trucks	Misc Deliveries from Local/Regional Area	55.25	0.00	0.01
		Total Traffic Exhaust on Paved Roads	3,236.06	0.02	0.12
		Total Emissions	**3,366.0**	**0.02**	**0.1**

Greenhouse Gases (GHGs)	Global Warming Potential (GWP)	Emission Rate (lb/hr)[a]	Emission Rate (TPY)	Annual Emissions (TPY CO_2e)
Carbon dioxide (CO_2)	1	0.000	3,366.0	3,366
Methane (CH_4)	25	0.000	0.02	1
Nitrous oxide (N_20)	298	0.000	0.1	36
			Total	**3,403**

[a] Appropriate reporting units are tons/yr.

Table 3
Fugitive Particulate Matter (PM) Off-Site Emissions from Vehicle Movement on Paved Roads
Construction Phase-High 12 Month Period
Hydrostor WRESC

Parameters	Construction Workforce															
	Road 1		Road 2		Road 3		Road 4		Road 5		Road 6		Road 7		Road 8	
	From Rosamond CDP, CA		From Lancaster City, CA		From Palmdale City, CA		From Los Angeles City, CA		From Mojave CDP, CA		From Tehachapi City, CA		From California City, CA		From Santa Clarita City, CA	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data																
W = Average Vehicle Weight (tons) [b]	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Daily Operation Hours (hrs/day)	0.16	0.16	0.68	0.68	1.00	1.00	3.56	3.56	0.44	0.44	1.28	1.28	1.00	1.00	2.36	2.36
Total No. of Operating Days for activity (days) [b]	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
Total No. of equipment for activity (#/day) [b]	174	174	253	253	171	171	5	5	3	3	3	3	2	2	2	2
D = Distance traveled on Paved roads (RT miles) [c]	8	8	34	34	50	50	178	178	22	22	64	64	50	50	118	118
Daily Vehicle Miles Travelled (VMT)	1,392	1,392	8,602	8,602	8,550	8,550	890	890	66	66	192	192	100	100	236	236
Activity Duration Vehicle Miles Travelled (VMT)	508,080	508,080	3,139,730	3,139,730	3,120,750	3,120,750	324,850	324,850	24,090	24,090	70,080	70,080	36,500	36,500	86,140	86,140
Site Characteristics																
k = Particle size multiplier (lb/VMT) [d]	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003
sL = Silt Loading (g/m^2) [e]	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [f]	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
a (constant)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant)	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Control Efficiency																
Dust Control Efficiency (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emission Factors [a]																
Emission Factor (lb/VMT) - Daily	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000
Emission Factor (lb/VMT) - Annual	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000
Emission Rates [a]																
Uncontrolled Emissions - Annual (tons/yr, TPY)	0.03	0.00	0.18	0.00	0.18	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Controlled Annual Emissions (TPY)	0.03	0.00	0.18	0.00	0.18	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes:

[a] Emission Factor (E) calculated from AP-42 Section 13.2.1 (Paved Roads) Equation 2 -
E = k * (sL)^a * (W)^b * (1-P/(4X365))

[b] Assumed LDGV (LDP or LDT) for workforce and HHDT at 12 cubic yard (21 tons) of capacity based on the document TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor. Assumed high 12 month period

[c] Estimated average distance travelled by each vehicle based on data supplied by Applicant

[d] Particle size multiplier and constants per CARB.

[e] Silt loading based on "2020 National Emissions Inventory TSD-Dust Paved Roads, EPA OAQPS, EPA-454/R-23-001w, March 2023,Table 23-2 (Rural and Urban Interstates, Freeways, and Expressways = 0.015 g/m2 for all ADVT categories.
Avg passenger vehicle weight per CARB is 2.4 tons.

[f] Precipitation data: AP-42, Section 13.2.2 (Unpaved Roads), Figure 13.2.2-1, 11/2006.
Travel times based on an average speed of 60 mph on high capacity interstate roads, freeways, and expressways with a 20% time margin added. See reference in footnote "e" above.

[g] Road 14 added for misc material and supply deliveries from the local Lancaster/Palmdale area. Avg RT mileage = 42 assuming 50% from Lancaster and 50% from Palmdale.
(Types of deliveries anticipated per day: concrete, gravel, fuel, potable water, non-potable water, equipment, misc building supplies, etc.)

		Truck Trips									
Road 9		Road 10		Road 11		Road 12		Road 13		Road 14[g]	
From Sun Village CDP, CA		From Quartz Hill CDP, CA		From Port of Los Angeles		From Port of Oakland		Waste Rock Haulage Berm Option		Misc Deliveries from Local Area	
PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
2.4	2.4	2.4	2.4	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35
1.44	1.44	0.92	0.92	2.30	2.30	6.90	6.90	0	0	0.84	0.84
365	365	365	365	365	365	365	365	365	365	312	312
2	2	1	1	3	3	1	1	0	0	25	25
72	72	46	46	115	115	345	345	0	0	42	42
144	144	46	46	345	345	345	345	0	0	1,050	1,050
52,560	52,560	16,790	16,790	125,925	125,925	125,925	125,925	0	0	327,600	327,600
0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003
0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
20	20	20	20	20	20	20	20	20	20	20	20
0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
0	0	0	0	0	0	0	0	0	0	0	0
0.0001	0.0000	0.0001	0.0000	0.0018	0.0000	0.0018	0.0000	0.0018	0.0000	0.0019	0.0000
0.0001	0.0000	0.0001	0.0000	0.0018	0.0000	0.0018	0.0000	0.0018	0.0000	0.0019	0.0000
0.00	0.00	0.00	0.00	0.1	0.0	0.1	0.0	0.0	0.0	0.3	0.0
0.00	0.00	0.00	0.00	0.1	0.0	0.1	0.0	0.0	0.0	0.3	0.0

would be 365 work days. See footnote "e" below.

TABLE 4 (4 Pages)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR OFF-SITE EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase
Hydrostor WRESC

Road ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	EMFAC Vehicle Type: Vehicle Type	EMFAC Vehicle Type: Weight Range (lbs)	Fuel Type	Total Miles Travelled (VMT/day)	CO	NO_X	SO_2	$PM_{10\ Exhaust}$	$PM_{10\ TBW}$	$PM_{2.5\ Exhaust}$	$PM_{2.5\ TBW}$	VOC
										Fleet Aggregate Average Air Pollutant Emissions Factors (g/mile) [a]							
						LDGV	<6,000	Gas		0.8383	0.0642	0.0033	0.0012	0.0151	0.0011	0.0045	0.0617
						HHDT	>33,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859
										Daily Emissions (lbs/day) [b]							
Road 1	Rosamond CDP, CA	8	365	0.16	5,400	LDGV	<6,000	Gas	1,392	2.57E+00	1.97E-01	1.03E-02	3.72E-03	4.64E-02	3.42E-03	1.38E-02	1.89E-01
Road 2	Lancaster City, CA	34	365	0.68	5,400	LDGV	<6,000	Gas	8,602	1.59E+01	1.22E+00	6.35E-02	2.30E-02	2.87E-01	2.12E-02	8.51E-02	1.17E+00
Road 3	Palmdale City, CA	50	365	1.00	5,400	LDGV	<6,000	Gas	8,550	1.58E+01	1.21E+00	6.31E-02	2.29E-02	2.85E-01	2.10E-02	8.46E-02	1.16E+00
Road 4	Los Angeles City, CA	178	365	3.56	5,400	LDGV	<6,000	Gas	890	1.64E+00	1.26E-01	6.57E-03	2.38E-03	2.96E-02	2.19E-03	8.81E-03	1.21E-01
Road 5	Mojave CDP, CA	22	365	0.44	5,400	LDGV	<6,000	Gas	66	1.22E-01	9.34E-03	4.87E-04	1.77E-04	2.20E-03	1.62E-04	6.53E-04	8.98E-03
Road 6	Tehachapi City, CA	64	365	1.28	5,400	LDGV	<6,000	Gas	192	3.55E-01	2.72E-02	1.42E-03	5.14E-04	6.40E-03	4.72E-04	1.90E-03	2.61E-02
Road 7	California City, CA	50	365	1.00	5,400	LDGV	<6,000	Gas	100	1.85E-01	1.42E-02	7.38E-04	2.68E-04	3.33E-03	2.46E-04	9.90E-04	1.36E-02
Road 8	Santa Clarita City, CA	118	365	2.36	5,400	LDGV	<6,000	Gas	236	4.36E-01	3.34E-02	1.74E-03	6.31E-04	7.86E-03	5.81E-04	2.34E-03	3.21E-02
Road 9	Sun Village CDP, CA	72	365	1.44	5,400	LDGV	<6,000	Gas	144	2.66E-01	2.04E-02	1.06E-03	3.85E-04	4.80E-03	3.54E-04	1.42E-03	1.96E-02
Road 10	Quartz Hill CDP, CA	46	365	0.92	5,400	LDGV	<6,000	Gas	46	8.50E-02	6.51E-03	3.40E-04	1.23E-04	1.53E-03	1.13E-04	4.55E-04	6.26E-03
Road 11	Port of Los Angeles	230	365	2.3	78,000	HHDT	>33,000	Diesel	345	4.63E-02	1.19E+00	1.10E-02	2.22E-02	8.48E-02	2.12E-02	2.70E-02	4.69E-02
Road 12	Port of Oakland	690	365	6.9	78,000	HHDT	>33,000	Diesel	345	4.63E-02	1.19E+00	1.10E-02	2.22E-02	8.48E-02	2.12E-02	2.70E-02	4.69E-02
Road 13	Waste Rock Storage on Site (arch. berm)	0	365	0.0	89,000	HHDT	>33,000	Diesel	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Road 14	Misc Deliveries from Local Area/Region	42	260	10.0	78,000	HHDT	>33,000	Diesel	1,050	1.41E-01	3.62E+00	3.35E-02	6.75E-02	2.58E-01	6.46E-02	8.21E-02	1.43E-01

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).
LDGV = LDP and/or LDT

Potential Waste Rock Haul Routes and approx. Distances (RT miles) Not used for the Berm Option
Vulcan-Palmdale, 67 miles
Vulcan-Palmdale Option 2, 72 miles
Robertson-Palmdale, 68 miles
Holiday Quarry, 19.7 miles
Ridgeline Quarry, 22.7 miles
Golden Queen Mine/Quarry,16 miles

TABLE 4 (4 Pages)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR OFF-SITE EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase-High 12 Month Period
Hydrostor WRESC

Road ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	EMFAC Vehicle Type		Fuel Type	Total Miles Travelled (VMT/year)	Pollutants from Vehicle Exhaust and Tire & Brake Wear								Annual Emissions					
						Vehicle Type	Weight Range (lbs)			CO	NO_X	SO_2	PM_{10} Exhaust	$PM_{10\ TBW}$	$PM_{2.5}$ Exhaust	$PM_{2.5\ TBW}$	VOC	Total PM_{10} (tons/yr)	Total $PM_{2.5}$ (tons/yr)	Total VOC (tons/yr)	Total NOx (tons/yr)	Total CO (tons/yr)	Total SO_2 (tons/yr)
										Fleet Aggregate Average Air Pollutant Emissions Factors (g/mile) [a]													
						LDGV	<6,000	Gas		0.8383	0.0642	0.0033	0.0012	0.0151	0.0011	0.0045	0.0617						
						HHDT	>33,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859						
										Annual Emissions (lbs/year) [b]													
Road 1	Rosamond CDP, CA	8	365	0.16	5400	LDGV	<6,000	Gas	508,080	938.96	71.90	3.75	1.36	16.92	1.25	5.03	69.11	0.0091	0.0031	0.0346	0.0360	0.4695	0.0019
Road 2	Lancaster City, CA	34	365	0.68	5400	LDGV	<6,000	Gas	3,139,730	5802.39	444.32	23.18	8.40	104.59	7.72	31.07	427.08	0.0565	0.0194	0.2135	0.2222	2.9012	0.0116
Road 3	Palmdale City, CA	50	365	1	5400	LDGV	<6,000	Gas	3,120,750	5767.31	441.63	23.04	8.35	103.96	7.68	30.88	424.49	0.0562	0.0193	0.2122	0.2208	2.8837	0.0115
Road 4	Los Angeles City, CA	178	365	3.56	5400	LDGV	<6,000	Gas	324,850	600.34	45.97	2.40	0.87	10.82	0.80	3.21	44.19	0.0058	0.0020	0.0221	0.0230	0.3002	0.0012
Road 5	Mojave CDP, CA	22	365	0.44	5400	LDGV	<6,000	Gas	24,090	44.52	3.41	0.18	0.06	0.80	0.06	0.24	3.28	0.0004	0.0001	0.0016	0.0017	0.0223	0.0001
Road 6	Tehachapi City, CA	64	365	1.28	5400	LDGV	<6,000	Gas	70,080	129.51	9.92	0.52	0.19	2.33	0.17	0.69	9.53	0.0013	0.0004	0.0048	0.0050	0.0648	0.0003
Road 7	California City, CA	50	365	1	5400	LDGV	<6,000	Gas	36,500	67.45	5.17	0.27	0.10	1.22	0.09	0.36	4.96	0.0007	0.0002	0.0025	0.0026	0.0337	0.0001
Road 8	Santa Clarita City, CA	118	365	2.36	5400	LDGV	<6,000	Gas	86,140	159.19	12.19	0.64	0.23	2.87	0.21	0.85	11.72	0.0015	0.0005	0.0059	0.0061	0.0796	0.0003
Road 9	Sun Village CDP, CA	72	365	1.44	5400	LDGV	<6,000	Gas	52,560	97.13	7.44	0.39	0.14	1.75	0.13	0.52	7.15	0.0009	0.0003	0.0036	0.0037	0.0486	0.0002
Road 10	Quartz Hill CDP, CA	46	365	0.92	5400	LDGV	<6,000	Gas	16,790	31.03	2.38	0.12	0.04	0.56	0.04	0.17	2.28	0.0003	0.0001	0.0011	0.0012	0.0155	0.0001
Road 11	Port of Los Angeles	230	365	2.3	78000	HHDT	>33,000	Diesel	125,925	16.88	433.98	4.02	8.10	30.97	7.75	9.84	51.62	0.0195	0.0088	0.0258	0.2170	0.0084	0.0020
Road 12	Port of Oakland	690	365	6.9	78000	HHDT	>33,000	Diesel	125,925	16.88	433.98	4.02	8.10	30.97	7.75	9.84	51.62	0.0195	0.0088	0.0258	0.2170	0.0084	0.0020
Road 13	Waste Rock Storage on Site (arch. berm)	0	365	0	89000	HHDT	>33,000	Diesel	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Road 14	Misc Deliveries from Local Area/Region	42	312	10	78000	HHDT	>33,000	Diesel	1,050	0.14	3.62	0.03	0.07	0.26	0.06	0.08	0.43	0.0002	0.0001	0.0002	0.0018	0.0001	0.0000

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).
LDGV = LDP and/or LDT

Table 5
Estimation of Off-Site Emissions Factors for Non-Road Equipment Used in the Project
Construction Phase-Offsite T-Line
Hydrostor WRESC

Equipment Description	Number of Equipment	Engine Power (hp)	Emission Factor (EF) [a]					
			ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO_2
			(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)
Transmission Line Construction (Civil works - Typical equipment)								
Backhoe	1	97	0.162	3.089	1.183	0.059	525.997	0.0049
Drill rigs	1	221	0.102	0.983	0.825	0.030	521.059	0.0048
30 ton cranes	1	231	0.356	3.362	3.321	0.181	528.683	0.0049

CalEEMod Equipment Type
Tractors/Loaders/Backhoes
Bore/Drill Rigs
Cranes

Notes
[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2020.4.0)

Table 6
Estimation of Off-Site Emissions Rates for Non-Road Equipment used in the Project
Construction Phase-Offsite T-Line
Hydrostor WRESC

Equipment Description	NUMBER OF EQUIPMENT	ENGINE POWER (hp)	Load Factor[e] (%)	Availability (%)	Estimated Equipment Use Hours [d]	Emission Factors [a]						Hourly Emission Rates (Average Hourly) [b]						Annual Emission Rates (Average Annual) [c]					
						ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2
						(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)
Transmission Line Construction (Civil works - Typical equipment)																							
Backhoe	1	97	37%	100%	1,320	0.162	3.089	1.183	0.059	525.997	0.005	0.006	0.111	0.042	0.002	18.878	0.000	0.01	0.15	0.06	0.00	24.92	0.00
Drill rigs	1	221	50%	100%	1,000	0.102	0.983	0.825	0.030	521.059	0.005	0.011	0.109	0.091	0.003	57.577	0.001	0.01	0.11	0.09	0.00	57.58	0.00
30 ton cranes	1	231	29%	100%	1,000	0.356	3.362	3.321	0.181	528.683	0.005	0.024	0.225	0.222	0.012	35.416	0.000	0.02	0.23	0.22	0.01	35.42	0.00
											EXH-12 Total (kg/h and tonne/year)	0.041	0.445	0.356	0.017	111.872	0.001	0.04	0.48	0.37	0.02	117.91	0.00
											EXH-12 Total (lb/h and ton/year)	**0.090**	**0.980**	**0.785**	**0.038**	**246.634**	**0.002**	**0.05**	**0.53**	**0.41**	**0.02**	**129.98**	**0.00**

Notes

[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2020.4.0)

[b] Hourly emission rate (kg/hr) = Engine HP-rating x Emission Factor (g/hp-hr) x No. of Equipment x (kg/1,000 g).

[c] Annual emission rate (tonne/year) = Hourly Emission Rate (kg/h) x Annual Operating Hours (hr/year) x (tonne/1,000 kg).

[d] See the equipment use hour calculation below.

[e] Engine HP and Load factors from California Emissions Estimator Model (CalEEMod version 2020.4.0)

T-Line distance to SCE Whirlwind Substation: point to point=16 miles to WSW
Actual T-Line route distance ~= 19 miles Avg Distance between pole sites ~= 850 ft.
Estimated Max # of **offsite** pole sites = 125 (per Applicant)
Estimated maximum total acres disturbed for construction of all **offsite** pole sites =16 acres. Plus 5 acres at mid-point, plus 5 acres at substation = 26 acres.
Max const time at each pole site = 24 hrs (broken down as follows)

Backhoe use, max hrs per site	8	(clear the pole setting area and rough leveling, before and after)
Drill rig use, max hrs per site	8	(drill the single pole foundation hole)
Crane use,max hrs per site	8	(lift pole onto the mounting plate, hold till secured)

(Interim crane use - set the mounting plate and rebar cage, and pour concrete)
Max hours of use for each identified piece of construction equipment = 8 x 125 = 1000
Additional hours for backhoe for underground portion of T-Line ~= 320 hrs
Fugitive dust emissions from the 2.3 acres disturbed for the pole sites is as follows:
Disturbed area by backhoe for underground portion of route <= 2 acres

	Pole sites	Underground	
EF, lb/acre-work hr	0.13	0.13	WRAP Fugitive Dust Handbook, Sept 2006, Table 3.2
Work hrs per site	24	320	
Site area, ft2	800	87120	
Site area, acres	26.00000	2	
PM10 per Site, lbs	81.120	83.200	
# of Offsite Pole Sites	125	0	
Total PM10 Emissions, lbs	10140.00	83.200	
T-Line Const, months	18	18	
Estimated PM10, lbs/period	10140.00	83.200	
Watering Control Eff = 50%	0.5	0.5	
Controlled PM10 Emissions, lbs	5070.0	41.6	lbs per construction period
		2.56	Total tons per construction period
	PM10	1.7	Tons per normalized year (any 12 month period)

TABLE 7
GREENHOUSE GASES OFF-SITE EMISSION ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase-High 12 Month Period
Hydrostor WRESC

Road ID	Description	Vehicle	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Fuel Type	Total Miles Travelled (VMT/day)	Total Miles Travelled (VMT/year)	GHG Emissions Factors (g/mile) [a]			Annual Emissions [c]		
									CO2	CH4	N2O	Total CO_2 (tons/yr)	Total CH_4 (tons/yr)	Total N_2O (tons/yr)
Road 1	Rosamond CDP, CA	Worker Vehicles	8.00	365	0.16	Gas	1,392	508,080	338.8	0.0026	0.0057	189.75	0.0015	0.0032
Road 2	Lancaster City, CA	Worker Vehicles	34.00	365	0.7	Gas	8,602	3,139,730	338.8	0.0026	0.0057	1172.59	0.0091	0.0197
Road 3	Palmdale City, CA	Worker Vehicles	50.00	365	1.0	Gas	8,550	3,120,750	338.8	0.0026	0.0057	1165.51	0.0090	0.0196
Road 4	Los Angeles City, CA	Worker Vehicles	178.00	365	3.6	Gas	890	324,850	338.8	0.0026	0.0057	121.32	0.0009	0.0020
Road 5	Mojave CDP, CA	Worker Vehicles	22.00	365	0.4	Gas	66	24,090	338.8	0.0026	0.0057	9.00	0.0001	0.0002
Road 6	Tehachapi City, CA	Worker Vehicles	64.00	365	1.3	Gas	192	70,080	338.8	0.0026	0.0057	26.17	0.0002	0.0004
Road 7	California City, CA	Worker Vehicles	50.00	365	1.0	Gas	100	36,500	338.8	0.0026	0.0057	13.63	0.0001	0.0002
Road 8	Santa Clarita City, CA	Worker Vehicles	118.00	365	2.4	Gas	236	86,140	338.8	0.0026	0.0057	32.17	0.0002	0.0005
Road 9	Sun Village CDP, CA	Worker Vehicles	72.00	365	1.4	Gas	144	52,560	338.8	0.0026	0.0057	19.63	0.0002	0.0003
Road 10	Quartz Hill CDP, CA	Worker Vehicles	46.00	365	0.9	Gas	46	16,790	338.8	0.0026	0.0057	6.27	0.0000	0.0001
Road 11	Port of Los Angeles	Flatbed tractor trailer	230.00	365	2.3	ULSD	345	125,925	1,530.0	0.0006	0.2411	212.38	0.0001	0.0335
Road 12	Port of Oakland	Flatbed tractor trailer	690.00	365	6.9	ULSD	345	125,925	1,530.0	0.0006	0.2411	212.38	0.0001	0.0335
Road 13	Waste Rock Storage on Site (arch. berm)	Dump trucks (12 yd)	0.00	365	0.0	ULSD	0	0	1,530.0	0.0006	0.2411	0.00	0.0000	0.0000
Road 14	Misc Deliveries from Local/Regional Area	Flatbed or Box trailer	42.00	312	10.0	ULSD	126	32760	1,530.0	0.0006	0.2411	55.25	0.0000	0.0087

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Table 8 Emissions Factor Development

Fleet aggregate average vehicle emission factors for 2025 in Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Type	Fleet Aggregate Average Air Pollutant Emissions Factors for 2025										
	CO (g/mile)	NO_X (g/mile)	SO_2 (g/mile)	$PM_{10\ Exhaust}$ (g/mile)	$PM_{10\ TBW}$ (g/mile)	$PM_{2.5\ Exhaust}$ (g/mile)	$PM_{2.5\ TBW}$ (g/mile)	VOC (g/mile)	CO2 (g/mile)	CH4 (g/mile)	N2O (g/mile)
LDGV	0.8383	0.0642	0.0033	0.0012	0.0151	0.0011	0.0045	0.0101	338.8119	0.0026	0.0057
HHDT	0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.0132	1,530.0419	0.0006	0.2411

LDGV -Gas = Light-Duty Vehicles Gasoline
HHDT - Diesel = Heavy-Heavy Duty Trucks (>33,000 lb GVWR) Diesel Fueled
TBW = tire and brake wear

Hydrostor WRESC - Offsite T-Line Construction and Offsite Vehicle/Truck Traffic Emissions Estimates

Hydrostor WRESC - Construction Workers Trips

Location	Percentage Commute	Non-specialized Workers (15%)	Average One-Way Distance (Miles)	NSW One-Way Miles Traveled	Percentage Lodging	Specialized Workers (85%)	SW One-Way Miles Travelled
Rosamond CDP, CA	47%	43	4	172	25%	131	524
Lancaster City, CA	19%	16	17	272	45%	237	4029
Palmdale City, CA	14%	13	25	325	30%	158	3950
Los Angeles City, CA	6%	5	89	445			
Mojave CDP, CA	4%	3	11	33			
Tehachapi City, CA	3%	3	32	96			
California City, CA	2%	2	25	50			
Santa Clarita City, CA	2%	2	59	118			
Sun Village CDP, CA	2%	2	36	72			
Quartz Hill CDP, CA	1%	1	23	23			
		90		1606		526	8,503
Total Miles Travelled (Workers)							10,109
Total Number of Workers per Avg Day for highest manpower year (2028) = 615							616
Vehicle Miles Traveled per capita							16.4

WRESC - Truck Delivery and Waste Hauling Trips

Location	Percentage of Trips	One-Way Distance (Miles)	Truck Deliveries per Day	Miles Traveled per Year	Percentage of Mileage
Port of Los Angeles	75%	115	3	125,925	50%
Port of Oakland	25%	345	1	125,925	50%
		RT Distance, mi.	**Hauls Per Day**		
Waste Rock Haulage Opt #1	Holiday Quarry	19.7	180	1,294,290	
Waste Rock Haulage Opt #2	Vulcan Palmdale	67	180	4,401,900	
Waste Rock Storage on Site (arch. berm)		0	0	0	**Berm Option**
					(all hauling emissions are onsite)

Notes:

Road 14 was added for misc delvieries from the local/regional area, i.e., Lancaster and Palmdale suppliers and depots.
Avg RT delivery distance was 42 miles at 3 deliveries per day for a maximum of 312 days per year. See Tables 3 and 4 for Road 14 data and emissions.

Waste Rock Haulage Option 2 is Worst Case, and was used for conservative emissions estimates.

HHDT from the two Ports will be brokered, therefore the one-way distance is used to assign the offsite emissions from these deliveries.
Port deliveries assumed to occur for 365 days/yr during the high 12 month period.

Project Manpower Data Summary	9/5/2023	With Berm Update 12/12/2023
Avg daily manpower for 60 month period	268	269
Max single month	728	731
Max year avg month	615	532

Offsite Construction Emissions
No Berm Option

TABLE 1
OFF-SITE EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCION PHASE-High 12 Month Period
Hydrostor WRESC

ID	Activity	Description	PM_{10} Annual (tons/yr)	$PM_{2.5}$ Annual (tons/yr)	Nox Annual (tons/yr)	VOC Annual (tons/yr)	CO Annual (tons/yr)	SO_2 Annual (tons/yr)
Non-Stationary Sources								
Offsite Unpaved Roads Fugitives ***(Category does not apply to Offsite Emissions)***								
UP1	Cavern Works		0.0	0.0	-	-	-	-
UP2	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.0	0.0	-	-	-	-
UP3	Cavern Works	Equipment mobilization - Cavern Works	0.0	0.0	-	-	-	-
UP4	Cavern Works	Equipment demobilization - Cavern Works	0.0	0.0	-	-	-	-
UP5	Cavern Works	Fuel delivery - Cavern Works	0.0	0.0	-	-	-	-
UP6	Cavern Works	Fencing delivery - Cavern Works	0.0	0.0	-	-	-	-
UP7	Cavern Works	Concrete trucks - Cavern Works	0.0	0.0	-	-	-	-
UP8	Cavern Works	Gravel delivery - Cavern Works	0.0	0.0	-	-	-	-
UP9	Cavern Works	Trailer delivery - Cavern Works	0.0	0.0	-	-	-	-
UP10	Cavern Works	Workforce (Shaft) - Cavern Works	0.0	0.0	-	-	-	-
UP11	Cavern Works	Shaft cuttings for disposal - Cavern Works	0.0	0.0	-	-	-	-
UP12	Cavern Works	Workforce (Mining) - Cavern Works	0.0	0.0	-	-	-	-
UP13	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.0	0.0	-	-	-	-
UP14	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.0	0.0	-	-	-	-
UP15	Cavern Works	Ground support - Cavern Works	0.0	0.0	-	-	-	-
UP16	Cavern Works	Explosives - Cavern Works	0.0	0.0	-	-	-	-
UP17	Surface Works	Transportation of waste rock - Cavern Works	0.0	0.0	-	-	-	-
UP18	Surface Works	Workforce - Surface Works	0.0	0.0	-	-	-	-
UP19	Surface Works	Site clearing (overburden) - Surface Works	0.0	0.0	-	-	-	-
UP20	Surface Works	Civil foundation excavation Surface Works	0.0	0.0	-	-	-	-
UP21	Surface Works	Cement Trucks Surface Works	0.0	0.0	-	-	-	-
UP22	Surface and Cavern Works	Equipment and material delivery Surface Works	0.0	0.0	-	-	-	-
UP23	Surface and Cavern Works	Potable Water - Surface and Cavern	0.0	0.0	-	-	-	-
UP24	Reservoir Fill	Non Potable Water - Surface and Cavern	0.0	0.0	-	-	-	-
		Total Unpaved Fugitives	0.00	0.00	0.00	0.00	0.00	0.00
Exhaust Emissions from Non-Road Engines								
EXH-12	Transmission Line Construction	Civil works - Typical equipment	0.02	0.02	0.41	0.05	0.53	0.00
		T-Line Construction Exhaust Emissions	0.02	0.02	0.41	0.05	0.53	0.00

T-Line Const Sites and Paved Roads Fugitive Emissions								
Road 1	Workforce	From Rosamond CDP, CA to Site	0.03	0.00	-	-	-	-
Road 2	Workforce	From Lancaster City, CA to Site	0.18	0.00	-	-	-	-
Road 3	Workforce	From Palmdale City, CA to Site	0.18	0.00	-	-	-	-
Road 4	Workforce	From Los Angeles City, CA to Site	0.02	0.00	-	-	-	-
Road 5	Workforce	From Mojave CDP, CA to Site	0.00	0.00	-	-	-	-
Road 6	Workforce	From Tehachapi City, CA to Site	0.00	0.00	-	-	-	-
Road 7	Workforce	From California City, CA to Site	0.00	0.00	-	-	-	-
Road 8	Workforce	From Santa Clarita City, CA to Site	0.00	0.00	-	-	-	-
Road 9	Workforce	From Sun Village CDP, CA to Site	0.00	0.00	-	-	-	-
Road 10	Workforce	From Quartz Hill CDP, CA to Site	0.00	0.00	-	-	-	-
Road 11	Trucks	From Port of Los Angeles to Site	0.11	0.00	-	-	-	-
Road 12	Trucks	From Port of Oakland to Site	0.11	0.00	-	-	-	-
Road 13	Trucks	Waste Rock Haulage - Option 2	4.22	0.07	-	-	-	-
Road 14	Trucks	Misc Deliveries from Local Area/Region	0.30	0.00	-	-	-	-
	Fugitive Dust	T-Line Construction Sites, Laydown Areas, etc.	1.70	0.36				
		Total Paved	6.88	0.44	0.00	0.00	0.00	0.00
Exhaust Emissions from Haul Truck Traffic on Paved Roads								
Road 1	Workforce	From Rosamond CDP, CA to Site	0.0091	0.0031	0.0360	0.0346	0.4695	0.0019
Road 2	Workforce	From Lancaster City, CA to Site	0.0565	0.0194	0.2222	0.2135	2.9012	0.0116
Road 3	Workforce	From Palmdale City, CA to Site	0.0562	0.0193	0.2208	0.2122	2.8837	0.0115
Road 4	Workforce	From Los Angeles City, CA to Site	0.0058	0.0020	0.0230	0.0221	0.3002	0.0012
Road 5	Workforce	From Mojave CDP, CA to Site	0.0004	0.0001	0.0017	0.0016	0.0223	0.0001
Road 6	Workforce	From Tehachapi City, CA to Site	0.0013	0.0004	0.0050	0.0048	0.0648	0.0003
Road 7	Workforce	From California City, CA to Site	0.0007	0.0002	0.0026	0.0025	0.0337	0.0001
Road 8	Workforce	From Santa Clarita City, CA to Site	0.0015	0.0005	0.0061	0.0059	0.0796	0.0003
Road 9	Workforce	From Sun Village CDP, CA to Site	0.0009	0.0003	0.0037	0.0036	0.0486	0.0002
Road 10	Workforce	From Quartz Hill CDP, CA to Site	0.0003	0.0001	0.0012	0.0011	0.0155	0.0001
Road 11	Trucks	From Port of Los Angeles to Site	0.0195	0.0088	0.2170	0.0258	0.0084	0.0020
Road 12	Trucks	From Port of Oakland to Site	0.0195	0.0088	0.2170	0.0258	0.0084	0.0020
Road 13	Trucks	Waste Rock Haulage - Option 2	0.7338	0.3304	8.1513	0.9695	0.3171	0.0755
Road 14	Trucks	Misc Deliveries from Local Area/Region	0.0002	0.0001	0.0018	0.0002	0.0001	0.0000
		Total Non-Road Exhaust on Paved Roads	0.91	0.39	9.11	1.52	7.15	0.11
		Total Emissions, tons (12 month period)	**7.8**	**0.9**	**9.5**	**1.6**	**7.7**	**0.11**
		Average Monthly Emissions, lbs	**1,301.5**	**142.1**	**1,586.1**	**261.7**	**1,280.4**	**18.0**
		Average Daily Emissions, lbs	**43.4**	**4.7**	**52.9**	**8.7**	**42.7**	**0.6**

TABLE 2
OFF-SITE EMISSIONS SUMMARY - GREENHOUSE GASES
CONSTRUCION PHASE -High 12 Month Period
Hydrostor WRESC

ID	Activity	Description	CO_2 Annual (tons/yr)	CH_4 Annual (tons/yr)	N_2O Annual (tons/yr)
Non-Stationary Sources					
Exhaust Emissions from Non-Road Engines					
EXH-12	Transmission Line Construction	Civil works - Typical equipment	129.98	-	-
		Total Non-Road Exhaust	129.98	0.00	0.00
Exhaust Emissions from Haul Truck Traffic on Paved Roads					
Road 1	Workforce	From Rosamond CDP, CA to Site	189.75	0.00	0.00
Road 2	Workforce	From Lancaster City, CA to Site	1,172.59	0.01	0.02
Road 3	Workforce	From Palmdale City, CA to Site	1,165.51	0.01	0.02
Road 4	Workforce	From Los Angeles City, CA to Site	121.32	0.00	0.00
Road 5	Workforce	From Mojave CDP, CA to Site	9.00	0.00	0.00
Road 6	Workforce	From Tehachapi City, CA to Site	26.17	0.00	0.00
Road 7	Workforce	From California City, CA to Site	13.63	0.00	0.00
Road 8	Workforce	From Santa Clarita City, CA to Site	32.17	0.00	0.00
Road 9	Workforce	From Sun Village CDP, CA to Site	19.63	0.00	0.00
Road 10	Workforce	From Quartz Hill CDP, CA to Site	6.27	0.00	0.00
Road 11	Trucks	From Port of Los Angeles to Site	212.38	0.00	0.03
Road 12	Trucks	From Port of Oakland to Site	212.38	0.00	0.03
Road 13	Trucks	Waste Rock Haulage - Option 2	7,978.08	0.00	1.26
Road 14	Trucks	Misc Deliveries from Local/Regional Area	55.25	0.00	0.01
		Total Traffic Exhaust on Paved Roads	11,214.13	0.02	1.38
		Total Emissions	**11,344.1**	**0.02**	**1.4**

Greenhouse Gases (GHGs)	Global Warming Potential (GWP)	Emission Rate (lb/hr)[a]	Emission Rate (TPY)	Annual Emissions (TPY CO_2e)
Carbon dioxide (CO_2)	1	0.000	11,344.1	11,344
Methane (CH_4)	25	0.000	0.02	1
Nitrous oxide (N_20)	298	0.000	1.4	411
			Total	**11,756**

[a] Appropriate reporting units are tons/yr.

Table 3
Fugitive Particulate Matter (PM) Off-Site Emissions from Vehicle Movement on Paved Roads
Construction Phase-High 12 Month Period
Hydrostor WRESC

Parameters	Construction Workforce															
	Road 1		Road 2		Road 3		Road 4		Road 5		Road 6		Road 7		Road 8	
	From Rosamond CDP, CA		From Lancaster City, CA		From Palmdale City, CA		From Los Angeles City, CA		From Mojave CDP, CA		From Tehachapi City, CA		From California City, CA		From Santa Clarita City, CA	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data																
W = Average Vehicle Weight (tons) [b]	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Daily Operation Hours (hrs/day)	0.16	0.16	0.68	0.68	1.00	1.00	3.56	3.56	0.44	0.44	1.28	1.28	1.00	1.00	2.36	2.36
Total No. of Operating Days for activity (days) [b]	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
Total No. of equipment for activity (#/day) [b]	174	174	253	253	171	171	5	5	3	3	3	3	2	2	2	2
D = Distance traveled on Paved roads (RT miles) [c]	8	8	34	34	50	50	178	178	22	22	64	64	50	50	118	118
Daily Vehicle Miles Travelled (VMT)	1,392	1,392	8,602	8,602	8,550	8,550	890	890	66	66	192	192	100	100	236	236
Activity Duration Vehicle Miles Travelled (VMT)	508,080	508,080	3,139,730	3,139,730	3,120,750	3,120,750	324,850	324,850	24,090	24,090	70,080	70,080	36,500	36,500	86,140	86,140
Site Characteristics																
k = Particle size multiplier (lb/VMT) [d]	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003
sL = Silt Loading (g/m^2) [e]	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [f]	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
a (constant)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant)	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Control Efficiency																
Dust Control Efficiency (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emission Factors [a]																
Emission Factor (lb/VMT) - Daily	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000
Emission Factor (lb/VMT) - Annual	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000
Emission Rates [a]																
Uncontrolled Emissions - Annual (tons/yr, TPY)	0.03	0.00	0.18	0.00	0.18	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Controlled Annual Emissions (TPY)	0.03	0.00	0.18	0.00	0.18	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes:

[a] Emission Factor (E) calculated from AP-42 Section 13.2.1 (Paved Roads) Equation 2 -
E = k * (sL)^a * (W)^b * (1-P/(4X365))

[b] Assumed LDGV (LDP or LDT) for workforce and HHDT at 12 cubic yard (21 tons) of capacity based on the document TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor. Assumed high 12 month period

[c] Estimated average distance travelled by each vehicle based on data supplied by Applicant

[d] Particle size multiplier and constants per CARB.

[e] Silt loading based on "2020 National Emissions Inventory TSD-Dust Paved Roads, EPA OAQPS, EPA-454/R-23-001w, March 2023,Table 23-2 (Rural and Urban Interstates, Freeways, and Expressways = 0.015 g/m2 for all ADVT categories.
Avg passenger vehicle weight per CARB is 2.4 tons.

[f] Precipitation data: AP-42, Section 13.2.2 (Unpaved Roads), Figure 13.2.2-1, 11/2006.
Travel times based on an average speed of 60 mph on high capacity interstate roads, freeways, and expressways with a 20% time margin added. See reference in footnote "e" above.

[g] Road 14 added for misc material and supply deliveries from the local Lancaster/Palmdale area. Avg RT mileage = 42 assuming 50% from Lancaster and 50% from Palmdale.
(Types of deliveries anticipated per day: concrete, gravel, fuel, potable water, non-potable water, equipment, misc building supplies, etc.)

		Truck Trips									
Road 9		Road 10		Road 11		Road 12		Road 13		Road 14[9]	
From Sun Village CDP, CA		From Quartz Hill CDP, CA		From Port of Los Angeles		From Port of Oakland		Waste Rock Haulage Option 2		Misc Deliveries from Local Area	
PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
2.4	2.4	2.4	2.4	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35
1.44	1.44	0.92	0.92	2.30	2.30	6.90	6.90	10	10	0.84	0.84
365	365	365	365	365	365	365	365	365	365	312	312
2	2	1	1	3	3	1	1	18	18	25	25
72	72	46	46	115	115	345	345	72	72	42	42
144	144	46	46	345	345	345	345	12,960	12,960	1,050	1,050
52,560	52,560	16,790	16,790	125,925	125,925	125,925	125,925	4,730,400	4,730,400	327,600	327,600
0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003	0.0022	0.00003
0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
20	20	20	20	20	20	20	20	20	20	20	20
0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
0	0	0	0	0	0	0	0	0	0	0	0
0.0001	0.0000	0.0001	0.0000	0.0018	0.0000	0.0018	0.0000	0.0018	0.0000	0.0019	0.0000
0.0001	0.0000	0.0001	0.0000	0.0018	0.0000	0.0018	0.0000	0.0018	0.0000	0.0019	0.0000
0.00	0.00	0.00	0.00	0.1	0.0	0.1	0.0	4.2	0.1	0.3	0.0
0.00	0.00	0.00	0.00	0.1	0.0	0.1	0.0	4.2	0.1	0.3	0.0

would be 365 work days. See footnote "e" below.

TABLE 4 (4 Pages)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR OFF-SITE EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase
Hydrostor WRESC

Road ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	EMFAC Vehicle Type: Vehicle Type	EMFAC Vehicle Type: Weight Range (lbs)	Fuel Type	Total Miles Travelled (VMT/day)	Pollutants from Vehicle Exhaust and Tire & Brake Wear: CO	NO_X	SO_2	$PM_{10\ Exhaust}$	$PM_{10\ TBW}$	$PM_{2.5\ Exhaust}$	$PM_{2.5\ TBW}$	VOC
										Fleet Aggregate Average Air Pollutant Emissions Factors (g/mile) [a]							
						LDGV	<6,000	Gas		0.8383	0.0642	0.0033	0.0012	0.0151	0.0011	0.0045	0.0617
						HHDT	>33,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859
										Daily Emissions (lbs/day) [b]							
Road 1	Rosamond CDP, CA	8	365	0.16	5,400	LDGV	<6,000	Gas	1,392	2.57E+00	1.97E-01	1.03E-02	3.72E-03	4.64E-02	3.42E-03	1.38E-02	1.89E-01
Road 2	Lancaster City, CA	34	365	0.68	5,400	LDGV	<6,000	Gas	8,602	1.59E+01	1.22E+00	6.35E-02	2.30E-02	2.87E-01	2.12E-02	8.51E-02	1.17E+00
Road 3	Palmdale City, CA	50	365	1.00	5,400	LDGV	<6,000	Gas	8,550	1.58E+01	1.21E+00	6.31E-02	2.29E-02	2.85E-01	2.10E-02	8.46E-02	1.16E+00
Road 4	Los Angeles City, CA	178	365	3.56	5,400	LDGV	<6,000	Gas	890	1.64E+00	1.26E-01	6.57E-03	2.38E-03	2.96E-02	2.19E-03	8.81E-03	1.21E-01
Road 5	Mojave CDP, CA	22	365	0.44	5,400	LDGV	<6,000	Gas	66	1.22E-01	9.34E-03	4.87E-04	1.77E-04	2.20E-03	1.62E-04	6.53E-04	8.98E-03
Road 6	Tehachapi City, CA	64	365	1.28	5,400	LDGV	<6,000	Gas	192	3.55E-01	2.72E-02	1.42E-03	5.14E-04	6.40E-03	4.72E-04	1.90E-03	2.61E-02
Road 7	California City, CA	50	365	1.00	5,400	LDGV	<6,000	Gas	100	1.85E-01	1.42E-02	7.38E-04	2.68E-04	3.33E-03	2.46E-04	9.90E-04	1.36E-02
Road 8	Santa Clarita City, CA	118	365	2.36	5,400	LDGV	<6,000	Gas	236	4.36E-01	3.34E-02	1.74E-03	6.31E-04	7.86E-03	5.81E-04	2.34E-03	3.21E-02
Road 9	Sun Village CDP, CA	72	365	1.44	5,400	LDGV	<6,000	Gas	144	2.66E-01	2.04E-02	1.06E-03	3.85E-04	4.80E-03	3.54E-04	1.42E-03	1.96E-02
Road 10	Quartz Hill CDP, CA	46	365	0.92	5,400	LDGV	<6,000	Gas	46	8.50E-02	6.51E-03	3.40E-04	1.23E-04	1.53E-03	1.13E-04	4.55E-04	6.26E-03
Road 11	Port of Los Angeles	230	365	2.3	78,000	HHDT	>33,000	Diesel	345	4.63E-02	1.19E+00	1.10E-02	2.22E-02	8.48E-02	2.12E-02	2.70E-02	4.69E-02
Road 12	Port of Oakland	690	365	6.9	78,000	HHDT	>33,000	Diesel	345	4.63E-02	1.19E+00	1.10E-02	2.22E-02	8.48E-02	2.12E-02	2.70E-02	4.69E-02
Road 13	Waste Rock Haulage Opt #2	72	365	10.0	89,000	HHDT	>33,000	Diesel	12,960	1.74E+00	4.47E+01	4.14E-01	8.33E-01	3.19E+00	7.97E-01	1.01E+00	1.76E+00
Road 14	Misc Deliveries from Local Area/Region	42	260	10.0	78,000	HHDT	>33,000	Diesel	1,050	1.41E-01	3.62E+00	3.35E-02	6.75E-02	2.58E-01	6.46E-02	8.21E-02	1.43E-01

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).
LDGV = LDP and/or LDT

Potential Waste Rock Haul Routes and approx. Distances (RT miles) for the No Berm Option
Vulcan-Palmdale, 67 miles
Vulcan-Palmdale Option 2, 72 miles
Robertson-Palmdale, 68 miles
Holiday Quarry, 19.7 miles
Ridgeline Quarry, 22.7 miles
Golden Queen Mine/Quarry,16 miles

TABLE 4 (4 Pages)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR OFF-SITE EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase-High 12 Month Period
Hydrostor WRESC

Road ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	EMFAC Vehicle Type		Fuel Type	Total Miles Travelled (VMT/year)	Pollutants from Vehicle Exhaust and Tire & Brake Wear								Annual Emissions					
						Vehicle Type	Weight Range (lbs)			CO	NO_X	SO_2	PM_{10} Exhaust	$PM_{10\ TBW}$	$PM_{2.5}$ Exhaust	$PM_{2.5\ TBW}$	VOC	Total PM_{10} (tons/yr)	Total $PM_{2.5}$ (tons/yr)	Total VOC (tons/yr)	Total NOx (tons/yr)	Total CO (tons/yr)	Total SO_2 (tons/yr)
										Fleet Aggregate Average Air Pollutant Emissions Factors (g/mile) [a]													
						LDGV	<6,000	Gas		0.8383	0.0642	0.0033	0.0012	0.0151	0.0011	0.0045	0.0617						
						HHDT	>33,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859						
										Annual Emissions (lbs/year) [b]													
Road 1	Rosamond CDP, CA	8	365	0.16	5400	LDGV	<6,000	Gas	508,080	938.96	71.90	3.75	1.36	16.92	1.25	5.03	69.11	0.0091	0.0031	0.0346	0.0360	0.4695	0.0019
Road 2	Lancaster City, CA	34	365	0.68	5400	LDGV	<6,000	Gas	3,139,730	5802.39	444.32	23.18	8.40	104.59	7.72	31.07	427.08	0.0565	0.0194	0.2135	0.2222	2.9012	0.0116
Road 3	Palmdale City, CA	50	365	1	5400	LDGV	<6,000	Gas	3,120,750	5767.31	441.63	23.04	8.35	103.96	7.68	30.88	424.49	0.0562	0.0193	0.2122	0.2208	2.8837	0.0115
Road 4	Los Angeles City, CA	178	365	3.56	5400	LDGV	<6,000	Gas	324,850	600.34	45.97	2.40	0.87	10.82	0.80	3.21	44.19	0.0058	0.0020	0.0221	0.0230	0.3002	0.0012
Road 5	Mojave CDP, CA	22	365	0.44	5400	LDGV	<6,000	Gas	24,090	44.52	3.41	0.18	0.06	0.80	0.06	0.24	3.28	0.0004	0.0001	0.0016	0.0017	0.0223	0.0001
Road 6	Tehachapi City, CA	64	365	1.28	5400	LDGV	<6,000	Gas	70,080	129.51	9.92	0.52	0.19	2.33	0.17	0.69	9.53	0.0013	0.0004	0.0048	0.0050	0.0648	0.0003
Road 7	California City, CA	50	365	1	5400	LDGV	<6,000	Gas	36,500	67.45	5.17	0.27	0.10	1.22	0.09	0.36	4.96	0.0007	0.0002	0.0025	0.0026	0.0337	0.0001
Road 8	Santa Clarita City, CA	118	365	2.36	5400	LDGV	<6,000	Gas	86,140	159.19	12.19	0.64	0.23	2.87	0.21	0.85	11.72	0.0015	0.0005	0.0059	0.0061	0.0796	0.0003
Road 9	Sun Village CDP, CA	72	365	1.44	5400	LDGV	<6,000	Gas	52,560	97.13	7.44	0.39	0.14	1.75	0.13	0.52	7.15	0.0009	0.0003	0.0036	0.0037	0.0486	0.0002
Road 10	Quartz Hill CDP, CA	46	365	0.92	5400	LDGV	<6,000	Gas	16,790	31.03	2.38	0.12	0.04	0.56	0.04	0.17	2.28	0.0003	0.0001	0.0011	0.0012	0.0155	0.0001
Road 11	Port of Los Angeles	230	365	2.3	78000	HHDT	>33,000	Diesel	125,925	16.88	433.98	4.02	8.10	30.97	7.75	9.84	51.62	0.0195	0.0088	0.0258	0.2170	0.0084	0.0020
Road 12	Port of Oakland	690	365	6.9	78000	HHDT	>33,000	Diesel	125,925	16.88	433.98	4.02	8.10	30.97	7.75	9.84	51.62	0.0195	0.0088	0.0258	0.2170	0.0084	0.0020
Road 13	Waste Rock Haulage Opt #2	72	365	10	89000	HHDT	>33,000	Diesel	4,730,400	634.28	16302.59	151.10	304.19	1163.32	291.04	369.82	1939.09	0.7338	0.3304	0.9695	8.1513	0.3171	0.0755
Road 14	Misc Deliveries from Local Area/Region	42	312	10	78000	HHDT	>33,000	Diesel	1,050	0.14	3.62	0.03	0.07	0.26	0.06	0.08	0.43	0.0002	0.0001	0.0002	0.0018	0.0001	0.0000

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).
LDGV = LDP and/or LDT

Table 5
Estimation of Off-Site Emissions Factors for Non-Road Equipment Used in the Project
Construction Phase-Offsite T-Line
Hydrostor WRESC

Equipment Description	Number of Equipment	Engine Power (hp)	Emission Factor (EF) [a]							CalEEMod Equipment Type
			ROG (g/hp-h)	CO (g/hp-h)	NOx (g/hp-h)	$PM_{10}/PM_{2.5}$ (g/hp-h)	CO2 (g/hp-hr)	SO_2 (g/hp-h)		
Transmission Line Construction (Civil works - Typical equipment)										
Backhoe	1	97	0.162	3.089	1.183	0.059	525.997	0.0049		Tractors/Loaders/Backhoes
Drill rigs	1	221	0.102	0.983	0.825	0.030	521.059	0.0048		Bore/Drill Rigs
30 ton cranes	1	231	0.356	3.362	3.321	0.181	528.683	0.0049		Cranes

Notes
[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2020.4.0)

Table 6
Estimation of Off-Site Emissions Rates for Non-Road Equipment used in the Project
Construction Phase-Offsite T-Line
Hydrostor WRESC

Equipment Description	NUMBER OF EQUIPMENT	ENGINE POWER (hp)	Load Factor[e] (%)	Availability (%)	Estimated Equipment Use Hours [d]	Emission Factors [a] ROG (g/hp-h)	CO (g/hp-h)	NOx (g/hp-h)	$PM_{10}/PM_{2.5}$ (g/hp-h)	CO2 (g/hp-hr)	SO2 (g/hp-h)
Transmission Line Construction (Civil works - Typical equipment)											
Backhoe	1	97	37%	100%	1,320	0.162	3.089	1.183	0.059	525.997	0.005
Drill rigs	1	221	50%	100%	1,000	0.102	0.983	0.825	0.030	521.059	0.005
30 ton cranes	1	231	29%	100%	1,000	0.356	3.362	3.321	0.181	528.683	0.005

Equipment Description	Hourly Emission Rates (Average Hourly) [b] ROG (kg/h)	CO (kg/h)	NOx (kg/h)	$PM_{10}/PM_{2.5}$ (kg/h)	CO2 (kg/h)	SO2 (kg/h)	Annual Emission Rates (Average Annual) [c] ROG (tonne/year)	CO (tonne/year)	NOx (tonne/year)	$PM_{10}/PM_{2.5}$ (tonne/year)	CO2 (tonne/year)	SO2 (tonne/year)
Backhoe	0.006	0.111	0.042	0.002	18.878	0.000	0.01	0.15	0.06	0.00	24.92	0.00
Drill rigs	0.011	0.109	0.091	0.003	57.577	0.001	0.01	0.11	0.09	0.00	57.58	0.00
30 ton cranes	0.024	0.225	0.222	0.012	35.416	0.000	0.02	0.23	0.22	0.01	35.42	0.00
EXH-12 Total (kg/h and tonne/year)	0.041	0.445	0.356	0.017	111.872	0.001	0.04	0.48	0.37	0.02	117.91	0.00
EXH-12 Total (lb/h and ton/year)	**0.090**	**0.980**	**0.785**	**0.038**	**246.634**	**0.002**	**0.05**	**0.53**	**0.41**	**0.02**	**129.98**	**0.00**

Notes

[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2020.4.0)

[b] Hourly emission rate (kg/hr) = Engine HP-rating x Emission Factor (g/hp-hr) x No. of Equipment x (kg/1,000 g).

[c] Annual emission rate (tonne/year) = Hourly Emission Rate (kg/h) x Annual Operating Hours (hr/year) x (tonne/1,000 kg).

[d] See the equipment use hour calculation below.

[e] Engine HP and Load factors from California Emissions Estimator Model (CalEEMod version 2020.4.0)

T-Line distance to SCE Whirlwind Substation: point to point=16 miles to WSW
Actual T-Line route distance ~= 19 miles Avg Distance between pole sites ~= 850 ft.
Estimated Max # of **offsite** pole sites = 125 (per Applicant)
Estimated maximum total acres disturbed for construction of all **offsite** pole sites =16 acres. Plus 5 acres at mid-point, plus 5 acres at substation = 26 acres.
Max const time at each pole site = 24 hrs (broken down as follows)
Backhoe use, max hrs per site 8 (clear the pole setting area and rough leveling, before and after)
Drill rig use, max hrs per site 8 (drill the single pole foundation hole)
Crane use,max hrs per site 8 (lift pole onto the mounting plate, hold till secured)
(Interim crane use - set the mounting plate and rebar cage, and pour concrete)
Max hours of use for each identified piece of construction equipment = 8 x 125 = 1000
Additional hours for backhoe for underground portion of T-Line ~= 320 hrs
Fugitive dust emissions from the 2.3 acres disturbed for the pole sites is as follows:
Disturbed area by backhoe for underground portion of route <= 2 acres

	Pole sites	Underground	
EF, lb/acre-work hr	0.13	0.13	WRAP Fugitive Dust Handbook, Sept 2006, Table 3.2
Work hrs per site	24	320	
Site area, ft2	800	87120	
Site area, acres	26.00000	2	
PM10 per Site, lbs	81.120	83.200	
# of Offsite Pole Sites	125	0	
Total PM10 Emissions, lbs	10140.00	83.200	
T-Line Const, months	18	18	
Estimated PM10, lbs/period	10140.00	83.200	
Watering Control Eff = 50%	0.5	0.5	
Controlled PM10 Emissions, lbs	5070.0	41.6	lbs per construction period
		2.56	Total tons per construction period
	PM10	1.7	Tons per normalized year (any 12 month period)

TABLE 7
GREENHOUSE GASES OFF-SITE EMISSION ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase-High 12 Month Period
Hydrostor WRESC

Road ID	Description	Vehicle	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Fuel Type	Total Miles Travelled (VMT/day)	Total Miles Travelled (VMT/year)	GHG Emissions Factors (g/mile) [a]			Annual Emissions [c]		
									CO2	CH4	N2O	Total CO_2 (tons/yr)	Total CH_4 (tons/yr)	Total N_2O (tons/yr)
Road 1	Rosamond CDP, CA	Worker Vehicles	8.00	365	0.16	Gas	1,392	508,080	338.8	0.0026	0.0057	189.75	0.0015	0.0032
Road 2	Lancaster City, CA	Worker Vehicles	34.00	365	0.7	Gas	8,602	3,139,730	338.8	0.0026	0.0057	1172.59	0.0091	0.0197
Road 3	Palmdale City, CA	Worker Vehicles	50.00	365	1.0	Gas	8,550	3,120,750	338.8	0.0026	0.0057	1165.51	0.0090	0.0196
Road 4	Los Angeles City, CA	Worker Vehicles	178.00	365	3.6	Gas	890	324,850	338.8	0.0026	0.0057	121.32	0.0009	0.0020
Road 5	Mojave CDP, CA	Worker Vehicles	22.00	365	0.4	Gas	66	24,090	338.8	0.0026	0.0057	9.00	0.0001	0.0002
Road 6	Tehachapi City, CA	Worker Vehicles	64.00	365	1.3	Gas	192	70,080	338.8	0.0026	0.0057	26.17	0.0002	0.0004
Road 7	California City, CA	Worker Vehicles	50.00	365	1.0	Gas	100	36,500	338.8	0.0026	0.0057	13.63	0.0001	0.0002
Road 8	Santa Clarita City, CA	Worker Vehicles	118.00	365	2.4	Gas	236	86,140	338.8	0.0026	0.0057	32.17	0.0002	0.0005
Road 9	Sun Village CDP, CA	Worker Vehicles	72.00	365	1.4	Gas	144	52,560	338.8	0.0026	0.0057	19.63	0.0002	0.0003
Road 10	Quartz Hill CDP, CA	Worker Vehicles	46.00	365	0.9	Gas	46	16,790	338.8	0.0026	0.0057	6.27	0.0000	0.0001
Road 11	Port of Los Angeles	Flatbed tractor trailer	230.00	365	2.3	ULSD	345	125,925	1,530.0	0.0006	0.2411	212.38	0.0001	0.0335
Road 12	Port of Oakland	Flatbed tractor trailer	690.00	365	6.9	ULSD	345	125,925	1,530.0	0.0006	0.2411	212.38	0.0001	0.0335
Road 13	Waste Rock Haulage Opt #2	Dump trucks (12 yd)	72.00	365	10.0	ULSD	12,960	4,730,400	1,530.0	0.0006	0.2411	7978.08	0.0032	1.2569
Road 14	Misc Deliveries from Local/Regional Area	Flatbed or Box trailer	42.00	312	10.0	ULSD	126	32760	1,530.0	0.0006	0.2411	55.25	0.0000	0.0087

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Table 8 Emissions Factor Development

Fleet aggregate average vehicle emission factors for 2025 in Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Type	CO (g/mile)	NO_X (g/mile)	SO_2 (g/mile)	$PM_{10\ Exhaust}$ (g/mile)	$PM_{10\ TBW}$ (g/mile)	$PM_{2.5\ Exhaust}$ (g/mile)	$PM_{2.5\ TBW}$ (g/mile)	VOC (g/mile)	CO2 (g/mile)	CH4 (g/mile)	N2O (g/mile)
	Fleet Aggregate Average Air Pollutant Emissions Factors for 2025										
LDGV	0.8383	0.0642	0.0033	0.0012	0.0151	0.0011	0.0045	0.0101	338.8119	0.0026	0.0057
HHDT	0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.0132	1,530.0419	0.0006	0.2411

LDGV -Gas = Light-Duty Vehicles Gasoline
HHDT - Diesel = Heavy-Heavy Duty Trucks (>33,000 lb GVWR) Diesel Fueled
TBW = tire and brake wear

Table 9 Preliminary Worker and Hauling Trip Data

Hydrostor WRESC - Offsite T-Line Construction and Offsite Vehicle/Truck Traffic Emissions Estimates

Hydrostor WRESC - Construction Workers Trips

Location	Percentage Commute	Non-specialized Workers (15%)	Average One-Way Distance (Miles)	NSW One-Way Miles Traveled	Percentage Lodging	Specialized Workers (85%)	SW One-Way Miles Travelled
Rosamond CDP, CA	47%	43	4	172	25%	131	524
Lancaster City, CA	19%	16	17	272	45%	237	4029
Palmdale City, CA	14%	13	25	325	30%	158	3950
Los Angeles City, CA	6%	5	89	445			
Mojave CDP, CA	4%	3	11	33			
Tehachapi City, CA	3%	3	32	96			
California City, CA	2%	2	25	50			
Santa Clarita City, CA	2%	2	59	118			
Sun Village CDP, CA	2%	2	36	72			
Quartz Hill CDP, CA	1%	1	23	23			
		90		1606		526	8,503
Total Miles Travelled (Workers)							10,109
Total Number of Workers per Avg Day for highest manpower year (2028) = 615							616
Vehicle Miles Traveled per capita							16.4

WRESC - Truck Delivery and Waste Hauling Trips

Location		Percentage of Trips	One-Way Distance (Miles)	Truck Deliveries per Day	Miles Traveled per Year	Percentage of Mileage
Port of Los Angeles		75%	115	3	125,925	50%
Port of Oakland		25%	345	1	125,925	50%
			RT Distance, mi.	**Hauls Per Day**		
Waste Rock Haulage Opt #1	Holiday Quarry		19.7	180	1,294,290	
Waste Rock Haulage Opt #2	Vulcan Palmdale		72	180	4,730,400	**No Berm Option**
Waste Rock Storage on Site (arch. berm)			0	0	0	

Notes:

Road 14 was added for misc delvieries from the local/regional area, i.e., Lancaster and Palmdale suppliers and depots.
Avg RT delivery distance was 42 miles at 3 deliveries per day for a maximum of 312 days per year. See Tables 3 and 4 for Road 14 data and emissions.

Waste Rock Haulage Option 2 is Worst Case, and was used for conservative emissions estimates.

HHDT from the two Ports will be brokered, therefore the one-way distance is used to assign the offsite emissions from these deliveries.
Port deliveries assumed to occur for 365 days/yr during the high 12 month period.

Project Manpower Data Summary	9/5/2023	No Berm Update 12/12/2023
Avg daily manpower for 60 month period	268	273
Max single month	728	749
Max year avg month	615	547

Onsite Construction Emissions
Berm Option

TABLE 1
EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCTION PHASE - WITH BERM
Hydrostor WRESC

ID	Activity	Description	PM_{10} Emissions Annual (tons/yr)	$PM_{2.5}$ Emissions Annual (tons/yr)	NO_x Emissions Annual (tons/yr)	VOC Emissions Annual (tons/yr)	CO Emissions Annual (tons/yr)	SO_2 Emissions Annual (tons/yr)
Non-Stationary Sources								
Internal Site Routes								
ISR 1	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.01	0.00	-	-	-	-
ISR 2	Cavern Works	Equipment mobilization - Cavern Works	0.00	0.00	-	-	-	-
ISR 3	Cavern Works	Equipment demobilization - Cavern Works	0.00	0.00	-	-	-	-
ISR 4	Cavern Works	Fuel delivery - Cavern Works	0.00	0.00	-	-	-	-
ISR 5	Cavern Works	Fencing delivery - Cavern Works	0.00	0.00	-	-	-	-
ISR 6	Cavern Works	Concrete trucks - Cavern Works	0.01	0.00	-	-	-	-
ISR 7	Cavern Works	Gravel delivery - Cavern Works	0.04	0.00	-	-	-	-
ISR 8	Cavern Works	Trailer delivery - Cavern Works	0.00	0.00	-	-	-	-
ISR 9	Cavern Works	Berm Construction - Workforce	0.13	0.01	-	-	-	-
ISR 10	Cavern Works	Berm Construction - Berm Material Remove and Replace	1.05	0.10	-	-	-	-
ISR 11	Cavern Works	Workforce (Mining) - Cavern Works	0.27	0.03	-	-	-	-
ISR 12	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.00	0.00	-	-	-	-
ISR 13	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.00	0.00	-	-	-	-
ISR 14	Cavern Works	Ground support - Cavern Works	0.00	0.00	-	-	-	-
ISR 15	Cavern Works	Explosives - Cavern Works	0.00	0.00	-	-	-	-
ISR 16	Cavern Works	Berm Construction - Transport of Waste Rock to Berm site	6.01	0.60	-	-	-	-
ISR 17	Surface Works	Workforce - Surface Works	0.36	0.04	-	-	-	-
ISR 18	Surface Works	Site clearing (overburden) - Surface Works	0.13	0.01	-	-	-	-
ISR 19	Surface Works	Civil foundation excavation Surface Works	0.06	0.01	-	-	-	-
ISR 20	Surface Works	Cement Trucks Surface Works	0.03	0.00	-	-	-	-
ISR 21	Surface Works	Equipment and material delivery Surface Works	0.01	0.00	-	-	-	-
ISR 22	Surface and Cavern Works	Potable Water - Surface and Cavern	0.01	0.00	-	-	-	-
ISR 23	Surface and Cavern Works	Non Potable Water - Surface and Cavern	0.09	0.01	-	-	-	-
ISR 24	Reservoir Fill	Non Potable Water - Reservoir Fill	0.58	0.06	-	-	-	-
		Total Unpaved	8.80	0.88	0.00	0.00	0.00	0.00
Exhaust Emissions from Haul Truck Traffic on Internal Site Routes								
ISR 1	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.000	0.000	0.000	0.000	0.001	0.000
ISR 2	Cavern Works	Equipment mobilization - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 3	Cavern Works	Equipment demobilization - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 4	Cavern Works	Fuel delivery - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 5	Cavern Works	Fencing delivery - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 6	Cavern Works	Concrete trucks - Cavern Works	0.000	0.000	0.001	0.000	0.000	0.000
ISR 7	Cavern Works	Gravel delivery - Cavern Works	0.000	0.000	0.004	0.000	0.000	0.000
ISR 8	Cavern Works	Trailer delivery - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 9	Cavern Works	Berm Construction - Workforce	0.000	0.000	0.001	0.001	0.012	0.000
ISR 10	Cavern Works	Berm Construction - Berm Material Remove and Replace	0.003	0.001	0.095	0.003	0.007	0.000
ISR 11	Cavern Works	Workforce (Mining) - Cavern Works	0.000	0.000	0.002	0.001	0.025	0.000
ISR 12	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 13	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 14	Cavern Works	Ground support - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 15	Cavern Works	Explosives - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 16	Cavern Works	Berm Construction - Transport of Waste Rock to Berm site	0.019	0.007	0.546	0.020	0.040	0.002
ISR 17	Surface Works	Workforce - Surface Works	0.001	0.000	0.002	0.001	0.033	0.000
ISR 18	Surface Works	Site clearing (overburden) - Surface Works	0.000	0.000	0.013	0.000	0.001	0.000
ISR 19	Surface Works	Civil foundation excavation Surface Works	0.000	0.000	0.006	0.000	0.000	0.000
ISR 20	Surface Works	Cement Trucks Surface Works	0.000	0.000	0.003	0.000	0.000	0.000
ISR 21	Surface Works	Equipment and material delivery Surface Works	0.000	0.000	0.001	0.000	0.000	0.000
ISR 22	Surface and Cavern Works	Potable Water - Surface and Cavern	0.000	0.000	0.001	0.000	0.000	0.000
ISR 23	Surface and Cavern Works	Non Potable Water - Surface and Cavern	0.000	0.000	0.010	0.000	0.001	0.000
ISR 24	Reservoir Fill	Non Potable Water - Reservoir Fill	0.002	0.001	0.063	0.002	0.005	0.000
		Total Traffic Exhaust	0.027	0.010	0.750	0.030	0.126	0.003

TABLE 1
EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCTION PHASE - WITH BERM
Hydrostor WRESC

ID	Activity	Description	PM_{10} Emissions Annual (tons/yr)	$PM_{2.5}$ Emissions Annual (tons/yr)	NO_x Emissions Annual (tons/yr)	VOC Emissions Annual (tons/yr)	CO Emissions Annual (tons/yr)	SO_2 Emissions Annual (tons/yr)
Exhaust Emissions from Non-Road Engines								
EXH-1	Surface Works	Indirects (5 days/week)	0.19	0.19	7.09	0.74	7.65	0.01
EXH-2	Surface Works	Civil & Fdns (5 days/week)	0.04	0.04	0.73	0.09	1.29	0.00
EXH-3	Surface Works	Turbine Hall (5 days/week)	0.07	0.07	2.28	0.22	2.61	0.01
EXH-4	Surface Works	Structural (5 days/week)	0.00	0.00	0.00	0.00	0.00	0.00
EXH-5	Surface Works	Piping (5 days/week)	0.04	0.04	1.63	0.19	2.41	0.00
EXH-6	Surface Works	Mechanical (5 days/week)	0.03	0.03	0.75	0.09	0.67	0.00
EXH-7	Surface Works	Cavern Rock Moving and Berming (7 days/week)	0.17	0.17	4.66	0.67	4.61	0.02
EXH-8	Cavern Works	Site Prep (5 days/week)	0.00	0.00	0.00	0.00	0.00	0.00
EXH-9	Cavern Works	Drilling - Conventionally Sunk Shaft (7 days/week)	0.00	0.00	0.00	0.00	0.00	0.00
EXH-10	Cavern Works	Surface Equipment (7 days/week)	0.04	0.04	1.06	0.17	1.15	0.00
EXH-11	Cavern Works	Underground Equipment (7 days/week)-Emissions vented to s	0.39	0.39	7.29	0.90	7.48	0.02
		Total Non-Road Exhaust	0.97	0.97	25.49	3.08	27.87	0.07
Stationary Sources								
Material Handling								
TA1	Cavern Works	Clearing and Stripping -Truck unloading	0.027	0.004	-	-	-	-
TB	Cavern Works	Mining Activities -Total TB1 -TB4	0.614	0.093	-	-	-	-
TC	Berm Construction	Berm- Overburden Total TC1 - TC2	0.076	0.011				
TD1	Surface Works	Site clearing -overburden - Truck loading	0.020	0.003	-	-	-	-
TD2	Surface Works	Civil & Foudation Excavations - Truck loading	0.007	0.001	-	-	-	-
		Tranfer Areas Total	0.74	0.11	0.00	0.00	0.00	0.00
Bulldozing								
BD1	Cavern Works	Cavern Rock Moving and Berming	1.27	0.62	-	-	-	-
BD2	Cavern Works	Mining Surface	0.00	0.00	-	-	-	-
		Bulldozing Total	1.27	0.62	0.00	0.00	0.00	0.00
Grading								
GD1	Surface Works	Foundation and Compaction	0.43	0.03	-	-	-	-
		Grading Total	0.43	0.03	0.0	0.0	0.0	0.0
Wind Erosion of Exposed Surface Areas								
WE1	Site Area Wind Erosion	Clearing& Stripping	2.04	1.02	-	-	-	-
WE2	Rock Storage Wind Erosion	Temporary Cavern Rock Storage Area	0.14	0.07				
WE3	Earthwork Storage Wind Erosion	Temporary Earthwork Storage Area	0.14	0.07				
WE4	Crushed Rock Storage Wind Erosio	Temporary Crushing Plant Storage Area	0.05	0.02				
WE5	Berm Area Wind Erosion	Berm Area -Construction	2.66	1.33				
		Wind Erosion Areas Total	5.04	2.52	0.000	0.000	0.000	0.000
Wind Erosion of Stock Piles								
WS1	Cavern Works	Shaft Cutting	0.22	0.03	-	-	-	-
WS2	Surface Works	Site Clearing	0.88	0.13	-	-	-	-
WS3	Surface Works	Excavations	0.53	0.08	-	-	-	-
		Wind Erosion Stockpile Total	1.63	0.24	0.00	0.00	0.00	0.00
Rock Crushing								
RC1	Rock Crushing System	Crushing, screening, conveyors	0.02	0.01	-	-	-	-
RC2	Generator Set	(Two Engines)	0.04	0.04	0.94	0.26	4.89	0.01
		Rock Crushing Total	0.06	0.04	0.94	0.26	4.89	0.01
		Estimated Highest 12 Month Period Emissions, TPY	**18.96**	**5.44**	**27.18**	**3.37**	**32.88**	**0.08**
		Avg High Month, lbs	**3,160.74**	**906.44**	**4,530.39**	**561.91**	**5,480.76**	**13.44**
		Avg High Day, lbs	**105.4**	**30.2**	**151.0**	**18.7**	**182.7**	**0.4**

Emissions Breakout	PM_{10}	$PM_{2.5}$	NO_x	VOC	CO	SO_2
OnSite Equipment Exhaust Emissions, tons per High 12 Months	1.06	1.02	27.18	3.37	32.88	0.08
OnSite Equipment Exhaust Emissions, lbs High Month	176.31	170.76	4530.39	561.91	5480.76	13.44
OnSite Equipment Exhaust Emissions, lbs High Day	**5.88**	**5.69**	**151.01**	**18.73**	**182.69**	**0.45**
Fugitive Emissions, tons per High 12 Months	17.91	4.41	0.00	0.00	0.00	0.00
Fugitive Emissions, lbs High Month	**2984.44**	**735.67**	0.00	0.00	0.00	0.00

TABLE 1
EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCTION PHASE - WITH BERM
Hydrostor WRESC

ID	Activity	Description	PM_{10} Emissions Annual (tons/yr)	$PM_{2.5}$ Emissions Annual (tons/yr)	NO_x Emissions Annual (tons/yr)	VOC Emissions Annual (tons/yr)	CO Emissions Annual (tons/yr)	SO_2 Emissions Annual (tons/yr)
	Fugitive Emissions, lbs High Day		99.48	24.52	0.00	0.00	0.00	0.00

TABLE 2
EMISSIONS SUMMARY - GREENHOUSE GASES
CONSTRUCTION PHASE - WITH BERM
Hydrostor WRESC

ID	Activity	Description	Annual Emission Rates CO_2 (tons/yr)	CH_4 (tons/yr)	N2O (tons/yr)
Non-Stationary Sources					
Exhaust Emissions from Haul Truck Traffic on Internal Site Routes					
ISR 1	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.45	0.00	0.00
ISR 2	Cavern Works	Equipment mobilization - Cavern Works	0.02	0.00	0.00
ISR 3	Cavern Works	Equipment demobilization - Cavern Works	0.02	0.00	0.00
ISR 4	Cavern Works	Fuel delivery - Cavern Works	0.15	0.00	0.00
ISR 5	Cavern Works	Fencing delivery - Cavern Works	0.00	0.00	0.00
ISR 6	Cavern Works	Concrete trucks - Cavern Works	0.60	0.00	0.00
ISR 7	Cavern Works	Gravel delivery - Cavern Works	1.77	0.00	0.00
ISR 8	Cavern Works	Trailer delivery - Cavern Works	0.02	0.00	0.00
ISR 9	Cavern Works	Berm Construction - Workforce	4.61	0.00	0.00
ISR 10	Cavern Works	Berm Construction - Berm Material Remove and Replace	40.35	0.00	0.00
ISR 11	Cavern Works	Workforce (Mining) - Cavern Works	9.33	0.00	0.00
ISR 12	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.09	0.00	0.00
ISR 13	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.07	0.00	0.00
ISR 14	Cavern Works	Ground support - Cavern Works	0.05	0.00	0.00
ISR 15	Cavern Works	Explosives - Cavern Works	0.05	0.00	0.00
ISR 16	Cavern Works	Berm Construction - Transport of Waste Rock to Berm site	231.92	0.00	0.03
ISR 17	Surface Works	Workforce - Surface Works	12.13	0.00	0.00
ISR 18	Surface Works	Site clearing (overburden) - Surface Works	5.56	0.00	0.00
ISR 19	Surface Works	Civil foundation excavation Surface Works	2.55	0.00	0.00
ISR 20	Surface Works	Cement Trucks Surface Works	1.47	0.00	0.00
ISR 21	Surface Works	Equipment and material delivery Surface Works	0.51	0.00	0.00
ISR 22	Surface and Cavern Works	Potable Water - Surface and Cavern	0.49	0.00	0.00
ISR 23	Surface and Cavern Works	Non Potable Water - Surface and Cavern	4.12	0.00	0.00
ISR 24	Reservoir Fill	Non Potable Water - Reservoir Fill	26.88	0.00	0.00
		Total Traffic Exhaust	343.21	0.00	0.04
Exhaust Emissions from Non-Road Engines					
EXH-1	Surface Works	Indirects (5 days/week)	1,157.00	-	-
EXH-2	Surface Works	Civil & Fdns (5 days/week)	210.48	-	-
EXH-3	Surface Works	Turbine Hall (5 days/week)	512.97	-	-
EXH-4	Surface Works	Structural (5 days/week)	0.00	-	-
EXH-5	Surface Works	Piping (5 days/week)	344.71	-	-
EXH-6	Surface Works	Mechanical (5 days/week)	128.78	-	-
EXH-7	Surface Works	Cavern Rock Moving and Berming (7 days/week)	1,965.81	-	-
EXH-8	Cavern Works	Site Prep (5 days/week)	0.00	-	-
EXH-9	Cavern Works	Drilling - Conventionally Sunk Shaft (7 days/week)	0.00	-	-
EXH-10	Cavern Works	Surface Equipment (7 days/week)	515.77	-	-
EXH-11	Cavern Works	Underground Equipment (7 days/week)-Emissions vented to	1,938.90	-	-
		Total Non-Road Exhaust	6,774.43	0.0000	0.0000
Exhaust Emissions from Generator Sets					
RC2	Rock Crushing System	Generator Set (Two Generators)	953.95	-	-
		Total Non-Road Exhaust	953.95	0.0000	0.0000
		Total Emissions	**8,071.6**	**0.000**	**0.035**

Greenhouse Gases (GHGs)	Global Warming Potential (GWP)			Annual Emissions (TPY CO_2e)
Carbon dioxide (CO_2)	1			8,072
Methane (CH_4)	25			0.01
Nitrous oxide (N_20)	298			10.43
			Total	8,082.03

Manpower and Construction Equipment by Month
Project: Willow Rock Energy Storage Center
Manpower by Month FOR Option with Architectural Berm

	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26
	2025										2026											
																			Manpower by Month (see Note 1)			
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Cavern and Shafts Construction																						
Mining																						
Mechanic																						
Electrician																						
Hoistman																						
Miner																						
Eqpt Operator																						
Site Supervision																						
Project Mgmt																						
Shaft Sinking (24' conventionally sunk)																						
Miners											5.16	6	6	6	6	6	6	6	6	6	6	6
Nippers											6.88	8	8	8	8	8	8	8	8	8	8	8
Batch Plant operators											5.16	6	6	6	6	6	6	6	6	6	6	6
Superintendant											1.72	2	2	2	2	2	2	2	2	2	2	2
shift boss											1.72	2	2	2	2	2	2	2	2	2	2	2
mechanic											1.72	2	2	2	2	2	2	2	2	2	2	2
electrician											1.72	2	2	2	2	2	2	2	2	2	2	2
clerk											1.72	2	2	2	2	2	2	2	2	2	2	2
equipment operators											3.44	4	4	4	4	4	4	4	4	4	4	4
hoistman											1.72	2	2	2	2	2	2	2	2	2	2	2
rigger											1.72	2	2	2	2	2	2	2	2	2	2	2
safety professional											1.72	2	2	2	2	2	2	2	2	2	2	2
Drilling (Blind Bore Shafts)																						
Project Mgmt										2.34	3	3	3	3	3	3	3	3	3	3	3	3
Eqpt Operator										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Laborer										4.68	6	6	6	6	6	6	6	6	6	6	6	6
Welder										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Site Prep																						
Eqpt Operator							6	6	6	6	6								0.66	6	6	6
Laborer							6	6	6	6	6								0.66	6	6	6
PM							1	1	1	1	1								0.11	1	1	1
Power Block Construction																						
Staff	9	4	3	4	3	2	3	4	7	9	7	7	8	15	19	44	43	40	47	40	46	58
Craft Support	5	2	2	2	2	1	2	2	4	5	4	4	5	8	10	24	24	22	26	22	25	32
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	32	32	32	32
Insulation	-	-	-	-	-	-	-	-	1	4	3	4	4	4	6	19	25	25	33	35	11	5
Instrumentation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	5	1	5
Scaffold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	11
Pipe Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	5	10
Mechanical Crew	-	-	-	-	-	-	-	-	-	-	1	7	3	2	4	10	6	2	2	4	17	15
InEight Startup Resources	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-	-
Electrical Crew	14	-	-	-	-	-	-	-	-	-	-	-	0	0	-	0	0	0	1	0	0	33
Concrete Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	5	4	5	8	8	31	28
Civil Crew	7	7	7	7	10	13	17	17	17	17	17	17	17	37	44	97	91	84	93	65	68	68
Buildings	4	4	4	4	3	1	1	2	7	7	5	2	2	1	2	2	1	1	1	1	1	3
Off Site																						
Cavern Waste Rock Moving																						
Transmission Line - A/G Offsite																						
Transmission Line - U/G Offsite																						
Total	40	17	15	17	17	17	35	39	49	76	112	107	105	134	154	269	263	279	312	292	325	380

Manpower and Construction Equipı
Project: Willow Rock Energy Storaç
Manpower by Month FOR Option with Architectura

	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28
	2027												2028											
Month	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Cavern and Shafts Construction																								
Mining																								
Mechanic		2.24	8	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Electrician		0.84	3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Hoistman		1.12	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Miner		6.16	22	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
Eqpt Operator		0.56	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Site Supervision		0.56	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Project Mgmt		1.68	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Shaft Sinking (24' conventionally sunk)																								
Miners	0.66																							
Nippers	0.88																							
Batch Plant operators	0.66																							
Superintendant	0.22																							
shift boss	0.22																							
mechanic	0.22																							
electrician	0.22																							
clerk	0.22																							
equipment operators	0.44																							
hoistman	0.22																							
rigger	0.22																							
safety professional	0.22																							
Drilling (Blind Bore Shafts)																								
Project Mgmt	3	3	1	1	1	1	1	1	1	1	1	1	0.16											
Eqpt Operator	9	9	3	3	3	3	3	3	3	3	3	3	0.48											
Laborer	6	6	2	2	2	2	2	2	2	2	2	2	0.32											
Welder	9	9	3	3	3	3	3	3	3	3	3	3	0.48											
Site Prep																								
Eqpt Operator	6																							
Laborer	6																							
PM	1																							
Power Block Construction																								
Staff	38	34	35	30	43	55	68	60	87	121	121	125	102	107	94	103	93	90	89	100	86	82	61	51
Craft Support	21	19	19	17	24	30	37	33	48	66	67	69	56	58	52	57	51	49	49	55	47	45	33	28
Tanks	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	-
Insulation	1	-	-	-	-	-	-	-	3	4	4	4	3	4	0	-	-	-	3	15	12	11	5	4
Instrumentation	-	2	1	1	1	1	1	-	-	1	-	3	1	2	4	6	10	12	12	18	13	20	10	14
Steel Crew	4	3	3	3	3	16	22	29	35	35	47	41	43	29	27	17	12	7	-	-	-	-	-	-
Scaffold	10	12	12	7	3	3	2	5	5	7	6	6	2	-	-	-	-	1	5	5	5	8	7	7
Pipe Crew	6	10	8	9	11	11	7	9	34	47	58	75	70	107	110	126	137	117	112	101	91	67	50	33
Mechanical Crew	5	6	5	4	2	17	27	38	50	81	92	108	104	104	90	72	84	64	58	34	25	21	13	11
InEight Startup Resources	-	5	4	1	1	2	0	-	3	8	3	3	1	1	1	1	5	5	12	7	3	6	10	6
Electrical Crew	26	16	6	4	1	41	63	48	52	93	78	78	38	42	26	53	66	84	81	114	108	106	82	73
Concrete Crew	11	4	24	24	76	51	65	48	64	56	53	40	34	15	4	6	3	6	3	7	1	3	1	1
Civil Crew	47	49	49	43	37	34	31	28	10	9	9	9	9	9	9	9	9	10	16	16	16	16	16	7
Buildings	3	4	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Off Site																								
Cavern Waste Rock Moving		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Transmission Line - A/G Offsite								20	20	20	20	20	20	20	20	20	20							
Transmission Line - U/G Offsite		19	19	18	17	9	9	12	13	17	17	17	17											
Total	248	259	278	297	354	407	468	465	559	700	708	731	628	624	563	596	615	570	532	566	500	479	382	325

Manpower and Construction Equipı

Project: Willow Rock Energy Storaç

Manpower by Month FOR Option with Architectura

	Jan-29	Feb-29	Mar-29	Apr-29	May-29	Jun-29	Jul-29	Aug-29	Sep-29	Oct-29	Nov-29	Dec-29	Jan-30	Feb-30
	2029												2030	
Month	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Cavern and Shafts Construction														
Mining														
Mechanic	16	16	2	2										
Electrician	6	6	2	2										
Hoistman	8	8												
Miner	44	44												
Eqpt Operator	4	4	6	6										
Site Supervision	4	4	2	2										
Project Mgmt	8	8	2	2										
Shaft Sinking (24' conventionally sunk)														
Miners														
Nippers														
Batch Plant operators														
Superintendant														
shift boss														
mechanic														
electrician														
clerk														
equipment operators														
hoistman														
rigger														
safety professional														
Drilling (Blind Bore Shafts)														
Project Mgmt														
Eqpt Operator														
Laborer														
Welder														
Site Prep														
Eqpt Operator														
Laborer														
PM														
Power Block Construction														
Staff	35	46	39	23	24	17	6	5	5	12	9	5	4	0
Craft Support	19	25	21	12	13	9	3	3	3	7	5	3	2	0
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insulation	7	18	20	11	10	7	-	-	-	-	-	-	-	-
Instrumentation	5	7	3	3	1	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scaffold	7	9	10	8	6	2	1	3	3	3	3	1	-	-
Pipe Crew	22	17	4	1	1	-	-	-	-	-	-	-	-	-
Mechanical Crew	6	7	4	2	-	-	-	-	1	9	-	-	-	-
InEight Startup Resources	3	40	48	33	43	32	8	4	6	20	15	11	12	1
Electrical Crew	47	31	18	2	1	1	1	0	-	-	-	-	-	-
Concrete Crew	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Civil Crew	7	7	7	7	8	7	8	7	7	8	7	3	-	-
Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Off Site														
Cavern Waste Rock Moving														
Transmission Line - A/G Offsite														
Transmission Line - U/G Offsite														
Total	248	298	190	116	107	75	27	22	25	58	39	22	18	1

Construction Equipment by Month

Categories	Avg HP	1		2		3		4		5		6		7		8		9		10		11	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																							
Pick-up trucks (for entire site)	150							25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100							12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																							
Wheel Loader	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120							12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160							7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270							9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120							16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100							11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210							1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																							
Cranes	200																						
JLG	75																						
Cranes	200																						
ManLift	75																						
Welding machine	50																						
Structural (5 days/week)																							
Cranes	200																						
Welding machine	50																						
Piping (5 days/week)																							
Welding machine	50																						
ManLift	75																						
Cranes	200																						
Mechanical (5 days/week)																							
Welding machines	50																						
Crane	200																						
Cavern Rock Moving and Berming																							
Dump Truck (21-ton)	400																						
Front End Loader	320																						
Dozer	475																						
Water Truck	210																						
Off-Site Transmission (5 days/week)																							
Various Equipment	600																						
Cavern Works																							
Underground Equipment (7 days/week)																							
Mercury 1B Bolter	55																						
Boomer 282 Jumbo	125																						
Scissor Lift	138																						
Welder	19																						
Buggy	47																						
LHD	201																						
Getman Boom Lift	147																						
Skid Steer	61																						
Surface Equipment (7 days/week)																							
wheel loader	260																						
20 Tn Off Road Dump Truck	320																						
Site Prep (5 days/week)																							
Dozers	215													2	10	2	10	2	10	2	10	2	10
Track hoe	172													1	10	1	10	1	10	1	10	1	10
Back hoe	172													1	10	1	10	1	10	1	10	1	10
Dumptruck (20Ton)	400													1	10	1	10	1	10	1	10	1	10
Water Truck	210													1	10	1	10	1	10	1	10	1	10
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	110																						
Articulating wheel loader	320																						
25-ton articulating dump truck	320																						

Categories	Avg HP	12		13		14		15		16		17		18		19		20		21		22	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																							
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																							
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210	1	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																							
Cranes	200																						
JLG	75																						
Cranes	200											2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75											12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50											4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																							
Cranes	200															2	4	2	4	4	4	4	4
Welding machine	50															2	8	2	8	4	8	4	8
Piping (5 days/week)																							
Welding machine	50									10	4	10	4	10	4	10	4	10	4	12	4	12	4
ManLift	75									2	4	2	4	3	4	3	4	6	4	6	4	10	4
Cranes	200									2	8	2	8	2	8	2	8	2	8	2	8	2	8
Mechanical (5 days/week)																							
Welding machines	50									2	4	2	4	2	4	2	4	2	4	4	4	4	4
Crane	200									1	4	1	4	1	4	1	4	1	4	2	4	2	4
Cavern Rock Moving and Berming																							
Dump Truck (21-ton)	400																						
Front End Loader	320																						
Dozer	475																						
Water Truck	210																						
Off-Site Transmission (5 days/week)																							
Various Equipment	600																						
Cavern Works																							
Underground Equipment (7 days/week)																							
Mercury 1B Bolter	55																						
Boomer 282 Jumbo	125																						
Scissor Lift	138																						
Welder	19																						
Buggy	47																						
LHD	201																						
Getman Boom Lift	147																						
Skid Steer	61																						
Surface Equipment (7 days/week)																							
wheel loader	260																						
20 Tn Off Road Dump Truck	320																						
Site Prep (5 days/week)																							
Dozers	215																						
Track hoe	172																						
Back hoe	172																						
Dumptruck (20Ton)	400																						
Water Truck	210																						
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	110	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
Articulating wheel loader	320	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
25-ton articulating dump truck	320	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18

Construction Equipment by Month

Categories	Avg HP	23		24		25		26		27		28		29		30		31		32		33		34	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																									
Pick-up trucks (for entire site)	150	25	4	40	4	40	4	40	4	40	4	40	4	60	4	60	4	60	4	60	4	60	4	60	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																									
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4		
Crawler Loader	120	12	4																						
Grader	160	7	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	1	4
Crawler dozer	120	2	4																						
Scraper	270	9	4																						
Backhoe	120	16	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4
Roller	100	11	4																						
Pile driver hammer	250	4	4																						
Water Truck	210	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																									
Cranes	200							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG	75							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																									
Cranes	200	2	4																						
Welding machine	50	2	8																						
Piping (5 days/week)																									
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	10	4	10	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																								
Mechanical (5 days/week)																									
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Berming																									
Dump Truck (21-ton)	400			4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10
Front End Loader	320			1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Dozer	475			1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Water Truck	210			1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)																									
Various Equipment	600			1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Cavern Works																									
Underground Equipment (7 days/week)																									
Mercury 1B Bolter	55			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	201			1.12	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																									
wheel loader	260			1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	320			1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
Site Prep (5 days/week)																									
Dozers	215																								
Track hoe	172																								
Back hoe	172																								
Dumptruck (20Ton)	400																								
Water Truck	210																								
Drilling - Conventionally Sunk Shaft (7 days/week)																									
Telehandler	110	1	18	1	18																				
Articulating wheel loader	320	1	18	1	18																				
25-ton articulating dump truck	320	1	18	1	18																				

Categories	Avg HP	35		36		37		38		39		40		41		42		43		44		45		46	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																									
Pick-up trucks (for entire site)	150	60	4	60	4	50	4	40	4	40	4	40	4	40	4	40	4	40	4	40	4	40	4	25	4
60 kW Diesel Gensets	100	12	8	12	8																				
Civil & Fdns (5 days/week)																									
Wheel Loader	120																								
Crawler Loader	120																								
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Crawler dozer	120																								
Scraper	270																								
Backhoe	120	1	4	1	4	1	4	1	.	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Roller	100																								
Pile driver hammer	250																								
Water Truck	210	2	10	2	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																									
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8														
ManLift	75	12	4	12	4	12	4	12	4	12	4														
Welding machine	50	4	6	4	6	4	6	4	6	4	6														
Structural (5 days/week)																									
Cranes	200																								
Welding machine	50																								
Piping (5 days/week)																									
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																								
Mechanical (5 days/week)																									
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Berming																									
Dump Truck (21-ton)	400	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10
Front End Loader	320	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Dozer	475	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)																									
Various Equipment	600	1	4	1	4	1	4	1	4	1	4														
Cavern Works																									
Underground Equipment (7 days/week)																									
Mercury 1B Bolter	55	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	201	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																									
wheel loader	260	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
20 Tn Off Road Dump Truck	320	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
Site Prep (5 days/week)																									
Dozers	215																								
Track hoe	172																								
Back hoe	172																								
Dumptruck (20Ton)	400																								
Water Truck	210																								
Drilling - Conventionally Sunk Shaft (7 days/week)																									
Telehandler	110																								
Articulating wheel loader	320																								
25-ton articulating dump truck	320																								

Construction Equipment by Month

Categories		47		48		49		50		51		52		53		54		55		56		57		58		59		60	
	Avg HP																												
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																													
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																												
Civil & Fdns (5 days/week)																													
Wheel Loader	120																												
Crawler Loader	120																												
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Crawler dozer	120																												
Scraper	270																												
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Roller	100																												
Pile driver hammer	250																												
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																													
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
JLG	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Cranes	200																												
ManLift	75																												
Welding machine	50																												
Structural (5 days/week)																													
Cranes	200																												
Welding machine	50																												
Piping (5 days/week)																													
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4						
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	8	4	8	4						
Cranes	200																												
Mechanical (5 days/week)																													
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
Cavern Rock Moving and Berming																													
Dump Truck (21-ton)	400	4	10	4	10																								
Front End Loader	320	1	10	1	10																								
Dozer	475	1	10	1	10																								
Water Truck	210	1	10	1	10																								
Off-Site Transmission (5 days/week)																													
Various Equipment	600																												
Cavern Works																													
Underground Equipment (7 days/week)																													
Mercury 1B Bolter	55	2	9.6	2	9.6																								
Boomer 282 Jumbo	125	2	9.6	2	9.6																								
Scissor Lift	138	1	9.6	1	9.6																								
Welder	19	1	9.6	1	9.6																								
Buggy	47	2	9.6	2	9.6																								
LHD	201	4	19.2	4	19.2																								
Getman Boom Lift	147	1	9.6	1	9.6																								
Skid Steer	61	1	9.6	1	9.6																								
Surface Equipment (7 days/week)																													
wheel loader	260																												
20 Tn Off Road Dump Truck	320																												
Site Prep (5 days/week)																													
Dozers	215																												
Track hoe	172																												
Back hoe	172																												
Dumptruck (20Ton)	400																												
Water Truck	210																												
Drilling - Conventionally Sunk Shaft (7 days/week)																													
Telehandler	110																												
Articulating wheel loader	320																												
25-ton articulating dump truck	320																												

Table 4 Construction Equipment and Operation Hours by Month
Site: WRESC

Hydrostor WRESC
With Berm

Construction Equipment by Month - With Berm (see Note 1)

Categories	Avg HP	1		2		3		4		5		6		7		8		9		10	
		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works																					
Indirects (5 days/week)																					
Pick-up trucks (for entire site) -not diesel	150							25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100							12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																					
Wheel Loader	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120							12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160							7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270							9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120							16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100							11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250							4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210							1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																					
Cranes	200																				
JLG Manlift	75																				
Cranes	200																				
ManLift	75																				
Welding machine	50																				
Structural (5 days/week)																					
Cranes	200																				
Welding machine	50																				
Piping (5 days/week)																					
Welding machine	50																				
ManLift	75																				
Cranes	200																				
Mechanical (5 days/week)																					
Welding machines	50																				
Crane	200																				
Cavern Rock Moving and Berming (7 days/week)																					
Dump Truck (21-ton)	400																				
Front End Loader	320																				
Dozer	475																				
Water Truck	210																				
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																				
Various Equipment	600																				
Cavern Works																					
Site Prep (5 days/week)																					
Dozers	215													2	10	2	10	2	10	2	10
Track hoe	172													1	10	1	10	1	10	1	10
Back hoe	172													1	10	1	10	1	10	1	10
Dumptruck (20Ton)	400													1	10	1	10	1	10	1	10
Water Truck	210													1	10	1	10	1	10	1	10
Drilling - Conventionally Sunk Shaft (7 days/week)																					
Telehandler	110																				
Articulating wheel loader	320																				
25-ton articulating dump truck	320																				
Surface Equipment (7 days/week)																					
wheel loader	260																				
20 Tn Off Road Dump Truck	320																				
Underground Equipment (7 days/week) - Emissions vented to surface																					
Mercury 1B Bolter	55																				
Boomer 282 Jumbo	125																				
Scissor Lift	138																				
Welder	19																				
Buggy	47																				
Loaders/haul/dump	201																				
Getman Boom Lift	147																				
Skid Steer	61																				

Categories	11		12		13		14		15		16		17		18		19		20	
	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works																				
Indirects (5 days/week)																				
Pick-up trucks (for entire site) -not diesel	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																				
Wheel Loader	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	1	10	1	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																				
Cranes																				
JLG Manlift																				
Cranes													2	8	2	8	2	8	2	8
ManLift													12	4	12	4	12	4	12	4
Welding machine													4	6	4	6	4	6	4	6
Structural (5 days/week)																				
Cranes																	2	4	2	4
Welding machine																	2	8	2	8
Piping (5 days/week)																				
Welding machine											10	4	10	4	10	4	10	4	10	4
ManLift											2	4	2	4	3	4	3	4	6	4
Cranes											2	8	2	8	2	8	2	8	2	8
Mechanical (5 days/week)																				
Welding machines											2	4	2	4	2	4	2	4	2	4
Crane											1	4	1	4	1	4	1	4	1	4
Cavern Rock Moving and Berming (7 days/week)																				
Dump Truck (21-ton)																				
Front End Loader																				
Dozer																				
Water Truck																				
Off-Site Transmission (5 days/week)																				
Various Equipment																				
Cavern Works																				
Site Prep (5 days/week)																				
Dozers	2	10																		
Track hoe	1	10																		
Back hoe	1	10																		
Dumptruck (20Ton)	1	10																		
Water Truck	1	10																		
Drilling - Conventionally Sunk Shaft (7 days/week)																				
Telehandler			1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
Articulating wheel loader			1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
25-ton articulating dump truck			1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
Surface Equipment (7 days/week)																				
wheel loader																				
20 Tn Off Road Dump Truck																				
Underground Equipment (7 days/week) - Emissions vented to surface																				
Mercury 1B Bolter																				
Boomer 282 Jumbo																				
Scissor Lift																				
Welder																				
Buggy																				
Loaders/haul/dump																				
Getman Boom Lift																				
Skid Steer																				

Rock Production and Hauling

Rock Production - Muck/Waste Rock Volume [m3]

Rock Production - Muck/Waste Rock Volume [tons]

Loads per Day

Trucks per Day (Included in Table Above)

1.7 tons/m3
21 tons (truck size)
30.417 days/month
1 hr (cycle time)
10 hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 4 Construction Equipment and Opera
Site: WRESC

Hydrostor WRESC
With Berm

Construction Equipment by Month - With Berm (see Note 1)

Maximum 12-Month Running Average Emissions Period (Months 25 through 36)

Categories	Avg HP	21 # used	21 hrs/day	22 # used	22 hrs/day	23 # used	23 hrs/day	24 # used	24 hrs/day	25 # used	25 hrs/day	26 # used	26 hrs/day	27 # used	27 hrs/day	28 # used	28 hrs/day
Surface Works																	
Indirects (5 days/week)																	
Pick-up trucks (for entire site) -not diesel	150	25	4	25	4	25	4	40	4	40	4	40	4	40	4	40	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																	
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120	12	4	12	4	12	4										
Grader	160	7	4	7	4	7	4	2	4	2	4	2	4	2	4	2	4
Crawler dozer	120	2	4	2	4	2	4										
Scraper	270	9	4	9	4	9	4										
Backhoe	120	16	4	16	4	16	4	4	4	4	4	4	4	4	4	4	4
Roller	100	11	4	11	4	11	4										
Pile driver hammer	250	4	4	4	4	4	4										
Water Truck	210	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																	
Cranes	200											2	4	2	4	2	4
JLG Manlift	75											4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																	
Cranes	200	4	4	4	4	2	4										
Welding machine	50	4	8	4	8	2	8										
Piping (5 days/week)																	
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	6	4	10	4	10	4	10	4	12	4	12	4	12	4	12	4
Cranes	200	2	8	2	8												
Mechanical (5 days/week)																	
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Berming (7 days/week)																	
Dump Truck (21-ton)	400							4	10	4	10	4	10	4	10	4	10
Front End Loader	320							1	10	1	10	1	10	1	10	1	10
Dozer	475							1	10	1	10	1	10	1	10	1	10
Water Truck	210							1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																
Various Equipment	600																
Cavern Works																	
Site Prep (5 days/week)																	
Dozers	215																
Track hoe	172																
Back hoe	172																
Dumptruck (20Ton)	400																
Water Truck	210																
Drilling - Conventionally Sunk Shaft (7 days/week)																	
Telehandler	110	1	18	1	18	1	18	1	18								
Articulating wheel loader	320	1	18	1	18	1	18	1	18								
25-ton articulating dump truck	320	1	18	1	18	1	18	1	18								
Surface Equipment (7 days/week)																	
wheel loader	260							1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	320							1	20	1	20	1	20	1	20	1	20
Underground Equipment (7 days/week) - Emissions vented to surface																	
Mercury 1B Bolter	55							0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125							0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138							0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19							0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47							0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Loaders/haul/dump	201							1.12	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147							0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61							0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6

Categories	Avg HP	29 # used	29 hrs/day	30 # used	30 hrs/day	31 # used	31 hrs/day	32 # used	32 hrs/day	33 # used	33 hrs/day	34 # used	34 hrs/day	35 # used	35 hrs/day	36 # used	36 hrs/day
Surface Works																	
Indirects (5 days/week)																	
Pick-up trucks (for entire site) -not diesel	150	60	4	60	4	60	4	60	4	60	4	60	4	60	4	60	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																	
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4						
Crawler Loader	120																
Grader	160	2	4	2	4	2	4	2	4	2	4	1	4	1	4	1	4
Crawler dozer	120																
Scraper	270																
Backhoe	120	4	4	4	4	4	4	4	4	4	4	1	4	1	4	1	4
Roller	100																
Pile driver hammer	250																
Water Truck	210	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																	
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG Manlift	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																	
Cranes	200																
Welding machine	50																
Piping (5 days/week)																	
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																
Mechanical (5 days/week)																	
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Berming (7 days/week)																	
Dump Truck (21-ton)	400	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10
Front End Loader	320	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Dozer	475	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																
Various Equipment	600																
Cavern Works																	
Site Prep (5 days/week)																	
Dozers	215																
Track hoe	172																
Back hoe	172																
Dumptruck (20Ton)	400																
Water Truck	210																
Drilling - Conventionally Sunk Shaft (7 days/week)																	
Telehandler	110																
Articulating wheel loader	320																
25-ton articulating dump truck	320																
Surface Equipment (7 days/week)																	
wheel loader	260	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	320	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
Underground Equipment (7 days/week) - Emissions vented to surface																	
Mercury 1B Bolter	55	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Loaders/haul/dump	201	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6

Categories	Avg HP	37 # used	37 hrs/day	38 # used	38 hrs/day	39 # used	39 hrs/day	40 # used	40 hrs/day	41 # used	41 hrs/day
Surface Works											
Indirects (5 days/week)											
Pick-up trucks (for entire site) -not diesel	150	50	4	40	4	40	4	40	4	40	4
60 kW Diesel Gensets	100										
Civil & Fdns (5 days/week)											
Wheel Loader	120										
Crawler Loader	120										
Grader	160	1	4	1	4	1	4	1	4	1	4
Crawler dozer	120										
Scraper	270										
Backhoe	120	1	4	1	.	1	4	1	4	1	4
Roller	100										
Pile driver hammer	250										
Water Truck	210	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)											
Cranes	200	2	4	2	4	2	4	2	4	2	4
JLG Manlift	75	4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8				
ManLift	75	12	4	12	4	12	4				
Welding machine	50	4	6	4	6	4	6				
Structural (5 days/week)											
Cranes	200										
Welding machine	50										
Piping (5 days/week)											
Welding machine	50	12	4	12	4	12	4	12	4	12	4
ManLift	75	12	4	12	4	12	4	12	4	12	4
Cranes	200										
Mechanical (5 days/week)											
Welding machines	50	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Berming (7 days/week)											
Dump Truck (21-ton)	400	4	10	4	10	4	10	4	10	4	10
Front End Loader	320	1	10	1	10	1	10	1	10	1	10
Dozer	475	1	10	1	10	1	10	1	10	1	10
Water Truck	210	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]										
Various Equipment	600										
Cavern Works											
Site Prep (5 days/week)											
Dozers	215										
Track hoe	172										
Back hoe	172										
Dumptruck (20Ton)	400										
Water Truck	210										
Drilling - Conventionally Sunk Shaft (7 days/week)											
Telehandler	110										
Articulating wheel loader	320										
25-ton articulating dump truck	320										
Surface Equipment (7 days/week)											
wheel loader	260	1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	320	1	20	1	20	1	20	1	20	1	20
Underground Equipment (7 days/week) - Emissions vented to surface											
Mercury 1B Bolter	55	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Loaders/haul/dump	201	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6

Rock Production and Hauling

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Rock Production - Muck/Waste Rock Volume [m3]	1469	5246	9968	10493	13831	34340	52464	58188	58188	58188	58188	58188	58188	58188	58188	58188	58188	58188
Rock Production - Muck/Waste Rock Volume [tons]	2497	8919	16946	17838	23514	58378	89189	98919	98919	98919	98919	98919	98919	98919	98919	98919	98919	98919
Loads per Day	3.9	14.0	26.5	27.9	36.8	91.4	139.6	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9
Trucks per Day (Included in Table Above)	0.39	1.40	2.65	2.79	3.68	9.14	13.96	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49

1.7 tons/m3
21 tons (truck size)
30.417 days/month
1 hr (cycle time)
10 hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 4 Construction Equipment and Opera

Site: WRESC

Hydrostor WRESC
With Berm

Construction Equipment by Month - With Berm (see Note 1)

Categories	Avg HP	42		43		44		45		46		47		48		49		50	
		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works																			
Indirects (5 days/week)																			
Pick-up trucks (for entire site) -not diesel	150	40	4	40	4	40	4	40	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																		
Civil & Fdns (5 days/week)																			
Wheel Loader	120																		
Crawler Loader	120																		
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Crawler dozer	120																		
Scraper	270																		
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Roller	100																		
Pile driver hammer	250																		
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																			
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG Manlift	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200																		
ManLift	75																		
Welding machine	50																		
Structural (5 days/week)																			
Cranes	200																		
Welding machine	50																		
Piping (5 days/week)																			
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																		
Mechanical (5 days/week)																			
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Berming (7 days/week)																			
Dump Truck (21-ton)	400	4	10	4	10	4	10	4	10	4	10	4	10	4	10				
Front End Loader	320	1	10	1	10	1	10	1	10	1	10	1	10	1	10				
Dozer	475	1	10	1	10	1	10	1	10	1	10	1	10	1	10				
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10				
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																		
Various Equipment	600																		
Cavern Works																			
Site Prep (5 days/week)																			
Dozers	215																		
Track hoe	172																		
Back hoe	172																		
Dumptruck (20Ton)	400																		
Water Truck	210																		
Drilling - Conventionally Sunk Shaft (7 days/week)																			
Telehandler	110																		
Articulating wheel loader	320																		
25-ton articulating dump truck	320																		
Surface Equipment (7 days/week)																			
wheel loader	260	1	20	1	20	1	20	1	20										
20 Tn Off Road Dump Truck	320	1	20	1	20	1	20	1	20										
Underground Equipment (7 days/week) - Emissions vented to surface																			
Mercury 1B Bolter	55	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6				
Boomer 282 Jumbo	125	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6				
Scissor Lift	138	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				
Welder	19	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				
Buggy	47	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6				
Loaders/haul/dump	201	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2				
Getman Boom Lift	147	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				
Skid Steer	61	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				

Categories	Avg HP	51		52		53		54		55		56		57		58		59		60	
		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works																					
Indirects (5 days/week)																					
Pick-up trucks (for entire site) -not diesel	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																				
Civil & Fdns (5 days/week)																					
Wheel Loader	120																				
Crawler Loader	120																				
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Crawler dozer	120																				
Scraper	270																				
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Roller	100																				
Pile driver hammer	250																				
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																					
Cranes	200	2	4	2	4	2	4	2	4												
JLG Manlift	75	4	4	4	4	4	4	4	4												
Cranes	200																				
ManLift	75																				
Welding machine	50																				
Structural (5 days/week)																					
Cranes	200																				
Welding machine	50																				
Piping (5 days/week)																					
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4						
ManLift	75	12	4	12	4	12	4	12	4	12	4	8	4	8	4						
Cranes	200																				
Mechanical (5 days/week)																					
Welding machines	50	4	4	4	4	4	4	4	4												
Crane	200	2	4	2	4	2	4	2	4												
Cavern Rock Moving and Berming (7 days/week)																					
Dump Truck (21-ton)	400																				
Front End Loader	320																				
Dozer	475																				
Water Truck	210																				
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																				
Various Equipment	600																				
Cavern Works																					
Site Prep (5 days/week)																					
Dozers	215																				
Track hoe	172																				
Back hoe	172																				
Dumptruck (20Ton)	400																				
Water Truck	210																				
Drilling - Conventionally Sunk Shaft (7 days/week)																					
Telehandler	110																				
Articulating wheel loader	320																				
25-ton articulating dump truck	320																				
Surface Equipment (7 days/week)																					
wheel loader	260																				
20 Tn Off Road Dump Truck	320																				
Underground Equipment (7 days/week) - Emissions vented to surface																					
Mercury 1B Bolter	55																				
Boomer 282 Jumbo	125																				
Scissor Lift	138																				
Welder	19																				
Buggy	47																				
Loaders/haul/dump	201																				
Getman Boom Lift	147																				
Skid Steer	61																				

Rock Production and Hauling

Rock Production - Muck/Waste Rock Volume [m3]	58188	58188	58188	38404
Rock Production - Muck/Waste Rock Volume [tons]	98919	98919	98919	65286
Loads per Day	154.9	154.9	154.9	102.2
Trucks per Day (Included in Table Above)	15.49	15.49	15.49	10.22

1.7 tons/m3
21 tons (truck size)
30.417 days/month
1 hr (cycle time)
10 hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 5 (Page 1 of 2)
Material Throughput and Vehicle Traffic Count on Onsite Unpaved Roads
Construction Phase - With Berm
Hydrostor WRESC

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Parameters	**Cavern Works**															
	Clearing & Stripping								**Berm Construction**		**Mining Activities**					
	Workforce	**Equipment mobilization**	**Equipment demobilization**	**Fuel delivery**	**Fencing delivery**	**Concrete trucks**	**Gravel delivery**	**Trailer delivery**	**Workforce**	**Berm Material Remove and Replace**	**Workforce**	**Surface equipment – mobilization**	**Subsurface equipment – mobilization**	**Ground support**	**Explosives**	**Waste Rock Trucks to Berm Site**
Material Throughput																
Total Area (acres)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Material Depth (in)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Material Volume (ft^3)	--	--	--	--	--	--	305,100	--	--	--	--	--	--	--	--	--
Material Volume (yd^3) [a]	--	--	--	--	--	14,640	11,300	--	--	120,000	--	--	--	--	--	624,000
Material Density (lb/ft^3) [b]	--	--	--	--	--	--	105.0	--	--	115.0	--	--	--	--	--	130.0
Total Material Weight (tons)	--	--	--	--	--	--	16,018	--	--	186,000	--	--	--	--	--	1,095,120
Operating Time																
Total Operating Weeks (weeks) [c]	16	1	1	16	1	26	3	1	52	52	52	4	4	52	52	52
Total Operating Days (days) [c]	80	7	7	80	7	183	15	7	365	365	365	30	30	365	365	365
Daily Operating Hours (hrs/day)	2	2	2	2	2	12	10	2	10	10	2	2	2	2	2	10
Vehicle and Travel Data																
Vehicle Model [d]	Passenger Car	Tractor Trailer	Tractor Trailer	Fuel truck (tandem)	Tractor Trailer	Cement mix truck (10 yd)	Tandem truck load (12 yd)	Tractor Trailer	Passenger car	12 cy dump truck	Passenger car	Tractor Trailer	Tractor Trailer	Flatbed tractor trailer	Flatbed tractor trailer	Dump trucks (12 yd)
Empty Vehicle Weight (tons) [e]	2.3	19.0	19.0	7.1	19.0	13.5	20.0	19.0	2.3	25.5	2.3	19.0	19.0	19.0	19.0	25.5
Vehicle Capacity (tons)	0.8	20.0	20.0	19.0	20.0	20.0	18.0	20.0	0.8	19	0.8	20.0	20.0	20.0	20.0	21
Vehicle Capacity (yd^3)	--	--	--	--	--	--	12.0	--	--	12.0	--	--	--	--	--	12.0
Loaded Vehicle Weight (tons)	3.0	39.0	39.0	26.1	39.0	33.5	38.0	39.0	3.0	44.1	3.0	39.0	39.0	39.0	39.0	46.6
W = Average Vehicle Weight (tons)	2.7	29.0	29.0	16.6	29.0	23.5	29.0	29.0	2.7	34.8	2.7	29.0	29.0	29.0	29.0	36.0
Number of Vehicles (duration)	960	10	10	80	2	1,464	942	12	9,855	10,000	19,957	50	35	24	24	52,000
Number of Vehicles (daily)	12	2	2	1	1	8	63	2	27	28	55	2	2	1	1	143
D = Distance traveled on unpaved roads (2-way miles) [f]	0.77	0.77	0.77	0.77	0.77	0.17	0.77	0.77	0.77	1.66	0.77	0.77	0.77	0.77	0.77	1.84
Daily Vehicle Miles Travelled (VMT)	9.3	1.5	1.5	0.8	0.8	1.4	48.8	1.5	20.9	46.5	42.6	1.5	1.5	0.8	0.8	262.4
Activity Duration Vehicle Miles Travelled (VMT)	743	8	8	62	2	249	729	9	7,628	16,600	15,447	39	27	19	19	95,420

Notes:
[a] Material quantities based on the document TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021)
[b] The density of 130 lb/ft^3 used for shat material and waste, 115 lb/ft^3 used for surface material such as topsoil and overburden, and density of 105 lb/ft^3 used for a typical gravel material. Densities are assumed based on Golder's experience.
[c] Operating weeks are based on construction schedule information obtained from Hydrostor.
[d] Vehicle model based on TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021)
[e] Empty vehicle weights were obtained from technical specifications of each vehicle.
[f] Hauling distance is conservatively estimated based on road design. Fugitive dust generation is directly proportional to the distance of travel.

Table 5 (Page 2 of 2)
Material Throughput and Vehicle Traffic Count on Onsite Unpaved Roads
Construction Phase
Ansel Site - Hydrostor

	17	18	19	20	21	22	23	24
	Surface Works					**Surface Works & Cavern**		**Reservoir Fill**
Parameters	**Workforce**	**Site clearing - overburden**	**Civil foundation excavation**	**Cement Trucks**	**Equipment and material delivery**	**Potable Water**	**Non Potable Water**	**Non Potable Water**
Material Throughput								
Total Area (acres)	--	--	--	--	--	--	--	--
Material Depth (in)	--	--	--	--	--	--	--	--
Material Volume (ft^3)	--	3,402,783	1,201,959	--	--	--	--	--
Material Volume (yd^3) [a]	--	126,029	44,517	--	--	--	--	--
Material Density (lb/ft^3) [b]	--	115	115	--	--	--	--	--
Total Material Weight (tons)	--	195,660	69,113	--	--	--	--	--
Operating Time								
Total Operating Weeks (weeks) [c]	52	16	12	4	52	52	52	52
Total Operating Days (days) [c]	240	120	90	30	365	365	365	365
Daily Operating Hours (hrs/day)	2	12	12	12	2	24	24	24
Vehicle and Travel Data								
Vehicle Model [d]	Passenger Car	12 cy dump truck	12 cy dump truck	12 cy cement truck	Flatbed	water truck 9000 gal	water truck 9000 gal	water truck 9000 gal
Empty Vehicle Weight (tons) [e]	2.3	25.5	25.5	23.0	19.0	23.2	23.2	23.2
Vehicle Capacity (tons)	0.8	19.0	19.0	24.0	20.0	12.0	12.0	12.0
Vehicle Capacity (yd^3)	--	12.0	12.0	12.0	--	-	-	-
Loaded Vehicle Weight (tons)	3.0	44.5	44.5	47.0	39.0	35.3	35.3	35.3
W = Average Vehicle Weight (tons)	2.7	35.0	35.0	35.0	29.0	29.2	29.2	29.2
Number of Vehicles (duration)	92,160	10,502	4,822	2,771	969	260	2,190	14,289
Number of Vehicles (daily)	384	88	54	93	3	1	6	40
D = Distance traveled on unpaved roads (2-way miles) [f]	0.22	0.22	0.22	0.22	0.22	0.77	0.77	0.77
Daily Vehicle Miles Travelled (VMT)	84	19	12	20	1	1	5	31
Activity Duration Vehicle Miles Travelled (VMT)	20,091	2,290	1,051	604	211	201	1,695	11,060

Notes:
[a] Material quantities based on the document TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021)
[b] The density of 130 lb/ft^3 used for shat material and waste, 115 lb/ft^3 used for surface material such as topsoil and overburden, and density of 105 lb/ft^3 used for a typical gravel material. Densities are assumed based on Golder's experience.
[c] Operating weeks are based on construction schedule information obtained from Hydrostor.
[d] Vehicle model based on TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021)
[e] Empty vehicle weights were obtained from technical specifications of each vehicle.
[f] Hauling distance is conservatively estimated based on road design. Fugitive dust generation is directly proportional to the distance of travel.

Table 6 (Page 1 of 2)
Fugitive Particulate Matter (PM) Emissions from Vehicle Traffic on Onsite Unpaved Roads
Construction Phase - With Berm
Hydrostor WRESC

ISR = Internal Site Route

Parameters	Clearing & Stripping																Berm Construction			
	ISR 1		ISR 2		ISR 3		ISR 4		ISR 5		ISR 6		ISR 7		ISR 8		ISR 9		ISR 10	
	Workforce		Equipment mobilization		Equipment demobilization		Fuel delivery		Fencing delivery		Concrete trucks		Gravel delivery		Trailer delivery		Workforce		Berm Material Remove and Replace	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data [b]																				
W = Average Vehicle Weight (tons)	2.7	2.7	29.0	29.0	29.0	29.0	16.6	16.6	29.0	29.0	23.5	23.5	29.0	29.0	29.0	29.0	2.7	2.7	44.5	44.5
D = Distance traveled on unpaved roads (2-way miles)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.2	0.2	0.8	0.8	0.8	0.8	0.8	0.8	1.7	1.7
Daily Operation Hours (hrs/day)	2	2	2	2	2	2	2	2	2	2	12	12	10	10	2	2	10	10	10	10
Total No. of Operating Days for activity (days)	80	80	7	7	7	7	80	80	7	7	183	183	15	15	7	7	365	365	365	365
No. of truck trips per day (trucks/day)	12	12	2	2	2	2	1	1	1	1	8	8	63	63	2	2	27	27	28	28
Total No. of trucks for activity (trucks)	960	960	10	10	10	10	80	80	2	2	1,464	1,464	942	942	12	12	9,855	9,855	10,000	10,000
Daily Vehicle Miles Travelled (VMT)	9.3	9.3	1.5	1.5	1.5	1.5	0.8	0.8	0.8	0.8	1.4	1.4	48.8	48.8	1.5	1.5	20.9	20.9	46.5	46.5
Activity Duration Vehicle Miles Travelled (VMT)	743	743	8	8	8	8	62	62	2	2	249	249	729	729	9	9	7,628	7,628	16,600	16,600
Site Characteristics																				
k = Particle size multiplier (lb/VMT) [c]	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036
s = Silt content of site specific unpaved roads (%) [d]	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [e]	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
a (constant, AP-42, Table 13.2.2-2)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant, AP-42, Table 13.2.2-2)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Control Efficiency																				
Dust Control Efficiency (%) [f]	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Emission Factors [a]																				
Emission Factor (lb/VMT) - Daily	0.25	0.025	0.7	0.1	0.7	0.1	0.6	0.1	0.73	0.07	0.67	0.07	0.73	0.07	0.73	0.07	0.25	0.02	0.89	0.09
Emission Factor (lb/VMT) - Annual	0.24	0.024	0.69	0.07	0.69	0.07	0.54	0.05	0.69	0.07	0.63	0.06	0.69	0.07	0.69	0.07	0.24	0.02	0.84	0.08
Emission Rates [a]																				
Uncontrolled Emission Factor (UEF) Equation - Daily (lb/day)	2.3	0.2	1.1	0.1	1.1	0.1	0.4	0.0	0.6	0.1	0.9	0.1	35.7	3.6	1.1	0.1	5.2	0.5	41.3	4.1
Uncontrolled Emission Factor (UEF) Equation - Duration (tons)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.9	0.1	7.0	0.7
Controlled Daily Emissions (lb/day)	0.3	0.0	0.2	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0	5.4	0.5	0.2	0.0	0.8	0.1	6.2	0.6
Controlled Annual Emissions (TPY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.0	0.1
Controlled Hourly Emissions (lb/hr, daily basis)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0

Notes:

[a] Emission Factor (E) calculated from AP-42 Section 13.2.2 (Unpaved Roads) Equation 1a (Industrial Sites) -
E = k * (s/12)^a * (W/3)^b * (365-P)/365

[b] See Table 1 for number of vehicles and travel data.

[c] Particle size multiplier: San Diego APCD-Haul Road Emissions.Technical Report, November 2021. (Per AP-42 the PM2.5 ratio to PM10 is 0.1)

[d] Silt content based on the Table 13.2.2-1 of AP-42 for Construction Sites. Consistent with Kern County Soil Survey, Southeastern Part, 1981, Cajon Soils.

[e] Precipitation data: AP-42, Section 13.2.2 (Unpaved Roads), Figure 13.2.2-1, 11/2006.

[f] Dust control efficiency based on 85% for basic watering plus chemical dust supressors on unpaved roads according to the Document Emission Factors for Paved and Unpaved Roads by the Department of Environmental Quality, State of Utah, January 2015

Table 6 (Page 2 of 2)
Fugitive Particulate Matter (PM) Emissions from Vehicle Traffic on Onsite Unpaved Roads
Construction Phase
Hydrostor WRESC

ISD = Internal Site Road

Parameters	Mining Activities											
	ISR 11		ISR 12		ISR 13		ISR 14		ISR 15		ISR 16	
	Workforce		Surface equipment – mobilization		Subsurface equipment – mobilization		Ground support		Explosives		Waste Rock Trucks to Berm Site	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data [b]												
W = Average Vehicle Weight (tons)	2.7	2.7	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	44.5	44.5
D = Distance traveled on unpaved roads (2-way miles)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.8	1.8
Daily Operation Hours (hrs/day)	2	2	2	2	2	2	2	2	2	2	10	10
Total No. of Operating Days for activity (days)	365	365	30	30	30	30	365	365	365	365	365	365
No. of truck trips per day (trucks/day)	55	55	2	2	2	2	1	1	1	1	143	143
Total No. of trucks for activity (trucks)	19,957	19,957	50	50	35	35	24	24	24	24	52,000	52,000
Daily Vehicle Miles Travelled (VMT)	42.6	42.6	1.5	1.5	1.5	1.5	0.8	0.8	0.8	0.8	262.4	262.4
Activity Duration Vehicle Miles Travelled (VMT)	15,447	15,447	39	39	27	27	19	19	19	19	95,420	95,420
Site Characteristics												
k = Particle size multiplier (lb/VMT) [c]	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036
s = Silt content of site specific unpaved roads (%) [d]	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [c]	20	20	20	20	20	20	20	20	20	20	20	20
a (constant, AP-42, Table 13.2.2-2)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant, AP-42, Table 13.2.2-2)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Control Efficiency												
Dust Control Efficiency (%) [e]	85	85	85	85	85	85	85	85	85	85	85	85
Emission Factors [a]												
Emission Factor (lb/VMT) - Daily [e]	0.25	0.02	0.73	0.07	0.73	0.07	0.73	0.07	0.73	0.07	0.89	0.09
Emission Factor (lb/VMT) - Annual	0.24	0.02	0.69	0.07	0.69	0.07	0.69	0.07	0.69	0.07	0.84	0.08
Emission Rates [a]												
Uncontrolled Emission Factor (UEF) Equation - Daily (lb/day)	10.6	1.1	1.1	0.1	1.1	0.1	0.6	0.1	0.6	0.1	233.1	23.3
Uncontrolled Emission Factor (UEF) Equation - Duration (tons)	1.82	0.18	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	40.06	4.01
Controlled Daily Emissions (lb/day)	1.6	0.2	0.2	0.0	0.2	0.0	0.1	0.0	0.1	0.0	35.0	3.5
Controlled Annual Emissions (TPY)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.6
Controlled Hourly Emissions (lb/hr, daily basis)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.3

Parameters	Surface Works										Surface Works & Cavern				Reservoir Fill	
	ISR 17		ISR 18		ISR 19		ISR 20		ISR 21		ISR 22		ISR 23		ISR 24	
	Workforce		Site clearing - overburden		Civil foundation excavation		Cement Trucks		Equipment and material delivery		Potable Water		Non Potable Water		Non Potable Water	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data [b]																
W = Average Vehicle Weight (tons)	2.7	2.7	35.0	35.0	35.0	35.0	35.0	35.0	29.0	29.0	29.2	29.2	29.2	29.2	29.2	29.2
D = Distance traveled on unpaved roads (2-way miles)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.8	0.8	0.8	0.8	0.8	0.8
Daily Operation Hours (hrs/day)	2	2	12	12	12	12.0	12	12	2	2	24	24.0	24	24.0	24	24.0
Total No. of Operating Days for activity (days)	240	240	120	120	90	90.0	30	30	365	365	365	365.0	365	365.0	365	365.0
No. of truck trips per day (trucks/day)	384	384	88	88	54	54.0	93	93	3	3	1	1.0	6	6.0	40	40.0
Total No. of trucks for activity (trucks)	92,160	92,160	10,502	10,502	10,502	10,502	2,771	2,771	969	260	260	259.7	2,190	2,190	14,289	14,289
Daily Vehicle Miles Travelled (VMT)	83.7	83.7	19.2	19.2	11.8	11.8	20.3	20.3	0.7	0.7	0.8	0.8	4.6	4.6	31.0	31.0
Activity Duration Vehicle Miles Travelled (VMT)	20,091	20,091	2,290	2,290	1,051	1,051	604	604	211	211	201	201.0	1,695	1,695	11,060	11,060
Site Characteristics																
k = Particle size multiplier (lb/VMT) [c]	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036
s = Silt content of site specific unpaved roads (%) [d]	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [c]	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
a (constant, AP-42, Table 13.2.2-2)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant, AP-42, Table 13.2.2-2)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Control Efficiency																
Dust Control Efficiency (%) [e]	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Emission Factors [a]																
Emission Factor (lb/VMT) - Daily [e]	0.25	0.02	0.80	0.08	0.80	0.08	0.80	0.08	0.73	0.07	0.74	0.07	0.74	0.07	0.74	0.07
Emission Factor (lb/VMT) - Annual	0.24	0.02	0.75	0.08	0.75	0.08	0.75	0.08	0.69	0.07	0.70	0.07	0.70	0.07	0.70	0.07
Emission Rates [a]																
Uncontrolled Emission Factor (UEF) Equation - Daily (lb/day)	20.9	2.1	15.3	1.5	9.4	0.9	16.2	1.6	0.5	0.0	0.6	0.1	3.4	0.3	22.8	2.3
Uncontrolled Emission Factor (UEF) Equation - Duration (tons)	2.37	0.24	0.86	0.09	0.40	0.04	0.23	0.02	0.07	0.01	0.07	0.01	0.59	0.06	3.84	0.38
Controlled Daily Emissions (lb/day)	3.1	0.3	2.3	0.2	1.4	0.1	2.4	0.2	0.1	0.0	0.1	0.0	0.5	0.1	3.4	0.3
Controlled Annual Emissions (TPY)	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.6	0.1
Controlled Hourly Emissions (lb/hr, daily basis)	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0

Notes:

[a] Emission Factor (E) calculated from AP-42 Section 13.2.2 (Unpaved Roads) Equation 1a (Industrial Sites) -

E = k * (s/12)^a * (W/3)^b * (365-P)/365

[b] See Table 1 for number of vehicles and travel data.

[c] Particle size multiplier and constants from AP-42 Table 13.2.2-2 for industrial roads

[d] Silt content based on the Table 13.2.2-1 of AP-42 for Construction Sites

[e] Precipitation data: AP-42, Section 13.2.2 (Unpaved Roads), Figure 13.2.2-1, 11/2006.

[f] Dust control efficiency based on 85% for basic watering plus chemical dust supressors on unpaved roads according to the Document Emission Factors for Paved and Unpaved Roads by the Department of Environmental Quality, State of Utah, January 2015

TABLE 7 (Page 1 of 2)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase - With Berm
Hydrostor WRESC

ISR = Internal Site Route

Internal Site Route ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	Vehicle Type	Weight Range (lbs)	Fuel Type	Total Miles Travelled (VMT/day)	Pollutants from Vehicle Exhaust and Tire & Brake Wear								Hourly Emissions					
										CO	NO_X	SO_2	$PM_{10\ Exhaust}$	$PM_{10\ TBW}$	$PM_{2.5\ Exhaust}$	$PM_{2.5\ TBW}$	VOC	Total PM_{10} (lbs/hr)	Total $PM_{2.5}$ (lbs/hr)	Total VOC (lbs/hr)	Total NOx (lbs/hr)	Total CO (lbs/hr)	Total SO_2 (lbs/hr)
										Fleet Aggregate Air Pollutant Emissions Factors for 2025 at 15 mph (g/mile) [a]													
						LDGV	<6,000	Gas		1.4752	0.0892	0.0027	0.0039	0.0202	0.0036	0.0063	0.0617						
						HHDT	>33,000	Diesel		0.3786	5.1916	0.0209	0.0082	0.1733	0.0079	0.0571	0.1859						
						HHDT	>33,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859						
ISR										**Daily Emissions (lbs/day) [b]**													
1	Workforce (Site Clearing) - Cavern Works	0.77	80	2	6,050	LDGV	<6,000	Gas	9	3.02E-02	1.83E-03	5.62E-05	7.95E-05	4.13E-04	7.31E-05	1.28E-04	1.26E-03	2.05E-05	8.39E-06	0.0006	0.0009	0.0151	0.0000
2	Equipment mobilization - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
3	Equipment demobilization - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
4	Fuel delivery - Cavern Works	0.77	80	2	52,200	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
5	Fencing delivery - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
6	Concrete trucks - Cavern Works	0.17	183	12	67,000	HHDT	>33,000	Diesel	1	1.14E-03	1.56E-02	6.26E-05	2.47E-05	5.19E-04	2.36E-05	1.71E-04	5.57E-04	2.27E-05	8.11E-06	0.0000	0.0013	0.0001	0.0000
7	Gravel delivery - Cavern Works	0.77	15	10	76,000	HHDT	>33,000	Diesel	49	4.07E-02	5.58E-01	2.24E-03	8.85E-04	1.86E-02	8.46E-04	6.13E-03	2.00E-02	8.13E-04	2.91E-04	0.0020	0.0558	0.0041	0.0002
8	Trailer delivery - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
9	Berm Construction - Workforce	0.77	365	10	6,050	LDGV	<6,000	Gas	21	6.80E-02	4.11E-03	1.26E-04	1.79E-04	9.29E-04	1.65E-04	2.88E-04	2.84E-03	4.62E-05	1.89E-05	0.0003	0.0004	0.0068	0.0000
10	Berm Construction - Berm Material Remove and Replace	1.66	365	10	88,200	HHDT	>33,000	Diesel	46	3.88E-02	5.32E-01	2.14E-03	8.43E-04	1.78E-02	8.07E-04	5.85E-03	1.91E-02	7.75E-04	2.77E-04	0.0019	0.0532	0.0039	0.0002
11	Workforce (Mining) - Cavern Works	0.77	365	2	6,050	LDGV	<6,000	Gas	43	1.38E-01	8.37E-03	2.57E-04	3.64E-04	1.89E-03	3.35E-04	5.87E-04	5.79E-03	9.40E-05	3.84E-05	0.0029	0.0042	0.0692	0.0001
12	Surface equipment (mobilization) - Cavern Works	0.77	30	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
13	Subsurface equipment (mobilization) - Cavern Works	0.77	30	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
14	Ground support - Cavern Works	0.77	365	2	78,000	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
15	Explosives - Cavern Works	0.77	365	2	78,000	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
16	Berm Construction - Transport of Waste Rock to Berm site	1.84	365	10	89,000	HHDT	>33,000	Diesel	262	2.19E-01	3.00E+00	1.21E-02	4.76E-03	1.00E-01	4.55E-03	3.30E-02	1.08E-01	4.37E-03	1.57E-03	0.0108	0.3003	0.0219	0.0012
17	Workforce - Surface Works	0.22	240	2	6,050	LDGV	<6,000	Gas	84	2.72E-01	1.65E-02	5.06E-04	7.17E-04	3.72E-03	6.59E-04	1.15E-03	1.14E-02	1.85E-04	7.56E-05	0.0057	0.0082	0.1361	0.0003
18	Site clearing (overburden) - Surface Works	0.22	120	12	89,000	HHDT	>33,000	Diesel	19	1.60E-02	2.20E-01	8.83E-04	3.48E-04	7.33E-03	3.33E-04	2.41E-03	7.86E-03	3.20E-04	1.14E-04	0.0007	0.0183	0.0013	0.0001
19	Civil foundation excavation Surface Works	0.22	90	12	89,000	HHDT	>33,000	Diesel	12	9.82E-03	1.35E-01	5.42E-04	2.14E-04	4.50E-03	2.04E-04	1.48E-03	4.83E-03	1.96E-04	7.02E-05	0.0004	0.0112	0.0008	0.0000
20	Cement Trucks Surface Works	0.22	30	12	94,000	HHDT	>33,000	Diesel	20	1.69E-02	2.32E-01	9.33E-04	3.68E-04	7.74E-03	3.52E-04	2.55E-03	8.31E-03	3.38E-04	1.21E-04	0.0007	0.0193	0.0014	0.0001
21	Equipment and material delivery Surface Works	0.22	365	2	78,000	HHDT	>33,000	Diesel	1	5.46E-04	7.49E-03	3.01E-05	1.19E-05	2.50E-04	1.14E-05	8.23E-05	2.68E-04	1.09E-05	3.90E-06	0.0001	0.0037	0.0003	0.0000
22	Potable Water - Surface and Cavern	0.77	365	24	70,512	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0000	0.0004	0.0000	0.0000
23	Non Potable Water - Surface and Cavern	0.77	365	24	70,512	HHDT	>33,000	Diesel	5	3.88E-03	5.32E-02	2.14E-04	8.42E-05	1.77E-03	8.06E-05	5.84E-04	1.90E-03	7.74E-05	2.77E-05	0.0001	0.0022	0.0002	0.0000
24	Non Potable Water - Reservoir Fill	0.77	365	24	70,512	HHDT	>33,000	Diesel	31	2.58E-02	3.54E-01	1.43E-03	5.62E-04	1.18E-02	5.37E-04	3.89E-03	1.27E-02	5.16E-04	1.85E-04	0.0005	0.0148	0.0011	0.0001

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

TABLE 7 (Page 2 of 2)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase
WRESC Site - Hydrostor

Internal Site Road ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	Vehicle Type	Weight Range (lbs)	Fuel Type	Total Miles Travelled (VMT/year)	Pollutants from Vehicle Exhaust and Tire & Brake Wear								Annual Emissions					
										CO	NO_x	SO_2	PM_{10} Exhaust	$PM_{10\ TBW}$	$PM_{2.5}$ Exhaust	$PM_{2.5\ TBW}$	VOC	Total PM_{10} (tons/yr)	Total $PM_{2.5}$ (tons/yr)	Total VOC (tons/yr)	Total NOx (tons/yr)	Total CO (tons/yr)	Total SO_2 (tons/yr)
										Fleet Aggregate Air Pollutant Emissions Factors for 2025 at 15 mph (g/mile) [a]													
						LDGV	<6,000	Diesel		1.4752	0.0892	0.0027	0.0039	0.0202	0.0036	0.0063	0.0617						
						HDGV8a	33,001-60,000	Diesel		0.3786	5.1916	0.0209	0.0082	0.1733	0.0079	0.0571	0.1859						
						HDDV8b	>60,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859						
ISR										**Annual Emissions (lbs/year)** [b]													
1	Workforce (Site Clearing) - Cavern Works	0.77	80	2	6050	LDGV	<6,000	Gas	743	2.42	0.15	0.00	0.01	0.03	0.01	0.01	0.10	0.0000	0.0000	0.0001	0.0001	0.0012	0.0000
2	Equipment mobilization - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	8	0.01	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	Equipment demobilization - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	8	0.01	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	Fuel delivery - Cavern Works	0.77	80	2	52200	HHDT	>33,000	Diesel	62	0.05	0.71	0.00	0.00	0.02	0.00	0.01	0.03	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000
5	Fencing delivery - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	2	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	Concrete trucks - Cavern Works	0.17	183	12	67000	HHDT	>33,000	Diesel	249	0.21	2.85	0.01	0.00	0.10	0.00	0.03	0.10	0.0000	0.0000	0.0001	0.0014	0.0001	0.0000
7	Gravel delivery - Cavern Works	0.77	15	10	76000	HHDT	>33,000	Diesel	729	0.61	8.34	0.03	0.01	0.28	0.01	0.09	0.30	0.0001	0.0001	0.0001	0.0042	0.0003	0.0000
8	Trailer delivery - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	9	0.01	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
9	Berm Construction - Workforce	0.77	365	10	6050	LDGV	<6,000	Gas	7,628	24.81	1.50	0.05	0.07	0.34	0.06	0.11	1.04	0.0002	0.0001	0.0005	0.0008	0.0124	0.0000
10	Berm Construction - Berm Material Remove a	1.66	365	10	88200	HHDT	>33,000	Diesel	16,600	13.85	189.99	0.76	0.30	6.34	0.29	2.09	6.80	0.0033	0.0012	0.0034	0.0950	0.0069	0.0004
11	Workforce (Mining) - Cavern Works	0.77	365	2	6050	LDGV	<6,000	Gas	15,447	50.24	3.04	0.09	0.13	0.69	0.12	0.21	2.10	0.0004	0.0002	0.0011	0.0015	0.0251	0.0000
12	Surface equipment (mobilization) - Cavern Wo	0.77	30	2	78000	HHDT	>33,000	Diesel	39	0.03	0.44	0.00	0.00	0.01	0.00	0.00	0.02	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000
13	Subsurface equipment (mobilization) - Cavern	0.77	30	2	78000	HHDT	>33,000	Diesel	27	0.02	0.31	0.00	0.00	0.01	0.00	0.00	0.01	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000
14	Ground support - Cavern Works	0.77	365	2	78000	HHDT	>33,000	Diesel	19	0.02	0.21	0.00	0.00	0.01	0.00	0.00	0.01	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
15	Explosives - Cavern Works	0.77	365	2	78000	HHDT	>33,000	Diesel	19	0.02	0.21	0.00	0.00	0.01	0.00	0.00	0.01	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
16	Berm Construction - Transport of Waste Rock	1.84	365	10	89000	HHDT	>33,000	Diesel	95,420	79.64	1092.11	4.39	1.73	36.45	1.66	12.00	39.11	0.0191	0.0068	0.0196	0.5461	0.0398	0.0022
17	Workforce - Surface Works	0.22	240	2	6050	LDGV	<6,000	Gas	20,091	65.34	3.95	0.12	0.17	0.89	0.16	0.28	2.73	0.0005	0.0002	0.0014	0.0020	0.0327	0.0001
18	Site clearing (overburden) - Surface Works	0.22	120	12	89000	HHDT	>33,000	Diesel	2,290	1.91	26.20	0.11	0.04	0.87	0.04	0.29	0.94	0.0005	0.0002	0.0005	0.0131	0.0010	0.0001
19	Civil foundation excavation Surface Works	0.22	90	12	89000	HHDT	>33,000	Diesel	1,051	0.88	12.03	0.05	0.02	0.40	0.02	0.13	0.43	0.0002	0.0001	0.0002	0.0060	0.0004	0.0000
20	Cement Trucks Surface Works	0.22	30	12	94000	HHDT	>33,000	Diesel	604	0.50	6.91	0.03	0.01	0.23	0.01	0.08	0.25	0.0001	0.0000	0.0001	0.0035	0.0003	0.0000
21	Equipment and material delivery Surface Worl	0.22	365	2	78000	HHDT	>33,000	Diesel	211	0.18	2.42	0.01	0.00	0.08	0.00	0.03	0.09	0.0000	0.0000	0.0000	0.0012	0.0001	0.0000
22	Potable Water - Surface and Cavern	0.77	365	24	70512	HHDT	>33,000	Diesel	201	0.17	2.30	0.01	0.00	0.08	0.00	0.03	0.08	0.0000	0.0000	0.0000	0.0012	0.0001	0.0000
23	Non Potable Water - Surface and Cavern	0.77	365	24	70512	HHDT	>33,000	Diesel	1,695	1.41	19.40	0.08	0.03	0.65	0.03	0.21	0.69	0.0003	0.0001	0.0003	0.0097	0.0007	0.0000
24	Non Potable Water - Reservoir Fill	0.77	365	24	70512	HHDT	>33,000	Diesel	11,060	9.23	126.58	0.51	0.20	4.22	0.19	1.39	4.53	0.0022	0.0008	0.0023	0.0633	0.0046	0.0003

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Table 8
Estimation of Emissions Factors for Non-Road Equipment Used in the Project
Construction Phase
Hydrostor WRESC

Equipment Description	Number of Equipment	Engine Power (hp)	Emission Factor (EF) [a]					
			ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO_2
			(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)
Surface Works								
Indirect								
60 kW Diesel Gensets	12	100	0.364	3.759	3.482	0.093	568.312	0.0073
Civil & Fdns								
Wheel Loader	2	120	0.225	3.283	1.602	0.085	526.161	0.0049
Crawler Loader	0	120	0.162	3.089	1.183	0.059	525.997	0.0049
Grader	2	160	0.340	3.419	2.859	0.159	531.194	0.005
Crawler dozer	0	120	0.299	3.211	2.697	0.151	527.479	0.005
Scraper	0	270	0.173	1.251	1.110	0.048	527.122	0.005
Backhoe	4	120	0.162	3.089	1.183	0.059	525.997	0.005
Roller	0	100	0.244	3.414	2.601	0.129	528.034	0.005
Pile driver hammer	0	250	0.113	1.055	0.113	0.035	525.609	0.005
Turbine Hall								
Cranes	2	200	0.270	1.537	2.772	0.118	527.564	0.0049
JLG Manlift	4	75	0.098	3.145	1.532	0.028	527.864	0.0049
Cranes	2	200	0.270	1.537	2.772	0.118	527.564	0.0049
ManLift	12	75	0.098	3.145	1.532	0.028	527.864	0.0049
Welding machine	4	50	0.498	4.525	3.676	0.113	568.301	0.0073
Structural								
Cranes	0	200	0.270	1.537	2.772	0.118	527.564	0.0049
Welding machine	0	50	0.498	4.525	3.676	0.113	568.301	0.0073
Piping								
Welding machine	12	50	0.498	4.525	3.676	0.113	568.301	0.0073
ManLift	12	75	0.098	3.145	1.532	0.028	527.864	0.0049
Cranes	0	200	0.270	1.537	2.772	0.118	527.564	0.0049
Mechanical								
Welding machines	4	50	0.498	4.525	3.676	0.113	568.301	0.0073
Crane	2	200	0.270	1.537	2.772	0.118	527.564	0.0049
Cavern Rock Moving and Berming (7 days/week)								
Dump Truck (21-ton)	4	400	0.177	1.174	1.086	0.038	528.587	0.0049
Front End Loader	1	320	0.197	1.261	1.459	0.055	527.135	0.0049
Dozer	1	475	0.180	1.417	1.630	0.065	528.093	0.0049
Cavern Works								
Site Prep (5 days/week)								
Dozers	0	215	0.277	1.749	2.934	0.122	527.288	0.0049
Track hoe	0	172	0.162	3.089	1.183	0.059	525.997	0.0049
Back hoe	0	172	0.162	3.089	1.183	0.059	525.997	0.0049
Dumptruck (20Ton)	0	400	0.177	1.174	1.086	0.038	528.587	0.0049
Drilling - Conventionally Sunk Shaft (7 days/week)								
Telehandler	0	110	0.179	2.942	1.471	0.101	527.759	0.0049
Articulating wheel loader	0	320	0.197	1.261	1.459	0.055	527.135	0.0049
25-ton articulating dump truck	0	320	0.177	1.174	1.086	0.038	528.587	0.0049
Surface Equipment (7 days/week)								
Wheel loader	1	260	0.179	1.160	1.492	0.050	526.675	0.0049
20 Ton Off Road Dump Truck	1	320	0.177	1.174	1.086	0.038	528.587	0.0049
Underground Equipment (7 days/week)-Emissions vented to surface								
Bolter (semi-electrical)	2	55	1.469	5.063	12.074	0.884	529.994	0.0049
Jumbo (semi-electrical)	2	125	0.115	2.952	0.900	0.040	530.619	0.0049
Scissor Lift	1	138	0.179	2.942	1.471	0.101	527.759	0.0049
Welder	1	19	0.578	2.806	4.358	0.180	568.329	0.0078
Buggy	2	47	0.757	4.872	4.304	0.268	591.483	0.0054
Loaders/haul/dump	4	201	0.163	1.221	1.399	0.053	526.844	0.0049
Getman Boom Lift	1	147	0.179	2.942	1.471	0.101	527.759	0.0049
Skid Steer	1	61	0.139	3.249	1.862	0.056	528.374	0.0049

Notes
[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2022.1), Appendix G, Table G-11

Table 9
Estimation of Emissions Rates for Non-Road Equipment used in the Project
Construction Phase - With Berm
Hydrostor WRESC

Equipment Description	NUMBER OF EQUIPMENT	ENGINE POWER (hp)	Load Factor[e] (%)	Availability (%)	HOURS OF OPERATION PER UNIT[d]	Emission Factors [a]						Hourly Emission Rates (Average Hourly) [b]						Annual Emission Rates (Average Annual) [c]					
						ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2
						(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)
Surface Works																							
Indirects (5 days/week)																							
60 kW Diesel Gensets	12	100	74%	100%	2,080	0.364	3.759	3.482	0.093	568.312	0.007	0.323	3.338	3.092	0.083	504.661	0.007	0.67	6.94	6.43	0.17	1049.61	0.01
EXH-1 Total (kg/h and tonne/year)												0.323	3.338	3.092	0.083	504.661	0.007	***0.67***	***6.94***	***6.43***	***0.17***	***1049.61***	***0.01***
EXH-1 Total (lb/h and ton/year)												0.713	7.359	6.817	0.182	1112.585	0.014	***0.74***	***7.65***	***7.09***	***0.19***	***1157.00***	***0.01***
Civil & Fdns (5 days/week)																							
Wheel Loader	2	120	36%	100%	780	0.225	3.283	1.602	0.085	526.161	0.005	0.019	0.284	0.138	0.007	45.460	0.000	0.02	0.22	0.11	0.01	35.46	0.00
Crawler Loader	0	120	37%	100%	0	0.162	3.089	1.183	0.059	525.997	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grader	2	160	41%	100%	953	0.340	3.419	2.859	0.159	531.194	0.005	0.045	0.449	0.375	0.021	69.693	0.001	0.04	0.43	0.36	0.02	66.44	0.00
Crawler dozer	0	120	43%	100%	0	0.299	3.211	2.697	0.151	527.479	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	0	270	48%	100%	0	0.173	1.251	1.110	0.048	527.122	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	4	120	37%	100%	953	0.162	3.089	1.183	0.059	525.997	0.005	0.029	0.549	0.210	0.010	93.417	0.001	0.03	0.52	0.20	0.01	89.05	0.00
Roller	0	100	38%	100%	0	0.244	3.414	2.601	0.129	528.034	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Pile driver hammer	0	250	50%	100%	0	0.113	1.055	0.113	0.035	525.609	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
EXH-2 Total (kg/h and tonne/year)												0.093	1.281	0.724	0.039	208.570	0.002	***0.09***	***1.17***	***0.67***	***0.04***	***190.94***	***0.00***
EXH-2 Total (lb/h and ton/year)												0.205	2.824	1.595	0.085	459.817	0.004	***0.09***	***1.29***	***0.73***	***0.04***	***210.48***	***0.00***
Turbine Hall (5 days/week)																							
Cranes	2	200	29%	100%	953	0.270	1.537	2.772	0.118	527.564	0.005	0.031	0.178	0.322	0.014	61.197	0.001	0.03	0.17	0.31	0.01	58.34	0.00
JLG Manlift	4	75	31%	100%	953	0.098	3.145	1.532	0.028	527.864	0.005	0.009	0.292	0.143	0.003	49.091	0.000	0.01	0.28	0.14	0.00	46.80	0.00
Cranes	2	200	29%	100%	2,080	0.270	1.537	2.772	0.118	527.564	0.005	0.031	0.178	0.322	0.014	61.197	0.001	0.07	0.37	0.67	0.03	127.28	0.00
ManLift	12	75	31%	100%	1,040	0.098	3.145	1.532	0.028	527.864	0.005	0.027	0.877	0.428	0.008	147.274	0.001	0.03	0.91	0.44	0.01	153.16	0.00
Welding machine	4	50	45%	100%	1,560	0.498	4.525	3.676	0.113	568.301	0.007	0.045	0.407	0.331	0.010	51.147	0.001	0.07	0.64	0.52	0.02	79.79	0.00
EXH-3 Total (kg/h and tonne/year)												0.144	1.934	1.544	0.048	369.907	0.004	***0.20***	***2.37***	***2.07***	***0.07***	***465.36***	***0.00***
EXH-3 Total (lb/h and ton/year)												0.317	4.263	3.404	0.106	815.505	0.008	***0.22***	***2.61***	***2.28***	***0.07***	***512.97***	***0.01***
Structural (5 days/week)																							
Cranes	0	200	29%	100%	0	0.270	1.537	2.772	0.118	527.564	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Welding machine	0	50	45%	100%	0	0.498	4.525	3.676	0.113	568.301	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
EXH-4 Total (kg/h and tonne/year)												0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
EXH-4 Total (lb/h and ton/year)												0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
Piping (5 days/week)																							
Welding machine	12	50	45%	100%	1,040	0.498	4.525	3.676	0.113	568.301	0.007	0.134	1.222	0.993	0.030	153.441	0.002	0.14	1.27	1.03	0.03	159.57	0.00
Manlift	12	75	31%	100%	1,040	0.098	3.145	1.532	0.028	527.864	0.005	0.027	0.877	0.428	0.008	147.274	0.001	0.03	0.91	0.44	0.01	153.15	0.00
Cranes	0	200	29%	100%	0	0.270	1.537	2.772	0.118	527.564	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
EXH-5 Total (kg/h and tonne/year)												0.162	2.099	1.420	0.038	300.715	0.003	***0.17***	***2.18***	***1.48***	***0.04***	***312.72***	***0.00***
EXH-5 Total (lb/h and ton/year)												0.356	4.628	3.131	0.084	662.963	0.007	***0.19***	***2.41***	***1.63***	***0.04***	***344.71***	***0.00***
Mechanical (5 days/week)																							
Welding machines	4	50	45%	100%	1,040	0.498	4.525	3.676	0.113	568.301	0.007	0.045	0.407	0.331	0.010	51.147	0.001	0.05	0.42	0.34	0.01	53.19	0.00
Crane	2	200	29%	100%	1,040	0.270	1.537	2.772	0.118	527.564	0.005	0.031	0.178	0.322	0.014	61.197	0.001	0.03	0.19	0.33	0.01	63.64	0.00
EXH-6 Total (kg/h and tonne/year)												0.076	0.585	0.652	0.024	112.344	0.001	***0.08***	***0.61***	***0.68***	***0.02***	***116.83***	***0.00***
EXH-6 Total (lb/h and ton/year)												0.168	1.291	1.438	0.052	247.677	0.003	***0.09***	***0.67***	***0.75***	***0.03***	***128.78***	***0.00***

Table 9
Estimation of Emissions Rates for Non-Road Equipment used in the Project
Construction Phase - With Berm
Hydrostor WRESC

Equipment Description	NUMBER OF EQUIPMENT	ENGINE POWER (hp)	Load Factor[e] (%)	Availability (%)	HOURS OF OPERATION PER UNIT[d]	Emission Factors [a]						Hourly Emission Rates (Average Hourly) [b]						Annual Emission Rates (Average Annual) [c]					
						ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2
						(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)
Cavern Rock Moving and Berming (7 days/week)																							
Dump Truck (21-ton)	4	400	38%	100%	3,640	0.177	1.174	1.086	0.038	528.587	0.005	0.108	0.714	0.660	0.023	321.381	0.003	0.39	2.60	2.40	0.09	1169.74	0.01
Front End Loader	1	320	36%	100%	3,640	0.197	1.261	1.459	0.055	527.135	0.005	0.023	0.145	0.168	0.006	60.726	0.001	0.08	0.53	0.61	0.02	221.03	0.00
Dozer	1	475	43%	100%	3,640	0.180	1.417	1.630	0.065	528.093	0.005	0.037	0.290	0.333	0.013	107.863	0.001	0.13	1.05	1.21	0.05	392.59	0.00
											EXH-7 Total (kg/h and tonne/year)	0.167	1.149	1.161	0.043	489.970	0.005	***0.61***	***4.18***	***4.23***	***0.16***	***1783.35***	***0.02***
											EXH-7 Total (lb/h and ton/year)	0.369	2.532	2.560	0.095	1080.198	0.010	***0.67***	***4.61***	***4.66***	***0.17***	***1965.81***	***0.02***
Cavern Works Site Prep (5 days/week)																							
Dozers	0	215	43%	100%	0	0.277	1.749	2.934	0.122	527.288	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Track hoe	0	172	37%	100%	0	0.162	3.089	1.183	0.059	525.997	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Back hoe	0	172	37%	100%	0	0.162	3.089	1.183	0.059	525.997	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Dumptruck (20Ton)	0	400	38%	100%	0	0.177	1.174	1.086	0.038	528.587	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
											EXH-8 Total (kg/h and tonne/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
											EXH-8 Total (lb/h and ton/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	0	110	50%	100%	0	0.179	2.942	1.471	0.101	527.759	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Articulating wheel loader	0	320	36%	100%	0	0.197	1.261	1.459	0.055	527.135	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
25-ton articulating dump truck	0	320	38%	100%	0	0.177	1.174	1.086	0.038	528.587	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
											EXH-9 Total (kg/h and tonne/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
											EXH-9 Total (lb/h and ton/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
Surface Equipment (7 days/week)																							
Wheel loader	1	260	36%	100%	7,279	0.179	1.160	1.492	0.050	526.675	0.005	0.017	0.109	0.140	0.005	49.297	0.000	0.12	0.79	1.02	0.03	358.85	0.00
20 Ton Off Road Dump Truck	1	320	38%	100%	7,279	0.177	1.174	1.086	0.038	528.587	0.005	0.022	0.143	0.132	0.005	64.276	0.001	0.16	1.04	0.96	0.03	467.89	0.00
											EXH-10 Total (kg/h and tonne/year)	0.022	0.143	0.132	0.005	64.276	0.001	***0.16***	***1.04***	***0.96***	***0.03***	***467.89***	***0.00***
											EXH-10 Total (lb/h and ton/year)	0.048	0.315	0.291	0.010	141.705	0.001	***0.17***	***1.15***	***1.06***	***0.04***	***515.77***	***0.00***
Underground Equipment (7 days/week)-Emissions vented to surface																							
Bolter	2	55	40%	100%	3,494	1.469	5.063	12.074	0.884	529.994	0.005	0.065	0.223	0.531	0.039	23.320	0.000	0.23	0.78	1.86	0.14	81.48	0.00
Jumbo	2	125	50%	100%	3,494	0.115	2.952	0.900	0.040	530.619	0.005	0.014	0.369	0.113	0.005	66.327	0.001	0.05	1.29	0.39	0.02	231.76	0.00
Scissor Lift	1	138	40%	100%	3,494	0.179	2.942	1.471	0.101	527.759	0.005	0.010	0.162	0.081	0.006	29.132	0.000	0.03	0.57	0.28	0.02	101.79	0.00
Welder	1	19	45%	100%	3,494	0.578	2.806	4.358	0.180	568.329	0.008	0.005	0.024	0.037	0.002	4.859	0.000	0.02	0.08	0.13	0.01	16.98	0.00
Buggy	2	47	42%	100%	3,494	0.757	4.872	4.304	0.268	591.483	0.005	0.030	0.192	0.170	0.011	23.352	0.000	0.10	0.67	0.59	0.04	81.59	0.00
Loaders/haul/dump	4	201	37%	100%	6,988	0.163	1.221	1.399	0.053	526.844	0.005	0.049	0.363	0.416	0.016	156.725	0.001	0.34	2.54	2.91	0.11	1095.24	0.01
Getman Boom Lift	1	147	40%	100%	3,494	0.179	2.942	1.471	0.101	527.759	0.005	0.011	0.173	0.086	0.006	31.032	0.000	0.04	0.60	0.30	0.02	108.43	0.00
Skid Steer	1	61	37%	100%	3,494	0.139	3.249	1.862	0.056	528.374	0.005	0.003	0.073	0.042	0.001	11.925	0.000	0.01	0.26	0.15	0.00	41.67	0.00
											EXH-11 Total (kg/h and tonne/year)	0.186	1.580	1.477	0.085	346.673	0.003	***0.82***	***6.79***	***6.61***	***0.35***	***1758.94***	***0.02***
											EXH-11 Total (lb/h and ton/year)	0.410	3.483	3.256	0.186	764.283	0.007	***0.90***	***7.48***	***7.29***	***0.39***	***1938.90***	***0.02***

Notes

[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2022.1), Appendix G, Table G-11

[b] Hourly emission rate (kg/hr) = Engine HP-rating x Emission Factor (g/hp-hr) x No. of Equipment x (kg/1,000 g).

[c] Annual emission rate (tonne/year) = Hourly Emission Rate (kg/h) x Annual Operating Hours (hr/year) x (tonne/1,000 kg).

[d] Annual Operating Hours based of the construction schedule and the hours of operation of each equipment.

[e] Load factors from CARB California Emissions Estimator Model (CalEEMod version 2022.1), Appendix G, Table G-12.

TABLE 10
ESTIMATION OF PM10 AND PM2.5 EMISSION FACTORS AND RATES FOR BATCH/CONTINUOUS DROP TRANSFER OPERATIONS
Construction Phase - With Berm
Hydrostor WRESC

ID	Material Handling Area	Material Type	Operational Data		Material Throughput [a]				Number of Transfers	Moisture Content (M) [b]	Emission Control Data		Uncontrolled Emission Factor [c]		Controlled Emission Factor [c]		Estimated Emission Rate (ER)			
					Total	Total	Daily	Hourly			Method	Efficiency	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}		$PM_{2.5}$	
			(hr/day)	(# days)	(CY)	(tons)	(tons/day)	(tons/hr)		(%)		(%)	(lb/ton)	(lb/ton)	(lb/ton)	(lb/ton)	(lb/hr)	(tons/year)	(lb/hr)	(tons/year)
Caverns Works																				
TA1	Clearing and Stripping -Truck unloading	Gravel	10	15	11,300	16,018	1,068	106.8	1	2	None	0	0.00342	0.00052	0.00342	0.00052	0.152	0.027	0.023	0.004
TB1	Mining-Drop to Surface	Waste Rock	24	365	--	1,095,120	3,000	125.0	1	15	None	0	0.00020	0.00003	0.00020	0.00003	0.025	0.112	0.004	0.017
TB2	Mining-Transfer to Waste Rock (WR) Storage	Waste Rock	10	365	--	1,095,120	3,000	300.0	2	15	None	0	0.00020	0.00003	0.00020	0.00003	0.051	0.223	0.008	0.034
TB3	Mining-75% Transfer from WR Storage to Berm	Waste Rock	10	365	--	821,340	2,250	225.0	2	15	None	0	0.00020	0.00003	0.00020	0.00003	0.038	0.167	0.006	0.025
TB4	Mining-25% transfer from WR Stor to Rock Plant then Berm	Waste Rock	10	365	--	273,780	750	75.0	4	15	None	0	0.00020	0.00003	0.00020	0.00003	0.025	0.112	0.004	0.017
TB	Mining Activities -Total TB1 -TB4	Waste Rock	24	365	--	--	--	--	9	--	None	0	--	--	--	--	0.140	0.614	0.021	0.093
TC1	Berm-Load and Truck Overburden to Temp Storage and Un	Overburden	10	365	120,000	186,000	510	51.0	2	15	None	0	0.00020	0.00003	0.00020	0.00003	0.009	0.038	0.001	0.006
TC2	Berm-Load and Truck Overburden from Temp Storage to Be	Overburden	10	365	115	186,000	510	51.0	2	15	None	0	0.00020	0.00003	0.00020	0.00003	0.009	0.038	0.001	0.006
TC	Berm- Overburden Total TC1 - TC2	Overburden	10	365	--	--	--	--	4	--	None	0	--	--	--	--	0.017	0.076	0.003	0.011
Surface Works																				
TD1	Site clearing -overburden - Truck loading	Topsoil	12	120	126,029	195,660	1,631	135.9	1	15	None	0	0.00020	0.00003	0.00020	0.00003	0.014	0.020	0.002	0.003
TD2	Civil & Foudation Excavations - Truck loading	Overburden	12	90	44,517	69,113	768	64.0	1	15	None	0	0.00020	0.00003	0.00020	0.00003	0.007	0.007	0.001	0.001

Emission factor: USEPA, 2006; AP-42, Section 13.2.4 for Aggregate Handling and Storage Piles.

[a] See Table 1 for material throughput information.

[b] Moisture content data based on the Golder specialist's experience in soils.

[c] Based on Emission Factor of USEPA, 2006; AP-42, Section 13.2.4 for Aggregate Handling and Storage Piles.

Uncontrolled EF (UEF) Equation :

UEF (lb/ton) = $k \times (0.0032) \times (U / 5)^{1.3})/[(M / 2)^{1.4}]$

Controlled EF (CEF) Equation :

CEF (lb/ton) = UEF (lb/ton) x [100% - Control efficiency (%)]

where: U = Mean wind speed (miles/hr) *

Annual	11.81

* Calculated from the project met data

k = Particle size multiplier

0.35	0.053
(PM10)	(PM2.5)

Table 11
Fugitive PM Emissions from Bulldozers
Construction Phase - With Berm
Hydrostor WRESC

Parameters	Bulldozing/Scraping Activities	
	Cavern Rock Moving and Berming	Mining Surface
ID	**BD1**	**BD2**
Operational Data		
Daily Operation Hours (hrs/day)	10	0
Total No. of Operating Days for activity (days)	365	0
No. of active bulldozers/excavators/scrapers	1	0
Site Characteristics [b]		
M = Moisture content (%)	3.4	3.4
s = Silt content of site specific unpaved roads (%)	7.5	7.5
Control Efficiency		
Dust Control Method [c]	Watering and Site Speed Controls	Watering and Site Speed Controls
Dust Control Efficiency (%)	75	75
Calculated PM Emission Factors (EF) [a]		
Uncontrolled TSP EF (lb/hr)	13.03	13.03
Controlled TSP EF (lb/hr)	3.26	3.26
Uncontrolled PM_{15} EF (lb/hr)	3.70	3.70
Controlled PM_{15} EF (lb/hr)	0.93	0.93
Uncontrolled PM_{10} EF (lb/hr)	2.78	2.78
Controlled PM_{10} EF (lb/hr)	0.69	0.69
Uncontrolled $PM_{2.5}$ EF (lb/hr)	1.37	1.37
Controlled $PM_{2.5}$ EF (lb/hr)	0.34	0.34
Estimated Emissions Rates (ER) [d]		
PM_{10} ER lb/hr (daily basis)	0.29	0.00
PM_{10} ER tons (year)	1.27	0.000
$PM_{2.5}$ ER lb/hr (daily basis)	0.14	0.00
$PM_{2.5}$ ER tons (year)	0.624	0.000

Notes:
[a] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on bulldozing fc

Table 12
Fugitive Particulate Matter (PM) Emissions from Grading Activities
Construction Phase - With Berm
Hydrostor WRESC

Parameters	**Surface Works**
	Foundation and Compaction
ID	**GD1**
Operational Data [a]	
Daily Operation Hours (hrs/day)	4
Total No. of Operating Days for activity (days)	365
No. of active motor graders	2
Vehicle Data	
Mean Vehicle Speed (S) (mph)	4
Basis for vehicle miles traveled (VMT)	
daily hours	4
annual hours	1460
Grader Utilization per day (%)	60
Distance traveled/vehicle/day (miles per per day per grader)	9.6
VMT (no. vehicles x mi traveled)	
total daily miles	19.2
total annual miles	7008.0
Control Efficiency	
Dust Control Method [c]	Watering and Site Speed Controls
Dust Control Efficiency (%)	75
Scaling Factors (unitless)	
TSP	1.0
PM_{15}	1.0
PM_{10}/PM_{15}	0.6
$PM_{2.5}$/TSP	0.031
Calculated Emission Factors (EF) [d]	
Uncontrolled TSP EF (lb/VMT)	1.28
Uncontrolled PM_{15} EF (lb/VMT)	0.82
Uncontrolled PM_{10} EF (lb/VMT)	0.49
Uncontrolled $PM_{2.5}$ EF (lb/VMT)	0.04
Estimated Uncontrolled Emission Rate (ER) [e]	
TSP ER lb/hr (daily basis)	1.02
tons/yr	4.49
PM_{10} ER lb/hr (daily basis)	0.39
tons/yr	1.72
$PM_{2.5}$ ER lb/hr (daily basis)	0.03
tons/yr	0.14
Estimated Controlled Emission Rate (ER)	
TSP ER lb/hr (daily basis)	0.26
tons/yr	1.12
PM_{10} ER lb/hr (daily basis)	0.10
tons/yr	0.43
$PM_{2.5}$ ER lb/hr (daily basis)	0.01
tons/yr	0.03

Notes:
[a] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines.
[b] Typical grader travel speed for graders in range from 3 to 5 mph while grading. Average speed of 4 mph assumed.
[c] According to the Air Pollutant Mitigation Measure for Construction site for Eastern Kern APCD, any soil excavated or graded should be sufficiently watered to prevent excessive dust (March, 2012).
See footnote "d" on Table 9 (Wind Erosion Open Areas) for references for the control factor.
[d] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on grading

Table 13
Fugitive PM Emissions from Wind Erosion of Exposed Surface Areas
Construction Phase - With Berm
Hydrostor WRESC

Parameters	Activity Areas					
	Clearing & Stripping	Temporary Cavern Rock Storage Area	Temporary Earthwork Storage Area	Temporary Crushing Plant Storage Area	Berm Area - Construction	All Areas
ID	**WE1**	**WE2**	**WE3**	**WE4**	**WE5**	**WE1-WE5**
Operational Data						
Possible Hours of Exposure (hrs/day)	24	24	24	24	24	24
Hours of Exposure (hrs/yr)	3927	3927	3927	3927	3927	3927
Unvegetated Disturbed Surface Area (acres) [b]	43	3	3	1	56	106.0
Site Characteristics [c]						
Annual days of precipitation ≥ 0.25 mm (p)	20	20	20	20	20	20
Daily % of time hourly wind speed ≥ 5.4 m/s (12 mph) (p)	66.7	66.7	66.7	66.7	66.7	66.7
Annual % of time hourly wind speed ≥ 5.4 m/s (12 mph) (p)	44.8	44.8	44.8	44.8	44.8	44.8
Control Efficiency						
Dust Control Method [d]	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph
Dust Control Efficiency (%) [d]	75	75	75	75	75	75
Particle Size Multipliers (k) [e]						
For TSP	1.0	1.0	1.0	1.0	1.0	1.0
For PM_{10}	0.50	0.50	0.50	0.50	0.50	0.50
For $PM_{2.5}$	0.25	0.25	0.25	0.25	0.25	0.25
Calculated PM Emission Factors (EF) [a]						
Uncontrolled TSP EF (ton/acre/yr)	0.38	0.38	0.38	0.38	0.38	0.38
Uncontrolled PM_{10} EF (ton/acre/yr)	0.19	0.19	0.19	0.19	0.19	0.19
Uncontrolled $PM_{2.5}$ EF (ton/acre/yr)	0.095	0.095	0.095	0.095	0.095	0.095
Controlled TSP EF (ton/acre/yr)	0.10	0.10	0.10	0.10	0.10	0.10
Controlled PM_{10} EF (ton/acre/yr)	0.05	0.05	0.05	0.05	0.05	0.05
Controlled $PM_{2.5}$ EF (ton/acre/yr)	0.024	0.024	0.024	0.024	0.024	0.024
Estimated Emissions Rates [a]						
TSP ER lb/hr (daily basis)	0.93	0.07	0.07	0.02	1.21	2.30
TSP ER tons (year)	4.09	0.29	0.29	0.10	5.32	10.07
PM_{10} ER lb/hr (daily basis)	0.47	0.03	0.03	0.01	0.61	1.15
PM_{10} ER tons (year)	2.04	0.14	0.14	0.05	2.66	5.04
$PM_{2.5}$ ER lb/hr (daily basis)	0.23	0.02	0.02	0.01	0.30	0.57
$PM_{2.5}$ ER tons (year)	1.02	0.07	0.07	0.02	1.33	2.52

Notes:

[a] Emission factor equation from Table 11.9-4 (wind erosion of exposed areas) of US EPA AP-42 Section 11.9 for Western Surface Coal Mines:

Uncontrolled TSP EF (UEF) Equation : UEF (ton/acre/yr) = k x 0.38
Controlled TSP EF (CEF) Equation : CEF (ton/acre/yr) = UEF (ton/acre/yr) x [100 - Control efficiency (%)]

[b] Area of unvegetated surface based on the total area of the future plant. It was assumed that half of the total area of the site where clearing and stripping activities will be happening is 12 months. Berm area for construction assumed to be three-quarters of the total berm area constructed over a 2-year period. Other areas based on project site plot plans.

[c] Based on hourly surface meteorological data from Lancaster Fox Field for 2018-2022. Precipitation data: AP-42, Section 13.2.2, Figure 13.2.2-1, 11/2006.

[d] According to the Air Pollutant Mitigation Measure for Construction site for Eastern Kern APCD,
any soil excavated or graded should be sufficiently watered to prevent excessive dust (March,

WRAP Fugitive Dust Handbook, WRAP, Western Governors Association, Sept 2006, Chap 8, Table 8-7, and SCAQMD Fugitive Dust from Storage Piles, Table XI-A.
SCAQMD data indicates watering achieves 61 % control and speed control to <=15 Mph achieves 57% control. Combining the two control measures results in a calculated control efficiency of 83%, but for purposes of conservativeness in a desert climate, a value of 75% was used.

[e] Particle size based on AP-42 Section 13.2.5 recommendation.

Table 14
Fugitive PM Emissions from Wind Erosion of Stock Piles
Construction Phase - With Berm
Hydrostor WRESC

Parameters	Cavern Works	Surface Works	
	Shaft Cutting	Site Clearing	Excavations
Activity ID	**WS1**	**WS2**	**WS3**
Operational Data			
Daily Operation Hours (hrs/day)	18	24	24
No. of Annual Operating Days (days/yr)	365	120	90
Material Type	Waste Rock	Topsoil	Overburden
Pile Description (shape)	Conical	Conical	Conical
Height of Pile (m) [a]	5	9	7
Total Material Piled (tons/period)	73,513	195,660	69,113
Daily Material Piled (tons/day)	201	1,631	768
Daily Material Piled (m^3/day) [b]	99	803	378
Cone-shaped pile base area (m^2)	65	263	159
Cone-shaped pile base radius (m)	4.6	9.2	7.1
Estimated angle of repose (degrees)	45.0	45.0	45.0
Cone-shaped pile exposed surface area (m^2)	92	372	225
Rectangular Pile Length (m)	--	--	--
Rectangular Pile Width (m)	--	--	--
Rectangular pile exposed surface area (m^2)	--	--	--
No. of piles	1	1	1
Emissions Factor			
Annual Erosion Potential, P ($g/m^2/yr$) [c]	17167.8	17167.8	17167.8
Annual % of time hourly wind speed ≥ 5.4 m/s or 12 mph [d]	44.8	44.8	44.8
Annual hours with wind speed ≥ 5.4 m/s or 12 mph [c]	3930	3930.0	3930.0
Control Efficiency			
Dust Control Method [e]	Watering	Watering	Watering
Dust Control Efficiency (%) [f]	75	75	75
Particle Size Multipliers (k) [e]			
For TSP	1.0	1.0	1.0
For PM_{10}	0.50	0.50	0.50
For $PM_{2.5}$	0.075	0.075	0.075
Estimated Emissions Rates (ER) [g]			
Annual TSP ER ton/yr	0.44	1.76	1.07
Annual PM_{10} ER ton/yr	0.22	0.88	0.53
Annual $PM_{2.5}$ ER ton/yr	0.03	0.13	0.08
TSP ER lb/hr (annual basis)	0.10	0.40	0.24
PM_{10} ER lb/hr (annual basis)	0.05	0.20	0.12
$PM_{2.5}$ ER lb/hr (annual basis)	0.007	0.030	0.018

Notes:

[a] Height estimated to result in a 45 degree angle of repose based on the daily throughput.

[b] The densities are provided in Table 1 for each material

[c] Annual wind erosion potential estimated based on Equation 3 of AP-42 Section 13.2.5 (Industrial Wind Erosion). Threshold wind speed assumed to be 0.50 m/s. Value from previous site assumed as reasonable default for the new site (distance separation See wind erosion potential calculations in the Hydrostor GEM site AFC construction appendix.

[d] Based on hourly surface meteorological data from Lancaster Fox Field for 2018-2022.

[e] According to the Air Pollutant Mitigation Measure for Construction site for Eastern Kern APCD, stockpiles of soil or other fine loose materialshall be stabilized by watering or other appropiate method to prevent wind-blown fugitive dust (March, 2012).
[illegible]
Fugitive Dist for Storage Piles, Table XI-E. (both documents state 90% control for watering). For conservativeness in a desert area 75% was assumed valid.

[g] Annual emissions estimated based on the exposed surface area and the wind erosion potential. Hourly emissions estimated from annual rates.

TABLE 15
GREENHOUSE GASES EMISSION ESTIMATION OF ENGINE EXHAUST VEHICLE TRAFFIC
Construction Phase
Hydrostor WRESC

Internal Site Route ID	Description	Vehicle	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Fuel Type	Total Miles Travelled (VMT/day)	Total Miles Travelled (VMT/year)	GHG Emissions Factors (g/mile) [a]			Daily Emissions			Maximum Hourly Emissions			Annual Emissions		
									CO2	CH4	N2O	Total CO_2 (lbs/day)	Total CH_4 (lbs/day)	Total N_2O (lbs/day)	Total CO_2 (lbs/hr)	Total CH_4 (lbs/hr)	Total N_2O (lbs/hr)	Total CO_2 (tons/yr)	Total CH_4 (tons/yr)	Total N_2O (tons/yr)
ISR 1	Workforce (Site Clearing) - Cavern Works	Worker Vehicle	0.77	80	2	Gas	9	743	547.8	0.0083	0.0080	11.2178	0.0002	0.0002	5.6089	0.0001	0.0001	0.4487	0.0000	0.0000
ISR 2	Equipment mobilization - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	2	8	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0188	0.0000	0.0000
ISR 3	Equipment demobilization - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	2	8	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0188	0.0000	0.0000
ISR 4	Fuel delivery - Cavern Works	Fuel truck (tandem)	0.77	80	2	ULSD	1	62	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.1505	0.0000	0.0000
ISR 5	Fencing delivery - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	1	2	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.0038	0.0000	0.0000
ISR 6	Concrete trucks - Cavern Works	Cement mix truck (10 yd)	0.17	183	12	ULSD	1	249	2,204.9	0.0006	0.2411	6.6109	0.0000	0.0007	0.5509	0.0000	0.0001	0.6049	0.0000	0.0001
ISR 7	Gravel delivery - Cavern Works	Tandem truck load (12 yd)	0.77	15	10	ULSD	49	729	2,204.9	0.0006	0.2411	237.0312	0.0001	0.0259	23.7031	0.0000	0.0026	1.7715	0.0000	0.0002
ISR 8	Trailer delivery - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	2	9	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0226	0.0000	0.0000
ISR 9	Berm Construction - Workforce	Worker Vehicle	0.77	365	10	Gas	21	7,628	547.8	0.0083	0.0080	25.2400	0.0004	0.0004	2.5240	0.0000	0.0000	4.6063	0.0001	0.0001
ISR 10	Berm Construction - Berm Material Remove and Replace	12 cy dump truck	1.66	365	10	ULSD	46	16,600	2,204.9	0.0006	0.2411	225.9385	0.0001	0.0247	22.5938	0.0000	0.0025	40.3462	0.0000	0.0044
ISR 11	Workforce (Mining) - Cavern Works	Worker Vehicle	0.77	365	2	Gas	43	15,447	547.8	0.0083	0.0080	51.4149	0.0008	0.0008	25.7074	0.0004	0.0004	9.3281	0.0001	0.0001
ISR 12	Surface equipment (mobilization) - Cavern Works	Tractor Trailer	0.77	30	2	ULSD	2	39	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0941	0.0000	0.0000
ISR 13	Subsurface equipment (mobilization) - Cavern Works	Tractor Trailer	0.77	30	2	ULSD	2	27	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0658	0.0000	0.0000
ISR 14	Ground support - Cavern Works	Flatbed tractor trailer	0.77	365	2	ULSD	1	19	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.0451	0.0000	0.0000
ISR 15	Explosives - Cavern Works	Flatbed tractor trailer	0.77	365	2	ULSD	1	19	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.0451	0.0000	0.0000
ISR 16	Berm Construction - Transport of Waste Rock to Berm site	Dump trucks (12 yd)	1.84	365	10	ULSD	262	95,420	2,204.9	0.0006	0.2411	1275.5461	0.0004	0.1395	127.5546	0.0000	0.0139	231.9175	0.0001	0.0254
ISR 17	Workforce - Surface Works	Worker Vehicle	0.22	240	2	Gas	84	20,091	547.8	0.0083	0.0080	101.1050	0.0015	0.0015	50.5525	0.0008	0.0007	12.1326	0.0002	0.0002
ISR 18	Site clearing (overburden) - Surface Works	12 cy dump truck	0.22	120	12	ULSD	19	2,290	2,204.9	0.0006	0.2411	93.2531	0.0000	0.0102	7.7711	0.0000	0.0008	5.5647	0.0000	0.0006
ISR 19	Civil foundation excavation Surface Works	12 cy dump truck	0.22	90	12	ULSD	12	1,051	2,204.9	0.0006	0.2411	57.2235	0.0000	0.0063	4.7686	0.0000	0.0005	2.5549	0.0000	0.0003
ISR 20	Cement Trucks Surface Works	12 cy cement truck	0.22	30	12	ULSD	20	604	2,204.9	0.0006	0.2411	98.5516	0.0000	0.0108	8.2126	0.0000	0.0009	1.4682	0.0000	0.0002
ISR 21	Equipment and material delivery Surface Works	Flatbed	0.22	365	2	ULSD	1	211	2,204.9	0.0006	0.2411	3.1791	0.0000	0.0003	1.5895	0.0000	0.0002	0.5135	0.0000	0.0001
ISR 22	Potable Water - Surface and Cavern	water truck 9000 gal	0.77	365	24	ULSD	1	201	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	0.1568	0.0000	0.0000	0.4885	0.0000	0.0001
ISR 23	Non Potable Water - Surface and Cavern	water truck 9000 gal	0.77	365	24	ULSD	5	1,695	2,204.9	0.0006	0.2411	22.5744	0.0000	0.0025	0.9406	0.0000	0.0001	4.1198	0.0000	0.0005
ISD 24	Non Potable Water - Reservoir Fill	water truck 9000 gal	0.77	365	24	ULSD	31	11,060	2,204.9	0.0006	0.2411	150.4960	0.0000	0.0165	6.2707	0.0000	0.0007	26.8801	0.0000	0.0029
																		343.2		

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Table 16 Emissions Factor Development

Fleet aggregate vehicle 2025 emission factors at 15 mph for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Type	Fleet Aggregate Air Pollutant Emissions Factors at 15 mph- 2025										
	CO (g/mile)	NO_X (g/mile)	SO_2 (g/mile)	$PM_{10\ Exhaust}$ (g/mile)	$PM_{10\ TBW}$ (g/mile)	$PM_{2.5\ Exhaust}$ (g/mile)	$PM_{2.5\ TBW}$ (g/mile)	VOC (g/mile)	CO2 (g/mile)	CH4 (g/mile)	N2O (g/mile)
LDGV - Gas	1.4752	0.0892	0.0027	0.0039	0.0202	0.0036	0.0063	0.0462	547.8	0.0083	0.0080
HHDT - Diesel	0.3786	5.1916	0.0209	0.0082	0.1733	0.0079	0.0571	0.0360	2,204.9	0.0006	0.2411

LDGV -Gas = Light-Duty Vehicles Gasoline
HHDT - Diesel = Heavy-Heavy Duty Trucks (>33,000 lb GVWR) Diesel Fueled

Table 17 WRESC Rock Crushing Operations - PM10/2.5 Emissions

With Berm Option

Emission Point Description	OPERATING DATA: Design Max Hourly Process Rate tons/hr	OPERATING DATA: Annual Operating Hours	UNCONTROLLED EMISSIONS: PM10 Emission Factor lb/ton	UNCONTROLLED EMISSIONS: PM10 Emissions lb/hr	UNCONTROLLED EMISSIONS: PM10 Emissions tons/yr	UNCONTROLLED EMISSIONS: PM2.5 Emission Factor lb/ton	UNCONTROLLED EMISSIONS: PM2.5 Emissions lb/hr	UNCONTROLLED EMISSIONS: PM2.5 Emissions tons/yr	CONTROLLED EMISSIONS: WRESC BACT Control Fraction	CONTROLLED EMISSIONS: BACT Control Type Codes	CONTROLLED EMISSIONS: PM10 Emissions lb/hr	CONTROLLED EMISSIONS: PM10 Emissions tons/yr	CONTROLLED EMISSIONS: PM2.5 Emissions lb/hr	CONTROLLED EMISSIONS: PM2.5 Emissions tons/yr	Emission Factor Source
Primary Crusher	95	300	0.0024	0.228	0.0342	0.00072	0.0684	0.0103	0.99	5	0.002	0.0003	0.001	0.0001	Ch. 11.17 AP-42
Secondary Crusher	50	300	0.0024	0.120	0.0180	0.00072	0.0360	0.0054	0.99	5	0.001	0.0002	0.000	0.0001	Ch. 11.17 AP-42
Screening	95	300	0.0087	0.827	0.1240	0.00261	0.2480	0.0372	0.85	5	0.124	0.0186	0.037	0.0056	Ch. 11.19, AP-42
Conveyor Transfer Points	95	300	0.00110	0.105	0.0157	0.00033	0.0314	0.0047	0.85	1,2	0.016	0.0024	0.005	0.0007	Ch. 11.19, AP-42
Aggregate Drop Operations[a]	95	300	0.0002	0.0194	0.0029	0.00003	0.0029	0.0004	0.68	2	0.0062	0.0009	0.0009	0.0001	Ch. 13.2.4.3, AP-42
			Total PM10 emissions		**0.19**	**Total PM2.5 emissions**		**0.06**			**Total PM10 emissions**	**0.02**	**Total PM2.5 emissions**	**0.01**	

[a] AP-42, Ch.13.2.4, See Table 10 for details

Notes: 25% of daily cavern rock to rock plant. 3 hrs/day for 365 days = 1095 hrs/yr. Plant rating = 350 TPH

Table 18 Emissions Estimates for Proposed Rock Plant Engines

	Scenario	Hrs/day	Days/Yr	Hrs/Yr*	Total Mo.	Process Rate, TPD
Plant Ops:	Berm	3	365	1095	22	950
	No Berm	11	365	4015	22	3800

*Normalized year based on 12 months of the 22 month total.

Engine Mfg:	**CAT or Equivalent**	# of Units:	2
Model #:	**Electric Generator Set**		
Fuel:	ULSD	**Engine Data**	

METRIC UNITs

BHP	kWe	Load %	RPM	Fuel, gph	Stk Ht, ft	Stk Diam, in	Stk Temp, F	mmbtu/hr	Stk Flow, ACFM	Stack Vel, f/s	Stk Diam, m	Stk Temp, Kelvins	Stk Vel, m/s
779	580	100	1800	39	~10	6	890	5.34	4300	364.9945	0.1524	749.82	111.2503

Fuel S, %wt:	0.0015				
Fuel wt, lb/gal:	7.05				
Btu/gal:	137000				
Lbs S/1000 gal:	0.10575				
Lbs SO2/1000 gal:	0.2115	equals	0.0048	g/bhp-hr	(use 0.005 g/bhp-hr as default SO2 factor for all loads)
EPA Tier:	4				
Control System:	None				
Turbocharged:	Yes				
Aftercooled:	Yes				

Stack Exit Area (sq.ft) = 0.19635

Scenarios	Emissions Factor Scenarios (all values in g/bhp-hr) NOx	CO	VOC	SO2	PM10	PM2.5	CO2e lb/mmbtu
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

	Controlled Emissions Factor Scenarios (all values in g/bhp- NOx	CO	VOC	SO2	PM10	PM2.5	CO2e lb/mmbtu
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

Scenario 1: **No Berm Option**

Max Hourly Runtime:	1
Max Daily Runtime:	11
Max Annual Runtime:	4015

Single Engine

	NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	0.859	4.465	0.240	0.009	0.034	0.034	na
lbs/day	9.446	49.118	2.645	0.094	0.378	0.378	na
TPY	1.724	8.964	0.483	0.017	0.069	0.069	1748.9

Two Engines

	NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	1.72	8.93	0.48	0.02	0.07	0.07	na
lbs/day	18.89	98.24	5.29	0.19	0.76	0.76	na
TPY	3.45	17.93	0.97	0.03	0.14	0.14	3497.82

Scenario 2: **Berm Option**

Max Hourly Runtime:	1
Max Daily Runtime:	3
Max Annual Runtime:	1095

Single Engine

	NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	0.859	4.465	0.240	0.009	0.034	0.034	na
lbs/day	2.576	13.396	0.721	0.026	0.103	0.103	na
TPY	0.470	2.445	0.132	0.005	0.019	0.019	477.0

Two Engines

	NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	1.72	8.93	0.48	0.02	0.07	0.07	na
lbs/day	5.15	26.79	1.44	0.05	0.21	0.21	na
TPY	0.94	4.89	0.26	0.01	0.04	0.04	953.95

Note 1: Rock Plant process rate, tons/hr: 350

Table 19
WRESC Cement Plant Emissions
PM10 and PM2.5 Emissions From Concrete Plant Operation
This scenario applies to the Berm and No Berm Options

Baseline Quantity of Concrete Produced (cu yds/yr) =	14,640
Annual Operation (days/yr) =	183
Max. Hourly Production Rate (yd/hr) =	6.67

Composition of Concrete

Material	lb/yd	Max. ton/hr	ton/yr
Course Aggregate	1160	3.8686	8,491
Sand	1730	5.76955	12,664
Cement (Type I/II Portland Cement)	750	2.50125	5,490
Cement Supplement	0	0	0
Water	307	1.023845	2,247
Total Concrete	3,947	13	28,892

Emissions from Concrete Batching - PM10

Process	PM10 (lb/ton)	Controlled (lb/ton)	PM10 (lb/yr)	Average lb/day	Annual (tons/year)
Aggregate delivery to ground storage[(1)]	0.00055	0.00017	4.70	0.026	0.002
Sand delivery to ground storage[(2)]	0.00024	0.00007	3.04	0.017	0.002
Aggregate transfer to conveyors[(1)]*	0.00055	0.00017	1.41	0.008	0.001
Sand transfer to conveyor[(2)]*	0.00024	0.00007	0.91	0.005	0.000
Aggregate transfer to elevated storage[(1)]*	0.00055	0.00017	1.41	0.008	0.001
Sand transfer to elevated storage[(2)]*	0.00024	0.00007	0.91	0.005	0.000
Cement delivery to Silo (controlled)[(3)]		0.00034	1.87	0.010	0.001
Cement supplement delivery to silo (controlled)[(3)]		0.00490	0.00	0.000	0.000
Weigh hopper loading[(3,4)]*	0.00280	0.00084	17.77	0.097	0.009
Central Mix loading (controlled)[(5,6)]		0.00550	30.20	0.165	0.015
PM10 Process Emissions from Concrete Batching (lb/yr) =			**62.22**	**0.34**	**0.031**

* water spray efficiency (BAAQMD Permit Handbook, Section 11.5) = 70%

(1) Emission factor calculated using AP-42 Section 13.2.4 Eq. for material transfer with moisture = 4.4% and wind speed = 6.8 mph.

(2) Emission factor calculated using AP-42 Section 13.2.4 Eq. for material transfer with moisture = 8% and wind speed = 6.8 mph.

(3) Emission factors obtained from AP-42, Table 11.12-2.

(4) Emission factor for lb of pollutant per ton of aggregate and sand.

(5) Emission factor for lb of pollutant per ton of cement and cement supplement.

Emissions from Concrete Batching - PM2.5

Process	PM2.5 (lb/ton)[(1)]	Controlled (lb/ton)	PM2.5 (lb/yr)	Average lb/day	Annual (tons/year)
Aggregate delivery to ground storage	0.00008	0.000025	0.71	0.004	0.000
Sand delivery to ground storage	0.00004	0.000011	0.46	0.002	0.000
Aggregate transfer to conveyors*	0.00008	0.000025	0.21	0.001	0.000
Sand transfer to conveyor*	0.00004	0.000011	0.14	0.001	0.000
Aggregate transfer to elevated storage*	0.00008	0.000025	0.21	0.001	0.000
Sand transfer to elevated storage*	0.00004	0.000011	0.14	0.001	0.000
Cement delivery to Silo (controlled)		0.000051	0.28	0.002	0.000
Cement supplement delivery to silo (controlled)		0.000735	0.00	0.000	0.000
Weigh hopper loading*	0.00042	0.000126	2.67	0.015	0.001
Central Mix loading (controlled)		0.000825	4.53	0.025	0.002
PM2.5 Process Emissions from Concrete Batching (lb/yr) =			**9.33**	**0.05**	**0.005**

* water spray efficiency (BAAQMD Permit Handbook, Section 11.5) = 70%

(1) Emission factors obtained by using speciation profile in PM3431 which states PM2.5 = 15% of PM10 (BAAQMD Permit Handbook, Section 11.5)

Total Process & Fugitive PM10 Emissions

Total PM10 Emissions (lb/yr) =	62.22
Total PM10 Emissions (TPY) =	0.03

lb/day	tpy
0.3	0.031

Total Process & Fugitive PM2.5 Emissions

Total PM2.5 Emissions (lb/yr) =	9.33
Total PM2.5 Emissions (TPY) =	0.00

lb/day	tpy
0.1	0.005

Table 20 Emissions Estimates for Proposed Cement Plant Engine

Engine Mfg:	**John Deere or Equivalent**	# of Units:	1	**Plant Ops:**	12	Hrs/day
Model #:	**4045TF150 or Equivalent (Electric Generator Set)**				183	Days/yr (Ops every other day)
Fuel:	ULSD	**Engine Data**		**Production Rate**	80	cu.yds./per OPs day

METRIC UNITs

Fuel S, %wt:	0.0015		**BHP**	**kWe**	**Load %**	**RPM**	**Fuel, gph**	**Stk Ht, ft**	**Stk Diam, in**	**Stk Temp, F**	**mmbtu/hr**	**Stk Flow, ACFM**	**Stack Vel, f/s**	**Stk Diam, m**	**Stk Temp, Kelvins**	**Stk Vel, m/s**
Fuel wt, lb/gal:	7.05		115	85	100	1800	6	~5	3	900	0.82	650	220.6966	0.0762	755.37	67.2683
Btu/gal:	137000															
Lbs S/1000 gal:	0.10575															
Lbs SO2/1000 gal:	0.2115	equals	0.0050	g/bhp-hr	(use 0.005 g/bhp-hr as default SO2 factor for all loads)											
EPA Tier:	4															
Control System:	None															
Turbocharged:	Yes						Stack Exit Area (sq.ft) =		0.049087							
Aftercooled:	No															

Scenarios	**NOx**	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e lb/mmbtu**
	Emissions Factor Scenarios (all values in g/bhp-hr)						
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e lb/mmbtu**
	Controlled Emissions Factor Scenarios (all values in g/bhp-I						
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

Scenario 1: **Normal Ops, Tier 4 EFs, 100% Load**

Max Hourly Runtime:	1								
Max Daily Runtime:	12				**Single Engine**				
Max Annual Runtime:	2196		**NOx**	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
		lbs/hr	0.127	0.659	0.035	0.001	0.005	0.005	na
		lbs/day	1.521	7.910	0.426	0.015	0.061	0.061	na
		TPY	0.139	0.724	0.039	0.001	0.006	0.006	147.2

This scenario applies to the Berm and No Berm options.

Onsite Construction Emissions
No Berm Option

TABLE 1
EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCTION PHASE - WITHOUT BERM
Hydrostor WRESC

ID	Activity	Description	PM_{10} Emissions Annual (tons/yr)	$PM_{2.5}$ Emissions Annual (tons/yr)	NO_x Emissions Annual (tons/yr)	VOC Emissions Annual (tons/yr)	CO Emission Annual (tons/yr)	SO_2 Emissions Annual (tons/yr)
Non-Stationary Sources								
Road Dust Emissions from Haul Truck Traffic on Internal Site Routes								
ISR 1	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.01	0.00	-	-	-	-
ISR 2	Cavern Works	Equipment mobilization - Cavern Works	0.00	0.00	-	-	-	-
ISR 3	Cavern Works	Equipment demobilization - Cavern Works	0.00	0.00	-	-	-	-
ISR 4	Cavern Works	Fuel delivery - Cavern Works	0.00	0.00	-	-	-	-
ISR 5	Cavern Works	Fencing delivery - Cavern Works	0.00	0.00	-	-	-	-
ISR 6	Cavern Works	Concrete trucks - Cavern Works	0.01	0.00	-	-	-	-
ISR 7	Cavern Works	Gravel delivery - Cavern Works	0.04	0.00	-	-	-	-
ISR 8	Cavern Works	Trailer delivery - Cavern Works	0.00	0.00	-	-	-	-
ISR 9	Cavern Works	[not used)	0.00	0.00	-	-	-	-
ISR 10	Cavern Works	Waste Rock Trucks Onsite Travel	5.57	0.56	-	-	-	-
ISR 11	Cavern Works	Workforce (Mining) - Cavern Works	0.27	0.03	-	-	-	-
ISR 12	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.00	0.00	-	-	-	-
ISR 13	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.00	0.00	-	-	-	-
ISR 14	Cavern Works	Ground support - Cavern Works	0.00	0.00	-	-	-	-
ISR 15	Cavern Works	Explosives - Cavern Works	0.00	0.00	-	-	-	-
ISR 16	Cavern Works	Waste Rock Export Trucks Onsite Travel	1.08	0.11	-	-	-	-
ISR 17	Surface Works	Workforce - Surface Works	0.36	0.04	-	-	-	-
ISR 18	Surface Works	Site clearing (overburden) - Surface Works	0.13	0.01	-	-	-	-
ISR 19	Surface Works	Civil foundation excavation Surface Works	0.06	0.01	-	-	-	-
ISR 20	Surface Works	Cement Trucks Surface Works	0.03	0.00	-	-	-	-
ISR 21	Surface Works	Equipment and material delivery Surface Works	0.01	0.00	-	-	-	-
ISR 22	Surface and Cavern Works	Potable Water - Surface and Cavern	0.01	0.00	-	-	-	-
ISR 23	Surface and Cavern Works	Non Potable Water - Surface and Cavern	0.07	0.01	-	-	-	-
ISR 24	Reservoir Fill	Non Potable Water - Reservoir Fill	0.58	0.06	-	-	-	-
		Total Unpaved	8.24	0.82	0.00	0.00	0.00	0.00
Exhaust Emissions from Haul Truck Traffic on Internal Site Routes								
ISR 1	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.000	0.000	0.000	0.000	0.001	0.000
ISR 2	Cavern Works	Equipment mobilization - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 3	Cavern Works	Equipment demobilization - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 4	Cavern Works	Fuel delivery - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 5	Cavern Works	Fencing delivery - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 6	Cavern Works	Concrete trucks - Cavern Works	0.000	0.000	0.001	0.000	0.000	0.000
ISR 7	Cavern Works	Gravel delivery - Cavern Works	0.000	0.000	0.004	0.000	0.000	0.000
ISR 8	Cavern Works	Trailer delivery - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 9	Cavern Works	[not used)	0.000	0.000	0.000	0.000	0.000	0.000
ISR 10	Cavern Works	Waste Rock Trucks Onsite Travel	0.018	0.006	0.506	0.018	0.037	0.002
ISR 11	Cavern Works	Workforce (Mining) - Cavern Works	0.000	0.000	0.002	0.001	0.025	0.000
ISR 12	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 13	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 14	Cavern Works	Ground support - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 15	Cavern Works	Explosives - Cavern Works	0.000	0.000	0.000	0.000	0.000	0.000
ISR 16	Cavern Works	Waste Rock Export Trucks Onsite Travel	0.003	0.001	0.098	0.004	0.007	0.000
ISR 17	Surface Works	Workforce - Surface Works	0.001	0.000	0.002	0.001	0.033	0.000
ISR 18	Surface Works	Site clearing (overburden) - Surface Works	0.000	0.000	0.013	0.000	0.001	0.000
ISR 19	Surface Works	Civil foundation excavation Surface Works	0.000	0.000	0.006	0.000	0.000	0.000
ISR 20	Surface Works	Cement Trucks Surface Works	0.000	0.000	0.003	0.000	0.000	0.000
ISR 21	Surface Works	Equipment and material delivery Surface Works	0.000	0.000	0.001	0.000	0.000	0.000
ISR 22	Surface and Cavern Works	Potable Water - Surface and Cavern	0.000	0.000	0.001	0.000	0.000	0.000
ISR 23	Surface and Cavern Works	Non Potable Water - Surface and Cavern	0.000	0.000	0.008	0.000	0.001	0.000
ISR 24	Reservoir Fill	Non Potable Water - Reservoir Fill	0.002	0.001	0.063	0.002	0.005	0.000
		Total Traffic Exhaust	0.026	0.009	0.711	0.028	0.111	0.003

TABLE 1
EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCTION PHASE - WITHOUT BERM
Hydrostor WRESC

ID	Activity	Description	PM_{10} Emissions Annual (tons/yr)	$PM_{2.5}$ Emissions Annual (tons/yr)	NO_x Emissions Annual (tons/yr)	VOC Emissions Annual (tons/yr)	CO Emission Annual (tons/yr)	SO_2 Emissions Annual (tons/yr)
Exhaust Emissions from Non-Road Engines								
EXH-1	Surface Works	Indirects (5 days/week)	0.11	0.11	4.14	0.43	4.46	0.01
EXH-2	Surface Works	Civil & Fdns (5 days/week)	0.04	0.04	0.72	0.09	1.25	0.00
EXH-3	Surface Works	Turbine Hall (5 days/week)	0.07	0.07	2.03	0.20	2.30	0.00
EXH-4	Surface Works	Structural (5 days/week)	0.00	0.00	0.00	0.00	0.00	0.00
EXH-5	Surface Works	Piping (5 days/week)	0.04	0.04	1.63	0.19	2.41	0.00
EXH-6	Surface Works	Mechanical (5 days/week)	0.03	0.03	0.75	0.09	0.67	0.00
EXH-7	Surface Works	Cavern Rock Moving and Hauling (7 days/week)	0.75	0.75	21.20	3.45	22.78	0.09
EXH-8	Cavern Works	Site Prep (5 days/week)	0.00	0.00	0.00	0.00	0.00	0.00
EXH-9	Cavern Works	Drilling - Conventionally Sunk Shaft (7 days/week)	0.00	0.00	0.00	0.00	0.00	0.00
EXH-10	Cavern Works	Surface Equipment (7 days/week)	0.04	0.04	1.06	0.17	1.15	0.00
EXH-11	Cavern Works	Underground Equipment (7 days/week)-Emissions vented to su	0.39	0.39	7.29	0.90	7.48	0.02
		Total Non-Road Exhaust	1.46	1.46	38.82	5.52	42.50	0.14
Stationary Sources								
Material Handling								
TA1	Cavern Works	Clearing and Stripping -Truck unloading	0.027	0.004	-	-	-	-
TB	Cavern Works	Mining Activities -Total TB1 -TB3	0.558	0.085	-	-	-	-
TD1	Surface Works	Site clearing - Truck loading	0.020	0.003	-	-	-	-
TD2	Surface Works	Excavations Activities - Truck loading	0.007	0.001	-	-	-	-
		Tranfer Areas Total	0.61	0.09	0.00	0.00	0.00	0.00
Bulldozing								
BD1	Surface Works	Foundation and Compaction - Surface Works	0.00	0.00	-	-	-	-
BD2	Cavern Works	Mining Surface	0.00	0.00	-	-	-	-
		Bulldozing Total	0.00	0.00	0.00	0.00	0.00	0.00
Grading								
GD1	Surface Works	Foundation and Compaction	0.43	0.03	-	-	-	-
		Grading Total	0.43	0.03	0.0	0.0	0.0	0.0
Wind Erosion of Exposed Surface Areas								
WE1	Site Area Wind Erosion	Clearing& Stripping	2.04	1.02	-	-	-	-
WE2	Rock Storage Wind Erosion	Temporary Cavern Rock Storage Area	0.14	0.07				
WE3	Earthwork Storage Wind Erosion	Temporary Earthwork Storage Area	0.14	0.07				
WE4	Crushed Rock Storage Wind Erosic	Temporary Crushing Plant Storage Area	0.05	0.02				
		Wind Erosion Areas Total	2.38	1.19	0.000	0.000	0.000	0.000
Wind Erosion of Stock Piles								
WS1	Cavern Works	Shaft Cutting	0.22	0.03	-	-	-	-
WS2	Surface Works	Site Clearing	0.88	0.13	-	-	-	-
WS3	Surface Works	Excavations	0.53	0.08	-	-	-	-
		Wind Erosion Stockpile Total	1.63	0.24	0.00	0.00	0.00	0.00
Rock Crushing								
RC1	Rock Crushing System	Crushing, screening, conveyors	0.25	0.07	-	-	-	-
RC2	Generator Sets	Generator Sets -Two Diesel Engines	0.14	0.14	3.45	0.97	17.93	0.03
		Rock Crushing Total	0.39	0.21	3.45	0.97	17.93	0.03
		Estimated Highest 12 Month Period Emissions, TPY	**15.17**	**4.06**	**42.98**	**6.51**	**60.54**	**0.18**
		Avg High Month, lbs	**2,527.74**	**677.11**	**7,162.80**	**1,084.77**	**10,090.53**	**29.18**
		Avg High Day, lbs	**84.3**	**22.6**	**238.8**	**36.2**	**336.4**	**1.0**

Emissions Breakout	PM_{10}	$PM_{2.5}$	NO_x	VOC	CO	SO_2
OnSite Equipment Exhaust Emissions, tons per High 12 Months	1.63	1.61	42.98	6.51	60.54	0.18
OnSite Equipment Exhaust Emissions, lbs High Month	271.24	268.50	7162.80	1084.77	10090.53	29.18
OnSite Equipment Exhaust Emissions, lbs High Day	9.04	8.95	238.76	36.16	336.35	0.97
Fugitive Emissions, tons per High 12 Months	13.54	2.45	0.00	0.00	0.00	0.00
Fugitive Emissions, lbs High Month	2256.49	408.61	0.00	0.00	0.00	0.00

TABLE 1
EMISSIONS SUMMARY - CRITERIA POLLUTANTS
CONSTRUCTION PHASE - WITHOUT BERM
Hydrostor WRESC

ID	Activity	Description	PM_{10} Emissions Annual (tons/yr)	$PM_{2,5}$ Emissions Annual (tons/yr)	NO_x Emissions Annual (tons/yr)	VOC Emissions Annual (tons/yr)	CO Emission Annual (tons/yr)	SO_2 Emissions Annual (tons/yr)
	Fugitive Emissions, lbs High Day		75.22	13.62	0.00	0.00	0.00	0.00

TABLE 2
EMISSIONS SUMMARY - GREENHOUSE GASES
CONSTRUCTION PHASE - WITHOUT BERM
Hydrostor WRESC

ID	Activity	Description	Annual Emission Rates CO_2 (tons/yr)	CH_4 (tons/yr)	N2O (tons/yr)
Non-Stationary Sources					
Exhaust Emissions from Haul Truck Traffic on Internal Site Routes					
ISR 1	Cavern Works	Workforce (Site Clearing) - Cavern Works	0.45	0.00	0.00
ISR 2	Cavern Works	Equipment mobilization - Cavern Works	0.02	0.00	0.00
ISR 3	Cavern Works	Equipment demobilization - Cavern Works	0.02	0.00	0.00
ISR 4	Cavern Works	Fuel delivery - Cavern Works	0.15	0.00	0.00
ISR 5	Cavern Works	Fencing delivery - Cavern Works	0.00	0.00	0.00
ISR 6	Cavern Works	Concrete trucks - Cavern Works	0.60	0.00	0.00
ISR 7	Cavern Works	Gravel delivery - Cavern Works	1.77	0.00	0.00
ISR 8	Cavern Works	Trailer delivery - Cavern Works	0.02	0.00	0.00
ISR 9	Cavern Works	[not used]	0.00	0.00	0.00
ISR 10	Cavern Works	Waste Rock Trucks Onsite Travel	214.86	0.00	0.02
ISR 11	Cavern Works	Workforce (Mining) - Cavern Works	9.33	0.00	0.00
ISR 12	Cavern Works	Surface equipment (mobilization) - Cavern Works	0.09	0.00	0.00
ISR 13	Cavern Works	Subsurface equipment (mobilization) - Cavern Works	0.07	0.00	0.00
ISR 14	Cavern Works	Ground support - Cavern Works	0.05	0.00	0.00
ISR 15	Cavern Works	Explosives - Cavern Works	0.05	0.00	0.00
ISR 16	Cavern Works	Waste Rock Export Trucks Onsite Travel	41.71	0.00	0.00
ISR 17	Surface Works	Workforce - Surface Works	12.13	0.00	0.00
ISR 18	Surface Works	Site clearing (overburden) - Surface Works	5.56	0.00	0.00
ISR 19	Surface Works	Civil foundation excavation Surface Works	2.55	0.00	0.00
ISR 20	Surface Works	Cement Trucks Surface Works	1.47	0.00	0.00
ISR 21	Surface Works	Equipment and material delivery Surface Works	0.51	0.00	0.00
ISR 22	Surface and Cavern Works	Potable Water - Surface and Cavern	0.49	0.00	0.00
ISR 23	Surface and Cavern Works	Non Potable Water - Surface and Cavern	3.43	0.00	0.00
ISR 24	Reservoir Fill	Non Potable Water - Reservoir Fill	26.88	0.00	0.00
		Total Traffic Exhaust	322.22	0.00	0.03
Exhaust Emissions from Non-Road Engines					
EXH-1	Surface Works	Indirects (5 days/week)	674.92	-	-
EXH-2	Surface Works	Civil & Fdns (5 days/week)	204.35	-	-
EXH-3	Surface Works	Turbine Hall (5 days/week)	457.33	-	-
EXH-4	Surface Works	Structural (5 days/week)	0.00	-	-
EXH-5	Surface Works	Piping (5 days/week)	344.71	-	-
EXH-6	Surface Works	Mechanical (5 days/week)	128.78	-	-
EXH-7	Surface Works	Cavern Rock Moving and Hauling (7 days/week)	10,236.60	-	-
EXH-8	Cavern Works	Site Prep (5 days/week)	0.00	-	-
EXH-9	Cavern Works	Drilling - Conventionally Sunk Shaft (7 days/week)	0.00	-	-
EXH-10	Cavern Works	Surface Equipment (7 days/week)	515.77	-	-
EXH-11	Cavern Works	Underground Equipment (7 days/week)-Emissions vented t	1,938.90	-	-
		Total Non-Road Exhaust	14,501.35	0.0000	0.0000
Exhaust Emissions from Generator Sets					
RC2	Rock Crushing System	Generator Sets -Two Diesel Engines	3,497.82	-	-
		Total Non-Road Exhaust	3,497.82	0.0000	0.0000
		Total Emissions	**18,321.4**	**0.000**	**0.033**

Greenhouse Gases (GHGs)	Global Warming Potential (GWP)			Annual Emissions (TPY CO_2e)
Carbon dioxide (CO_2)	1			18,321
Methane (CH_4)	25			0.01
Nitrous oxide (N_20)	298			9.88
			Total	18,331.27

Manpower and Construction Equipment by Month
Project: Willow Rock Energy Storage Center

ManPower by month for option without Architectural Berm

	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26
	2025										2026											
																			Manpower by Month (see Note 1)			
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Cavern and Shaft works																						
Mining																						
Mechanic																						
Electrician																						
Hoistman																						
Miner																						
Eqpt Operator																						
Site Supervision																						
Project Mgmt																						
Shaft Sinking (24' conventionally sunk)																						
Miners											5.16	6	6	6	6	6	6	6	6	6	6	6
Nippers											6.88	8	8	8	8	8	8	8	8	8	8	8
Batch Plant operators											5.16	6	6	6	6	6	6	6	6	6	6	6
Superintendant											1.72	2	2	2	2	2	2	2	2	2	2	2
shift boss											1.72	2	2	2	2	2	2	2	2	2	2	2
mechanic											1.72	2	2	2	2	2	2	2	2	2	2	2
electrician											1.72	2	2	2	2	2	2	2	2	2	2	2
clerk											1.72	2	2	2	2	2	2	2	2	2	2	2
equipment operators											3.44	4	4	4	4	4	4	4	4	4	4	4
hoistman											1.72	2	2	2	2	2	2	2	2	2	2	2
rigger											1.72	2	2	2	2	2	2	2	2	2	2	2
safety professional											1.72	2	2	2	2	2	2	2	2	2	2	2
Drilling (Blind Bore Shafts)																						
Project Mgmt										2.34	3	3	3	3	3	3	3	3	3	3	3	3
Eqpt Operator										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Laborer										4.68	6	6	6	6	6	6	6	6	6	6	6	6
Welder										7.02	9	9	9	9	9	9	9	9	9	9	9	9
Site Prep																						
Eqpt Operator							6	6	6	6	6								0.66	6	6	6
Laborer							6	6	6	6	6								0.66	6	6	6
PM							1	1	1	1	1								0.11	1	1	1
Topside (Power Block)																						
Staff	9	4	3	4	3	2	3	4	7	9	7	7	8	15	19	44	43	40	47	40	46	58
Craft Support	5	2	2	2	2	1	2	2	4	5	4	4	5	8	10	24	24	22	26	22	25	32
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	32	32	32	32
Insulation	-	-	-	-	-	-	-	-	1	4	3	4	4	4	6	19	25	25	33	35	11	5
Instrumentation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	5	1	5
Scaffold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	11
Pipe Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	5	10
Mechanical Crew	-	-	-	-	-	-	-	-	-	-	1	7	3	2	4	10	6	2	2	4	17	15
InEight Startup Resources	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-	-
Electrical Crew	14	-	-	-	-	-	-	-	-	-	-	-	0	0	-	0	0	0	1	0	0	33
Concrete Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	5	4	5	8	8	31	28
Civil Crew	7	7	7	7	10	13	17	17	17	17	17	17	17	37	44	97	91	84	93	65	68	68
Buildings	4	4	4	4	3	1	1	2	7	7	5	2	2	1	2	2	1	1	1	1	1	3
Offsite																						
Cavern Waste Rock Hauling																						
Transmission line - A/G Offsite																						
Transmission line - U/G Offsite																						
Total	40	17	15	17	17	17	35	39	49	76	112	107	105	134	154	269	263	279	312	292	325	380

Manpower and Construction Equipm

Project: Willow Rock Energy Storage

ManPower by month for option without Architectural Berm

	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27
	2027											
Month	23	24	25	26	27	28	29	30	31	32	33	34
Cavern and Shaft works												
Mining												
Mechanic		2.24	8	16	16	16	16	16	16	16	16	16
Electrician		0.84	3	6	6	6	6	6	6	6	6	6
Hoistman		1.12	4	8	8	8	8	8	8	8	8	8
Miner		6.16	22	44	44	44	44	44	44	44	44	44
Eqpt Operator		0.56	2	4	4	4	4	4	4	4	4	4
Site Supervision		0.56	2	4	4	4	4	4	4	4	4	4
Project Mgmt		1.68	6	8	8	8	8	8	8	8	8	8
Shaft Sinking (24' conventionally sunk)												
Miners	0.66											
Nippers	0.88											
Batch Plant operators	0.66											
Superintendant	0.22											
shift boss	0.22											
mechanic	0.22											
electrician	0.22											
clerk	0.22											
equipment operators	0.44											
hoistman	0.22											
rigger	0.22											
safety professional	0.22											
Drilling (Blind Bore Shafts)												
Project Mgmt	3	3	1	1	1	1	1	1	1	1	1	1
Eqpt Operator	9	9	3	3	3	3	3	3	3	3	3	3
Laborer	6	6	2	2	2	2	2	2	2	2	2	2
Welder	9	9	3	3	3	3	3	3	3	3	3	3
Site Prep												
Eqpt Operator	6											
Laborer	6											
PM	1											
Topside (Power Block)												
Staff	38	34	35	30	43	55	68	60	87	121	121	125
Craft Support	21	19	19	17	24	30	37	33	48	66	67	69
Tanks	32	32	32	32	32	32	32	32	32	32	32	32
Insulation	1	-	-	-	-	-	-	-	3	4	4	4
Instrumentation	-	2	1	1	1	1	1	-	-	1	-	3
Steel Crew	4	3	3	3	3	16	22	29	35	35	47	41
Scaffold	10	12	12	7	3	3	2	5	5	7	6	6
Pipe Crew	6	10	8	9	11	11	7	9	34	47	58	75
Mechanical Crew	5	6	5	4	2	17	27	38	50	81	92	108
InEight Startup Resources	-	5	4	1	1	2	0	-	3	8	3	3
Electrical Crew	26	16	6	4	1	41	63	48	52	93	78	78
Concrete Crew	11	4	24	24	76	51	65	48	64	56	53	40
Civil Crew	47	40	40	36	28	25	24	19	1	-	-	-
Buildings	3	4	1	1	1	1	1	1	-	-	-	-
Offsite												
Cavern Waste Rock Hauling		0	0	0	0	0	0	0	0	0	0	0
Transmission line - A/G Offsite								20	20	20	20	20
Transmission line - U/G Offsite		19	19	18	17	9	9	12	13	17	17	17
Total	248	245	265	286	342	393	457	452	546	687	695	718

	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28
	2028											
Month	35	36	37	38	39	40	41	42	43	44	45	46
Cavern and Shaft works												
Mining												
Mechanic	16	16	16	16	16	16	16	16	16	16	16	16
Electrician	6	6	6	6	6	6	6	6	6	6	6	6
Hoistman	8	8	8	8	8	8	8	8	8	8	8	8
Miner	44	44	44	44	44	44	44	44	44	44	44	44
Eqpt Operator	4	4	4	4	4	4	4	4	4	4	4	4
Site Supervision	4	4	4	4	4	4	4	4	4	4	4	4
Project Mgmt	8	8	8	8	8	8	8	8	8	8	8	8
Shaft Sinking (24' conventionally sunk)												
Miners												
Nippers												
Batch Plant operators												
Superintendant												
shift boss												
mechanic												
electrician												
clerk												
equipment operators												
hoistman												
rigger												
safety professional												
Drilling (Blind Bore Shafts)												
Project Mgmt	0.16											
Eqpt Operator	0.48											
Laborer	0.32											
Welder	0.48											
Site Prep												
Eqpt Operator												
Laborer												
PM												
Topside (Power Block)												
Staff	102	107	94	103	93	90	89	100	86	82	61	51
Craft Support	56	58	52	57	51	49	49	55	47	45	33	28
Tanks	32	32	32	32	32	32	-	-	-	-	-	-
Insulation	3	4	0	-	-	-	3	15	12	11	5	4
Instrumentation	1	2	4	6	10	12	12	18	13	20	10	14
Steel Crew	43	29	27	17	12	7	-	-	-	-	-	-
Scaffold	2	-	-	-	-	1	5	5	5	8	7	7
Pipe Crew	70	107	110	126	137	117	112	101	91	67	50	33
Mechanical Crew	104	104	90	72	84	64	58	34	25	21	13	11
InEight Startup Resources	1	1	1	1	5	5	12	7	3	6	10	6
Electrical Crew	38	42	26	53	66	84	81	114	108	106	82	73
Concrete Crew	34	15	4	6	3	6	3	7	1	3	1	1
Civil Crew	-	-	-	-	-	1	7	7	7	7	7	7
Buildings	-	-	-	-	-	-	-	-	-	-	-	-
Offsite												
Cavern Waste Rock Hauling	0	0	0	0	0	0	0	0	0	0	0	
Transmission line - A/G Offsite	20	20	20	20	20							
Transmission line - U/G Offsite	17											
Total	615	611	550	583	602	557	519	553	487	466	369	325

Manpower and Construction Equipm
Project: Willow Rock Energy Storage

ManPower by month for option without Architectural Berm

	Jan-29	Feb-29	Mar-29	Apr-29	May-29	Jun-29	Jul-29	Aug-29	Sep-29	Oct-29	Nov-29	Dec-29	Jan-30	Feb-30
	2029												2030	
Month	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Cavern and Shaft works														
Mining														
Mechanic	16	16	2	2										
Electrician	6	6	2	2										
Hoistman	8	8												
Miner	44	44												
Eqpt Operator	4	4	6	6										
Site Supervision	4	4	2	2										
Project Mgmt	8	8	2	2										
Shaft Sinking (24' conventionally sunk)														
Miners														
Nippers														
Batch Plant operators														
Superintendant														
shift boss														
mechanic														
electrician														
clerk														
equipment operators														
hoistman														
rigger														
safety professional														
Drilling (Blind Bore Shafts)														
Project Mgmt														
Eqpt Operator														
Laborer														
Welder														
Site Prep														
Eqpt Operator														
Laborer														
PM														
Topside (Power Block)														
Staff	35	46	39	23	24	17	6	5	5	12	9	5	4	0
Craft Support	19	25	21	12	13	9	3	3	3	7	5	3	2	0
Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insulation	7	18	20	11	10	7	-	-	-	-	-	-	-	-
Instrumentation	5	7	3	3	1	-	-	-	-	-	-	-	-	-
Steel Crew	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scaffold	7	9	10	8	6	2	1	3	3	3	3	1	-	-
Pipe Crew	22	17	4	1	1	-	-	-	-	-	-	-	-	-
Mechanical Crew	6	7	4	2	-	-	-	-	1	9	-	-	-	-
InEight Startup Resources	3	40	48	33	43	32	8	4	6	20	15	11	12	1
Electrical Crew	47	31	18	2	1	1	1	0	-	-	-	-	-	-
Concrete Crew	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Civil Crew	7	7	7	7	8	7	8	7	7	8	7	3	-	-
Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Offsite														
Cavern Waste Rock Hauling														
Transmission line - A/G Offsite														
Transmission line - U/G Offsite														
Total	248	298	190	116	107	75	27	22	25	58	39	22	18	1

Construction Equipment by Month

Categories																							
	Avg HP	1		2		3		4		5		6		7		8		9		10		11	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																							
Pick-up trucks (for entire site)	150							25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100							12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																							
Wheel Loader	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120							12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	160							7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	270							9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	120							16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	100							11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	250							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210							1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																							
Cranes	200																						
JLG	75																						
Cranes	200																						
ManLift	75																						
Welding machine	50																						
Structural (5 days/week)																							
Cranes	200																						
Welding machine	50																						
Piping (5 days/week)																							
Welding machine	50																						
ManLift	75																						
Cranes	200																						
Mechanical (5 days/week)																							
Welding machines	50																						
Crane	200																						
Cavern Rock Moving and Hauling (7 days/week)																							
Dump Truck (21-ton)	400																						
Front End Loader	320																						
Off-Site Transmission (5 days/week)																							
Various Equipment	600																						
Cavern Works																							
Underground Equipment (7 days/week)																							
Mercury 1B Bolter	55																						
Boomer 282 Jumbo	125																						
Scissor Lift	138																						
Welder	19																						
Buggy	47																						
LHD	201																						
Getman Boom Lift	147																						
Skid Steer	61																						
Surface Equipment (7 days/week)																							
wheel loader	260																						
20 Tn Off Road Dump Truck	320																						
Site Prep (5 days/week)																							
Dozers	215													2	10	2	10	2	10	2	10	2	10
Track hoe	172													1	10	1	10	1	10	1	10	1	10
Back hoe	172													1	10	1	10	1	10	1	10	1	10
Dumptruck (20Ton)	400													1	10	1	10	1	10	1	10	1	10
Water Truck	210													1	10	1	10	1	10	1	10	1	10
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	110																						
Articulating wheel loader	320																						
25-ton articulating dump truck	320																						

Categories																						
	12		13		14		15		16		17		18		19		20		21		22	
Surface Works	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																						
Pick-up trucks (for entire site)	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																						
Wheel Loader	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Grader	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
Crawler dozer	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Scraper	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4
Backhoe	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4
Roller	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4
Pile driver hammer	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	1	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																						
Cranes																						
JLG																						
Cranes											2	8	2	8	2	8	2	8	2	8	2	8
ManLift											12	4	12	4	12	4	12	4	12	4	12	4
Welding machine											4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																						
Cranes															2	4	2	4	4	4	4	4
Welding machine															2	8	2	8	4	8	4	8
Piping (5 days/week)																						
Welding machine									10	4	10	4	10	4	10	4	10	4	12	4	12	4
ManLift									2	4	2	4	3	4	3	4	6	4	6	4	10	4
Cranes									2	8	2	8	2	8	2	8	2	8	2	8	2	8
Mechanical (5 days/week)																						
Welding machines									2	4	2	4	2	4	2	4	2	4	4	4	4	4
Crane									1	4	1	4	1	4	1	4	1	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																						
Dump Truck (21-ton)																						
Front End Loader																						
Off-Site Transmission (5 days/week)																						
Various Equipment																						
Cavern Works																						
Underground Equipment (7 days/week)																						
Mercury 1B Bolter																						
Boomer 282 Jumbo																						
Scissor Lift																						
Welder																						
Buggy																						
LHD																						
Getman Boom Lift																						
Skid Steer																						
Surface Equipment (7 days/week)																						
wheel loader																						
20 Tn Off Road Dump Truck																						
Site Prep (5 days/week)																						
Dozers																						
Track hoe																						
Back hoe																						
Dumptruck (20Ton)																						
Water Truck																						
Drilling - Conventionally Sunk Shaft (7 days/week)																						
Telehandler	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
Articulating wheel loader	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18
25-ton articulating dump truck	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18

Construction Equipment by Month

Categories	Avg HP	23		24		25		26		27		28		29		30	
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																	
Pick-up trucks (for entire site)	150	25	4	40	4	40	4	40	4	40	4	40	4	60	4	60	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)																	
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120	12	4														
Grader	160	7	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler dozer	120	2	4														
Scraper	270	9	4														
Backhoe	120	16	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Roller	100	11	4														
Pile driver hammer	250	4	4														
Water Truck	210	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)																	
Cranes	200							2	4	2	4	2	4	2	4	2	4
JLG	75							4	4	4	4	4	4	4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																	
Cranes	200	2	4														
Welding machine	50	2	8														
Piping (5 days/week)																	
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	10	4	10	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																
Mechanical (5 days/week)																	
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																	
Dump Truck (21-ton)	400			0	10	0	10	0	10	0	10	0	10	0	10	0	10
Front End Loader	320			1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)																	
Various Equipment	600			1	4	1	4	1	4	1	4	1	4	1	4	1	4
Cavern Works																	
Underground Equipment (7 days/week)																	
Mercury 1B Bolter	55			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	19			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	47			0.56	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	201			1.12	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61			0.28	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																	
wheel loader	260			1	20	1	20	1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	320			1	20	1	20	1	20	1	20	1	20	1	20	1	20
Site Prep (5 days/week)																	
Dozers	215																
Track hoe	172																
Back hoe	172																
Dumptruck (20Ton)	400																
Water Truck	210																
Drilling - Conventionally Sunk Shaft (7 days/week)																	
Telehandler	110	1	18	1	18												
Articulating wheel loader	320	1	18	1	18												
25-ton articulating dump truck	320	1	18	1	18												

Categories	31		32		33		34		35		36		37		38	
Surface Works	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																
Pick-up trucks (for entire site)	60	4	60	4	60	4	60	4	60	4	60	4	50	4	40	4
60 kW Diesel Gensets	12	8	12	8	12	8	12	8	12	8	12	8				
Civil & Fdns (5 days/week)																
Wheel Loader	2	4	2	4	2	4										
Crawler Loader																
Grader	2	4	2	4	2	4	1	4	1	4	1	4	1	4	1	4
Crawler dozer																
Scraper																
Backhoe	4	4	4	4	4	4	1	4	1	4	1	4	1	4	1	.
Roller																
Pile driver hammer																
Water Truck	2	10	2	10	2	10	2	10	2	10	2	10	1	10	1	10
Turbines (5 days/week)																
Cranes	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)																
Cranes																
Welding machine																
Piping (5 days/week)																
Welding machine	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes																
Mechanical (5 days/week)																
Welding machines	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																
Dump Truck (21-ton)	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10
Front End Loader	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)																
Various Equipment	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Cavern Works																
Underground Equipment (7 days/week)																
Mercury 1B Bolter	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																
wheel loader	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	1	20	1	20	1	20	1	20	1	20	1	20	1	20	1	20
Site Prep (5 days/week)																
Dozers																
Track hoe																
Back hoe																
Dumptruck (20Ton)																
Water Truck																
Drilling - Conventionally Sunk Shaft (7 days/week)																
Telehandler																
Articulating wheel loader																
25-ton articulating dump truck																

Categories	39		40		41		42		43		44		45		46	
Surface Works	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																
Pick-up trucks (for entire site)	40	4	40	4	40	4	40	4	40	4	40	4	40	4	25	4
60 kW Diesel Gensets																
Civil & Fdns (5 days/week)																
Wheel Loader																
Crawler Loader																
Grader	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Crawler dozer																
Scraper																
Backhoe	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Roller																
Pile driver hammer																
Water Truck	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																
Cranes	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	2	8														
ManLift	12	4														
Welding machine	4	6														
Structural (5 days/week)																
Cranes																
Welding machine																
Piping (5 days/week)																
Welding machine	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes																
Mechanical (5 days/week)																
Welding machines	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																
Dump Truck (21-ton)	0	10	0	10	0	10	0	10	0	10	0	10	0	10		
Front End Loader	1	10	1	10	1	10	1	10	1	10	1	10	1	10		
Off-Site Transmission (5 days/week)																
Various Equipment	1	4														
Cavern Works																
Underground Equipment (7 days/week)																
Mercury 1B Bolter	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
LHD	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Surface Equipment (7 days/week)																
wheel loader	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
20 Tn Off Road Dump Truck	1	20	1	20	1	20	1	20	1	20	1	20	1	20		
Site Prep (5 days/week)																
Dozers																
Track hoe																
Back hoe																
Dumptruck (20Ton)																
Water Truck																
Drilling - Conventionally Sunk Shaft (7 days/week)																
Telehandler																
Articulating wheel loader																
25-ton articulating dump truck																

Construction Equipment by Month

Categories		47		48		49		50		51		52		53		54		55		56		57		58		59		60	
	Avg HP																												
Surface Works		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Indirects (5 days/week)																													
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																												
Civil & Fdns (5 days/week)																													
Wheel Loader	120																												
Crawler Loader	120																												
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Crawler dozer	120																												
Scraper	270																												
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Roller	100																												
Pile driver hammer	250																												
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																													
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
JLG	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Cranes	200																												
ManLift	75																												
Welding machine	50																												
Structural (5 days/week)																													
Cranes	200																												
Welding machine	50																												
Piping (5 days/week)																													
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4						
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	8	4	8	4						
Cranes	200																												
Mechanical (5 days/week)																													
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4												
Cavern Rock Moving and Hauling (7 days/week)																													
Dump Truck (21-ton)	400																												
Front End Loader	320																												
Off-Site Transmission (5 days/week)																													
Various Equipment	600																												
Cavern Works																													
Underground Equipment (7 days/week)																													
Mercury 1B Bolter	55	2	9.6	2	9.6																								
Boomer 282 Jumbo	125	2	9.6	2	9.6																								
Scissor Lift	138	1	9.6	1	9.6																								
Welder	19	1	9.6	1	9.6																								
Buggy	47	2	9.6	2	9.6																								
LHD	201	4	19.2	4	19.2																								
Getman Boom Lift	147	1	9.6	1	9.6																								
Skid Steer	61	1	9.6	1	9.6																								
Surface Equipment (7 days/week)																													
wheel loader	260																												
20 Tn Off Road Dump Truck	320																												
Site Prep (5 days/week)																													
Dozers	215																												
Track hoe	172																												
Back hoe	172																												
Dumptruck (20Ton)	400																												
Water Truck	210																												
Drilling - Conventionally Sunk Shaft (7 days/week)																													
Telehandler	110																												
Articulating wheel loader	320																												
25-ton articulating dump truck	320																												

Table 4 Construction Equipment and Operation Hours by Month
Site: WRESC

Hydrostor WRESC
Without Berm

Construction Equipment by Month - Without Berm (see Note 1)

Categories	Avg HP	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20
		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used
Surface Works																																								
Indirects (5 days/week)																																								
Pick-up trucks (for entire site)	150							25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25
60 kW Diesel Gensets	100							12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12
Civil & Fdns (5 days/week)																																								
Wheel Loader	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2
Crawler Loader	120							12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12
Grader	160							7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7
Crawler dozer	120							2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2
Scraper	270							9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9	4	9
Backhoe	120							16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16	4	16
Roller	100							11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11	4	11
Pile driver hammer	250							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Truck	210							1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2
Turbines (5 days/week)																																								
Cranes	200																																							
JLG Manlift	75																																							
Cranes	200																																	2	8	2	8	2	8	2
ManLift	75																																	12	4	12	4	12	4	12
Welding machine	50																																	4	6	4	6	4	6	4
Structural (5 days/week)																																								
Cranes	200																																					2	4	2
Welding machine	50																																					2	8	2
Piping (5 days/week)																																								
Welding machine	50																															10	4	10	4	10	4	10	4	10
ManLift	75																															2	4	2	4	3	4	3	4	6
Cranes	200																															2	8	2	8	2	8	2	8	2
Mechanical (5 days/week)																																								
Welding machines	50																															2	4	2	4	2	4	2	4	2
Crane	200																															1	4	1	4	1	4	1	4	1
Cavern Rock Moving and Hauling (7 days/week)																																								
Dump Truck (21-ton)	400																																							
Front End Loader	320																																							
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																																							
Various Equipment	600																																							
Cavern Works																																								
Site Prep (5 days/week)																																								
Dozers	215													2	10	2	10	2	10	2	10	2	10																	
Track hoe	172													1	10	1	10	1	10	1	10	1	10																	
Back hoe	172													1	10	1	10	1	10	1	10	1	10																	
Dumptruck (20Ton)	400													1	10	1	10	1	10	1	10	1	10																	
Water Truck	210													1	10	1	10	1	10	1	10	1	10																	
Drilling - Conventionally Sunk Shaft (7 days/week)																																								
Telehandler	110																							1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1
Articulating wheel loader	320																							1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1
25-ton articulating dump truck	320																							1	18	1	18	1	18	1	18	1	18	1	18	1	18	1	18	1
Surface Equipment (7 days/week)																																								
Wheel loader	260																																							
20 Tn Off Road Dump Truck	320																																							
Underground Equipment (7 days/week) - Emissions vented to surface																																								
Mercury 1B Bolter	55																																							
Boomer 282 Jumbo	125																																							
Scissor Lift	138																																							
Welder	19																																							
Buggy	47																																							
Loaders/haul/dump	201																																							
Getman Boom Lift	147																																							
Skid Steer	61																																							

Rock Production and Hauling

Rock Production - Muck/Waste Rock Volume [m3]

Rock Production - Muck/Waste Rock Volume [tons]

Loads per Day

Trucks per Day (Included in Table Above)

1.7 tons/m3
21 tons (truck size)
30.417 days/month
2 hr (cycle time)
10 hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 4 Construction Equipment and Operati
Site: WRESC

Hydrostor WRESC
Without Berm

Construction Equipment by Month - Without Berm (see Note 1)

Categories		
	Avg HP	
		hrs/day
Surface Works		
Indirects (5 days/week)		
Pick-up trucks (for entire site)	150	4
60 kW Diesel Gensets	100	8
Civil & Fdns (5 days/week)		
Wheel Loader	120	4
Crawler Loader	120	4
Grader	160	4
Crawler dozer	120	4
Scraper	270	4
Backhoe	120	4
Roller	100	4
Pile driver hammer	250	4
Water Truck	210	10
Turbines (5 days/week)		
Cranes	200	
JLG Manlift	75	
Cranes	200	8
ManLift	75	4
Welding machine	50	6
Structural (5 days/week)		
Cranes	200	4
Welding machine	50	8
Piping (5 days/week)		
Welding machine	50	4
ManLift	75	4
Cranes	200	8
Mechanical (5 days/week)		
Welding machines	50	4
Crane	200	4
Cavern Rock Moving and Hauling (7 days/week)		
Dump Truck (21-ton)	400	
Front End Loader	320	
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]	
Various Equipment	600	
Cavern Works		
Site Prep (5 days/week)		
Dozers	215	
Track hoe	172	
Back hoe	172	
Dumptruck (20Ton)	400	
Water Truck	210	
Drilling - Conventionally Sunk Shaft (7 days/week)		
Telehandler	110	18
Articulating wheel loader	320	18
25-ton articulating dump truck	320	18
Surface Equipment (7 days/week)		
Wheel loader	260	
20 Tn Off Road Dump Truck	320	
Underground Equipment (7 days/week) - Emissions vented to surface		
Mercury 1B Bolter	55	
Boomer 282 Jumbo	125	
Scissor Lift	138	
Welder	19	
Buggy	47	
Loaders/haul/dump	201	
Getman Boom Lift	147	
Skid Steer	61	

Rock Production and Hauling

Rock Production - Muck/Waste Rock Volume [m3]

Rock Production - Muck/Waste Rock Volume [tons]

Loads per Day

Trucks per Day (Included in Table Above)

1.7	tons/m3
21	tons (truck size)
30.417	days/month
2	hr (cycle time)
10	hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 4 Construction Equipment and Operati
Site: WRESC

Hydrostor WRESC
Without Berm

Construction Equipment by Month - Without Berm (see Note 1)

Categories	Avg HP	21		22		23		24		25		26		27	
		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works															
Indirects (5 days/week)															
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	40	4	40	4	40	4	40	4
60 kW Diesel Gensets	100	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)															
Wheel Loader	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Crawler Loader	120	12	4	12	4	12	4								
Grader	160	7	4	7	4	7	4	2	4	2	4	2	4	2	4
Crawler dozer	120	2	4	2	4	2	4								
Scraper	270	9	4	9	4	9	4								
Backhoe	120	16	4	16	4	16	4	4	4	4	4	4	4	4	4
Roller	100	11	4	11	4	11	4								
Pile driver hammer	250	4	4	4	4	4	4								
Water Truck	210	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)															
Cranes	200											2	4	2	4
JLG Manlift	75											4	4	4	4
Cranes	200	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	50	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)															
Cranes	200	4	4	4	4	2	4								
Welding machine	50	4	8	4	8	2	8								
Piping (5 days/week)															
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	6	4	10	4	10	4	10	4	12	4	12	4	12	4
Cranes	200	2	8	2	8										
Mechanical (5 days/week)															
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)															
Dump Truck (21-ton)	400							1	10	3	10	6	10	6	10
Front End Loader	320							1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]														
Various Equipment	600														
Cavern Works															
Site Prep (5 days/week)															
Dozers	215														
Track hoe	172														
Back hoe	172														
Dumptruck (20Ton)	400														
Water Truck	210														
Drilling - Conventionally Sunk Shaft (7 days/week)															
Telehandler	110	1	18	1	18	1	18	1	18						
Articulating wheel loader	320	1	18	1	18	1	18	1	18						
25-ton articulating dump truck	320	1	18	1	18	1	18	1	18						
Surface Equipment (7 days/week)															
Wheel loader	260							1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	320							1	20	1	20	1	20	1	20
Underground Equipment (7 days/week) - Emissions vented to surface															
Mercury 1B Bolter	55							0.56	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	125							0.56	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	138							0.28	9.6	1	9.6	1	9.6	1	9.6
Welder	19							0.28	9.6	1	9.6	1	9.6	1	9.6
Buggy	47							0.56	9.6	2	9.6	2	9.6	2	9.6
Loaders/haul/dump	201							1.12	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	147							0.28	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	61							0.28	9.6	1	9.6	1	9.6	1	9.6

Maximum 12-Month Running Average Emissions Period (Months 30 through 41)

Categories	28		29		30		31		32		33		34	
	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works														
Indirects (5 days/week)														
Pick-up trucks (for entire site)	40	4	60	4	60	4	60	4	60	4	60	4	60	4
60 kW Diesel Gensets	12	8	12	8	12	8	12	8	12	8	12	8	12	8
Civil & Fdns (5 days/week)														
Wheel Loader	2	4	2	4	2	4	2	4	2	4	2	4		
Crawler Loader														
Grader	2	4	2	4	2	4	2	4	2	4	2	4	1	4
Crawler dozer														
Scraper														
Backhoe	4	4	4	4	4	4	4	4	4	4	4	4	1	4
Roller														
Pile driver hammer														
Water Truck	2	10	2	10	2	10	2	10	2	10	2	10	2	10
Turbines (5 days/week)														
Cranes	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG Manlift	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	2	8	2	8	2	8	2	8	2	8	2	8	2	8
ManLift	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Welding machine	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Structural (5 days/week)														
Cranes														
Welding machine														
Piping (5 days/week)														
Welding machine	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes														
Mechanical (5 days/week)														
Welding machines	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)														
Dump Truck (21-ton)	8	10	19	10	28	10	31	10	31	10	31	10	31	10
Front End Loader	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Off-Site Transmission (5 days/week)														
Various Equipment														
Cavern Works														
Site Prep (5 days/week)														
Dozers														
Track hoe														
Back hoe														
Dumptruck (20Ton)														
Water Truck														
Drilling - Conventionally Sunk Shaft (7 days/week)														
Telehandler														
Articulating wheel loader														
25-ton articulating dump truck														
Surface Equipment (7 days/week)														
Wheel loader	1	20	1	20	1	20	1	20	1	20	1	20	1	20
20 Tn Off Road Dump Truck	1	20	1	20	1	20	1	20	1	20	1	20	1	20
Underground Equipment (7 days/week) - Emissions vented to surface														
Mercury 1B Bolter	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Boomer 282 Jumbo	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Scissor Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Welder	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Buggy	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6
Loaders/haul/dump	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2
Getman Boom Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6
Skid Steer	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6

Categories	35		36		37		38		39		40		41
	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used
Surface Works													
Indirects (5 days/week)													
Pick-up trucks (for entire site)	60	4	60	4	50	4	40	4	40	4	40	4	40
60 kW Diesel Gensets	12	8	12	8									
Civil & Fdns (5 days/week)													
Wheel Loader													
Crawler Loader													
Grader	1	4	1	4	1	4	1	4	1	4	1	4	1
Crawler dozer													
Scraper													
Backhoe	1	4	1	4	1	4	1	.	1	4	1	4	1
Roller													
Pile driver hammer													
Water Truck	2	10	2	10	1	10	1	10	1	10	1	10	1
Turbines (5 days/week)													
Cranes	2	4	2	4	2	4	2	4	2	4	2	4	2
JLG Manlift	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	2	8	2	8	2	8	2	8	2	8			
ManLift	12	4	12	4	12	4	12	4	12	4			
Welding machine	4	6	4	6	4	6	4	6	4	6			
Structural (5 days/week)													
Cranes													
Welding machine													
Piping (5 days/week)													
Welding machine	12	4	12	4	12	4	12	4	12	4	12	4	12
ManLift	12	4	12	4	12	4	12	4	12	4	12	4	12
Cranes													
Mechanical (5 days/week)													
Welding machines	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	2	4	2	4	2	4	2	4	2	4	2	4	2
Cavern Rock Moving and Hauling (7 days/week)													
Dump Truck (21-ton)	31	10	31	10	31	10	31	10	31	10	31	10	31
Front End Loader	1	10	1	10	1	10	1	10	1	10	1	10	1
Off-Site Transmission (5 days/week)													
Various Equipment													
Cavern Works													
Site Prep (5 days/week)													
Dozers													
Track hoe													
Back hoe													
Dumptruck (20Ton)													
Water Truck													
Drilling - Conventionally Sunk Shaft (7 days/week)													
Telehandler													
Articulating wheel loader													
25-ton articulating dump truck													
Surface Equipment (7 days/week)													
Wheel loader	1	20	1	20	1	20	1	20	1	20	1	20	1
20 Tn Off Road Dump Truck	1	20	1	20	1	20	1	20	1	20	1	20	1
Underground Equipment (7 days/week) - Emissions vented to surface													
Mercury 1B Bolter	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2
Boomer 282 Jumbo	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2
Scissor Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1
Welder	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1
Buggy	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2
Loaders/haul/dump	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4
Getman Boom Lift	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1
Skid Steer	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1

Rock Production and Hauling

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Rock Production - Muck/Waste Rock Volume [m3]	1469	5246	9968	10493	13831	34340	52464	58188	58188	58188	58188	58188	58188	58188	58188	58188	58188	58188
Rock Production - Muck/Waste Rock Volume [tons]	2497	8919	16946	17838	23514	58378	89189	98919	98919	98919	98919	98919	98919	98919	98919	98919	98919	98919
Loads per Day	3.9	14.0	26.5	27.9	36.8	91.4	139.6	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9	154.9
Trucks per Day (Included in Table Above)	0.78	2.79	5.31	5.59	7.36	18.28	27.93	30.97	30.97	30.97	30.97	30.97	30.97	30.97	30.97	30.97	30.97	30.97

1.7 tons/m3
21 tons (truck size)
30.417 days/month
2 hr (cycle time)
10 hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 4 Construction Equipment and Operati
Site: WRESC

Hydrostor WRESC
Without Berm

Construction Equipment by Month - Without Berm (see Note 1)		
Categories		
	Avg HP	
		hrs/day
Surface Works		
Indirects (5 days/week)		
Pick-up trucks (for entire site)	150	4
60 kW Diesel Gensets	100	
Civil & Fdns (5 days/week)		
Wheel Loader	120	
Crawler Loader	120	
Grader	160	4
Crawler dozer	120	
Scraper	270	
Backhoe	120	4
Roller	100	
Pile driver hammer	250	
Water Truck	210	10
Turbines (5 days/week)		
Cranes	200	4
JLG Manlift	75	4
Cranes	200	
ManLift	75	
Welding machine	50	
Structural (5 days/week)		
Cranes	200	
Welding machine	50	
Piping (5 days/week)		
Welding machine	50	4
ManLift	75	4
Cranes	200	
Mechanical (5 days/week)		
Welding machines	50	4
Crane	200	4
Cavern Rock Moving and Hauling (7 days/week)		
Dump Truck (21-ton)	400	10
Front End Loader	320	10
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]	
Various Equipment	600	
Cavern Works		
Site Prep (5 days/week)		
Dozers	215	
Track hoe	172	
Back hoe	172	
Dumptruck (20Ton)	400	
Water Truck	210	
Drilling - Conventionally Sunk Shaft (7 days/week)		
Telehandler	110	
Articulating wheel loader	320	
25-ton articulating dump truck	320	
Surface Equipment (7 days/week)		
Wheel loader	260	20
20 Tn Off Road Dump Truck	320	20
Underground Equipment (7 days/week) - Emissions vented to surface		
Mercury 1B Bolter	55	9.6
Boomer 282 Jumbo	125	9.6
Scissor Lift	138	9.6
Welder	19	9.6
Buggy	47	9.6
Loaders/haul/dump	201	19.2
Getman Boom Lift	147	9.6
Skid Steer	61	9.6

Rock Production and Hauling

Rock Production - Muck/Waste Rock Volume [m3]

Rock Production - Muck/Waste Rock Volume [tons]

Loads per Day

Trucks per Day (Included in Table Above)

1.7	tons/m3
21	tons (truck size)
30.417	days/month
2	hr (cycle time)
10	hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 4 Construction Equipment and Operati
Site: WRESC

Hydrostor WRESC
Without Berm

Construction Equipment by Month - Without Berm (see Note 1)

Categories	Avg HP	42		43		44		45		46		47		48		49		50	
		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works																			
Indirects (5 days/week)																			
Pick-up trucks (for entire site)	150	40	4	40	4	40	4	40	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																		
Civil & Fdns (5 days/week)																			
Wheel Loader	120																		
Crawler Loader	120																		
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Crawler dozer	120																		
Scraper	270																		
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Roller	100																		
Pile driver hammer	250																		
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																			
Cranes	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
JLG Manlift	75	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cranes	200																		
ManLift	75																		
Welding machine	50																		
Structural (5 days/week)																			
Cranes	200																		
Welding machine	50																		
Piping (5 days/week)																			
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
ManLift	75	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4
Cranes	200																		
Mechanical (5 days/week)																			
Welding machines	50	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Crane	200	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Cavern Rock Moving and Hauling (7 days/week)																			
Dump Truck (21-ton)	400	31	10	31	10	31	10	21	10										
Front End Loader	320	1	10	1	10	1	10	1	10										
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																		
Various Equipment	600																		
Cavern Works																			
Site Prep (5 days/week)																			
Dozers	215																		
Track hoe	172																		
Back hoe	172																		
Dumptruck (20Ton)	400																		
Water Truck	210																		
Drilling - Conventionally Sunk Shaft (7 days/week)																			
Telehandler	110																		
Articulating wheel loader	320																		
25-ton articulating dump truck	320																		
Surface Equipment (7 days/week)																			
Wheel loader	260	1	20	1	20	1	20	1	20										
20 Tn Off Road Dump Truck	320	1	20	1	20	1	20	1	20										
Underground Equipment (7 days/week) - Emissions vented to surface																			
Mercury 1B Bolter	55	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6				
Boomer 282 Jumbo	125	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6				
Scissor Lift	138	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				
Welder	19	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				
Buggy	47	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6	2	9.6				
Loaders/haul/dump	201	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2	4	19.2				
Getman Boom Lift	147	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				
Skid Steer	61	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6	1	9.6				

Categories	Avg HP	51		52		53		54		55		56		57		58		59		60	
		# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day	# used	hrs/day
Surface Works																					
Indirects (5 days/week)																					
Pick-up trucks (for entire site)	150	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
60 kW Diesel Gensets	100																				
Civil & Fdns (5 days/week)																					
Wheel Loader	120																				
Crawler Loader	120																				
Grader	160	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Crawler dozer	120																				
Scraper	270																				
Backhoe	120	1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Roller	100																				
Pile driver hammer	250																				
Water Truck	210	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
Turbines (5 days/week)																					
Cranes	200	2	4	2	4	2	4	2	4												
JLG Manlift	75	4	4	4	4	4	4	4	4												
Cranes	200																				
ManLift	75																				
Welding machine	50																				
Structural (5 days/week)																					
Cranes	200																				
Welding machine	50																				
Piping (5 days/week)																					
Welding machine	50	12	4	12	4	12	4	12	4	12	4	12	4	12	4						
ManLift	75	12	4	12	4	12	4	12	4	12	4	8	4	8	4						
Cranes	200																				
Mechanical (5 days/week)																					
Welding machines	50	4	4	4	4	4	4	4	4												
Crane	200	2	4	2	4	2	4	2	4												
Cavern Rock Moving and Hauling (7 days/week)																					
Dump Truck (21-ton)	400																				
Front End Loader	320																				
Off-Site Transmission (5 days/week)	[Not included in on-site emissions]																				
Various Equipment	600																				
Cavern Works																					
Site Prep (5 days/week)																					
Dozers	215																				
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Water Truck	210																				
Drilling - Conventionally Sunk Shaft (7 days/week)																					
Telehandler	110																				
Articulating wheel loader	320																				
25-ton articulating dump truck	320																				
Surface Equipment (7 days/week)																					
Wheel loader	260																				
20 Tn Off Road Dump Truck	320																				
Underground Equipment (7 days/week) - Emissions vented to surface																					
Mercury 1B Bolter	55																				
Boomer 282 Jumbo	125																				
Scissor Lift	138																				
Welder	19																				
Buggy	47																				
Loaders/haul/dump	201																				
Getman Boom Lift	147																				
Skid Steer	61																				

Rock Production and Hauling

Rock Production - Muck/Waste Rock Volume [m3]	58188	58188	58188	38404
Rock Production - Muck/Waste Rock Volume [tons]	98919	98919	98919	65286
Loads per Day	154.9	154.9	154.9	102.2
Trucks per Day (Included in Table Above)	30.97	30.97	30.97	20.44

1.7	tons/m3
21	tons (truck size)
30.417	days/month
2	hr (cycle time)
10	hr per day per truck

Notes:
1. Assumed shifts:
Surface works: 10 hrs/day x 5 days/week

Table 5 (Page 1 of 2)
Material Throughput and Vehicle Traffic Count on Onsite Unpaved Roads
Construction Phase - Without Berm
Hydrostor WRESC

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Parameters	**Cavern Works**															
	Clearing & Stripping								**Mining Activities**							
	Workforce	**Equipment mobilization**	**Equipment demobilization**	**Fuel delivery**	**Fencing delivery**	**Concrete trucks**	**Gravel delivery**	**Trailer delivery**		**Waste Rock Trucks Onsite Travel**	**Workforce**	**Surface equipment – mobilization**	**Subsurface equipment – mobilization**	**Ground support**	**Explosives**	**Waste Rock Export Trucks Onsite Travel**
Material Throughput																
Total Area (acres)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Material Depth (in)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Material Volume (ft^3)	--	--	--	--	--	--	305,100	--	--	--	--	--	--	--	--	--
Material Volume (yd^3) [a]	--	--	--	--	--	14,640	11,300	--	--	624,000	--	--	--	--	--	624,000
Material Density (lb/ft^3) [b]	--	--	--	--	--	--	105.0	--	--	130.0	--	--	--	--	--	130.0
Total Material Weight (tons)	--	--	--	--	--	--	16,018	--	--	1,095,120	--	--	--	--	--	1,095,120
Operating Time																
Total Operating Weeks (weeks) [c]	16	1	1	16	1	26	3	1	52	52	52	4	4	52	52	52
Total Operating Days (days) [c]	80	7	7	80	7	183	15	7	365	365	365	30	30	365	365	365
Daily Operating Hours (hrs/day)	2	2	2	2	2	12	10	2	10	10	2	2	2	2	2	10
Vehicle and Travel Data																
Vehicle Model [d]	Passenger Car	Tractor Trailer	Tractor Trailer	Fuel truck (tandem)	Tractor Trailer	Cement mix truck (10 yd)	Tandem truck load (12 yd)	Tractor Trailer	Passenger car	Dump trucks (12 yd)	Passenger car	Tractor Trailer	Tractor Trailer	Flatbed tractor trailer	Flatbed tractor trailer	Dump trucks (12 yd)
Empty Vehicle Weight (tons) [e]	2.3	19.0	19.0	7.1	19.0	13.5	20.0	19.0	2.3	25.5	2.3	19.0	19.0	19.0	19.0	25.5
Vehicle Capacity (tons)	0.8	20.0	20.0	19.0	20.0	20.0	18.0	20.0	0.8	21	0.8	20.0	20.0	20.0	20.0	21
Vehicle Capacity (yd^3)	--	--	--	--	--	--	12.0	--	--	12.0	--	--	--	--	--	12.0
Loaded Vehicle Weight (tons)	3.0	39.0	39.0	26.1	39.0	33.5	38.0	39.0	3.0	46.6	3.0	39.0	39.0	39.0	39.0	46.6
W = Average Vehicle Weight (tons)	2.7	29.0	29.0	16.6	29.0	23.5	29.0	29.0	2.7	36.0	2.7	29.0	29.0	29.0	29.0	36.0
Number of Vehicles (duration)	960	10	10	80	2	1,464	942	12	0	52,000	19,957	50	35	24	24	52,000
Number of Vehicles (daily)	12	2	2	1	1	8	63	2	0	143	55	2	2	1	1	143
D = Distance traveled on unpaved roads (2-way miles) [f]	0.774	0.77	0.77	0.77	0.77	0.17	0.77	0.77	0.77	1.70	0.77	0.77	0.77	0.77	0.77	0.33
Daily Vehicle Miles Travelled (VMT)	9.3	1.5	1.5	0.8	0.8	1.4	48.8	1.5	0.0	243.1	42.6	1.5	1.5	0.8	0.8	47.2
Activity Duration Vehicle Miles Travelled (VMT)	743	8	8	62	2	249	729	9	0	88,400	15,447	39	27	19	19	17,160

Notes:
[a] Material quantities based on the document TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021).
[b] The density of 130 lb/ft^3 used for shat material and waste, 115 lb/ft^3 used for surface material such as topsoil and overburden, and density of 105 lb/ft^3 used for a typical gravel material. Densities are assumed based on Golder's experience.
[c] Operating weeks are based on construction schedule information obtained from Hydrostor.
[d] Vehicle model based on TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021).
[e] Empty vehicle weights were obtained from technical specifications of each vehicle.
[f] Hauling distance is conservatively estimated based on road design. Fugitive dust generation is directly proportional to the distance of travel.

Table 15(Page 2 of 2)
Material Throughput and Vehicle Traffic Count on Onsite Unpaved Roads
Construction Phase
Ansel Site - Hydrostor

	17	18	19	20	21	22	23	24
	Surface Works					Surface Works & Cavern		Reservoir Fill
Parameters	**Workforce**	**Site clearing - overburden**	**Civil foundation excavation**	**Cement Trucks**	**Equipment and material delivery**	**Potable Water**	**Non Potable Water**	**Non Potable Water**
Material Throughput								
Total Area (acres)	--	--	--	--	--	--	--	--
Material Depth (in)	--	--	--	--	--	--	--	--
Material Volume (ft^3)	--	3,402,783	1,201,959	--	--	--	--	--
Material Volume (yd^3) [a]	--	126,029	44,517	--	--	--	--	--
Material Density (lb/ft^3) [b]	--	115	115	--	--	--	--	--
Total Material Weight (tons)	--	195,660	69,113	--	--	--	--	--
Operating Time								
Total Operating Weeks (weeks) [c]	52	16	12	4	52	52	52	52
Total Operating Days (days) [c]	240	120	90	30	365	365	365	365
Daily Operating Hours (hrs/day)	2	12	12	12	2	24	24	24
Vehicle and Travel Data								
Vehicle Model [d]	Passenger Car	12 cy dump truck	12 cy dump truck	12 cy cement truck	Flatbed	water truck 9000 gal	water truck 9000 gal	water truck 9000 gal
Empty Vehicle Weight (tons) [e]	2.3	25.5	25.5	23.0	19.0	23.2	23.2	23.2
Vehicle Capacity (tons)	0.8	19.0	19.0	24.0	20.0	12.0	12.0	12.0
Vehicle Capacity (yd^3)	--	12.0	12.0	12.0	--	-	-	-
Loaded Vehicle Weight (tons)	3.0	44.5	44.5	47.0	39.0	35.3	35.3	35.3
W = Average Vehicle Weight (tons)	2.7	35.0	35.0	35.0	29.0	29.2	29.2	29.2
Number of Vehicles (duration)	92,160	10,502	4,822	2,771	969	260	1,825	14,289
Number of Vehicles (daily)	384	88	54	93	3	1	5	40
D = Distance traveled on unpaved roads (2-way miles) [f]	0.22	0.22	0.22	0.22	0.22	0.77	0.77	0.77
Daily Vehicle Miles Travelled (VMT)	84	19	12	20	1	1	4	31
Activity Duration Vehicle Miles Travelled (VMT)	20,091	2,290	1,051	604	211	201	1,413	11,060

Notes:
[a] Material quantities based on the document TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021).
[b] The density of 130 lb/ft^3 used for shat material and waste, 115 lb/ft^3 used for surface material such as topsoil and overburden, and density of 105 lb/ft^3 used for a typical gravel material. Densities are assumed based on Golder's experience.
[c] Operating weeks are based on construction schedule information obtained from Hydrostor.
[d] Vehicle model based on TWD 21-5375-00-5000-001 - Table 2 - Haul and Material Truck Quantities provided by Hydrostor (July 2021).
[e] Empty vehicle weights were obtained from technical specifications of each vehicle.
[f] Hauling distance is conservatively estimated based on road design. Fugitive dust generation is directly proportional to the distance of travel.

Table 6 (Page 1 of 2)
Fugitive Particulate Matter (PM) Emissions from Vehicle Traffic on Onsite Unpaved Roads
Construction Phase - Without Berm
Hydrostor WRESC

ISR = Internal Site Route

Parameters	Clearing & Stripping																Mining Activities			
	ISR 1		ISR 2		ISR 3		ISR 4		ISR 5		ISR 6		ISR 7		ISR 8		ISR 9		ISR 10	
	Workforce		Equipment mobilization		Equipment demobilization		Fuel delivery		Fencing delivery		Concrete trucks		Gravel delivery		Trailer delivery				Waste Rock Trucks Onsite Travel	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data [b]																				
W = Average Vehicle Weight (tons)	2.7	2.7	29.0	29.0	29.0	29.0	16.6	16.6	29.0	29.0	23.5	23.5	29.0	29.0	29.0	29.0	2.7	2.7	44.5	44.5
D = Distance traveled on unpaved roads (2-way miles)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.2	0.2	0.8	0.8	0.8	0.8	0.8	0.8	1.7	1.7
Daily Operation Hours (hrs/day)	2	2	2	2	2	2	2	2	2	2	12	12	10	10	2	2	10	10	10	10
Total No. of Operating Days for activity (days)	80	80	7	7	7	7	80	80	7	7	183	183	15	15	7	7	365	365	365	365
No. of truck trips per day (trucks/day)	12	12	2	2	2	2	1	1	1	1	8	8	63	63	2	2	0	0	143	143
Total No. of trucks for activity (trucks)	960	960	10	10	10	10	80	80	2	2	1,464	1,464	942	942	12	12	0	0	52,000	52,000
Daily Vehicle Miles Travelled (VMT)	9.3	9.3	1.5	1.5	1.5	1.5	0.8	0.8	0.8	0.8	1.4	1.4	48.8	48.8	1.5	1.5	0.0	0.0	243.1	243.1
Activity Duration Vehicle Miles Travelled (VMT)	743	743	8	8	8	8	62	62	2	2	249	249	729	729	9	9	0	0	88,400	88,400
Site Characteristics																				
k = Particle size multiplier (lb/VMT) [c]	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036
s = Silt content of site specific unpaved roads (%) [d]	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [e]	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
a (constant, AP-42, Table 13.2.2-2)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant, AP-42, Table 13.2.2-2)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Control Efficiency																				
Dust Control Efficiency (%) [f]	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Emission Factors [a]																				
Emission Factor (lb/VMT) - Daily	0.25	0.025	0.7	0.1	0.7	0.1	0.6	0.1	0.73	0.07	0.67	0.07	0.73	0.07	0.73	0.07	0.25	0.02	0.89	0.09
Emission Factor (lb/VMT) - Annual	0.24	0.024	0.69	0.07	0.69	0.07	0.54	0.05	0.69	0.07	0.63	0.06	0.69	0.07	0.69	0.07	0.24	0.02	0.84	0.08
Emission Rates [a]																				
Uncontrolled Emission Factor (UEF) Equation - Daily (lb/day)	2.3	0.2	1.1	0.1	1.1	0.1	0.4	0.0	0.6	0.1	0.9	0.1	35.7	3.6	1.1	0.1	0.0	0.0	216.0	21.6
Uncontrolled Emission Factor (UEF) Equation - Duration (tons)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	37.1	3.7
Controlled Daily Emissions (lb/day)	0.3	0.0	0.2	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0	5.4	0.5	0.2	0.0	0.0	0.0	32.4	3.2
Controlled Annual Emissions (TPY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.6
Controlled Hourly Emissions (lb/hr, daily basis)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	1.3	0.1

Notes:

[a] Emission Factor (E) calculated from AP-42 Section 13.2.2 (Unpaved Roads) Equation 1a (Industrial Sites) -

E = k * (s/12)^a * (W/3)^b * (365-P)/365

[b] See Table 1 for number of vehicles and travel data.

[c] Particle size multiplier: San Diego APCD-Haul Road Emissions.Technical Report, November 2021. (Per AP-42 the PM2.5 ratio to PM10 is 0.1)

[d] Silt content based on the Table 13.2.2-1 of AP-42 for Construction Sites. Consistent with Kern County Soil Survey, Southeastern Part, 1981, Cajon Soils.

[e] Precipitation data: AP-42, Section 13.2.2 (Unpaved Roads), Figure 13.2.2-1, 11/2006.

[f] Dust control efficiency based on 85% for basic watering plus chemical dust supressors on unpaved roads according to the Document Emission Factors for Paved and Unpaved Roads by the Department of Environmental Quality, State of Utah, January 2015

Table 6 (Page 2 of 2)
Fugitive Particulate Matter (PM) Emissions from Vehicle Traffic on Onsite Unpaved Roads
Construction Phase
Hydrostor WRESC

ISD = Internal Site Road

Parameters	Mining Activities											
	ISR 11		ISR 12		ISR 13		ISR 14		ISR 15		ISR 16	
	Workforce		Surface equipment – mobilization		Subsurface equipment – mobilization		Ground support		Explosives		Waste Rock Export Trucks Onsite Travel	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data [b]												
W = Average Vehicle Weight (tons)	2.7	2.7	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	44.5	44.5
D = Distance traveled on unpaved roads (2-way miles)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.3	0.3
Daily Operation Hours (hrs/day)	2	2	2	2	2	2	2	2	2	2	10	10
Total No. of Operating Days for activity (days)	365	365	30	30	30	30	365	365	365	365	365	365
No. of truck trips per day (trucks/day)	55	55	2	2	2	2	1	1	1	1	143	143
Total No. of trucks for activity (trucks)	19,957	19,957	50	50	35	35	24	24	24	24	52,000	52,000
Daily Vehicle Miles Travelled (VMT)	42.6	42.6	1.5	1.5	1.5	1.5	0.8	0.8	0.8	0.8	47.2	47.2
Activity Duration Vehicle Miles Travelled (VMT)	15,447	15,447	39	39	27	27	19	19	19	19	17,160	17,160
Site Characteristics												
k = Particle size multiplier (lb/VMT) [c]	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036
s = Silt content of site specific unpaved roads (%) [d]	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [c]	20	20	20	20	20	20	20	20	20	20	20	20
a (constant, AP-42, Table 13.2.2-2)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant, AP-42, Table 13.2.2-2)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Control Efficiency												
Dust Control Efficiency (%) [e]	85	85	85	85	85	85	85	85	85	85	85	85
Emission Factors [a]												
Emission Factor (lb/VMT) - Daily [e]	0.25	0.02	0.73	0.07	0.73	0.07	0.73	0.07	0.73	0.07	0.89	0.09
Emission Factor (lb/VMT) - Annual	0.24	0.02	0.69	0.07	0.69	0.07	0.69	0.07	0.69	0.07	0.84	0.08
Emission Rates [a]												
Uncontrolled Emission Factor (UEF) Equation - Daily (lb/day)	10.6	1.1	1.1	0.1	1.1	0.1	0.6	0.1	0.6	0.1	41.9	4.2
Uncontrolled Emission Factor (UEF) Equation - Duration (tons)	1.82	0.18	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	7.20	0.72
Controlled Daily Emissions (lb/day)	1.6	0.2	0.2	0.0	0.2	0.0	0.1	0.0	0.1	0.0	6.3	0.6
Controlled Annual Emissions (TPY)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.1
Controlled Hourly Emissions (lb/hr, daily basis)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1

Parameters	Surface Works										Surface Works & Cavern				Reservoir Fill	
	ISR 17		ISR 18		ISR 19		ISR 20		ISR 21		ISR 22		ISR 23		ISR 24	
	Workforce		Site clearing - overburden		Civil foundation excavation		Cement Trucks		Equipment and material delivery		Potable Water		Non Potable Water		Non Potable Water	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Vehicle and Travel Data [b]																
W = Average Vehicle Weight (tons)	2.7	2.7	35.0	35.0	35.0	35.0	35.0	35.0	29.0	29.0	29.2	29.2	29.2	29.2	29.2	29.2
D = Distance traveled on unpaved roads (2-way miles)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.8	0.8	0.8	0.8	0.8	0.8
Daily Operation Hours (hrs/day)	2	2	12	12	12	12.0	12	12	2	2	24	24.0	24	24.0	24	24.0
Total No. of Operating Days for activity (days)	240	240	120	120	90	90.0	30	30	365	365	365	365.0	365	365.0	365	365.0
No. of truck trips per day (trucks/day)	384	384	88	88	54	54.0	93	93	3	3	1	1.0	5	5.0	40	40.0
Total No. of trucks for activity (trucks)	92,160	92,160	10,502	10,502	10,502	10,502	2,771	2,771	969	260	260	259.7	1,825	1,825	14,289	14,289
Daily Vehicle Miles Travelled (VMT)	83.7	83.7	19.2	19.2	11.8	11.8	20.3	20.3	0.7	0.7	0.8	0.8	3.9	3.9	31.0	31.0
Activity Duration Vehicle Miles Travelled (VMT)	20,091	20,091	2,290	2,290	1,051	1,051	604	604	211	211	201	201.0	1,413	1,413	11,060	11,060
Site Characteristics																
k = Particle size multiplier (lb/VMT) [c]	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036	0.36	0.036
s = Silt content of site specific unpaved roads (%) [d]	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
P = Mean annual number of days with precipitation greater than or equal to 0.01 inch (0.25 mm) [c]	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
a (constant, AP-42, Table 13.2.2-2)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
b (constant, AP-42, Table 13.2.2-2)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Control Efficiency																
Dust Control Efficiency (%) [e]	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Emission Factors [a]																
Emission Factor (lb/VMT) - Daily [e]	0.25	0.02	0.80	0.08	0.80	0.08	0.80	0.08	0.73	0.07	0.74	0.07	0.74	0.07	0.74	0.07
Emission Factor (lb/VMT) - Annual	0.24	0.02	0.75	0.08	0.75	0.08	0.75	0.08	0.69	0.07	0.70	0.07	0.70	0.07	0.70	0.07
Emission Rates [a]																
Uncontrolled Emission Factor (UEF) Equation - Daily (lb/day)	20.9	2.1	15.3	1.5	9.4	0.9	16.2	1.6	0.5	0.0	0.6	0.1	2.8	0.3	22.8	2.3
Uncontrolled Emission Factor (UEF) Equation - Duration (tons)	2.37	0.24	0.86	0.09	0.40	0.04	0.23	0.02	0.07	0.01	0.07	0.01	0.49	0.05	3.84	0.38
Controlled Daily Emissions (lb/day)	3.1	0.3	2.3	0.2	1.4	0.1	2.4	0.2	0.1	0.0	0.1	0.0	0.4	0.0	3.4	0.3
Controlled Annual Emissions (TPY)	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.6	0.1
Controlled Hourly Emissions (lb/hr, daily basis)	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0

Notes:

[a] Emission Factor (E) calculated from AP-42 Section 13.2.2 (Unpaved Roads) Equation 1a (Industrial Sites) -

E = k * (s/12)^a * (W/3)^b * (365-P)/365

[b] See Table 1 for number of vehicles and travel data.

[c] Particle size multiplier and constants from AP-42 Table 13.2.2-2 for industrial roads

[d] Silt content based on the Table 13.2.2-1 of AP-42 for Construction Sites

[e] Precipitation data: AP-42, Section 13.2.2 (Unpaved Roads), Figure 13.2.2-1, 11/2006.

[f] Dust control efficiency based on 85% for basic watering plus chemical dust supressors on unpaved roads according to the Document Emission Factors for Paved and Unpaved Roads by the Department of Environmental Quality, State of Utah, January 2015

TABLE 7 (Page 1 of 2)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase - Without Berm
Hydrostor WRESC

ISR = Internal Site Route

Internal Site Route ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	Vehicle Type	Weight Range (lbs)	Fuel Type	Total Miles Travelled (VMT/day)	Pollutants from Vehicle Exhaust and Tire & Brake Wear								Hourly Emissions					
										CO	NO_X	SO_2	$PM_{10\ Exhaust}$	$PM_{10\ TBW}$	$PM_{2.5\ Exhaust}$	$PM_{2.5\ TBW}$	VOC	Total PM_{10} (lbs/hr)	Total $PM_{2.5}$ (lbs/hr)	Total VOC (lbs/hr)	Total NOx (lbs/hr)	Total CO (lbs/hr)	Total SO_2 (lbs/hr)
										Fleet Aggregate Air Pollutant Emissions Factors for 2025 at 15 mph (g/mile) [a]													
						LDGV	<6,000	Gas		1.4752	0.0892	0.0027	0.0039	0.0202	0.0036	0.0063	0.0617						
						HHDT	>33,000	Diesel		0.3786	5.1916	0.0209	0.0082	0.1733	0.0079	0.0571	0.1859						
						HHDT	>33,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859						
ISR										**Daily Emissions (lbs/day)**													
1	Workforce (Site Clearing) - Cavern Works	0.77	80	2	6,050	LDGV	<6,000	Gas	9	3.02E-02	1.83E-03	5.62E-05	7.95E-05	4.13E-04	7.31E-05	1.28E-04	1.26E-03	2.05E-05	8.39E-06	0.0006	0.0009	0.0151	0.0000
2	Equipment mobilization - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
3	Equipment demobilization - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
4	Fuel delivery - Cavern Works	0.77	80	2	52,200	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
5	Fencing delivery - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
6	Concrete trucks - Cavern Works	0.77	183	12	67,000	HHDT	>33,000	Diesel	1	1.14E-03	1.56E-02	6.26E-05	2.47E-05	5.19E-04	2.36E-05	1.71E-04	5.57E-04	2.27E-05	8.11E-06	0.0000	0.0013	0.0001	0.0000
7	Gravel delivery - Cavern Works	0.77	15	10	76,000	HHDT	>33,000	Diesel	49	4.07E-02	5.58E-01	2.24E-03	8.85E-04	1.86E-02	8.46E-04	6.13E-03	2.00E-02	8.13E-04	2.91E-04	0.0020	0.0558	0.0041	0.0002
8	Trailer delivery - Cavern Works	0.77	7	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
9	[not used]	-	365	10	6,050	LDGV	<6,000	Gas	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0000	0.0000	0.0000	0.0000
10	Waste Rock Trucks Onsite Travel	1.70	365	10	93,120	HHDT	>33,000	Diesel	243	2.03E-01	2.78E+00	1.12E-02	4.41E-03	9.29E-02	4.22E-03	3.06E-02	9.97E-02	4.05E-03	1.45E-03	0.0100	0.2782	0.0203	0.0011
11	Workforce (Mining) - Cavern Works	0.77	365	2	6,050	LDGV	<6,000	Gas	43	1.38E-01	8.37E-03	2.57E-04	3.64E-04	1.89E-03	3.35E-04	5.87E-04	5.79E-03	9.40E-05	3.84E-05	0.0029	0.0042	0.0692	0.0001
12	Surface equipment (mobilization) - Cavern Works	0.77	30	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
13	Subsurface equipment (mobilization) - Cavern Works	0.77	30	2	78,000	HHDT	>33,000	Diesel	2	1.29E-03	1.77E-02	7.13E-05	2.81E-05	5.91E-04	2.69E-05	1.95E-04	6.35E-04	2.58E-05	9.23E-06	0.0003	0.0089	0.0006	0.0000
14	Ground support - Cavern Works	0.77	365	2	78,000	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
15	Explosives - Cavern Works	0.77	365	2	78,000	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0002	0.0044	0.0003	0.0000
16	Waste Rock Export Trucks Onsite Travel	0.33	365	10	89,000	HHDT	>33,000	Diesel	47	3.94E-02	5.40E-01	2.17E-03	8.56E-04	1.80E-02	8.19E-04	5.94E-03	1.93E-02	7.87E-04	2.81E-04	0.0019	0.0540	0.0039	0.0002
17	Workforce - Surface Works	0.22	240	2	6,050	LDGV	<6,000	Gas	84	2.72E-01	1.65E-02	5.06E-04	7.17E-04	3.72E-03	6.59E-04	1.15E-03	1.14E-02	1.85E-04	7.56E-05	0.0057	0.0082	0.1361	0.0003
18	Site clearing (overburden) - Surface Works	0.22	120	12	89,000	HHDT	>33,000	Diesel	19	1.60E-02	2.20E-01	8.83E-04	3.48E-04	7.33E-03	3.33E-04	2.41E-03	7.86E-03	3.20E-04	1.14E-04	0.0007	0.0183	0.0013	0.0001
19	Civil foundation excavation Surface Works	0.22	90	12	89,000	HHDT	>33,000	Diesel	12	9.82E-03	1.35E-01	5.42E-04	2.14E-04	4.50E-03	2.04E-04	1.48E-03	4.83E-03	1.96E-04	7.02E-05	0.0004	0.0112	0.0008	0.0000
20	Cement Trucks Surface Works	0.22	30	12	94,000	HHDT	>33,000	Diesel	20	1.69E-02	2.32E-01	9.33E-04	3.68E-04	7.74E-03	3.52E-04	2.55E-03	8.31E-03	3.38E-04	1.21E-04	0.0007	0.0193	0.0014	0.0001
21	Equipment and material delivery Surface Works	0.22	365	2	78,000	HHDT	>33,000	Diesel	1	5.46E-04	7.49E-03	3.01E-05	1.19E-05	2.50E-04	1.14E-05	8.23E-05	2.68E-04	1.09E-05	3.90E-06	0.0001	0.0037	0.0003	0.0000
22	Potable Water - Surface and Cavern	0.77	365	24	70,512	HHDT	>33,000	Diesel	1	6.46E-04	8.86E-03	3.56E-05	1.40E-05	2.96E-04	1.34E-05	9.74E-05	3.17E-04	1.29E-05	4.62E-06	0.0000	0.0004	0.0000	0.0000
23	Non Potable Water - Surface and Cavern	0.77	365	24	70,512	HHDT	>33,000	Diesel	4	3.23E-03	4.43E-02	1.78E-04	7.02E-05	1.48E-03	6.72E-05	4.87E-04	1.59E-03	6.45E-05	2.31E-05	0.0001	0.0018	0.0001	0.0000
24	Non Potable Water - Reservoir Fill	0.77	365	24	70,512	HHDT	>33,000	Diesel	31	2.58E-02	3.54E-01	1.43E-03	5.62E-04	1.18E-02	5.37E-04	3.89E-03	1.27E-02	5.16E-04	1.85E-04	0.0005	0.0148	0.0011	0.0001

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

TABLE 7 (Page 2 of 2)
ESTIMATION OF ENGINE EXHAUST AND TIRE AND BRAKE WEAR EMISSIONS FOR WORKER AND HAUL TRUCK TRAFFIC
Construction Phase
WRESC Site - Hydrostor

Internal Site Road ID	Description	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Maximum Haul Weight (lbs)	Vehicle Type	Weight Range (lbs)	Fuel Type	Total Miles Travelled (VMT/year)	Pollutants from Vehicle Exhaust and Tire & Brake Wear								Annual Emissions					
										CO	NO_X	SO_2	PM_{10} Exhaust	$PM_{10\ TBW}$	$PM_{2.5}$ Exhaust	$PM_{2.5\ TBW}$	VOC	Total PM_{10} (tons/yr)	Total $PM_{2.5}$ (tons/yr)	Total VOC (tons/yr)	Total NOx (tons/yr)	Total CO (tons/yr)	Total SO_2 (tons/yr)
										Fleet Aggregate Air Pollutant Emissions Factors for 2025 at 15 mph (g/mile) [a]													
						LDGV	<6,000	Diesel		1.4752	0.0892	0.0027	0.0039	0.0202	0.0036	0.0063	0.0617						
						HDGV8a	33,001-60,000	Diesel		0.3786	5.1916	0.0209	0.0082	0.1733	0.0079	0.0571	0.1859						
						HDDV8b	>60,000	Diesel		0.0608	1.5633	0.0145	0.0292	0.1116	0.0279	0.0355	0.1859						
ISR										**Annual Emissions (lbs/year)**								Annual Emissions (tons/year)					
1	Workforce (Site Clearing) - Cavern Works	0.77	80	2	6050	LDGV	<6,000	Gas	743	2.42	0.15	0.00	0.01	0.03	0.01	0.01	0.10	0.0000	0.0000	0.0001	0.0001	0.0012	0.0000
2	Equipment mobilization - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	8	0.01	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	Equipment demobilization - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	8	0.01	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	Fuel delivery - Cavern Works	0.77	80	2	52200	HHDT	>33,000	Diesel	62	0.05	0.71	0.00	0.00	0.02	0.00	0.01	0.03	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000
5	Fencing delivery - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	2	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	Concrete trucks - Cavern Works	0.77	183	12	67000	HHDT	>33,000	Diesel	249	0.21	2.85	0.01	0.00	0.10	0.00	0.03	0.10	0.0000	0.0000	0.0001	0.0014	0.0001	0.0000
7	Gravel delivery - Cavern Works	0.77	15	10	76000	HHDT	>33,000	Diesel	729	0.61	8.34	0.03	0.01	0.28	0.01	0.09	0.30	0.0001	0.0001	0.0001	0.0042	0.0003	0.0000
8	Trailer delivery - Cavern Works	0.77	7	2	78000	HHDT	>33,000	Diesel	9	0.01	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
9	[not used)	-	365	10	6050	LDGV	<6,000	Gas	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	Waste Rock Trucks Onsite Travel	1.70	365	10	93120	HHDT	>33,000	Diesel	88,400	73.78	1011.76	4.07	1.60	33.77	1.53	11.12	36.24	0.0177	0.0063	0.0181	0.5059	0.0369	0.0020
11	Workforce (Mining) - Cavern Works	0.77	365	2	6050	LDGV	<6,000	Gas	15,447	50.24	3.04	0.09	0.13	0.69	0.12	0.21	2.10	0.0004	0.0002	0.0011	0.0015	0.0251	0.0000
12	Surface equipment (mobilization) - Cavern Wc	0.77	30	2	78000	HHDT	>33,000	Diesel	39	0.03	0.44	0.00	0.00	0.01	0.00	0.00	0.02	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000
13	Subsurface equipment (mobilization) - Cavern	0.77	30	2	78000	HHDT	>33,000	Diesel	27	0.02	0.31	0.00	0.00	0.01	0.00	0.00	0.01	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000
14	Ground support - Cavern Works	0.77	365	2	78000	HHDT	>33,000	Diesel	19	0.02	0.21	0.00	0.00	0.01	0.00	0.00	0.01	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
15	Explosives - Cavern Works	0.77	365	2	78000	HHDT	>33,000	Diesel	19	0.02	0.21	0.00	0.00	0.01	0.00	0.00	0.01	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
16	Waste Rock Export Trucks Onsite Travel	0.33	365	10	89000	HHDT	>33,000	Diesel	17,160	14.32	196.40	0.79	0.31	6.55	0.30	2.16	7.03	0.0034	0.0012	0.0035	0.0982	0.0072	0.0004
17	Workforce - Surface Works	0.22	240	2	6050	LDGV	<6,000	Gas	20,091	65.34	3.95	0.12	0.17	0.89	0.16	0.28	2.73	0.0005	0.0002	0.0014	0.0020	0.0327	0.0001
18	Site clearing (overburden) - Surface Works	0.22	120	12	89000	HHDT	>33,000	Diesel	2,290	1.91	26.20	0.11	0.04	0.87	0.04	0.29	0.94	0.0005	0.0002	0.0005	0.0131	0.0010	0.0001
19	Civil foundation excavation Surface Works	0.22	90	12	89000	HHDT	>33,000	Diesel	1,051	0.88	12.03	0.05	0.02	0.40	0.02	0.13	0.43	0.0002	0.0001	0.0002	0.0060	0.0004	0.0000
20	Cement Trucks Surface Works	0.22	30	12	94000	HHDT	>33,000	Diesel	604	0.50	6.91	0.03	0.01	0.23	0.01	0.08	0.25	0.0001	0.0000	0.0001	0.0035	0.0003	0.0000
21	Equipment and material delivery Surface Worl	0.22	365	2	78000	HHDT	>33,000	Diesel	211	0.18	2.42	0.01	0.00	0.08	0.00	0.03	0.09	0.0000	0.0000	0.0000	0.0012	0.0001	0.0000
22	Potable Water - Surface and Cavern	0.77	365	24	70512	HHDT	>33,000	Diesel	201	0.17	2.30	0.01	0.00	0.08	0.00	0.03	0.08	0.0000	0.0000	0.0000	0.0012	0.0001	0.0000
23	Non Potable Water - Surface and Cavern	0.77	365	24	70512	HHDT	>33,000	Diesel	1,413	1.18	16.17	0.07	0.03	0.54	0.02	0.18	0.58	0.0003	0.0001	0.0003	0.0081	0.0006	0.0000
24	Non Potable Water - Reservoir Fill	0.77	365	24	70512	HHDT	>33,000	Diesel	11,060	9.23	126.58	0.51	0.20	4.22	0.19	1.39	4.53	0.0022	0.0008	0.0023	0.0633	0.0046	0.0003

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Table 8
Estimation of Emissions Factors for Non-Road Equipment Used in the Project
Construction Phase - Without Berm
Hydrostor WRESC

Equipment Description	Number of Equipment	Engine Power (hp)	Emission Factor (EF) [a]					
			ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO_2
			(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)
Surface Works								
Indirect								
60 kW Diesel Gensets	12	100	0.364	3.759	3.482	0.093	568.312	0.0073
Civil & Fdns								
Wheel Loader	2	120	0.225	3.283	1.602	0.085	526.161	0.0049
Crawler Loader	0	120	0.162	3.089	1.183	0.059	525.997	0.0049
Grader	2	160	0.340	3.419	2.859	0.159	531.194	0.005
Crawler dozer	0	120	0.299	3.211	2.697	0.151	527.479	0.005
Scraper	0	270	0.173	1.251	1.110	0.048	527.122	0.005
Backhoe	4	120	0.162	3.089	1.183	0.059	525.997	0.005
Roller	0	100	0.244	3.414	2.601	0.129	528.034	0.005
Pile driver hammer	0	250	0.113	1.055	0.113	0.035	525.609	0.005
Turbine Hall								
Cranes	2	200	0.270	1.537	2.772	0.118	527.564	0.0049
JLG Manlift	4	75	0.098	3.145	1.532	0.028	527.864	0.0049
Cranes	2	200	0.270	1.537	2.772	0.118	527.564	0.0049
ManLift	12	75	0.098	3.145	1.532	0.028	527.864	0.0049
Welding machine	4	50	0.498	4.525	3.676	0.113	568.301	0.0073
Structural								
Cranes	0	200	0.270	1.537	2.772	0.118	527.564	0.0049
Welding machine	0	50	0.498	4.525	3.676	0.113	568.301	0.0073
Piping								
Welding machine	12	50	0.498	4.525	3.676	0.113	568.301	0.0073
ManLift	12	75	0.098	3.145	1.532	0.028	527.864	0.0049
Cranes	0	200	0.270	1.537	2.772	0.118	527.564	0.0049
Mechanical								
Welding machines	4	50	0.498	4.525	3.676	0.113	568.301	0.0073
Crane	2	200	0.270	1.537	2.772	0.118	527.564	0.0049
Cavern Rock Moving and Hauling (7 days/week)								
Dump Truck (21-ton)	31	400	0.177	1.174	1.086	0.038	528.587	0.0049
Front End Loader	1	320	0.197	1.261	1.459	0.055	527.135	0.0049
Cavern Works								
Site Prep (5 days/week)								
Dozers	0	215	0.277	1.749	2.934	0.122	527.288	0.0049
Track hoe	0	172	0.162	3.089	1.183	0.059	525.997	0.0049
Back hoe	0	172	0.162	3.089	1.183	0.059	525.997	0.0049
Dumptruck (20Ton)	0	400	0.177	1.174	1.086	0.038	528.587	0.0049
Drilling - Conventionally Sunk Shaft (7 days/week)								
Telehandler	0	110	0.179	2.942	1.471	0.101	527.759	0.0049
Articulating wheel loader	0	320	0.197	1.261	1.459	0.055	527.135	0.0049
25-ton articulating dump truck	0	320	0.177	1.174	1.086	0.038	528.587	0.0049
Surface Equipment (7 days/week)								
Wheel loader	1	260	0.179	1.160	1.492	0.050	526.675	0.0049
20 Tn Off Road Dump Truck	1	320	0.177	1.174	1.086	0.038	528.587	0.0049
Underground Equipment (7 days/week)-Emissions vented to surface								
Bolter (semi-electrical)	2	55	1.469	5.063	12.074	0.884	529.994	0.0049
Jumbo (semi-electrical)	2	125	0.115	2.952	0.900	0.040	530.619	0.0049
Scissor Lift	1	138	0.179	2.942	1.471	0.101	527.759	0.0049
Welder	1	19	0.578	2.806	4.358	0.180	568.329	0.0078
Buggy	2	47	0.757	4.872	4.304	0.268	591.483	0.0054
Loaders/haul/dump	4	201	0.163	1.221	1.399	0.053	526.844	0.0049
Getman Boom Lift	1	147	0.179	2.942	1.471	0.101	527.759	0.0049
Skid Steer	1	61	0.139	3.249	1.862	0.056	528.374	0.0049

Notes
[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2022.1), Appendix G, Table G-11

Table 9
Estimation of Emissions Rates for Non-Road Equipment used in the Project
Construction Phase - Without Berm
Hydrostor WRESC

Equipment Description	NUMBER OF EQUIPMENT	ENGINE POWER (hp)	Load Factor[e] (%)	Availability (%)	HOURS OF OPERATION PER UNIT[d]	Emission Factors [a]						Hourly Emission Rates (Average Hourly) [b]						Annual Emission Rates (Average Annual) [c]					
						ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2
						(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)
Surface Works																							
Indirects (5 days/week)																							
60 kW Diesel Gensets	12	100	74%	100%	1,213	0.364	3.759	3.482	0.093	568.312	0.007	0.323	3.338	3.092	0.083	504.661	0.007	0.39	4.05	3.75	0.10	612.27	0.01
											EXH-1 Total (kg/h and tonne/year)	0.323	3.338	3.092	0.083	504.661	0.007	*0.39*	*4.05*	*3.75*	*0.10*	*612.27*	*0.01*
											EXH-1 Total (lb/h and ton/year)	0.713	7.359	6.817	0.182	1112.585	0.014	*0.43*	*4.46*	*4.14*	*0.11*	*674.92*	*0.01*
Civil & Fdns (5 days/week)																							
Wheel Loader	2	120	36%	100%	347	0.225	3.283	1.602	0.085	526.161	0.005	0.019	0.284	0.138	0.007	45.460	0.000	0.01	0.10	0.05	0.00	15.76	0.00
Crawler Loader	0	120	37%	100%	0	0.162	3.089	1.183	0.059	525.997	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grader	2	160	41%	100%	1,040	0.340	3.419	2.859	0.159	531.194	0.005	0.045	0.449	0.375	0.021	69.693	0.001	0.05	0.47	0.39	0.02	72.47	0.00
Crawler dozer	0	120	43%	100%	0	0.299	3.211	2.697	0.151	527.479	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	0	270	48%	100%	0	0.173	1.251	1.110	0.048	527.122	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	4	120	37%	100%	1,040	0.162	3.089	1.183	0.059	525.997	0.005	0.029	0.549	0.210	0.010	93.417	0.001	0.03	0.57	0.22	0.01	97.15	0.00
Roller	0	100	38%	100%	0	0.244	3.414	2.601	0.129	528.034	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Pile driver hammer	0	250	50%	100%	0	0.113	1.055	0.113	0.035	525.609	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
											EXH-2 Total (kg/h and tonne/year)	0.093	1.281	0.724	0.039	208.570	0.002	*0.08*	*1.14*	*0.66*	*0.04*	*185.38*	*0.00*
											EXH-2 Total (lb/h and ton/year)	0.205	2.824	1.595	0.085	459.817	0.004	*0.09*	*1.25*	*0.72*	*0.04*	*204.35*	*0.00*
Turbine Hall (5 days/week)																							
Cranes	2	200	29%	100%	1,040	0.270	1.537	2.772	0.118	527.564	0.005	0.031	0.178	0.322	0.014	61.197	0.001	0.03	0.19	0.33	0.01	63.64	0.00
JLG Manlift	4	75	31%	100%	1,040	0.098	3.145	1.532	0.028	527.864	0.005	0.009	0.292	0.143	0.003	49.091	0.000	0.01	0.30	0.15	0.00	51.05	0.00
Cranes	2	200	29%	100%	1,733	0.270	1.537	2.772	0.118	527.564	0.005	0.031	0.178	0.322	0.014	61.197	0.001	0.05	0.31	0.56	0.02	106.07	0.00
ManLift	12	75	31%	100%	867	0.098	3.145	1.532	0.028	527.864	0.005	0.027	0.877	0.428	0.008	147.274	0.001	0.02	0.76	0.37	0.01	127.63	0.00
Welding machine	4	50	45%	100%	1,300	0.498	4.525	3.676	0.113	568.301	0.007	0.045	0.407	0.331	0.010	51.147	0.001	0.06	0.53	0.43	0.01	66.49	0.00
											EXH-3 Total (kg/h and tonne/year)	0.144	1.934	1.544	0.048	369.907	0.004	*0.18*	*2.09*	*1.84*	*0.06*	*414.88*	*0.00*
											EXH-3 Total (lb/h and ton/year)	0.317	4.263	3.404	0.106	815.505	0.008	*0.20*	*2.30*	*2.03*	*0.07*	*457.33*	*0.00*
Structural (5 days/week)																							
Cranes	0	200	29%	100%	0	0.270	1.537	2.772	0.118	527.564	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Welding machine	0	50	45%	100%	0	0.498	4.525	3.676	0.113	568.301	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
											EXH-4 Total (kg/h and tonne/year)	0.000	0.000	0.000	0.000	0.000	0.000	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
											EXH-4 Total (lb/h and ton/year)	0.000	0.000	0.000	0.000	0.000	0.000	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Piping (5 days/week)																							
Welding machine	12	50	45%	100%	1,040	0.498	4.525	3.676	0.113	568.301	0.007	0.134	1.222	0.993	0.030	153.441	0.002	0.14	1.27	1.03	0.03	159.57	0.00
Manlift	12	75	31%	100%	1,040	0.098	3.145	1.532	0.028	527.864	0.005	0.027	0.877	0.428	0.008	147.274	0.001	0.03	0.91	0.44	0.01	153.15	0.00
Cranes	0	200	29%	100%	0	0.270	1.537	2.772	0.118	527.564	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
											EXH-5 Total (kg/h and tonne/year)	0.162	2.099	1.420	0.038	300.715	0.003	*0.17*	*2.18*	*1.48*	*0.04*	*312.72*	*0.00*
											EXH-5 Total (lb/h and ton/year)	0.356	4.628	3.131	0.084	662.963	0.007	*0.19*	*2.41*	*1.63*	*0.04*	*344.71*	*0.00*
Mechanical (5 days/week)																							
Welding machines	4	50	45%	100%	1,040	0.498	4.525	3.676	0.113	568.301	0.007	0.045	0.407	0.331	0.010	51.147	0.001	0.05	0.42	0.34	0.01	53.19	0.00
Crane	2	200	29%	100%	1,040	0.270	1.537	2.772	0.118	527.564	0.005	0.031	0.178	0.322	0.014	61.197	0.001	0.03	0.19	0.33	0.01	63.64	0.00
											EXH-6 Total (kg/h and tonne/year)	0.076	0.585	0.652	0.024	112.344	0.001	*0.08*	*0.61*	*0.68*	*0.02*	*116.83*	*0.00*
											EXH-6 Total (lb/h and ton/year)	0.168	1.291	1.438	0.052	247.677	0.003	*0.09*	*0.67*	*0.75*	*0.03*	*128.78*	*0.00*

Table 9
Estimation of Emissions Rates for Non-Road Equipment used in the Project
Construction Phase - Without Berm
Hydrostor WRESC

Equipment Description	NUMBER OF EQUIPMENT	ENGINE POWER (hp)	Load Factor[e] (%)	Availability (%)	HOURS OF OPERATION PER UNIT[d]	Emission Factors [a]						Hourly Emission Rates (Average Hourly) [b]						Annual Emission Rates (Average Annual) [c]					
						ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2	ROG	CO	NOx	$PM_{10}/PM_{2.5}$	CO2	SO2
						(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-h)	(g/hp-hr)	(g/hp-h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)	(tonne/year)
Cavern Rock Moving and Hauling (7 days/week)																							
Dump Truck (21-ton)	31	400	38%	100%	3,640	0.177	1.174	1.086	0.038	528.587	0.005	0.836	5.533	5.117	0.181	2490.704	0.023	3.04	20.14	18.62	0.66	9065.46	0.08
Front End Loader	1	320	36%	100%	3,640	0.197	1.261	1.459	0.055	527.135	0.005	0.023	0.145	0.168	0.006	60.726	0.001	0.08	0.53	0.61	0.02	221.03	0.00
											EXH-7 Total (kg/h and tonne/year)	0.859	5.678	5.285	0.188	2551.430	0.024	***3.13***	***20.67***	***19.24***	***0.68***	***9286.49***	***0.09***
											EXH-7 Total (lb/h and ton/year)	1.894	12.518	11.652	0.414	5624.933	0.052	***3.45***	***22.78***	***21.20***	***0.75***	***10236.60***	***0.09***
Cavern Works																							
Site Prep (5 days/week)																							
Dozers	0	215	43%	100%	0	0.277	1.749	2.934	0.122	527.288	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Track hoe	0	172	37%	100%	0	0.162	3.089	1.183	0.059	525.997	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Back hoe	0	172	37%	100%	0	0.162	3.089	1.183	0.059	525.997	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Dumptruck (20Ton)	0	400	38%	100%	0	0.177	1.174	1.086	0.038	528.587	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
											EXH-8 Total (kg/h and tonne/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
											EXH-8 Total (lb/h and ton/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
Drilling - Conventionally Sunk Shaft (7 days/week)																							
Telehandler	0	110	50%	100%	0	0.179	2.942	1.471	0.101	527.759	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Articulating wheel loader	0	320	36%	100%	0	0.197	1.261	1.459	0.055	527.135	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
25-ton articulating dump truck	0	320	38%	100%	0	0.177	1.174	1.086	0.038	528.587	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
											EXH-9 Total (kg/h and tonne/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
											EXH-9 Total (lb/h and ton/year)	0.000	0.000	0.000	0.000	0.000	0.000	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
Surface Equipment (7 days/week)																							
Wheel loader	1	260	36%	100%	7,279	0.179	1.160	1.492	0.050	526.675	0.005	0.017	0.109	0.140	0.005	49.297	0.000	0.12	0.79	1.02	0.03	358.85	0.00
20 Tn Off Road Dump Truck	1	320	38%	100%	7,279	0.177	1.174	1.086	0.038	528.587	0.005	0.022	0.143	0.132	0.005	64.276	0.001	0.16	1.04	0.96	0.03	467.89	0.00
											EXH-10 Total (kg/h and tonne/year)	0.022	0.143	0.132	0.005	64.276	0.001	***0.16***	***1.04***	***0.96***	***0.03***	***467.89***	***0.00***
											EXH-10 Total (lb/h and ton/year)	0.048	0.315	0.291	0.010	141.705	0.001	***0.17***	***1.15***	***1.06***	***0.04***	***515.77***	***0.00***
Underground Equipment (7 days/week)-Emissions vented to surface																							
Bolter	2	55	40%	100%	3,494	1.469	5.063	12.074	0.884	529.994	0.005	0.065	0.223	0.531	0.039	23.320	0.000	0.23	0.78	1.86	0.14	81.48	0.00
Jumbo	2	125	50%	100%	3,494	0.115	2.952	0.900	0.040	530.619	0.005	0.014	0.369	0.113	0.005	66.327	0.001	0.05	1.29	0.39	0.02	231.76	0.00
Scissor Lift	1	138	40%	100%	3,494	0.179	2.942	1.471	0.101	527.759	0.005	0.010	0.162	0.081	0.006	29.132	0.000	0.03	0.57	0.28	0.02	101.79	0.00
Welder	1	19	45%	100%	3,494	0.578	2.806	4.358	0.180	568.329	0.008	0.005	0.024	0.037	0.002	4.859	0.000	0.02	0.08	0.13	0.01	16.98	0.00
Buggy	2	47	42%	100%	3,494	0.757	4.872	4.304	0.268	591.483	0.005	0.030	0.192	0.170	0.011	23.352	0.000	0.10	0.67	0.59	0.04	81.59	0.00
Loaders/haul/dump	4	201	37%	100%	6,988	0.163	1.221	1.399	0.053	526.844	0.005	0.049	0.363	0.416	0.016	156.725	0.001	0.34	2.54	2.91	0.11	1095.24	0.01
Getman Boom Lift	1	147	40%	100%	3,494	0.179	2.942	1.471	0.101	527.759	0.005	0.011	0.173	0.086	0.006	31.032	0.000	0.04	0.60	0.30	0.02	108.43	0.00
Skid Steer	1	61	37%	100%	3,494	0.139	3.249	1.862	0.056	528.374	0.005	0.003	0.073	0.042	0.001	11.925	0.000	0.01	0.26	0.15	0.00	41.67	0.00
											EXH-11 Total (kg/h and tonne/year)	0.186	1.580	1.477	0.085	346.673	0.003	***0.82***	***6.79***	***6.61***	***0.35***	***1758.94***	***0.02***
											EXH-11 Total (lb/h and ton/year)	0.410	3.483	3.256	0.186	764.283	0.007	***0.90***	***7.48***	***7.29***	***0.39***	***1938.90***	***0.02***

Notes
[a] Emission factors for offroad equipment in 2025 from the CARB California Emissions Estimator Model (CalEEMod version 2022.1), Appendix G, Table G-11
[b] Hourly emission rate (kg/hr) = Engine HP-rating x Emission Factor (g/hp-hr) x No. of Equipment x (kg/1,000 g).
[c] Annual emission rate (tonne/year) = Hourly Emission Rate (kg/h) x Annual Operating Hours (hr/year) x (tonne/1,000 kg).
[d] Annual Operating Hours based of the construction schedule and the hours of operation of each equipment.
[e] Load factors from CARB California Emissions Estimator Model (CalEEMod version 2022.1), Appendix G, Table G-12.

TABLE 10
ESTIMATION OF PM10 AND PM2.5 EMISSION FACTORS AND RATES FOR BATCH/CONTINUOUS DROP TRANSFER OPERATIONS
Construction Phase - Without Berm
Hydrostor WRESC

ID	Material Handling Area	Material Type	Operational Data		Material Throughput [a]				Number of Transfers	Moisture Content (M) [b]	Emission Control Data		Uncontrolled Emission Factor [c]		Controlled Emission Factor [c]		Estimated Emission Rate (ER)			
					Total	Total	Daily	Hourly			Method	Efficiency	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}		$PM_{2.5}$	
			(hr/day)	(# days)	(CY)	(tons)	(tons/day)	(tons/hr)		(%)		(%)	(lb/ton)	(lb/ton)	(lb/ton)	(lb/ton)	(lb/hr)	(tons/year)	(lb/hr)	(tons/year)
Caverns Works																				
TA1	Clearing and Stripping -Truck unloading	Gravel	10	15	11,300	16,018	1,068	106.8	1	2	None	0	0.00342	0.00052	0.00342	0.00052	0.152	0.027	0.023	0.004
TB1	Mining-Drop to Surface	Waste Rock	24	365	--	1,095,120	3,000	125.0	1	15	None	0	0.00020	0.00003	0.00020	0.00003	0.025	0.112	0.004	0.017
TB2	Mining-Load at shaft storage and haul to rock crusher	Waste Rock	10	365	--	1,095,120	3,000	300.0	2	15	None	0	0.00020	0.00003	0.00020	0.00003	0.051	0.223	0.008	0.034
TB3	Mining-Transfer from WR Storage to trucks for export	Waste Rock	10	365	--	1,095,120	3,000	300.0	2	15	None	0	0.00020	0.00003	0.00020	0.00003	0.051	0.223	0.008	0.034
TB	Mining Activities -Total TB1 -TB3	Waste Rock	24	365	--	--	--	--	9	--	None	0	--	--	--	--	0.127	0.558	0.019	0.085
Surface Works																				
TD1	Site clearing - Truck loading	Topsoil	12	120	126,029	195,660	1,631	135.9	1	15	None	0	0.00020	0.00003	0.00020	0.00003	0.014	0.020	0.002	0.003
TD2	Excavations Activities - Truck loading	Overburden	12	90	44,517	69,113	768	64.0	1	15	None	0	0.00020	0.00003	0.00020	0.00003	0.007	0.007	0.001	0.001

Emission factor: USEPA, 2006; AP-42, Section 13.2.4 for Aggregate Handling and Storage Piles.

1.171

[a] See Table 1 for material throughput information.

[b] Moisture content data based on the Golder specialist's experience in soils.

[c] Based on Emission Factor of USEPA, 2006; AP-42, Section 13.2.4 for Aggregate Handling and Storage Piles.

Uncontrolled EF (UEF) Equation :

UEF (lb/ton) = k x (0.0032) x $(U / 5)^{1.3}$/$[(M / 2)^{1.4}]$

Controlled EF (CEF) Equation :

CEF (lb/ton) = UEF (lb/ton) x [100% - Control efficiency (%)]

where: U = Mean wind speed (miles/hr) *

Annual	11.81

* Calculated from the project met data

k = Particle size multiplier

0.35	0.053
(PM10)	(PM2.5)

Table 11
Fugitive PM Emissions from Bulldozers
Construction Phase - Without Berm
Hydrostor WRESC

Parameters	Bulldozing/Scraping Activities	
	Foundation and Compaction - Surface Works	Mining Surface
ID	**BD1**	**BD2**
Operational Data		
Daily Operation Hours (hrs/day)	0	0
Total No. of Operating Days for activity (days)	0	0
No. of active bulldozers/excavators/scrapers	0	0
Site Characteristics [b]		
M = Moisture content (%)	3.4	3.4
s = Silt content of site specific unpaved roads (%)	7.5	7.5
Control Efficiency		
Dust Control Method [c]	Watering and Site Speed Controls	Watering and Site Speed Controls
Dust Control Efficiency (%)	75	75
Calculated PM Emission Factors (EF) [a]		
Uncontrolled TSP EF (lb/hr)	13.03	13.03
Controlled TSP EF (lb/hr)	3.26	3.26
Uncontrolled PM_{15} EF (lb/hr)	3.70	3.70
Controlled PM_{15} EF (lb/hr)	0.93	0.93
Uncontrolled PM_{10} EF (lb/hr)	2.78	2.78
Controlled PM_{10} EF (lb/hr)	0.69	0.69
Uncontrolled $PM_{2.5}$ EF (lb/hr)	1.37	1.37
Controlled $PM_{2.5}$ EF (lb/hr)	0.34	0.34
Estimated Emissions Rates (ER) [d]		
PM_{10} ER lb/hr (daily basis)	0.00	0.00
PM_{10} ER tons (year)	0.00	0.000
$PM_{2.5}$ ER lb/hr (daily basis)	0.00	0.00
$PM_{2.5}$ ER tons (year)	0.000	0.000

Notes:
[a] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on bulldozing for overburden

Table 12
Fugitive Particulate Matter (PM) Emissions from Grading Activities
Construction Phase - Without Berm
Hydrostor WRESC

Parameters	Surface Works – Foundation and Compaction
ID	**GD1**
Operational Data [a]	
Daily Operation Hours (hrs/day)	4
Total No. of Operating Days for activity (days)	365
No. of active motor graders	2
Vehicle Data	
Mean Vehicle Speed (S) (mph)	4
Basis for vehicle miles traveled (VMT)	
daily hours	4
annual hours	1460
Grader Utilization per day (%)	60
Distance traveled/vehicle/day (miles per per day per grader)	9.6
VMT (no. vehicles x mi traveled)	
total daily miles	19.2
total annual miles	7008.0
Control Efficiency	
Dust Control Method [c]	Watering and Site Speed Controls
Dust Control Efficiency (%)	75
Scaling Factors (unitless)	
TSP	1.0
PM_{15}	1.0
PM_{10}/PM_{15}	0.6
$PM_{2.5}$/TSP	0.031
Calculated Emission Factors (EF) [d]	
Uncontrolled TSP EF (lb/VMT)	1.28
Uncontrolled PM_{15} EF (lb/VMT)	0.82
Uncontrolled PM_{10} EF (lb/VMT)	0.49
Uncontrolled $PM_{2.5}$ EF (lb/VMT)	0.04
Estimated Uncontrolled Emission Rate (ER) [e]	
TSP ER lb/hr (daily basis)	1.02
tons/yr	4.49
PM_{10} ER lb/hr (daily basis)	0.39
tons/yr	1.72
$PM_{2.5}$ ER lb/hr (daily basis)	0.03
tons/yr	0.14
Estimated Controlled Emission Rate (ER)	
TSP ER lb/hr (daily basis)	0.26
tons/yr	1.12
PM_{10} ER lb/hr (daily basis)	0.10
tons/yr	0.43
$PM_{2.5}$ ER lb/hr (daily basis)	0.01
tons/yr	0.03

Notes:

[a] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines.

[b] Typical grader travel speed for graders in range from 3 to 5 mph while grading. Average speed of 4 mph assumed.

[c] According to the Air Pollutant Mitigation Measure for Construction site for Eastern Kern APCD, any soil excavated or graded should be sufficiently watered to prevent excessive dust (March, 2012).
See footnote "d" on Table 9 (Wind Erosion Open Areas) for references for the control factor.

[d] Emission Factor equations from Table 11.9-1 of US EPA AP-42 Section 11.9 for Western Surface Coal Mines, based on grading

Table 13
Fugitive PM Emissions from Wind Erosion of Exposed Surface Areas
Construction Phase - Without Berm
Hydrostor WRESC

Parameters	Activity Areas				All Areas
	Clearing & Stripping	Temporary Cavern Rock Storage Area	Temporary Earthwork Storage	Temporary Crushing Plant	
ID	**WE1**	**WE2**	**WE3**	**WE4**	**WE1-WE4**
Operational Data					
Possible Hours of Exposure (hrs/day)	24	24	24	24	24
Hours of Exposure (hrs/yr)	3927	3927	3927	3927	3927
Unvegetated Disturbed Surface Area (acres) [b]	43	3	3	1	50.0
Site Characteristics [c]					
Annual days of precipitation ≥ 0.25 mm (p)	20	20	20	20	20
Daily % of time hourly wind speed ≥ 5.4 m/s (12 mph) (p)	66.7	66.7	66.7	66.7	66.7
Annual % of time hourly wind speed ≥ 5.4 m/s (12 mph) (p)	44.8	44.8	44.8	44.8	44.8
Control Efficiency					
Dust Control Method [d]	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph	Watering as needed and onsite speed control <=15 mph
Dust Control Efficiency (%) [d]	75	75	75	75	75
Particle Size Multipliers (k) [e]					
For TSP	1.0	1.0	1.0	1.0	1.0
For PM_{10}	0.50	0.50	0.50	0.50	0.50
For $PM_{2.5}$	0.25	0.25	0.25	0.25	0.25
Calculated PM Emission Factors (EF) [a]					
Uncontrolled TSP EF (ton/acre/yr)	0.38	0.38	0.38	0.38	0.38
Uncontrolled PM_{10} EF (ton/acre/yr)	0.19	0.19	0.19	0.19	0.19
Uncontrolled $PM_{2.5}$ EF (ton/acre/yr)	0.095	0.095	0.095	0.095	0.095
Controlled TSP EF (ton/acre/yr)	0.10	0.10	0.10	0.10	0.10
Controlled PM_{10} EF (ton/acre/yr)	0.05	0.05	0.05	0.05	0.05
Controlled $PM_{2.5}$ EF (ton/acre/yr)	0.024	0.024	0.024	0.024	0.024
Estimated Emissions Rates [a]					
TSP ER lb/hr (daily basis)	0.93	0.07	0.07	0.02	1.08
TSP ER tons (year)	4.09	0.29	0.29	0.10	4.75
PM_{10} ER lb/hr (daily basis)	0.47	0.03	0.03	0.01	0.54
PM_{10} ER tons (year)	2.04	0.14	0.14	0.05	2.38
$PM_{2.5}$ ER lb/hr (daily basis)	0.23	0.02	0.02	0.01	0.27
$PM_{2.5}$ ER tons (year)	1.02	0.07	0.07	0.02	1.19

Notes:

[a] Emission factor equation from Table 11.9-4 (wind erosion of exposed areas) of US EPA AP-42 Section 11.9 for Western Surface Coal Mines:

Uncontrolled TSP EF (UEF) Equation : UEF (ton/acre/yr) = k x 0.38
Controlled TSP EF (CEF) Equation : CEF (ton/acre/yr) = UEF (ton/acre/yr) x [100 - Control efficiency (%)]

[b] Area of unvegetated surface based on the total area of the future plant. It was assumed that half of the total area of the site where clearing and stripping activities will be happening is 12 months. Site size is 86 acres. Other areas based on project site plot plans.

[c] Based on hourly surface meteorological data from Lancaster Fox Field for 2018-2022. Precipitation data: AP-42, Section 13.2.2, Figure 13.2.2-1, 11/2006.

[d] According to the Air Pollutant Mitigation Measure for Construction site for Eastern Kern APCD,
any soil excavated or graded should be sufficiently watered to prevent excessive dust (March,

WRAP Fugitive Dust Handbook, WRAP, Western Governors Association, Sept 2006, Chap 8, Table 8-7, and SCAQMD Fugitive Dust from Storage Piles, Table XI-A.
SCAQMD data indicates watering achieves 61 % control and speed control to <=15 Mph achieves 57% control. Combining the two control measures results in a calculated control efficiency of 83%, but for purposes of conservativeness in a desert climate, a value of 75% was used.

[e] Particle size based on AP-42 Section 13.2.5 recommendation.

Table 14
Fugitive PM Emissions from Wind Erosion of Stock Piles
Construction Phase - Without Berm
Hydrostor WRESC

Parameters	Cavern Works	Surface Works	
	Shaft Cutting	Site Clearing	Excavations
Activity ID	**WS1**	**WS2**	**WS3**
Operational Data			
Daily Operation Hours (hrs/day)	18	24	24
No. of Annual Operating Days (days/yr)	365	120	90
Material Type	Waste Rock	Topsoil	Overburden
Pile Description (shape)	Conical	Conical	Conical
Height of Pile (m) [a]	5	9	7
Total Material Piled (tons/period)	73,513	195,660	69,113
Daily Material Piled (tons/day)	201	1,631	768
Daily Material Piled (m^3/day) [b]	88	803	378
Cone-shaped pile base area (m^2)	65	263	159
Cone-shaped pile base radius (m)	4.5	9.2	7.1
Estimated angle of repose (degrees)	45.1	45.0	45.0
Cone-shaped pile exposed surface area (m^2)	92	372	225
Rectangular Pile Length (m)	--	--	--
Rectangular Pile Width (m)	--	--	--
Rectangular pile exposed surface area (m^2)	--	--	--
No. of piles	1	1	1
Emissions Factor			
Annual Erosion Potential, P ($g/m^2/yr$) [c]	17167.8	17167.8	17167.8
Annual % of time hourly wind speed ≥ 5.4 m/s or 12 mph [d]	44.8	44.8	44.8
Annual hours with wind speed ≥ 5.4 m/s or 12 mph [c]	3930	3930.0	3930.0
Control Efficiency			
Dust Control Method [e]	Watering	Watering	Watering
Dust Control Efficiency (%) [f]	75	75	75
Particle Size Multipliers (k) [e]			
For TSP	1.0	1.0	1.0
For PM_{10}	0.50	0.50	0.50
For $PM_{2.5}$	0.075	0.075	0.075
Estimated Emissions Rates (ER) [g]			
Annual TSP ER ton/yr	0.44	1.76	1.07
Annual PM_{10} ER ton/yr	0.22	0.88	0.53
Annual $PM_{2.5}$ ER ton/yr	0.03	0.13	0.08
TSP ER lb/hr (annual basis)	0.10	0.40	0.24
PM_{10} ER lb/hr (annual basis)	0.05	0.20	0.12
$PM_{2.5}$ ER lb/hr (annual basis)	0.007	0.030	0.018

Notes:

[a] Height estimated to result in a 45 degree angle of repose based on the daily throughput.

[b] The densities are provided in Table 1 for each material

[c] Annual wind erosion potential estimated based on Equation 3 of AP-42 Section 13.2.5 (Industrial Wind Erosion). Threshold wind speed assumed to be 0.50 m/s. Value from previous site assumed as reasonable default for the new site (distance separation i See wind erosion potential calculations in the Hydrostor GEM site AFC construction appendix.

[d] Based on hourly surface meteorological data from Lancaster Fox Field for 2018-2022.

[e] According to the Air Pollutant Mitigation Measure for Construction site for Eastern Kern APCD, stockpiles of soil or other fine loose materialshall be stabilized by watering or other appropiate method to prevent wind-blown fugitive dust (March, 2012).

Fugitive Dist for Storage Piles, Table XI-E. (both documents state 90% control for watering). For conservativeness in a desert area 75% was assumed valid.

[g] Annual emissions estimated based on the exposed surface area and the wind erosion potential. Hourly emissions estimated from annual rates.

TABLE 15
GREENHOUSE GASES EMISSION ESTIMATION OF ENGINE EXHAUST VEHICLE TRAFFIC
Construction Phase - Without Berm
Hydrostor WRESC

Internal Site Route ID	Description	Vehicle	Roundtrip Distance (mi)	Total Operating Days (days)	Daily Operating Hours (hrs/day)	Fuel Type	Total Miles Travelled (VMT/day)	Total Miles Travelled (VMT/year)	GHG Emissions Factors (g/mile) [a]			Daily Emissions			Maximum Hourly Emissions			Annual Emissions		
									CO2	CH4	N2O	Total CO_2 (lbs/day)	Total CH_4 (lbs/day)	Total N_2O (lbs/day)	Total CO_2 (lbs/hr)	Total CH_4 (lbs/hr)	Total N_2O (lbs/hr)	Total CO_2 (tons/yr)	Total CH_4 (tons/yr)	Total N_2O (tons/yr)
ISR 1	Workforce (Site Clearing) - Cavern Works	Worker Vehicle	0.77	80	2	Gas	9	743	547.8	0.0083	0.0080	11.2178	0.0002	0.0002	5.6089	0.0001	0.0001	0.4487	0.0000	0.0000
ISR 2	Equipment mobilization - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	2	8	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0188	0.0000	0.0000
ISR 3	Equipment demobilization - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	2	8	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0188	0.0000	0.0000
ISR 4	Fuel delivery - Cavern Works	Fuel truck (tandem)	0.77	80	2	ULSD	1	62	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.1505	0.0000	0.0000
ISR 5	Fencing delivery - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	1	2	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.0038	0.0000	0.0000
ISR 6	Concrete trucks - Cavern Works	Cement mix truck (10 yd)	0.77	183	12	ULSD	1	249	2,204.9	0.0006	0.2411	6.6109	0.0000	0.0007	0.5509	0.0000	0.0001	0.6049	0.0000	0.0001
ISR 7	Gravel delivery - Cavern Works	Tandem truck load (12 yd)	0.77	15	10	ULSD	49	729	2,204.9	0.0006	0.2411	237.0312	0.0001	0.0259	23.7031	0.0000	0.0026	1.7715	0.0000	0.0002
ISR 8	Trailer delivery - Cavern Works	Tractor Trailer	0.77	7	2	ULSD	2	9	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0226	0.0000	0.0000
ISR 9	[not used]	Worker Vehicle	-	365	10	Gas	0	0	547.8	0.0083	0.0080	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ISR 10	Waste Rock Trucks Onsite Travel	Dump trucks (12 yd)	1.70	365	10	ULSD	243	88,400	2,204.9	0.0006	0.2411	1181.7049	0.0003	0.1292	118.1705	0.0000	0.0129	214.8554	0.0001	0.0235
ISR 11	Workforce (Mining) - Cavern Works	Worker Vehicle	0.77	365	2	Gas	43	15,447	547.8	0.0083	0.0080	51.4149	0.0008	0.0008	25.7074	0.0004	0.0004	9.3281	0.0001	0.0001
ISR 12	Surface equipment (mobilization) - Cavern Works	Tractor Trailer	0.77	30	2	ULSD	2	39	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0941	0.0000	0.0000
ISR 13	Subsurface equipment (mobilization) - Cavern Works	Tractor Trailer	0.77	30	2	ULSD	2	27	2,204.9	0.0006	0.2411	7.5248	0.0000	0.0008	3.7624	0.0000	0.0004	0.0658	0.0000	0.0000
ISR 14	Ground support - Cavern Works	Flatbed tractor trailer	0.77	365	2	ULSD	1	19	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.0451	0.0000	0.0000
ISR 15	Explosives - Cavern Works	Flatbed tractor trailer	0.77	365	2	ULSD	1	19	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	1.8812	0.0000	0.0002	0.0451	0.0000	0.0000
ISR 16	Waste Rock Export Trucks Onsite Travel	Dump trucks (12 yd)	0.33	365	10	ULSD	47	17,160	2,204.9	0.0006	0.2411	229.3898	0.0001	0.0251	22.9390	0.0000	0.0025	41.7072	0.0000	0.0046
ISR 17	Workforce - Surface Works	Worker Vehicle	0.22	240	2	Gas	84	20,091	547.8	0.0083	0.0080	101.1050	0.0015	0.0015	50.5525	0.0008	0.0007	12.1326	0.0002	0.0002
ISR 18	Site clearing (overburden) - Surface Works	12 cy dump truck	0.22	120	12	ULSD	19	2,290	2,204.9	0.0006	0.2411	93.2531	0.0000	0.0102	7.7711	0.0000	0.0008	5.5647	0.0000	0.0006
ISR 19	Civil foundation excavation Surface Works	12 cy dump truck	0.22	90	12	ULSD	12	1,051	2,204.9	0.0006	0.2411	57.2235	0.0000	0.0063	4.7686	0.0000	0.0005	2.5549	0.0000	0.0003
ISR 20	Cement Trucks Surface Works	12 cy cement truck	0.22	30	12	ULSD	20	604	2,204.9	0.0006	0.2411	98.5516	0.0000	0.0108	8.2126	0.0000	0.0009	1.4682	0.0000	0.0002
ISR 21	Equipment and material delivery Surface Works	Flatbed	0.22	365	2	ULSD	1	211	2,204.9	0.0006	0.2411	3.1791	0.0000	0.0003	1.5895	0.0000	0.0002	0.5135	0.0000	0.0001
ISR 22	Potable Water - Surface and Cavern	water truck 9000 gal	0.77	365	24	ULSD	1	201	2,204.9	0.0006	0.2411	3.7624	0.0000	0.0004	0.1568	0.0000	0.0000	0.4885	0.0000	0.0001
ISR 23	Non Potable Water - Surface and Cavern	water truck 9000 gal	0.77	365	24	ULSD	4	1,413	2,204.9	0.0006	0.2411	18.8120	0.0000	0.0021	0.7838	0.0000	0.0001	3.4332	0.0000	0.0004
ISR 24	Non Potable Water - Reservoir Fill	water truck 9000 gal	0.77	365	24	ULSD	31	11,060	2,204.9	0.0006	0.2411	150.4960	0.0000	0.0165	6.2707	0.0000	0.0007	26.8801	0.0000	0.0029
																		322.2		

[a] 2025 emission factors for Kern County from the CARB Emission Factors model (EMFAC2021 v1.0.2).

Table 16 Emissions Factor Development

Fleet aggregate vehicle 2025 emission factors at 15 mph for Kern County from the CARB Emission Factors model (EMFAC2021

Type	Fleet Aggregate Air Pollutant Emissions Factors at 15 mph- 2025										
	CO (g/mile)	NO_X (g/mile)	SO_2 (g/mile)	$PM_{10\ Exhaust}$ (g/mile)	$PM_{10\ TBW}$ (g/mile)	$PM_{2.5\ Exhaust}$ (g/mile)	$PM_{2.5\ TBW}$ (g/mile)	VOC (g/mile)	CO2 (g/mile)	CH4 (g/mile)	N2O (g/mile)
LDGV - Gas	1.4752	0.0892	0.0027	0.0039	0.0202	0.0036	0.0063	0.0462	547.8	0.0083	0.0080
HHDT - Diesel	0.3786	5.1916	0.0209	0.0082	0.1733	0.0079	0.0571	0.0360	2,204.9	0.0006	0.2411

LDGV -Gas = Light-Duty Vehicles Gasoline
HHDT - Diesel = Heavy-Heavy Duty Trucks (>33,000 lb GVWR) Diesel Fueled

Table 17 WRESC Rock Crushing Operations - PM10/2.5 Emissions

No Berm Option

	OPERATING DATA		UNCONTROLLED EMISSIONS						CONTROLLED EMISSIONS						
Emission Point Description	Design Max Hourly Process Rate tons/hr	Annual Operating Hours	PM10 Emission Factor lb/ton	PM10 Emissions lb/hr	PM10 Emissions tons/yr	PM2.5 Emission Factor lb/ton	PM2.5 Emissions lb/hr	PM2.5 Emissions tons/yr	WRESC BACT Control Fraction	BACT Control Type Codes	PM10 Emissions lb/hr	PM10 Emissions tons/yr	PM2.5 Emissions lb/hr	PM2.5 Emissions tons/yr	Emission Factor Source
Primary Crusher	350	4015	0.0024	0.840	1.6863	0.00072	0.2520	0.5059	0.99	5	0.008	0.0169	0.003	0.0051	Ch. 11.17 AP-42
Secondary Crusher	175	4015	0.0024	0.420	0.8432	0.00072	0.1260	0.2529	0.99	5	0.004	0.0084	0.001	0.0025	Ch. 11.17 AP-42
Screening	350	4015	0.0087	3.045	6.1128	0.00261	0.9135	1.8339	0.99	5	0.030	0.0611	0.009	0.0183	Ch. 11.19, AP-42
Conveyor Transfer Point	350	4015	0.00110	0.385	0.7729	0.00033	0.1155	0.2319	0.85	1,2	0.058	0.1159	0.017	0.0348	Ch. 11.19, AP-42
Aggregate Drop Operations[a]	350	4015	0.0002	0.0714	0.1433	0.00003	0.0108	0.0217	0.68	2	0.023	0.0458	0.003	0.0069	Ch. 13.2.4.3, AP-42
			Total PM10 emissions		**9.56**	**Total PM2.5 emissions**		**2.85**			**Total PM10 emissions**	**0.25**	**Total PM2.5 emissions**	**0.07**	

[a] AP-42, Ch.13.2.4, See Table 10 for details

Notes: 100% of cavern rock is crushed and sized before hauled offiste. 11 hrs/day for 365 days = 4015 hrs/yr. Plant rating = 350 TPH.

Table 18 Emissions Estimates for Proposed Rock Plant Engines

Engine Mfg:	**CAT or Equivalent**	# of Units:	2
Model #:	**Electric Generator Set**		
Fuel:	ULSD	**Engine Data**	

Plant Ops:

Scenario	Hrs/day	Days/Yr	Hrs/Yr*	Total Mo.	Process Rate, TPD
Berm	3	365	1095	22	950
No Berm	11	365	4015	22	3800

*Normalized year based on 12 months of the 22 month total.

METRIC UNITs

BHP	kWe	Load %	RPM	Fuel, gph	Stk Ht, ft	Stk Diam, in	Stk Temp, F	mmbtu/hr	Stk Flow, ACFM	Stack Vel, f/s	Stk Diam, m	Stk Temp, Kelvins	Stk Vel, m/s
779	580	100	1800	39	~10	6	890	5.34	4300	364.9945	0.1524	749.82	111.2503

Fuel S, %wt:	0.0015			
Fuel wt, lb/gal:	7.05			
Btu/gal:	137000			
Lbs S/1000 gal:	0.10575			
Lbs SO2/1000 gal:	0.2115	equals	0.0048	g/bhp-hr (use 0.005 g/bhp-hr as default SO2 factor for all loads)
EPA Tier:	4			
Control System:	None			
Turbocharged:	Yes			
Aftercooled:	Yes			

Stack Exit Area (sq.ft) = 0.19635

Scenarios	**Emissions Factor Scenarios (all values in g/bhp-hr)**						**CO2e**
	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**lb/mmbtu**
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

	Controlled Emissions Factor Scenarios (all values in g/bhp-						**CO2e**
	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**lb/mmbtu**
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

Scenario 1: **No Berm Option**

Max Hourly Runtime:	1
Max Daily Runtime:	11
Max Annual Runtime:	4015

Single Engine

	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	0.859	4.465	0.240	0.009	0.034	0.034	na
lbs/day	9.446	49.118	2.645	0.094	0.378	0.378	na
TPY	1.724	8.964	0.483	0.017	0.069	0.069	1748.9

Two Engines

	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	1.72	8.93	0.48	0.02	0.07	0.07	na
lbs/day	18.89	98.24	5.29	0.19	0.76	0.76	na
TPY	3.45	17.93	0.97	0.03	0.14	0.14	3497.82

Scenario 2: **Berm Option**

Max Hourly Runtime:	1
Max Daily Runtime:	3
Max Annual Runtime:	1095

Single Engine

	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	0.859	4.465	0.240	0.009	0.034	0.034	na
lbs/day	2.576	13.396	0.721	0.026	0.103	0.103	na
TPY	0.470	2.445	0.132	0.005	0.019	0.019	477.0

Two Engines

	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	1.72	8.93	0.48	0.02	0.07	0.07	na
lbs/day	5.15	26.79	1.44	0.05	0.21	0.21	na
TPY	0.94	4.89	0.26	0.01	0.04	0.04	953.95

Note 1: Rock Plant process rate, tons/hr: 350

Table 19
WRES Cement Plant Emissions
PM10 and PM2.5 Emissions From Concrete Plant Operation
This scenario applies to the Berm and No Berm Options

Baseline Quantity of Concrete Produced (cu yds/yr) =	14,640
Annual Operation (days/yr) =	183
Max. Hourly Production Rate (yd/hr) =	6.67

Composition of Concrete

Material	lb/yd	Max. ton/hr	ton/yr
Course Aggregate	1160	3.8686	8,491
Sand	1730	5.76955	12,664
Cement (Type I/II Portland Cement)	750	2.50125	5,490
Cement Supplement	0	0	0
Water	307	1.023845	2,247
Total Concrete	3,947	13	28,892

Emissions from Concrete Batching - PM10

Process	PM10 (lb/ton)	Controlled (lb/ton)	PM10 (lb/yr)	Average lb/day	Annual (tons/year)
Aggregate delivery to ground storage(1)	0.00055	0.00017	4.70	0.026	0.002
Sand delivery to ground storage(2)	0.00024	0.00007	3.04	0.017	0.002
Aggregate transfer to conveyors(1)*	0.00055	0.00017	1.41	0.008	0.001
Sand transfer to conveyor(2)*	0.00024	0.00007	0.91	0.005	0.000
Aggregate transfer to elevated storage(1)*	0.00055	0.00017	1.41	0.008	0.001
Sand transfer to elevated storage(2)*	0.00024	0.00007	0.91	0.005	0.000
Cement delivery to Silo (controlled)(3)		0.00034	1.87	0.010	0.001
Cement supplement delivery to silo (controlled)(3)		0.00490	0.00	0.000	0.000
Weigh hopper loading(3,4)*	0.00280	0.00084	17.77	0.097	0.009
Central Mix loading (controlled)(3,5)		0.00550	30.20	0.165	0.015
PM10 Process Emissions from Concrete Batching (lb/yr) =			**62.22**	**0.34**	**0.031**

* water spray efficiency (BAAQMD Permit Handbook, Section 11.5) = 70%

(1) Emission factor calculated using AP-42 Section 13.2.4 Eq. for material transfer with moisture = 4.4% and wind speed = 6.8 mph.

(2) Emission factor calculated using AP-42 Section 13.2.4 Eq. for material transfer with moisture = 8% and wind speed = 6.8 mph.

(3) Emission factors obtained from AP-42, Table 11.12-2.

(4) Emission factor for lb of pollutant per ton of aggregate and sand.

(5) Emission factor for lb of pollutant per ton of cement and cement supplement.

Emissions from Concrete Batching - PM2.5

Process	PM2.5 (lb/ton)(1)	Controlled (lb/ton)	PM2.5 (lb/yr)	Average lb/day	Annual (tons/year)
Aggregate delivery to ground storage	0.00008	0.000025	0.71	0.004	0.000
Sand delivery to ground storage	0.00004	0.000011	0.46	0.002	0.000
Aggregate transfer to conveyors*	0.00008	0.000025	0.21	0.001	0.000
Sand transfer to conveyor*	0.00004	0.000011	0.14	0.001	0.000
Aggregate transfer to elevated storage*	0.00008	0.000025	0.21	0.001	0.000
Sand transfer to elevated storage*	0.00004	0.000011	0.14	0.001	0.000
Cement delivery to Silo (controlled)		0.000051	0.28	0.002	0.000
Cement supplement delivery to silo (controlled)		0.000735	0.00	0.000	0.000
Weigh hopper loading*	0.00042	0.000126	2.67	0.015	0.001
Central Mix loading (controlled)		0.000825	4.53	0.025	0.002
PM2.5 Process Emissions from Concrete Batching (lb/yr) =			**9.33**	**0.05**	**0.005**

* water spray efficiency (BAAQMD Permit Handbook, Section 11.5) = 70%

(1) Emission factors obtained by using speciation profile in PM3431 which states PM2.5 = 15% of PM10 (BAAQMD Permit Handbook, Section 11.5)

Total Process & Fugitive PM10 Emissions

Total PM10 Emissions (lb/yr) =	62.22
Total PM10 Emissions (TPY) =	0.03

lb/day	tpy
0.3	0.031

Total Process & Fugitive PM2.5 Emissions

Total PM2.5 Emissions (lb/yr) =	9.33
Total PM2.5 Emissions (TPY) =	0.00

lb/day	tpy
0.1	0.005

Table 20 Emissions Estimates for Proposed Cement Plant Engine

Engine Mfg:	**John Deere or Equivalent**	# of Units:	1	**Plant Ops:**	12	Hrs/day			
Model #:	**4045TF150 or Equivalent (Electric Generator Set)**				183	Days/yr (Ops every other day)			
Fuel:	ULSD	**Engine Data**		**Production Rate**	80	cu.yds./per OPs day			***METRIC UNITs***

		BHP	**kWe**	**Load %**	**RPM**	**Fuel, gph**	**Stk Ht, ft**	**Stk Diam, in**	**Stk Temp, F**	**mmbtu/hr**	**Stk Flow, ACFM**	**Stack Vel, f/s**	**Stk Diam, m**	**Stk Temp, Kelvins**	**Stk Vel, m/s**
Fuel S, %wt:	0.0015														
Fuel wt, lb/gal:	7.05	115	85	100	1800	6	~5	3	900	0.82	650	220.6966	0.0762	755.37	67.2683
Btu/gal:	137000														
Lbs S/1000 gal:	0.10575														
Lbs SO2/1000 gal:	0.2115	equals 0.0050 g/bhp-hr (use 0.005 g/bhp-hr as default SO2 factor for all loads)													
EPA Tier:	4														
Control System:	None														
Turbocharged:	Yes	Stack Exit Area (sq.ft) = 0.049087													
Aftercooled:	No														

Emissions Factor Scenarios (all values in g/bhp-hr)

Scenarios	**NOx**	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e lb/mmbtu**
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

Controlled Emissions Factor Scenarios (all values in g/bhp-l

	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e lb/mmbtu**
Normal Ops, Tier 4 EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052

Scenario 1: **Normal Ops, Tier 4 EFs, 100% Load**

Max Hourly Runtime: 1

Max Daily Runtime: 12

Max Annual Runtime: 2196

Single Engine

	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	0.127	0.659	0.035	0.001	0.005	0.005	na
lbs/day	1.521	7.910	0.426	0.015	0.061	0.061	na
TPY	0.139	0.724	0.039	0.001	0.006	0.006	147.2

This scenario applies to the Berm and No Berm options.

Shaft Excavation and Drilling Data

(Applicable to the Berm and No Berm Options)

Table 1 Hydrostor WRESC Shaft Drilling Data

Shaft Excavation

Shaft ID Type	**Main Const**	**H2O**	**Air**	**Vent**	
Diameter, ft.	24	8	4	7	
Radius, ft.	12	4	2	3.5	
Avg Depth, ft.	2500	2500	2500	2500	
Sfc Area, ft2	452.39	50.27	12.57	38.48	a=Pi (r^2)
Volume, ft3	1130972.4	125663.6	31415.9	96211.2	v=a*depth
Volume, yd3	41887.9	4654.2	1163.6	3563.4	yd^3=ft.^3/27
Tons Removed	73513.2	8168.1	2042.0	6253.7	tons=1.75*yd^3
Number of Shafts:	1	3	1	2	
Total Shaft Volume, tons	112567.1				
Tons subject to fugitive emissions calcs:	**73513.2**				
Density, materials	1.755	same value as used in the main const calcs			

Shaft Notes:

1. 24 ft diameter shaft is the construction equipment shaft (blasted, excavated, etc.)
2. 8 ft., 7 ft., and 4 ft. shafts are blind drilled (wet drilled), these shafts will have virtually no fugive dust emissons
3. excavation scenario provided by Hydrostor, worst case applicable to both Berm and No Berm options

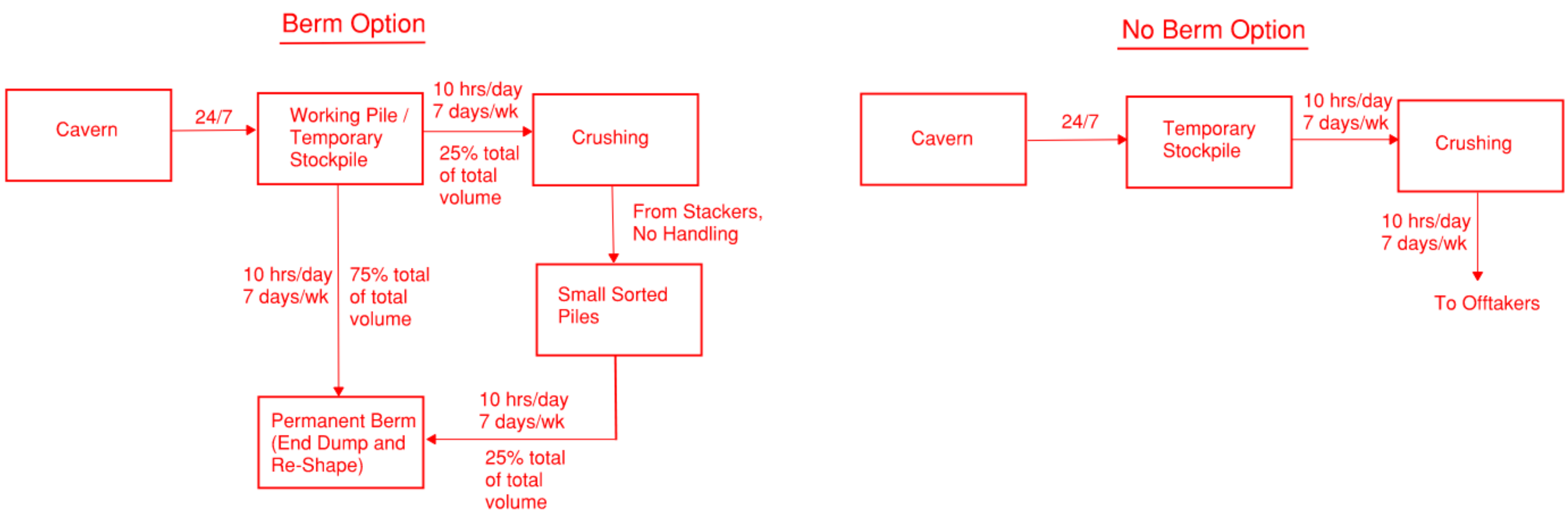


Figure 5.1B-1

Waste Rock Flow Chart

Berm and No Berm Options

APPENDIX 5.1C

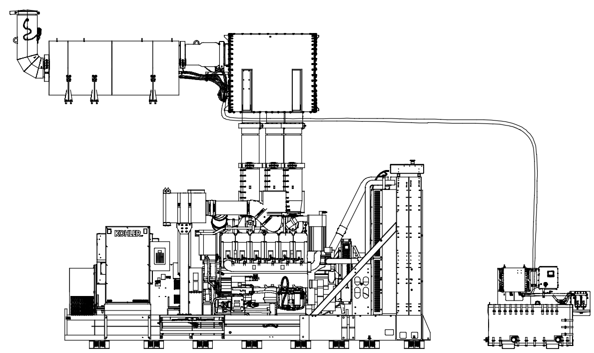
Operations Equipment Specifications and Descriptive Data

Appendix 5.1C
Engine Specifications

KOHLER®

Industrial Diesel Generator Set - KD2500-4

Tier 4 EPA-Certified for Stationary, Prime, Continuous Applications



KDxxxx-4 designates a 60 Hz generator set with a Tier 4 EPA-Certified engine.

Ratings Range

		60 Hz
Standby:	**kW**	2250-2500
	kVA	2812-3125
Prime:	**kW**	2050-2270
	kVA	2562-2838
Continuous:	**kW**	1720-1900
	kVA	2150-2375

Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- A standard three-year or 1000-hour limited warranty for standby applications. Five-year basic, five-year comprehensive, and ten-year extended limited warranties are also available.
- A standard two-year or 8700-hour limited warranty for prime power applications. Five-year basic and five-year comprehensive warranties are also available.
- A standard one-year warranty with unlimited hours for continuous power applications.
- Other features:
  - Kohler designed controllers for one-source system integration and remote communication. See Controller on page 4.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).

General Specifications

Orderable Generator Model Number	GMKD2500-4
Manufacturer	Kohler
Engine: model	KD62V12
Alternator Choices	KH06930TO4D KH07000TO4D KH07770TO4D KH08100TO4D KH08430TO4D KH09270TO4D
Performance Class	Per ISO 8528-5
One Step Load Acceptance	100%
Voltage	Wye, 600 V., 4160 V, or 6600-13800 V
Controller	APM603
Fuel Tank Capacity, L (gal.)	16383 (4328)
Fuel Consumption, L/hr (gal./hr) 100% at Standby	661 (174.6)
Fuel Consumption, L/hr (gal./hr) 100% at Prime Power	595 (157.2)
Fuel Consumption, L/hr (gal./hr) 100% at Continuous Power	484 (127.8)
DEF Consumption, L/hr (gal./hr) 100% at Standby	46.2 (12.2)
DEF Consumption, L/hr (gal./hr) 100% at Prime Power	53.5 (14.2)
DEF Consumption, L/hr (gal./hr) 100% at Continuous Power	45.9 (12.1)
Emission Level Compliance (KDxxxx)	Tier 4
Open Unit Noise Level @ 7 m dB(A) at Rated Load	—
Data Center Continuous (DCC) Rating (Refer to TIB-101 for definitions)	Same as the Standby Rating below

Generator Set Ratings

				150°C Rise Standby Rating		130°C Rise Standby Rating		125°C Rise Prime Rating		105°C Rise Prime Rating		80°C Rise Continuous Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
KH06930TO4D	277/480	3	60	2500/3125	3759	2500/3125	3759	2270/2838	3414	2270/2838	3414	1890/2362	2842
KH07000TO4D	347/600	3	60	2500/3125	3008	2500/3125	3008	2270/2838	2731	2250/2812	2706	1880/2350	2262
	2400/4160	3	60	2500/3125	434	2500/3125	434	2270/2838	394	2250/2812	391	1880/2350	327
KH07770TO4D	277/480	3	60	2500/3125	3759	2500/3125	3759	2270/2838	3414	2270/2838	3414	1880/2350	2827
	347/600	3	60	2500/3125	3008	2500/3125	3008	2270/2838	2731	2270/2838	2731	1880/2350	2262
	2400/4160	3	60	2500/3125	434	2500/3125	434	2270/2838	394	2270/2838	394	1900/2375	330
KH08430TO4D	240/416	3	60	2500/3125	4338	2500/3125	4338	2270/2838	3939	2270/2838	3939	1880/2350	3262
	277/480	3	60	2500/3125	3759	2500/3125	3759	2270/2838	3414	2270/2838	3414	1880/2350	2827
	347/600	3	60	2500/3125	3008	2500/3125	3008	2270/2838	2731	2270/2838	2731	1890/2362	2273
	2400/4160	3	60	2500/3125	434	2500/3125	434	2270/2838	394	2270/2838	394	1880/2350	327

RATINGS: All three-phase units are rated at 0.8 power factor. *Standby Ratings:* The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. *Prime Power Ratings:* At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. For limited running time and continuous ratings, consult the factory. Obtain technical information bulletin (TIB-101) for ratings guidelines, complete ratings definitions, and site condition derates. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

KOHLER

Industrial Diesel Generator Set - KD2500-4

Tier 4 EPA-Certified for Stationary, Prime, Continuous Applications

				130°C Rise Standby Rating		105°C Rise Prime Rating		80°C Rise Continuous Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
KH08100TO4D	3810/6600	3	60	2500/3125	274	2270/2838	249	1880/2350	206
	7200/12470	3	60	2250/2812	131	2050/2562	119	1710/2138	100
	7620/13200	3	60	2380/2975	131	2180/2725	120	1820/2275	100
	7970/13800	3	60	2500/3125	131	2270/2838	119	1880/2350	99
KH09270TO4D	3810/6600	3	60	2500/3125	274	2270/2838	249	1890/2362	207
	7200/12470	3	60	2500/3125	145	2270/2838	132	1880/2350	109
	7620/13200	3	60	2500/3125	137	2270/2838	125	1880/2350	103
	7970/13800	3	60	2500/3125	131	2270/2838	119	1880/2350	99

Engine Specifications	**60 Hz**
Manufacturer	Kohler
Engine: model	KD62V12-6CNS KD62V12-6CNP KD62V12-6CNC
Engine: type	4-Cycle, Turbocharged, Intercooled
Cylinder arrangement	12-V
Displacement, L (cu. in.)	62 (3783)
Bore and stroke, mm (in.)	175 x 215 (6.89 x 8.46)
Compression ratio	16.0:1
Piston speed, m/min. (ft./min.)	774 (2539)
Main bearings: quantity, type	7, Precision Half Shells
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	2700 (3621)
Cylinder head material	Cast Iron
Crankshaft material	Steel
Valve (exhaust) material	Steel
Governor: type, make/model	KODEC Electronic Control
Frequency regulation, no-load to-full load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Lubricating System	**60 Hz**
Type	Full Pressure
Oil pan capacity with filter (initial fill), L (qt.) §	335 (354)
Oil filter: quantity, type §	6, Cartridge
Oil cooler	Water-Cooled

§ Kohler recommends the use of Kohler Genuine oil and filters.

Fuel System	**60 Hz**
Fuel supply line, min. ID, mm (in.)	25 (1.0)
Fuel return line, min. ID, mm (in.)	19 (0.75)
Max. fuel flow, Lph (gph)	881 (232.7)
Min./max. fuel pressure at engine supply connection, kPa (in. Hg)	-50/50 (-14.8/14.8)
Max. return line restriction, kPa (in. Hg)	30 (8.9)
Fuel filter: quantity, type	2, Primary Engine Filter 2, Fuel/Water Separator
Recommended fuel	#2 Diesel ULSD

	Diesel Fuel Consumption	**DEF Consumption**
	Standby Rating	**Standby Rating**
% load	**Lph (gph)**	**Lph (gph)**
100%	661 (174.6)	46.2 (12.2)
75%	479 (126.5)	45.5 (12.0)
50%	334 (88.1)	35.0 (9.3)
25%	195 (51.4)	19.5 (5.1)
10%	108 (28.5)	9.7 (2.6)
	Prime Rating	**Prime Rating**
% load	**Lph (gph)**	**Lph (gph)**
100%	595 (157.2)	53.5 (14.2)
75%	440 (116.2)	44.0 (11.6)
50%	310 (82.0)	32.6 (8.6)
25%	184 (48.7)	18.4 (4.9)
10%	107 (28.2)	9.6 (2.5)
	Continuous Rating	**Continuous Rating**
% load	**Lph (gph)**	**Lph (gph)**
100%	484 (127.8)	45.9 (12.1)
75%	372 (98.2)	37.2 (9.8)
50%	265 (69.9)	27.8 (7.3)
25%	159 (42.1)	15.1 (4.0)
10%	95 (25.1)	8.6 (2.3)

Radiator System	**60 Hz**	
Ambient temperature, °C (°F)*	50 (122)	40 (104)
Engine jacket water capacity, L (gal.)	356 (94)	
Radiator system capacity, including engine, L (gal.)	643 (170)	539 (142)
Engine jacket water flow, Lpm (gpm)	2082 (550)	
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	ESP 920 (52320) PRP 850 (48339) COP 770 (43790)	
Charge cooler water flow, Lpm (gpm)	662 (174)	
Heat rejected to charge cooling water at rated kW, dry exhaust, kW (Btu/min.)	ESP 870 (49476) PRP 750 (42652) COP 530 (30141)	
Water pump type	Centrifugal	
Fan diameter, including blades, mm (in.)	2235 (88)	1901 (75)
Fan, kWm (HP)	90 (120.7)	85 (114)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)	

* Enclosure with enclosed silencer reduces ambient temperature capability by 5°C (9°F).

Remote Radiator System†	60 Hz
Exhaust manifold type	Dry
Connection sizes:	Class 150 ANSI Flange
Water inlet/outlet, mm (in.)	216 (8.5) Bolt Circle
Intercooler inlet/outlet, mm (in.)	178 (7.0) Bolt Circle
Static head allowable above engine, kPa (ft. H_2O)	70 (23.5)

† Contact your local distributor for cooling system options and specifications based on your specific requirements.

Exhaust System	60 Hz
Exhaust flow at rated kW, m^3/min. (cfm)	551 (19468)
Exhaust temperature at rated kW at 25°C (77°F) ambient, dry exhaust, °C (°F)	490 (914)
Maximum allowable back pressure, kPa (in. Hg)	See TIB- 119
Exh. outlet size at eng. hookup, mm (in.)	See ADV drawing

Electrical System	60 Hz
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	24
Ampere rating	140
Starter motor qty. at starter motor power rating, rated voltage (DC)	Standard: 2 @ 9 kW, 24; Redundant (optional); 2 @ 15 kW, 24
Battery, recommended cold cranking amps (CCA):	
Quantity, CCA rating each, type (with standard starters)	4, 1110, AGM
Quantity, CCA rating each, type (with redundant starters)	8, 1110, AGM
Battery voltage (DC)	12

Air Requirements	60 Hz	
Radiator-cooled cooling air, m^3/min. (scfm)‡	50°C 2549 (90000)	40°C 2321 (82000)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m^3/min. (scfm)‡	1116 (39398)	
Combustion air, m^3/min. (cfm)	ESP 207 (7310) PRP 194.3 (6863) COP 168 (5943)	
Heat rejected to ambient air:		
Engine, kW (Btu/min.)	ESP 130 (7393) PRP 120 (6824) COP 100 (5687)	
Alternator, kW (Btu/min.)	160 (9099)	

‡ Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

Alternator Specifications		60 Hz
Type		4-Pole, Rotating-Field
Exciter type		Brushless, Permanent-Magnet Pilot Exciter
Voltage regulator		Solid-State, Volts/Hz
Insulation:		NEMA MG1, UL 1446, Vacuum Pressure Impregnated (VPI)
Material		Class H, Synthetic, Nonhygroscopic
Temperature rise		130°C, 150°C Standby
Bearing: quantity, type		1 or 2, Sealed
Coupling type		Flexible Disc or Coupling
Amortisseur windings		Full
Alternator winding type (up to 600 V)		Random Wound
Alternator winding type (above 600 V)		Form Wound
Rotor balancing		125%
Voltage regulation, no-load to full-load		±0.25%
Unbalanced load capability		100% of Rated Standby Current
Peak motor starting kVA:		(35% dip for voltages below)
480 V	KH06930TO4D	5990
480 V	KH07770TO4D	7170
480 V	KH08430TO4D	9908

Alternator Standard Features

- The pilot-excited, permanent magnet (PM) alternator provides superior short-circuit capability.
- All models are brushless, rotating-field alternators.
- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- Brushless alternator with brushless pilot exciter for excellent load response.

NOTE: See TIB- 102 Alternator Data Sheets for alternator application data and ratings, efficiency curves, voltage dip with motor starting curves, and short circuit decrement curves.

Controller

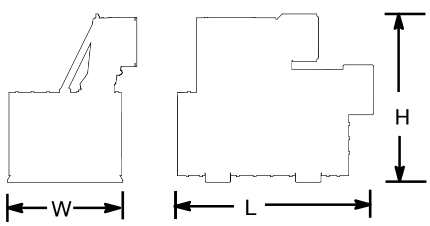
APM603 Controller
Provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility.

- 7-inch graphic display with touch screen and menu control provides easy local data access
- Measurements are selectable in metric or English units
- Paralleling capability to control up to 8 generators on an isolated bus with first-on logic, synchronizer, kW and kVAR load sharing, and protective relays
  Note: Parallel with other APM603 controllers only
- Generator management to turn paralleled generators off and on as required by load demand
- Load management to connect and disconnect loads as required
- Controller supports Modbus® RTU, Modbus® TCP, SNMP and BACnet®
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- UL-listed overcurrent protective device
- NFPA 110 Level 1 capability

Refer to G6-162 for additional controller features and accessories.

BACNet® is a registered trademark of ASHRAE.

Diesel Exhaust Fluid (DEF) Tank



Approximate size, L x W x H, mm(in.):	1868 x 1042 x 1479 (73.5 x 41.0 x 58.2)
Tank weight (dry), kg (lb.):	420.6 (927 lb)
Fillable volume:	224 gallons
Consumable volume:	164 gallons
Material:	Stainless steel

Codes and Standards

- Engine- generator set is designed and manufactured in facilities certified to ISO 9001.
- Generator set meets NEMA MG1, BS5000, ISO, DIN EN, and IEC standards, NFPA 110.
- Engine generator set is tested to ISO 8528-5 for transient response.
- The generator set and its components are prototype-tested, factory-built, and production-tested.

Third-Party Compliance

- Tier 4 EPA-Certified for Stationary, Prime, and Continuous Applications

Available Approvals and Listings

- ❑ CSA Certified
- ❑ UL 2200 Listing

Warranty Information

- A standard three-year or 1000-hour limited warranty for standby applications. Five-year basic, five-year comprehensive, and ten-year extended limited warranties are also available.
- A standard two-year or 8700-hour limited warranty for prime power applications. Five-year basic and five-year comprehensive warranties are also available.
- A standard one-year warranty with unlimited hours for continuous power applications.

Available Warranties for Standby Applications

- ❑ 5-Year Basic Limited Warranty
- ❑ 5-Year Comprehensive Limited Warranty
- ❑ 10-Year Major Components Limited Warranty

Available Warranties for Prime Applications

- ❑ 5-Year Basic Limited Warranty
- ❑ 5-Year Comprehensive Limited Warranty

Standard Features

- Closed Crankcase Ventilation (CCV) Filters
- Customer Connection
- Local Emergency Stop Switch
- Oil Drain and Coolant Drain Extension
- Operation and Installation Literature
- Fan Bearing Grease Extension
- Fuel/Water Separator
- Generator Heater
- Spring Isolation Under the Skid
- Battery Rack and Cables

Available Options

Circuit Breakers

Type
- ❑ Magnetic Trip
- ❑ Thermal Magnetic Trip
- ❑ Electronic Trip (LI)
- ❑ Electronic Trip with Short Time (LSI)
- ❑ Electronic Trip with Ground Fault (LSIG)

Rating
- ❑ 80%
- ❑ 100%

Operation
- ❑ Manual
- ❑ Electrically Operated (for paralleling)

Circuit Breaker Mounting
- ❑ Generator Mounted
- ❑ Remote Mounted
- ❑ Bus Bar (for remote mounted breakers)

Enclosed Remote Mounted Circuit Breakers
- ❑ NEMA 1 (15- 5000 A)
- ❑ NEMA 3R (15- 1200 A)

Engine Type
- ❑ KDxxxx Tier 4 EPA- Certified Engine

Approvals and Listings
- ❑ CSA Certified
- ❑ IBC Certification Request—Contact Factory
- ❑ UL 2200 Listing
- ❑ cULus Listing (fuel tanks only)
- ❑ Florida Dept. of Environmental Protection (FDEP) Compliance (fuel tanks only)

Enclosed Unit
- ❑ Sound Level 2 Enclosure/Fuel Tank Package

Controller
- ❑ Input/Output, Digital
- ❑ Input/Output, Thermocouple
- ❑ Manual Key Switch
- ❑ Remote Emergency Stop Switch
- ❑ Lockable Emergency Stop Switch
- ❑ Remote Serial Annunciator Panel

Cooling System
- ❑ Block Heater; 9000 W, 208 V, (Select 1 Ph or 3 Ph) *
- ❑ Block Heater; 9000 W, 240 V, (Select 1 Ph or 3 Ph) *
- ❑ Block Heater; 9000 W, 380 V, 3 Ph *
- ❑ Block Heater; 9000 W, 480 V, (Select 1 Ph or 3 Ph) *

* Required for Ambient Temperatures Below 10°C (50°F)

Electrical System
- ❑ Battery, 4/12 V, AGM (kit with qty. 4)
- ❑ Battery Charger
- ❑ Battery Heater; 100 W, 120 V, 1Ph
- ❑ Redundant Starters
- ❑ DEF Tank Heater
- ❑ Load Bank, 300 kW / 350 kW [Recommended for Ambient Temperature > - 5°C (23°F)]
- ❑ Load Bank, 600 kW / 650 kW [Recommended for Ambient Temperature < - 5°C (23°F)]

Fuel System
- ❑ Flexible Fuel Lines
- ❑ Dual Fuel/Water Separator
- ❑ Restriction Gauge (for fuel/water separator)

Literature
- ❑ General Maintenance
- ❑ NFPA 110
- ❑ Overhaul
- ❑ Production

Miscellaneous
- ❑ Air Cleaner, Heavy Duty
- ❑ Air Cleaner Restriction Indicator
- ❑ Automatic Oil Replenishment System
- ❑ Engine Fluids (oil and coolant) Added
- ❑ Rated Power Factor Testing
- ❑ Weld- On Flange, DIN300
- ❑ Weld- On Flange, DEF Tank

Electrical Package (Requires Enclosure selection)
- ❑ Basic Electrical Package (select 1 Ph or 3 Ph)
- ❑ Wire Battery Charger (1 Ph)
- ❑ Wire Block Heater (select 1 Ph or 3 Ph)
- ❑ Wire Power Supply
- ❑ Wire Generator Heater (1 Ph)

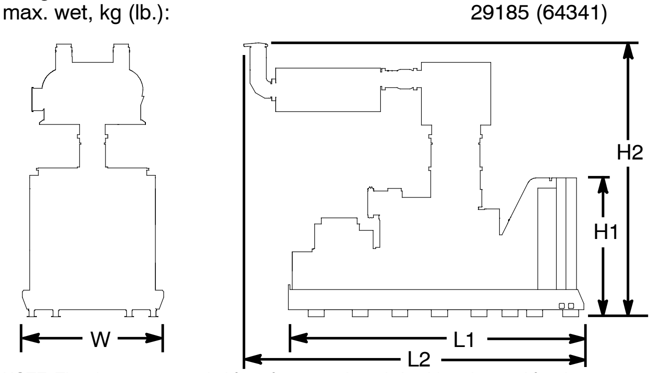
Warranty (Standby Applications only)
- ❑ 5-Year Basic Limited Warranty
- ❑ 5-Year Comprehensive Limited Warranty
- ❑ 10-Year Major Components Limited Warranty

Warranty (Prime Applications only)
- ❑ 5-Year Basic Limited Warranty
- ❑ 5-Year Comprehensive Limited Warranty

Other
- ❑

Dimensions and Weights

Generator set size, max., L1 x W x H1, mm (in.):	6958 x 3210 x 3301 (273.9 x 126.4 x 130)
With rear- facing SCR, max., L2 x W x H2, mm (in.):	7696 x 3210 x 6216 (302.9 x 126.4 x 244.7)
Weight, radiator model, max. wet, kg (lb.):	27033 (59598)
Weight, with radiator and SCR, max. wet, kg (lb.):	29185 (64341)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

Industrial Diesel Generator Set - KD2500-4

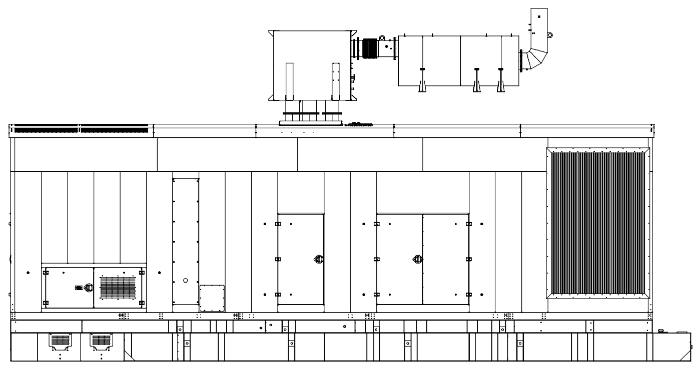
Tier 4 EPA-Certified for Stationary, Prime, Continuous Applications

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales and service outlet in the
US and Canada, phone 1-800-544-2444
KOHLERPower.com

Sound Enclosures and Subbase Fuel Tank

Sound Level 2 Enclosure Standard Features

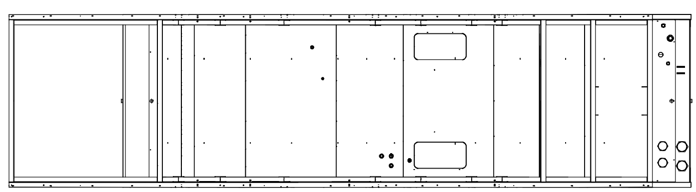
- Lift base or tank-mounted, aluminum construction enclosure with internal-mounted, exhaust silencers.
- Every enclosure has a sloped roof to reduce the buildup of moisture and debris.
- Sound attenuated enclosure that offers noise reduction using up to 51 mm (2 in.) acoustic insulation material, acoustic-lined air inlets, an acoustic-lined air discharge intake sound baffles, vertical air discharge, and secondary silencers.
- Fade-, scratch-, and corrosion-resistant Kohler® Power Armor™ automotive-grade textured finish.
- Acoustic insulation that meets UL 94 HF1 flammability classification.
- Enclosure has large access doors that are hinged and removable which allow for easy maintenance.
- Lockable, flush-mounted door latches.
- Air inlet louvers reduce rain and snow entry.
- High wind bracing, 241 kph (150 mph).
- Louvered air inlet and vertical outlet hood with 90 degree angles to redirect air and reduce noise.



Sound Level 2 Enclosure
(Shown with available spill containment)

Subbase Fuel Tank Features

- The fuel tank has a Power Armor Plus™ textured epoxy-based rubberized coating.
- The above-ground rectangular secondary containment tank mounts directly to the generator set, below the generator set skid (subbase).
- Both the inner and outer tanks have UL-listed emergency relief vents.
- Flexible fuel lines are provided with subbase fuel tank selection.
- The containment tank's construction protects against fuel leaks or ruptures. The inner (primary) tank is sealed inside the outer (secondary) tank. The outer tank contains the fuel if the inner tank leaks or ruptures.
- The above ground secondary containment subbase fuel tank meets UL 142 requirements.
- Features include:
  - Additional fittings for optional accessories (qty. 3)
  - Electrical stub-up area open to bottom
  - Emergency inner and outer tank relief vents
  - Fuel fill with lockable cap and 51 mm (2 in.) riser
  - Fuel leak detection switch
  - Fuel level mechanical gauge
  - Fuel level sender
  - Normal vent
  - Removable engine supply and return diptubes



Subbase Fuel Tank (Top View)

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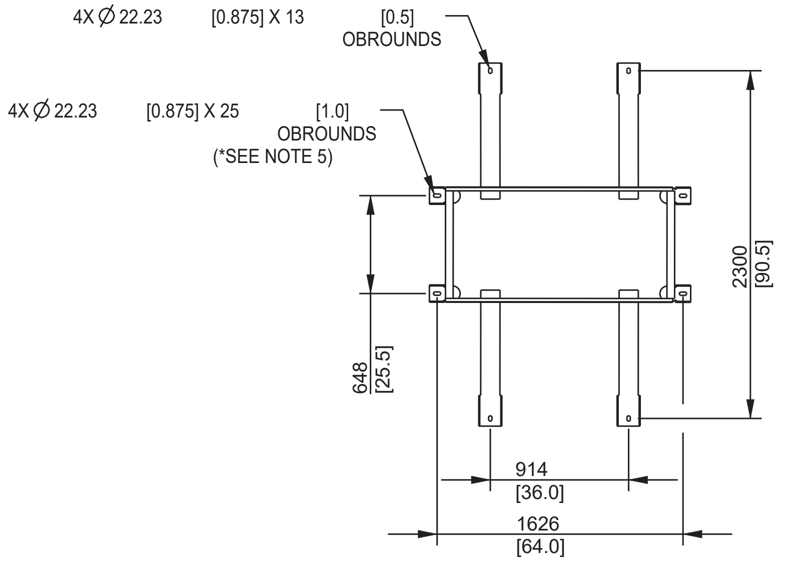
ACRONYM	FULL DESCRIPTION
DEF	DIESEL EXHAUST FLUID
SCR	SELECTIVE CATALYTIC REDUCTION
CRM	COMMON RAIL MANIFOLD
FDS	FLUID DOSING SYSTEM



COLLECTOR MOUNTING DETAIL
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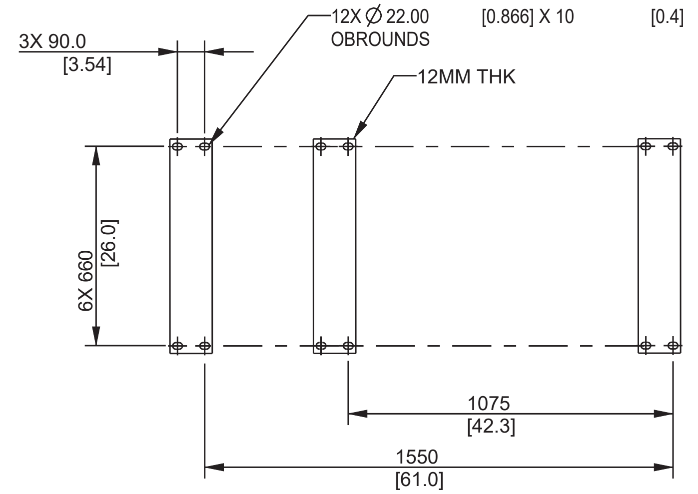

SCR MOUNTING DETAIL (2 PLACES)
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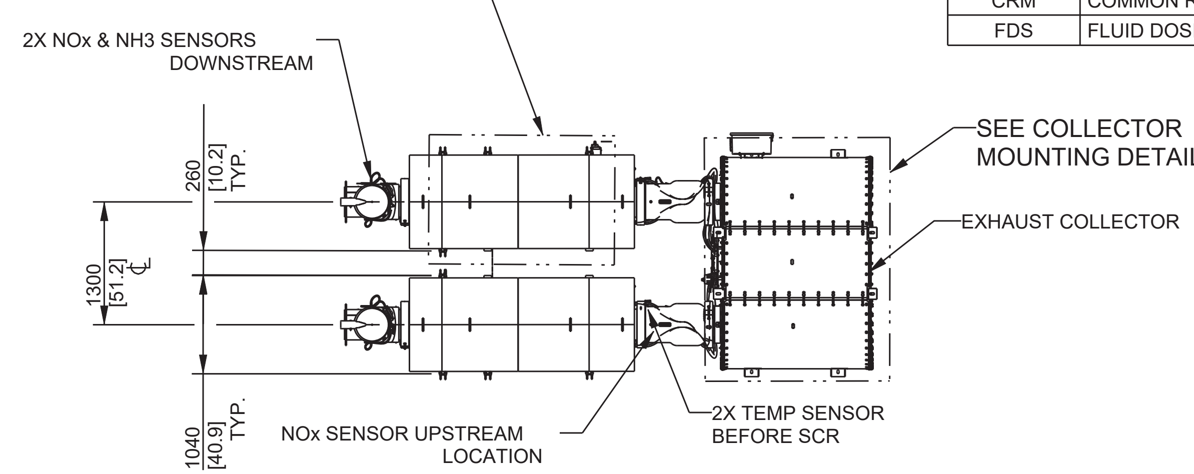

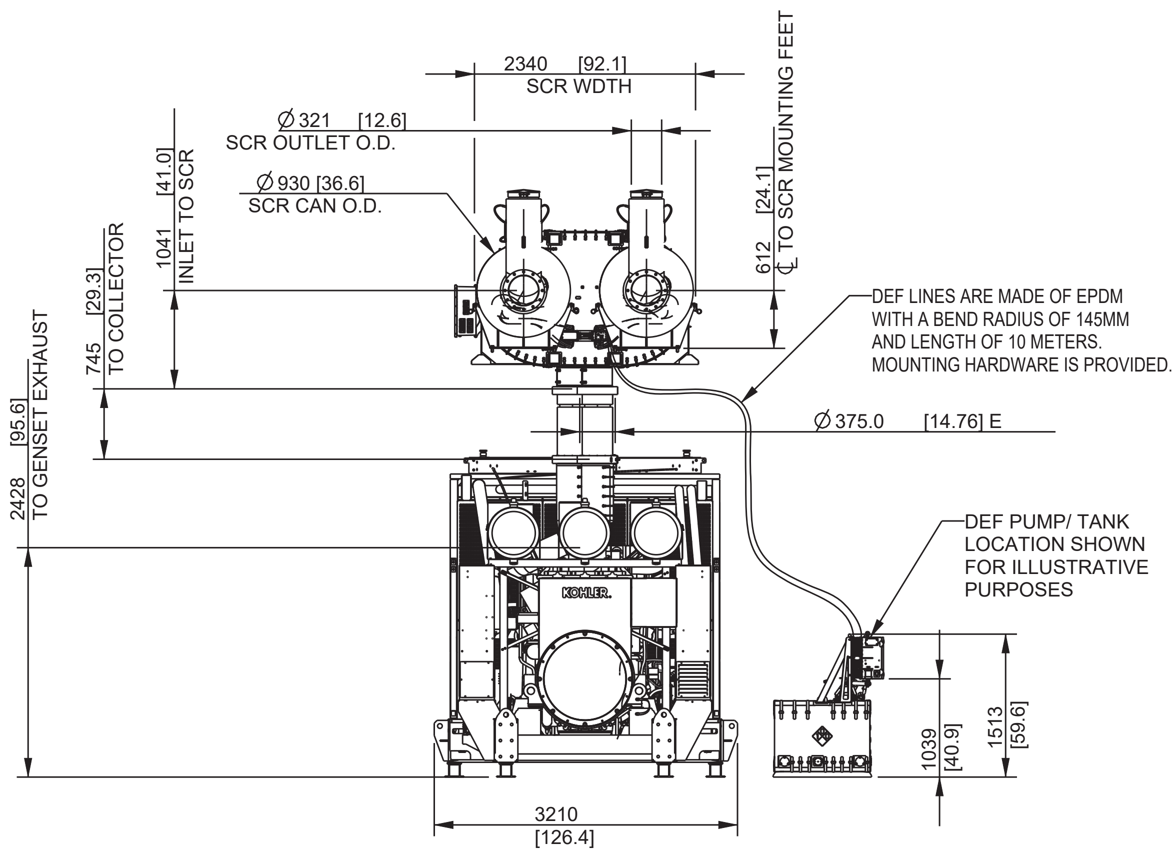

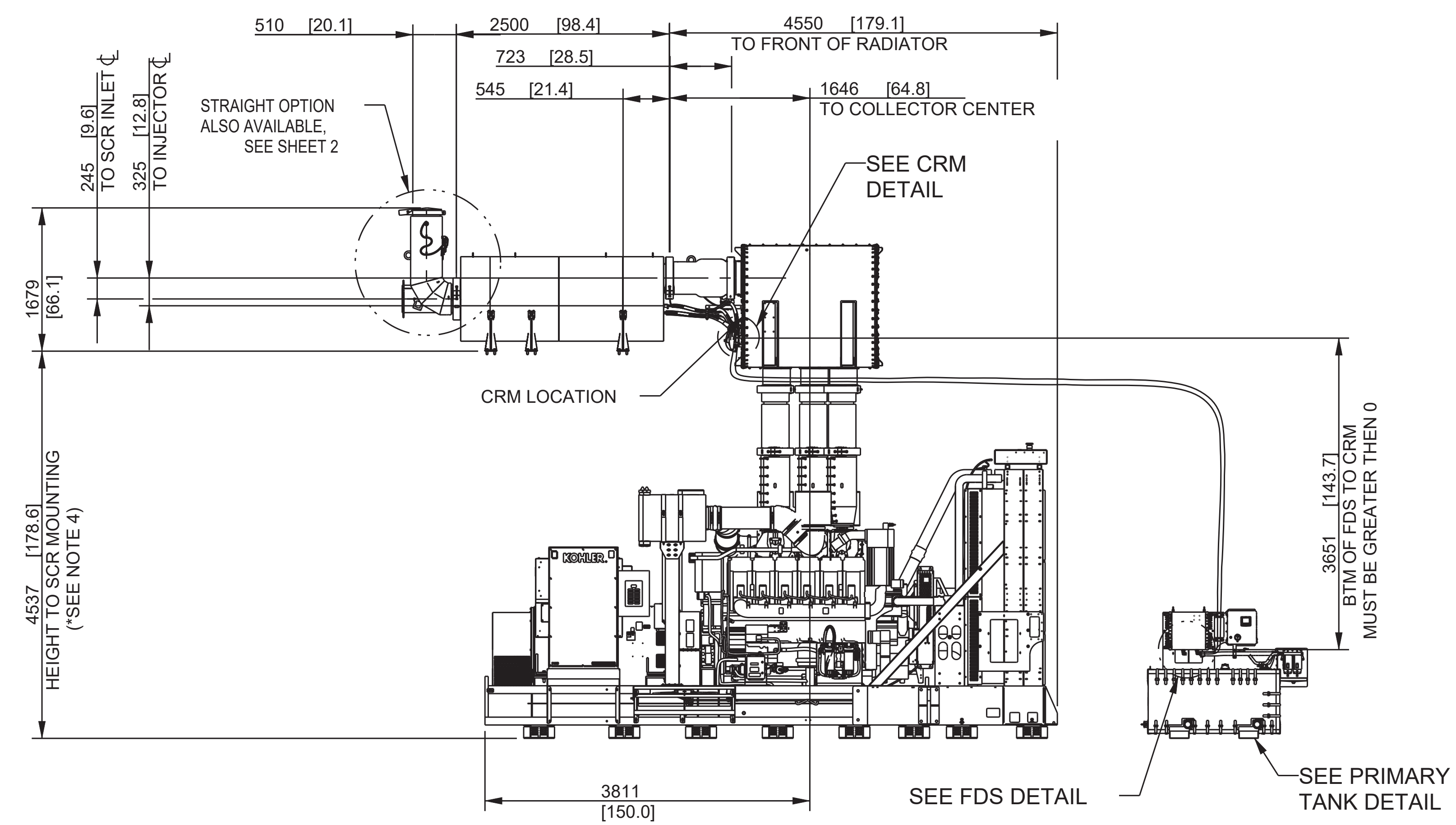

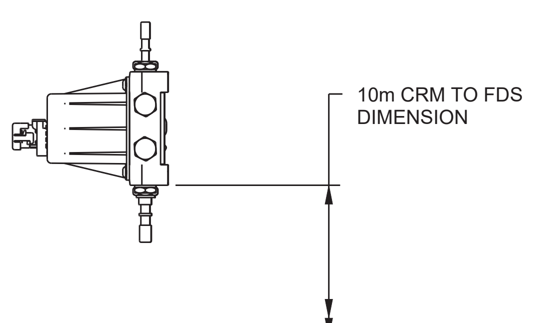

CRM DETAIL
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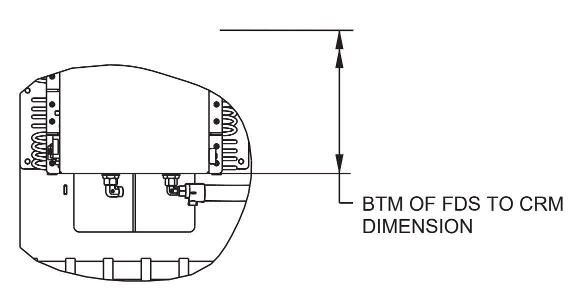

FDS DETAIL
SCALE 0.10

KD2500-4
TIER 4 CERTIFIED

NOTES:
1. SEE BASE GENERATOR ADV-8925 FOR MORE DIMENSIONAL INFORMATION.
2. SEE TP-7153 FOR MORE INFORMATION ON AFTER TREATMENT SYSTEM.
3. COLLECTOR MOUNTING MUST FULLY SUPPORT EXHAUST PIPING SUCH THAT NO WEIGHT IS ON TURBO ELBOWS.
4. IT IS RECOMMENDED THAT THE STRUCTURE MANUFACTURING AND MOUNTING PAD CONSTRUCTION TOLERANCES BE SUBTRACTED FROM THIS DIMENSION AND THE SCR BE SHIMMED DURING INSTALLATION TO ALLOW PROPER ALIGNMENT OF THE SYSTEM COMPONENTS.
5. 4X RECOMMENDED LIFT POINTS.

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
-	2-14-20	NEW DRAWING [CT201889]	SLR

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN MILLIMETERS GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	SLR	2-14-20
CHECKED	BGW	2-14-20
APPROVED	BMK	2-14-20

KOHLER
KOHLER, WISCONSIN 53044

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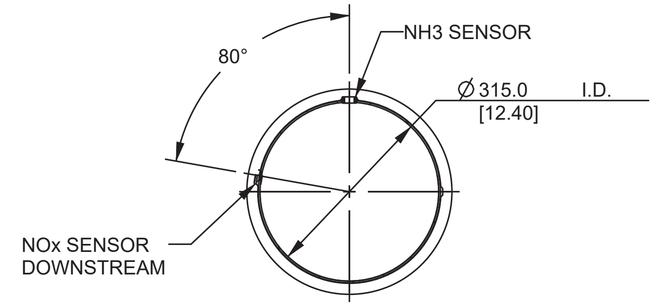
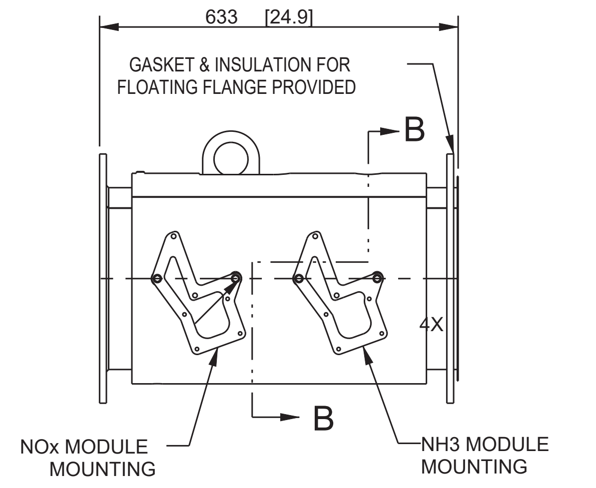
TITLE: DIMENSION PRINT, KD2500-4 (T4 CERTIFIED)

SCALE 0.03 | CAD NO. | SHEET 1 of 3

DWG NO. ADV-9163 | D



SECTION B-B



STRAIGHT OUTLET OPTION
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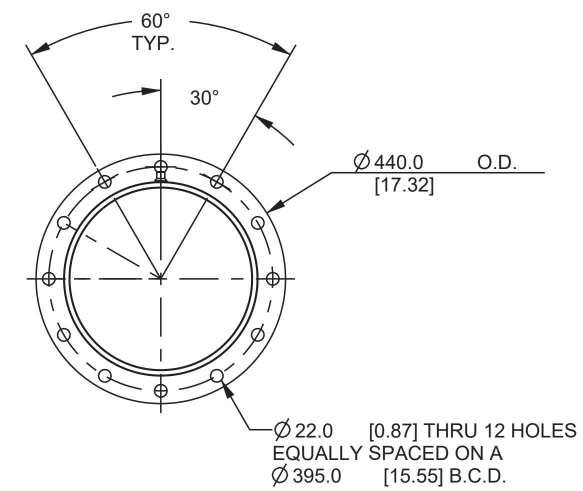
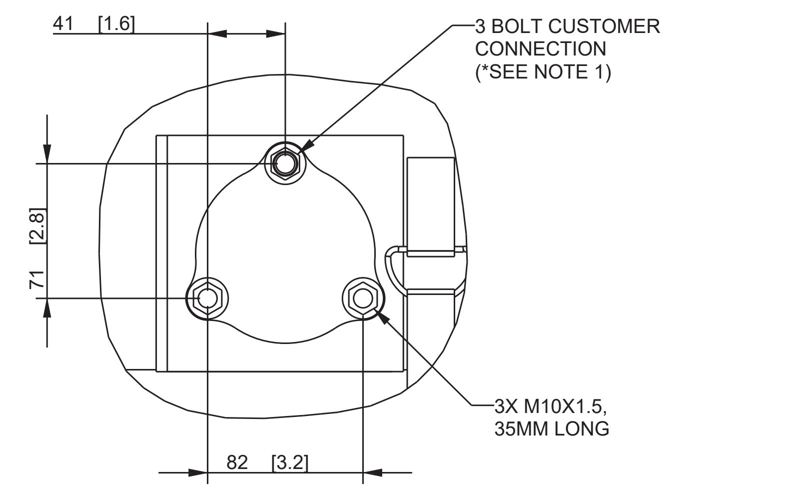
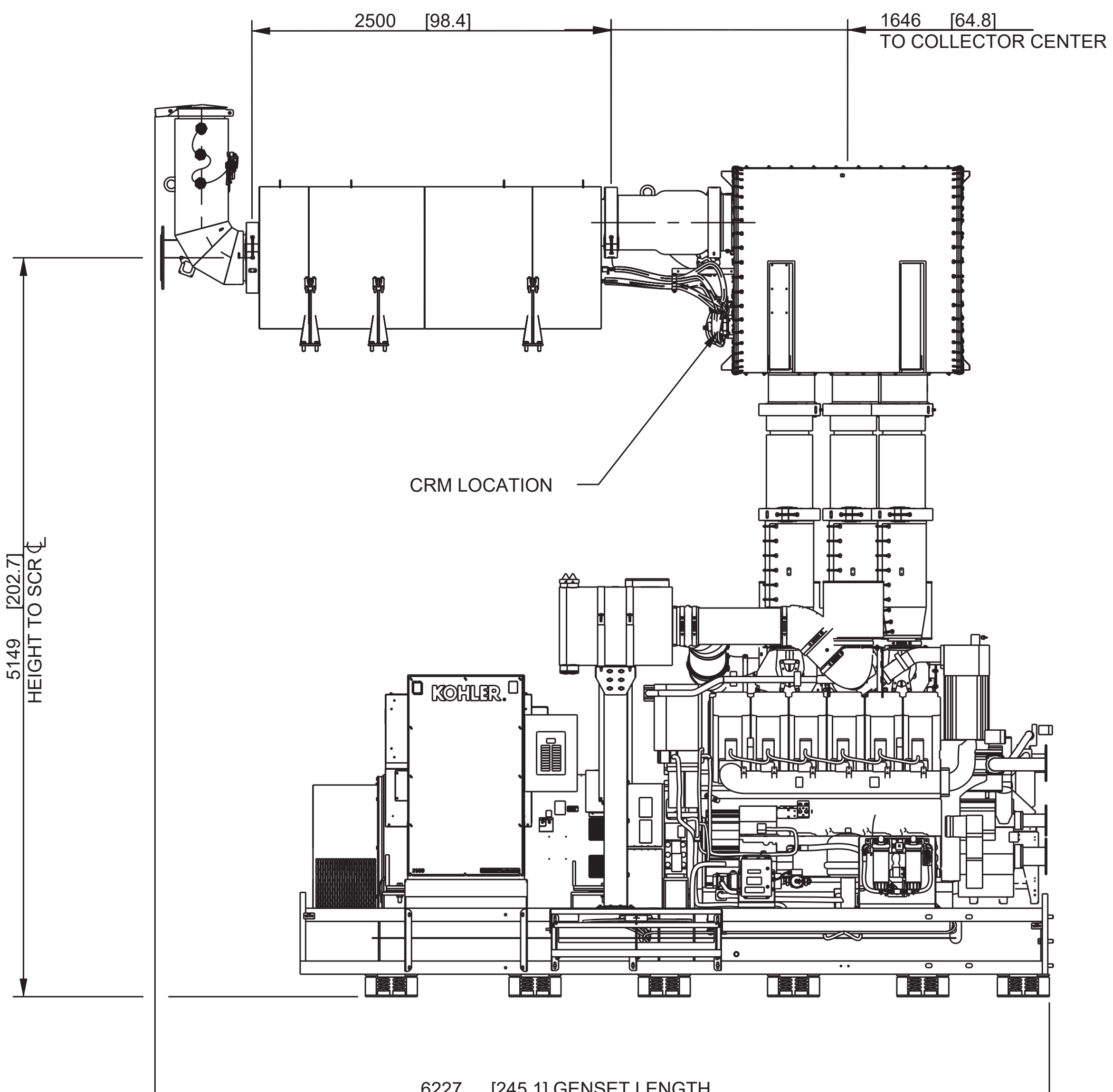
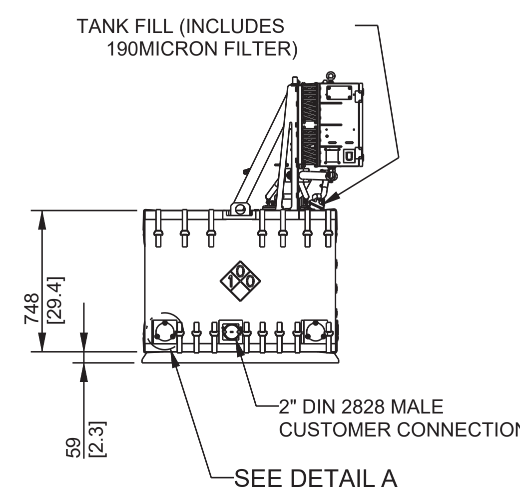


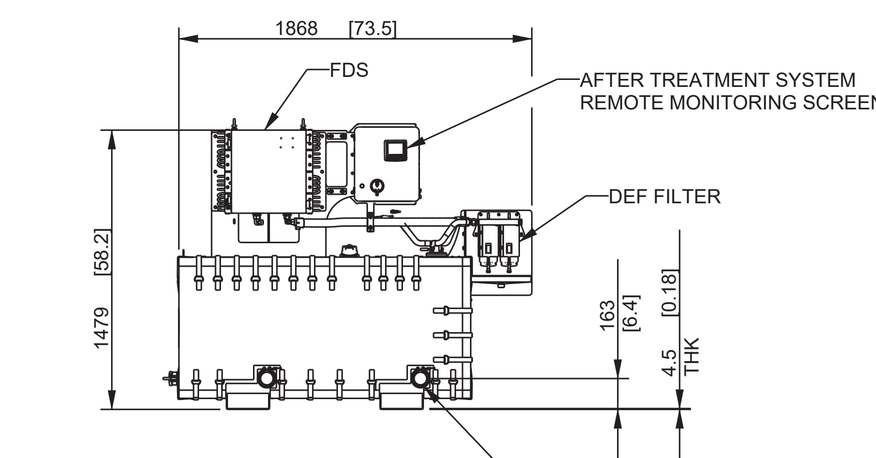


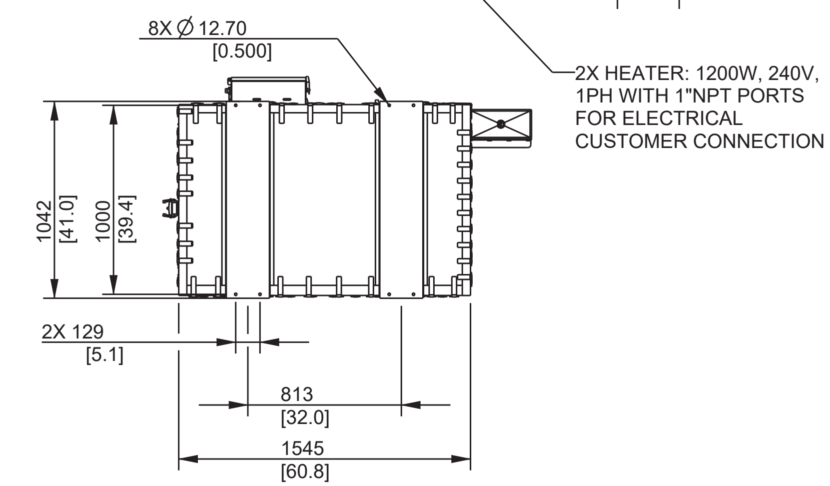
DETAIL A
SCALE 0.50



REMOTE RADIATOR CONFIGURATION SHOWN FOR VISUALIZATION







PRIMARY DEF TANK DETAIL
SCALE 0.05

NOTES:
1. SCR DOSING SYSTEM IS 24V DC PROVIDED BY THE GENERATOR.

KD2500-4
TIER 4 CERTIFIED

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
-	2-14-20	NEW DRAWING [CT201889]	SLR

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	SLR	2-14-20
CHECKED	BGW	2-14-20
APPROVED	BMK	2-14-20

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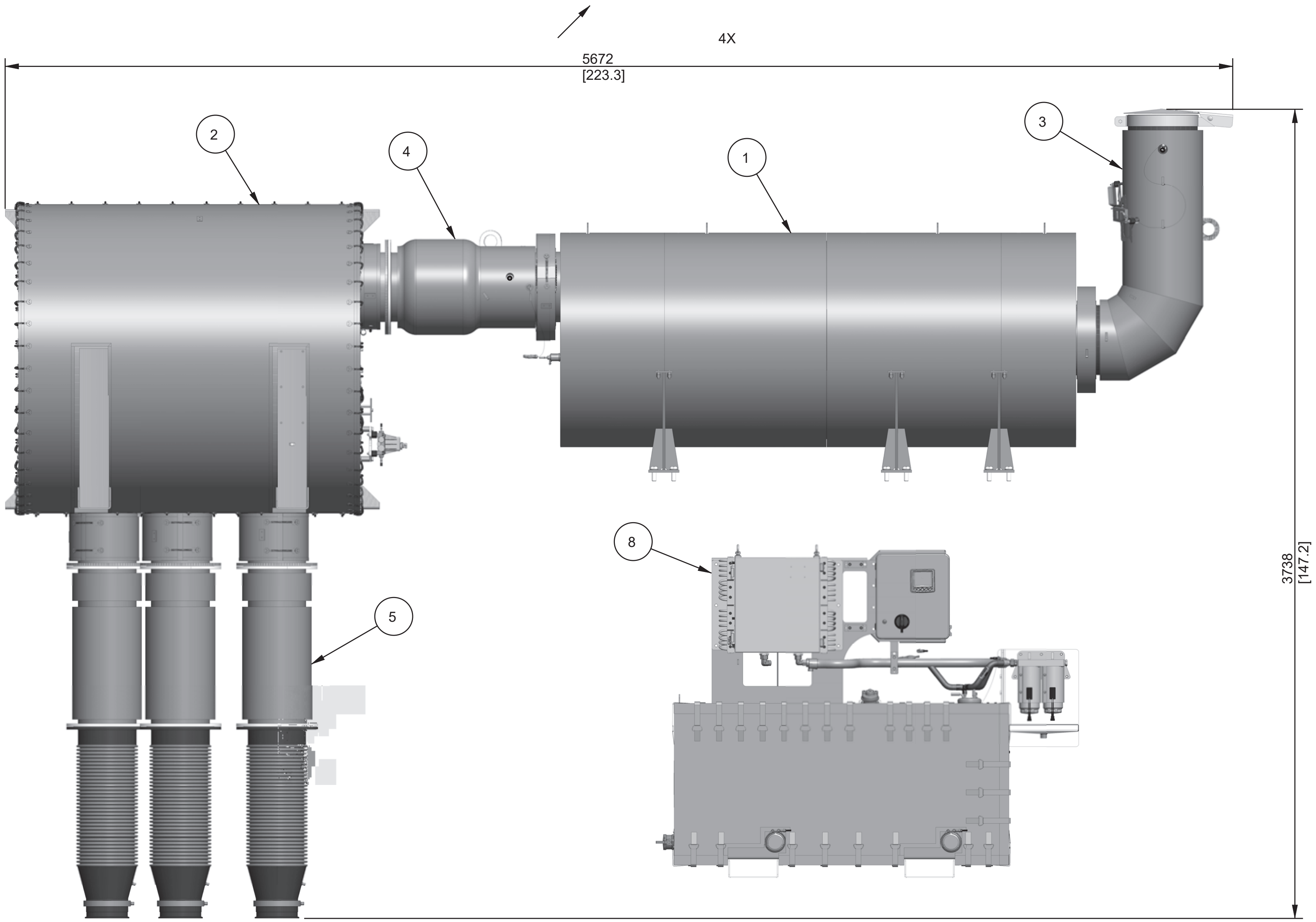
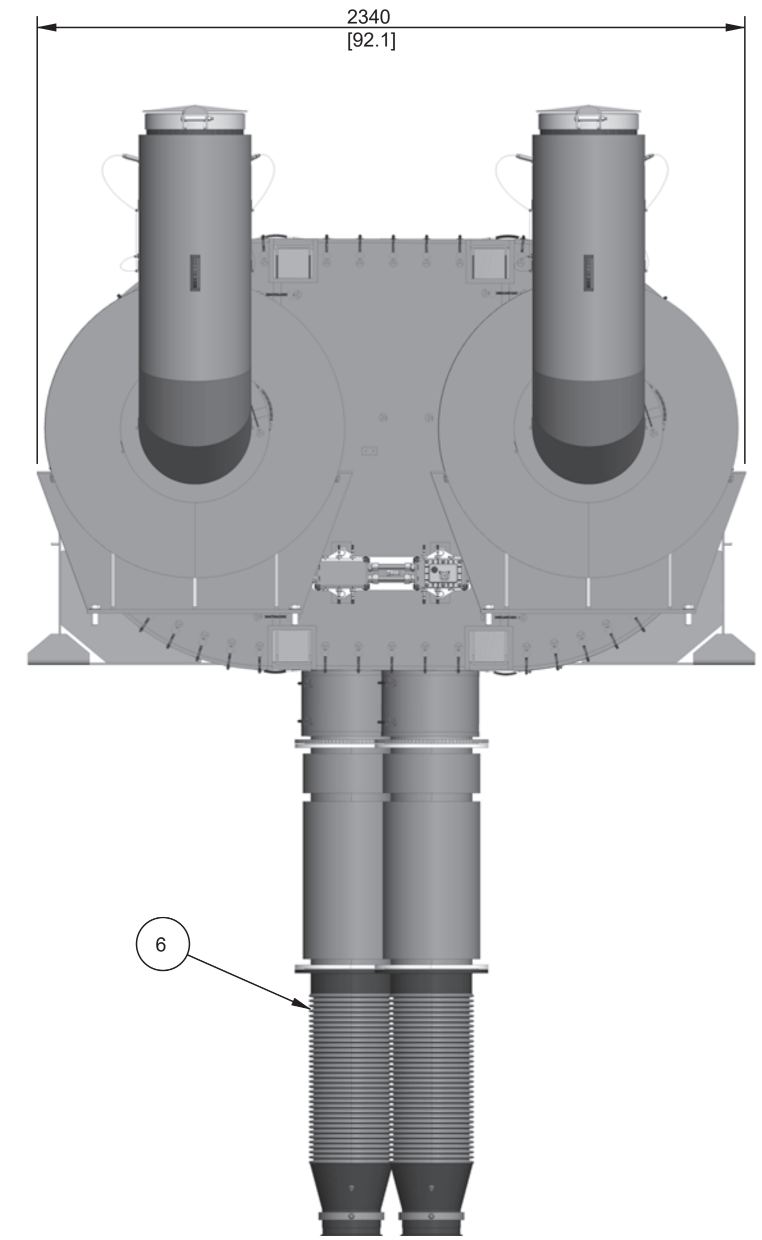
TITLE: DIMENSION PRINT, KD2500-4 (T4 CERTIFIED)

SCALE 0.04 | CAD NO. | SHEET 2 of 3

DWG NO. ADV-9163 | D

ITEM NO	PART NUMBER	DESCRIPTION	MASS [Kg]	QTY	SUBTOTAL OF MASS [Kg]	NOTES
1	10901011701	SCR	550	2	1100	
2	10901016301	COLLECTOR, EXHAUST, K175V16	663	1	663	
3	10901015800	TUBE, OUTLET SCR (DOWNSTREAM)	43	2	86	
4	10901017301	TUBE, INLET SCR, K175	36	2	71	
5	10901027702	PIPE, EXHAUST	8	3	25	
6	10901017401	TUBE, FLEX EXHAUST	19	3	57	
7	-	INSULATION, PIPING	150	1	150	
GRAND TOTAL MASS [Kg]					2152	





DEF TANK (ITEM 8)		
DESCRIPTION	MASS [Kg]	NOTES
DRY TANK	420.6	WITH ALL ACCESSORIES
WET TANK	1375.6	WITH ALL ACCESSORIES

KD2500-4
TIER 4 CERTIFIED

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
-	2-14-20	NEW DRAWING [CT201889]	SLR

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	SLR	2-14-20
CHECKED	BGW	2-14-20
APPROVED	BMK	2-14-20

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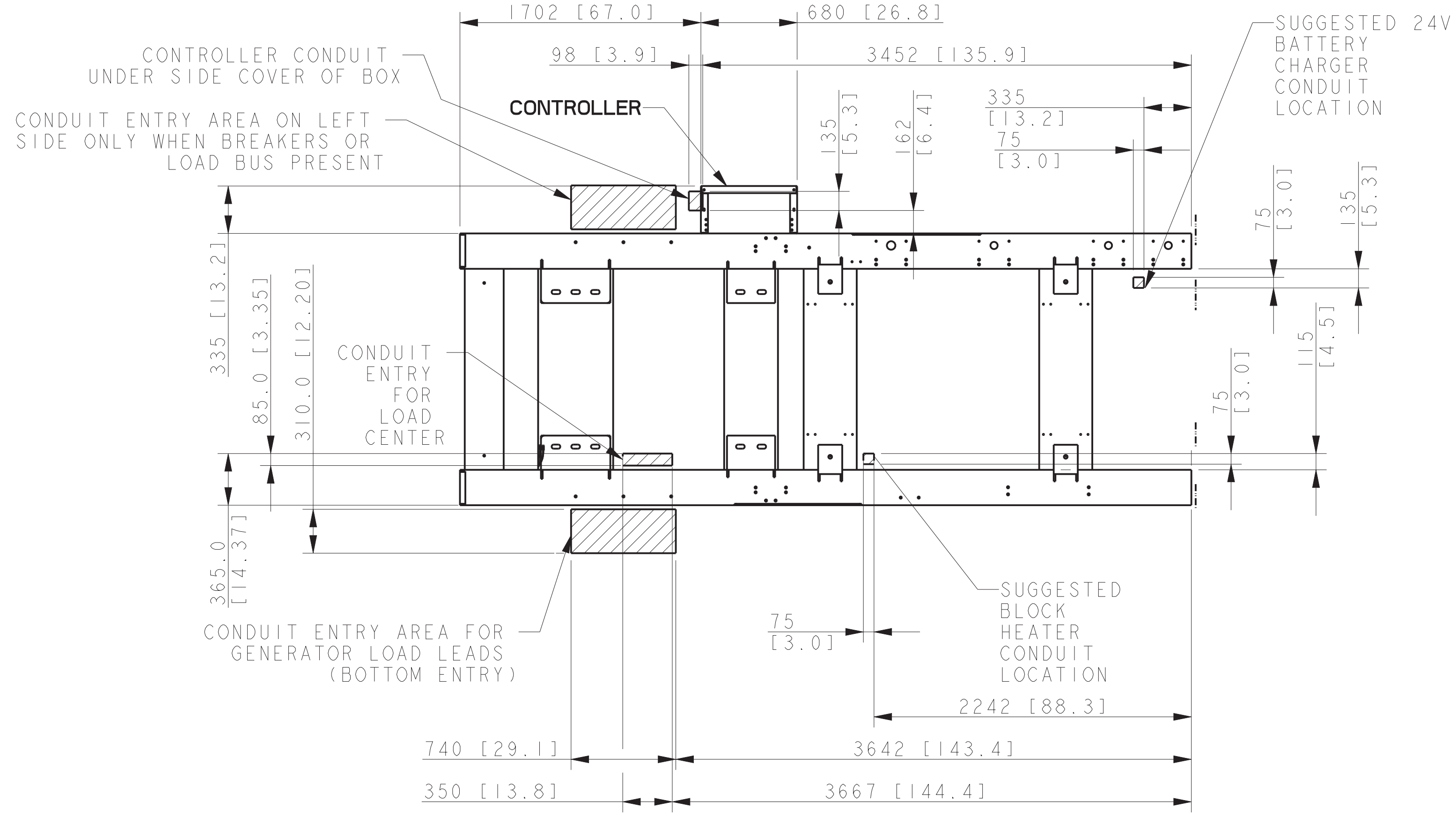
TITLE: DIMENSION PRINT, KD2500-4 (T4 CERTIFIED)

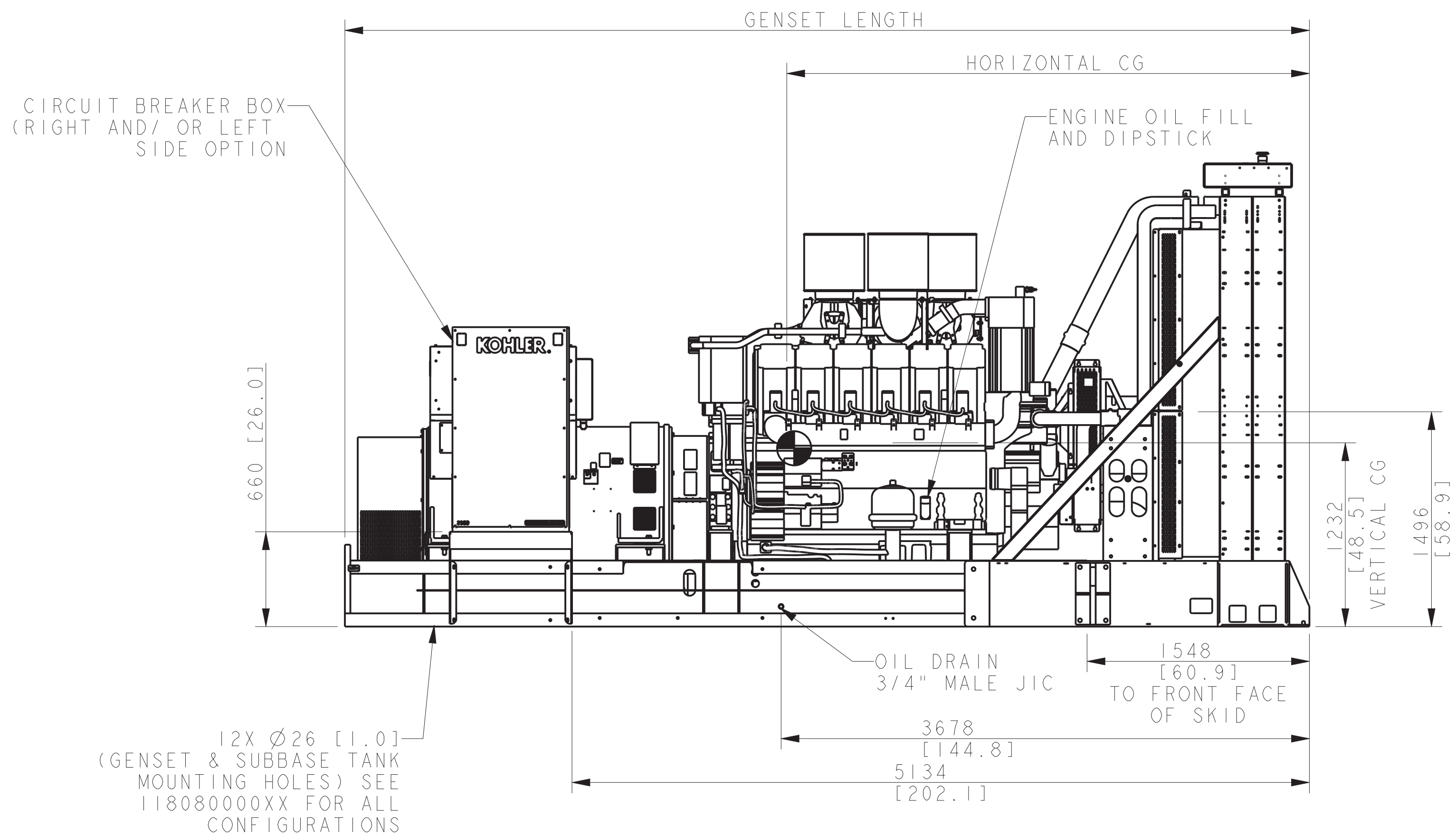
SCALE 0.08 | CAD NO. | SHEET 3 of 3

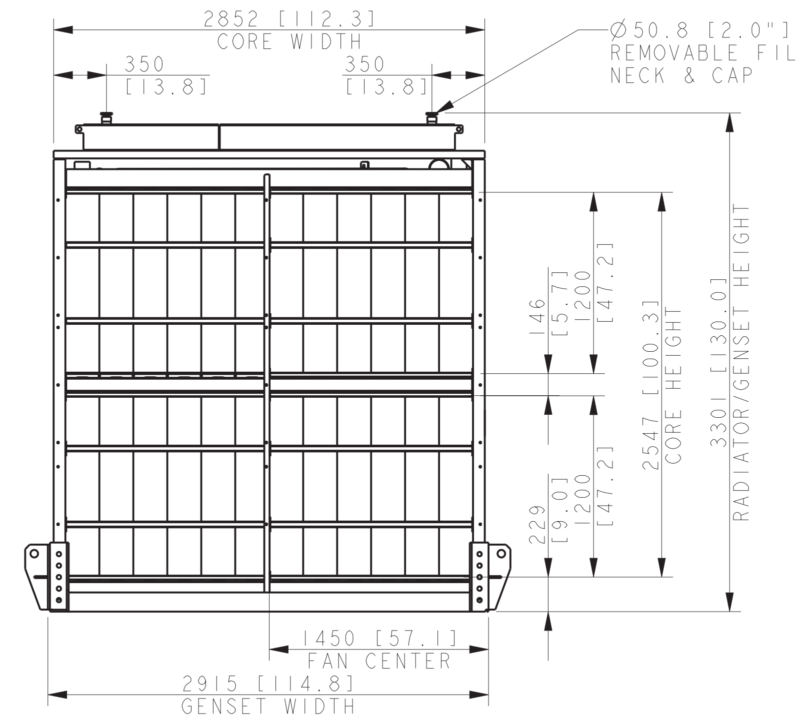
DWG NO. ADV-9163 D

MODEL	ALTERNATOR	GENSET MAXIMUM WEIGHT (WET) KG [LB]	HORIZONTAL CG (WET) MM [IN]	GENSET LENGTH MM [IN]
KD2000	KH04970TO4D	22417 [49422]	3114 [122.6]	6215 [244.7]
KD2000	KH07080TO4D	25447 [56101]	3439 [135.4]	6958 [273.9]
KD2000/ KD2250	KH05790TO4D	22940 [50574]	3171 [124.9]	6215 [244.7]
KD2000/ KD2250	KH06220TO4D	22936 [50565]	3202 [126.1]	6715 [264.4]
KD2000/ KD2250	KH07630TO4D	25859 [57010]	3472 [136.7]	6715 [264.4]
KD2250/ KD2500	KH08100TO4D	26883 [59266]	3567 [140.4]	6958 [273.9]
KD2000/ KD2250/ KD2500	KH06930TO4D	23471 [51744]	3222 [126.8]	6215 [244.7]
KD2000/ KD2250/ KD2500	KH07000TO4D	23486 [51778]	3257 [128.2]	6715 [264.4]
KD2000/ KD2250/ KD2500	KH07770TO4D	23881 [52648]	3326 [130.9]	6715 [264.4]
KD2000/ KD2250/ KD2500	KH09270TO4D	27033 [59598]	3597 [141.6]	6958 [273.9]
KD2000/ KD2250/ KD2500	KH08430TO4D	24205 [53363]	3362 [132.4]	6715 [264.4]

ALL VIEWS REPRESENTED WITH 50C RADIATOR







NOTES:
1) DIMENSIONS IN [ ] ARE ENGLISH EQUIVALENTS.

2) IF AN ENCLOSURE IS USED THE FUEL LINE MUST BE STUBBED UP FROM DIRECTLY UNDER THE UNIT. REFER TO ENCLOSURE ADV.

3) IF IBC OR OSHPD CERTIFICATION IS REQUIRED SEE SEISMIC ADV FOR INSTALLATION INSTRUCTIONS.

4) IF SUBBASE FUEL TANK AND/OR ENCLOSURE IS USED, REFER TO SUBBASE FUEL TANK/ENCLOSURE ADV TO DETERMINE MOUNTING LOCATIONS.

KD2000, KD2250, KD2500
KD62V12

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
K	9APR2019	(A-2) TOLERANCES REMOVED; (C-3)REDUNDANT RADIATOR LINES REMOVED [CT194818]	SUD
L	12-20-19	(C-3,2,1) RADIATOR DIMENSIONS TABLE REMOVED; (D-4,3) 50C RADIATOR NOTE ADDED; SHEET 2 ADDED; CONTENT FROM SHEET 2,3,4,5,6,7 & 8 MOVED TO 3,4,5,6,7,8 & 9 RESPECTIVELY; SEE SHEET 2 & 3 [CT200775]	SLR
M	19MAY2020	(D-8,-7,-6) CONTROLLER CALLOUT, 1702 [67.0], 680 [26.8] & 335 [13.2] ADDED; SEE SHEET 3 [CT204162]	PAR
N	10AUG2021	SHEET 10 ADDED; SEE SHEET 5 [CT213945]	RVM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN MILLIMETERS GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-29-16
CHECKED	WDG	11-29-16
APPROVED	WDG	11-29-16

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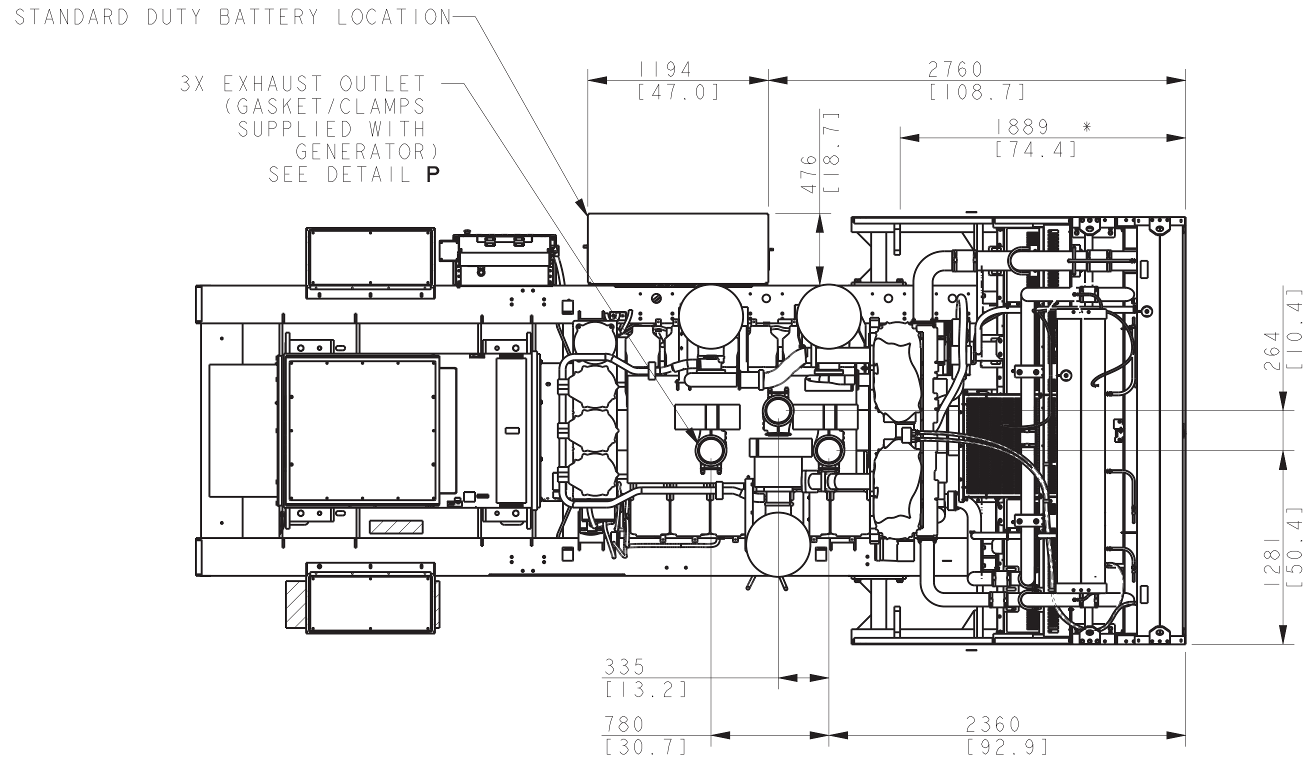
TITLE DIMENSIONAL PRINT, KD2000-2500

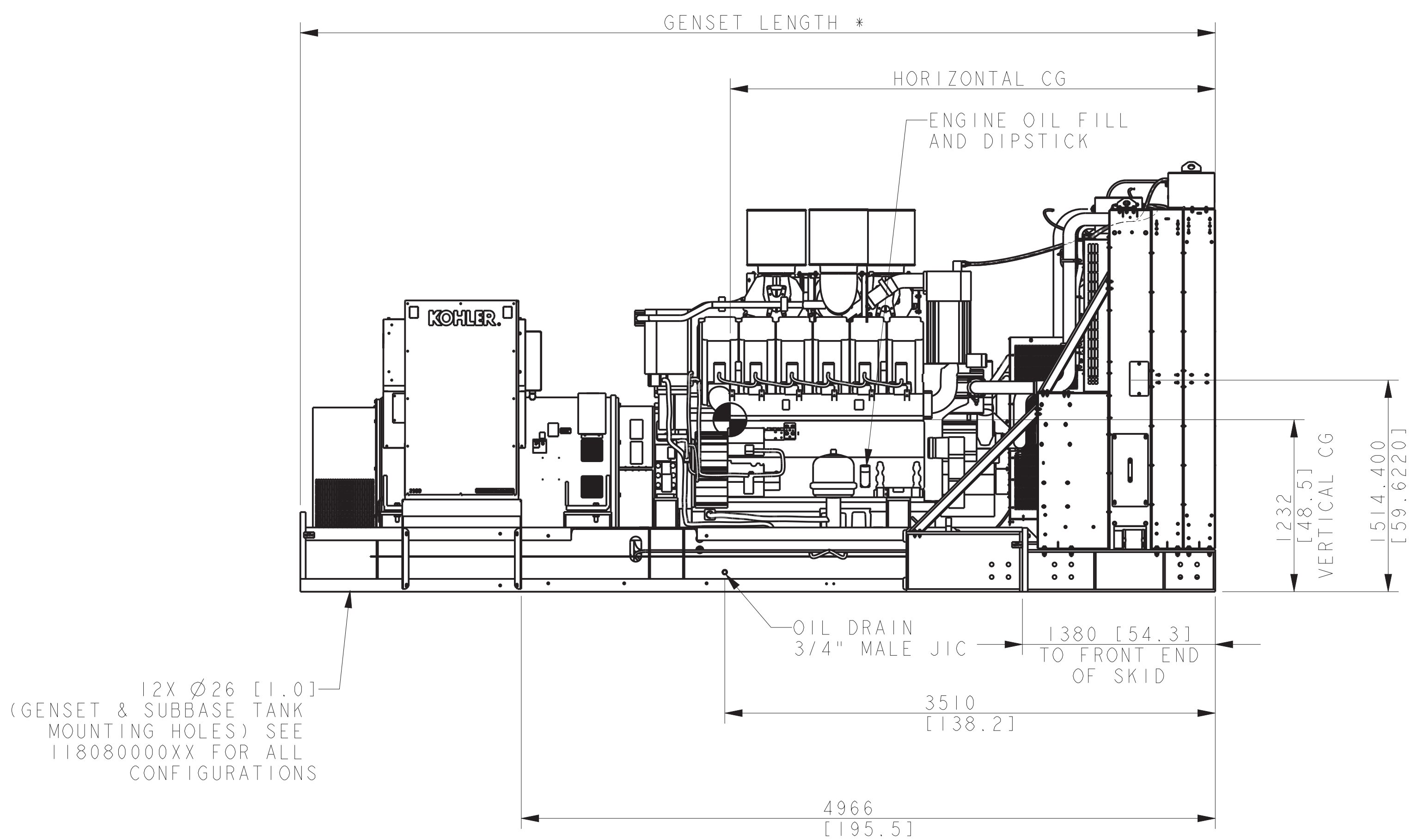
SCALE 0.04 CAD NO. SHEET 1 of 10

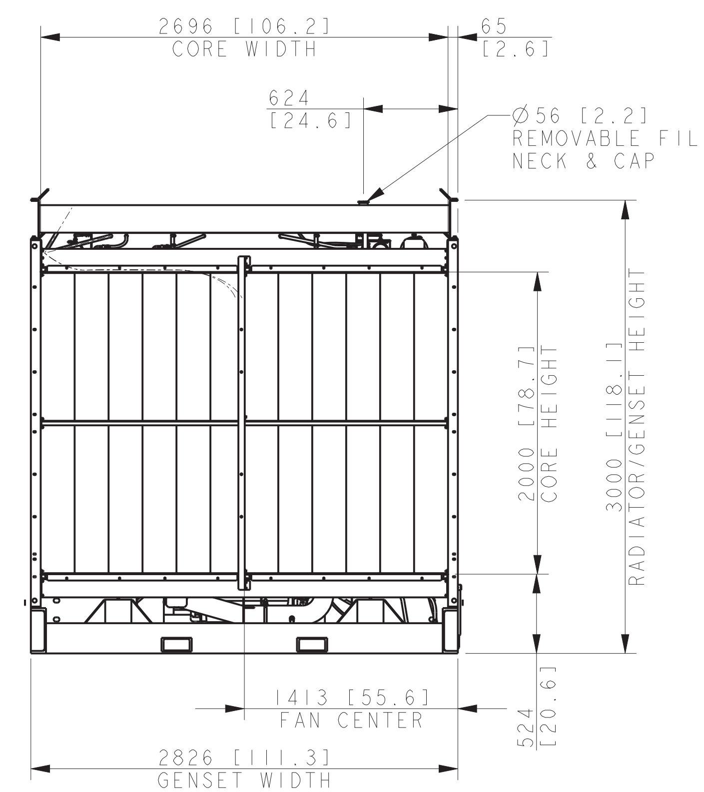
DWG NO. ADV-8925 D

MODEL	ALTERNATOR	GENSET MAXIMUM WEIGHT (WET) KG [LB]	HORIZONTAL CG (WET) MM [IN]	GENSET LENGTH MM [IN]
KD2000	KH04970TO4D	22417 [49422]	2952 [116.2]	6053 [238.3]
KD2000	KH07080TO4D	25447 [56101]	3277 [129.0]	6796 [267.5]
KD2000/ KD2250	KH05790TO4D	22940 [50574]	3009 [118.4]	6053 [238.3]
KD2000/ KD2250	KH06220TO4D	22936 [50565]	3040 [119.7]	6553 [258.0]
KD2000/ KD2250	KH07630TO4D	25859 [57010]	3310 [130.3]	6553 [258.0]
KD2250/ KD2500	KH08100TO4D	26883 [59266]	3405 [134.0]	6796 [267.5]
KD2000/ KD2250/ KD2500	KH06930TO4D	23471 [51744]	3060 [120.4]	6053 [238.3]
KD2000/ KD2250/ KD2500	KH07000TO4D	23486 [51778]	3095 [121.8]	6553 [258.0]
KD2000/ KD2250/ KD2500	KH07770TO4D	23881 [52648]	3164 [124.5]	6553 [258.0]
KD2000/ KD2250/ KD2500	KH09270TO4D	27033 [59598]	3435 [135.2]	6796 [267.5]
KD2000/ KD2250/ KD2500	KH08430TO4D	24205 [53363]	3200 [126.0]	6553 [258.0]

ALL VIEWS REPRESENTED WITH 40C RADIATOR







*40C GENERATOR LIFT POINTS

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
L	12-18-19	VIEWS FOR 40C RADIATOR ADDED, SEE SHEET 1 & 3 [CT200775]	SLR
M	19MAY2020	SEE SHEET 1 & 3 [CT204162]	PAR
N	10AUG2021	SEE SHEET 5 [CT213945]	RVM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: X.XX ± 0.25, X.X ± 1.0, X ± 1.5, ANGLES ± 0°30'
SURFACE FINISH MAX.
THIRD ANGLE PROJECTION

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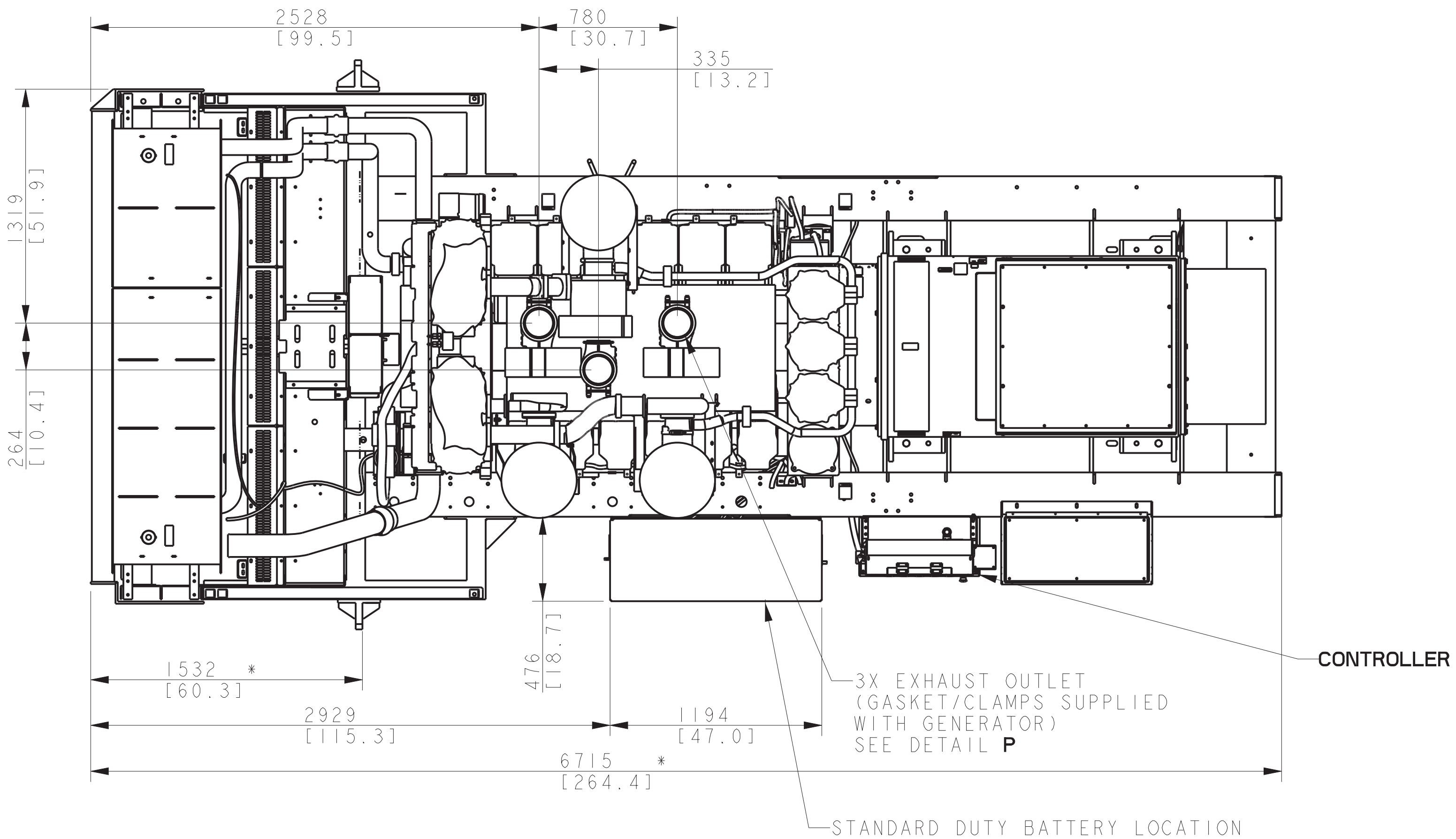
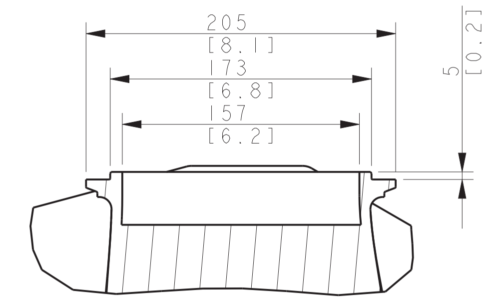
TITLE: DIMENSIONAL PRINT, KD2000-2500

APPROVALS		DATE
DRAWN	BGW	12-18-19
CHECKED	WDG	12-18-19
APPROVED	WDG	12-18-19

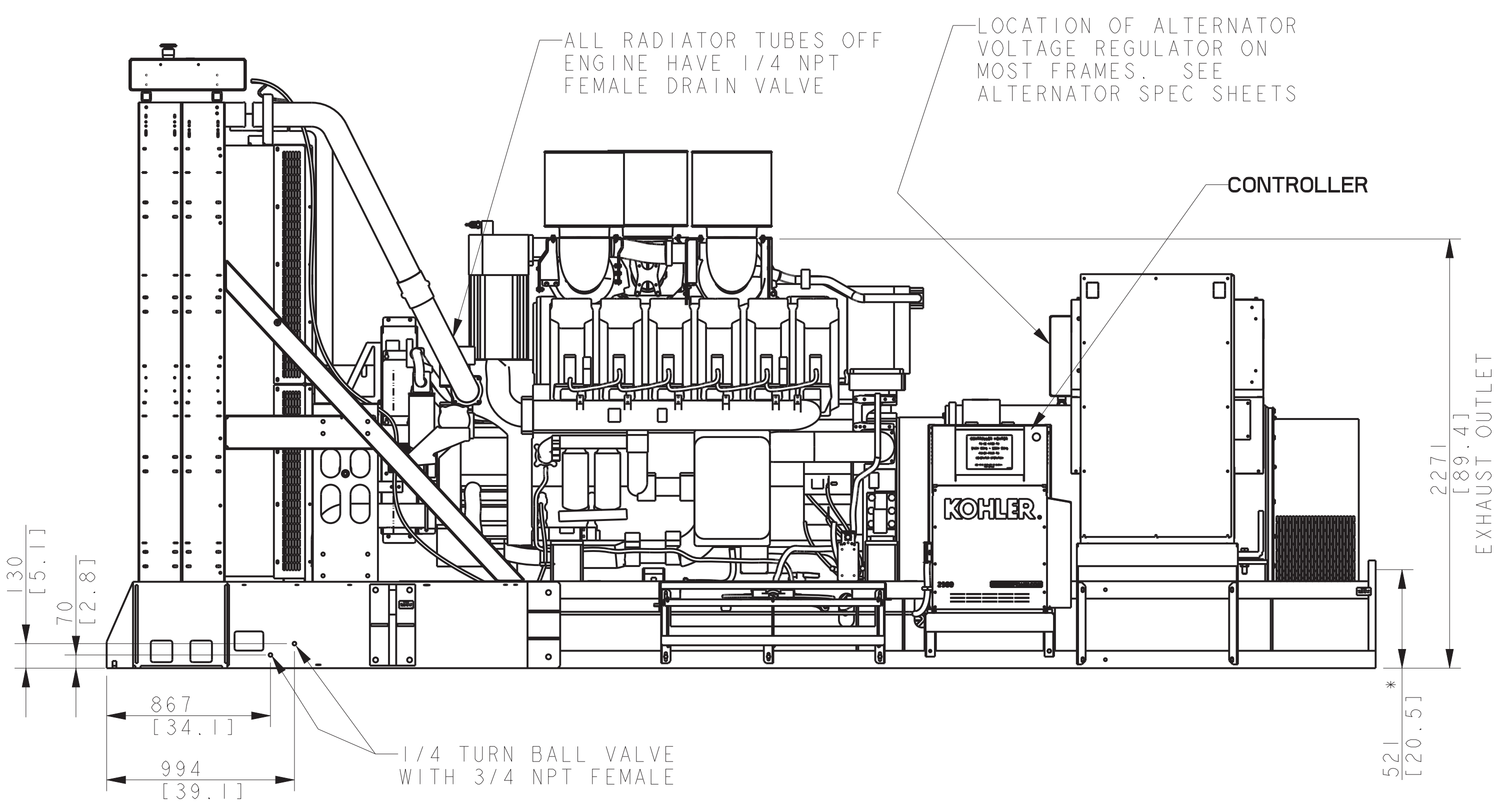
SCALE 0.04 | CAD NO. | SHEET 2 of 10

DWG NO. ADV-8925 D





DETAIL P
SCALE 0.40



KD2000, KD2250, KD2500
KD62V12

VIEWS SHOWN WITH 50C RADIATOR
* 50C GENERATOR RADIATOR LIFT POINTS

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
G	4-4-18	SEE SHEET 4 & 5 [CT186192]	SSS
H	12-5-18	SEE SHEET 3 [CT192176]	ADP
J	1-17-19	SEE SHEET 1 & 3 [PR07774]	BGW
K	9APR2019	(A-2) TOLERANCES REMOVED [CT194818]	SUD
L	12-20-19	CONTENTS OF SHEET 2 MOVED TO THIS SHEET, (A-2) 50C	
		RADIATOR NOTE ADDED; (C-4,3) GENERATOR LIFT POINTS	
		NOTE REMOVED; SEE SHEET 1 & 2 [CT200775]	SLR
M	19MAY2020	(B,C-4) CONTROLLER CALLOUT ADDED; SEE SHEET	
		1 [CT204162]	PAR
N	10AUG2021	SEE SHEET 5 [CT213945]	RVM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-29-16
CHECKED	WDG	11-29-16
APPROVED	WDG	11-29-16

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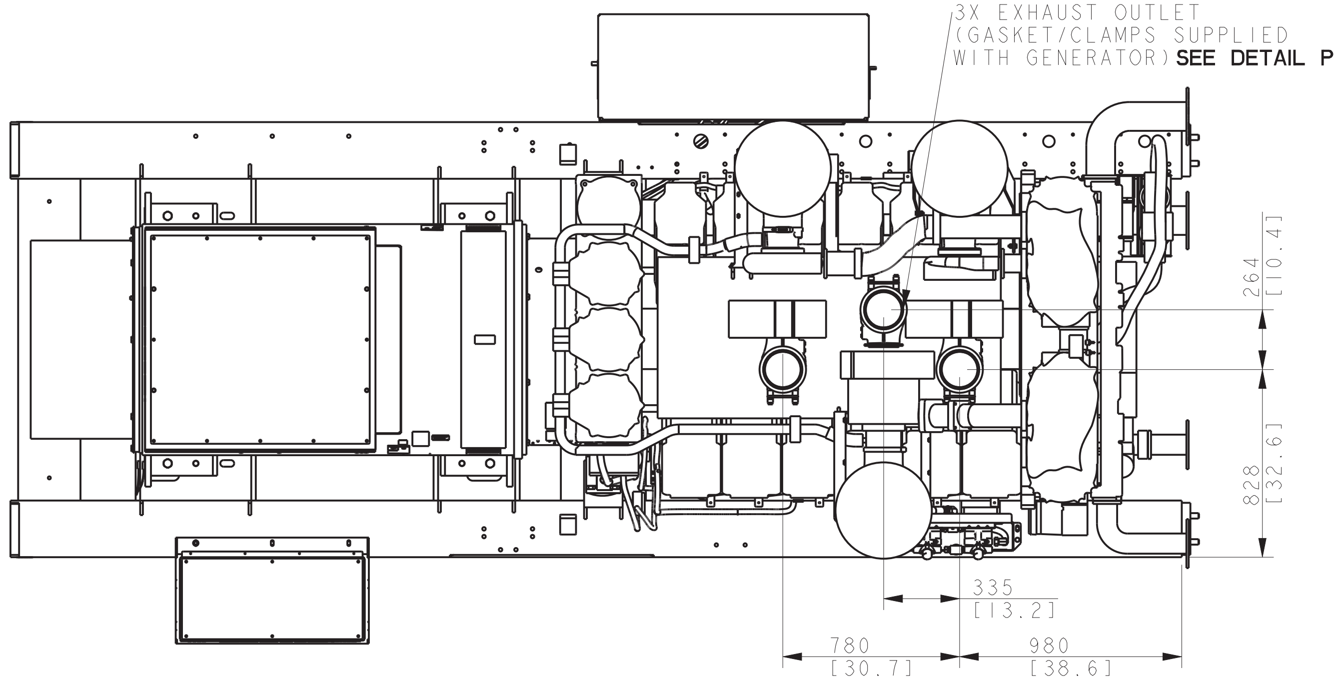
TITLE DIMENSIONAL PRINT,
KD2000-2500

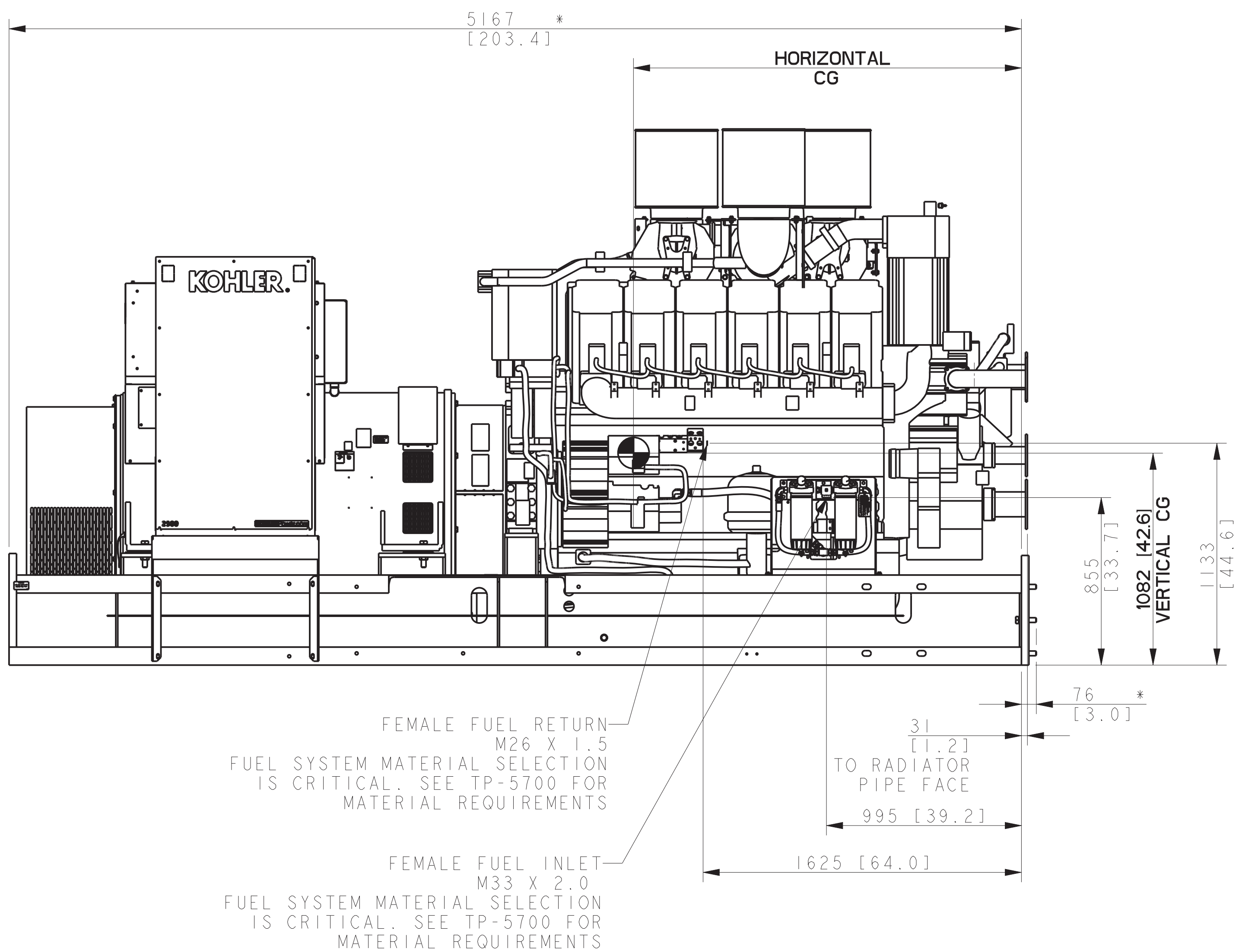
SCALE 0.05 | CAD NO. | SHEET 3 of 10

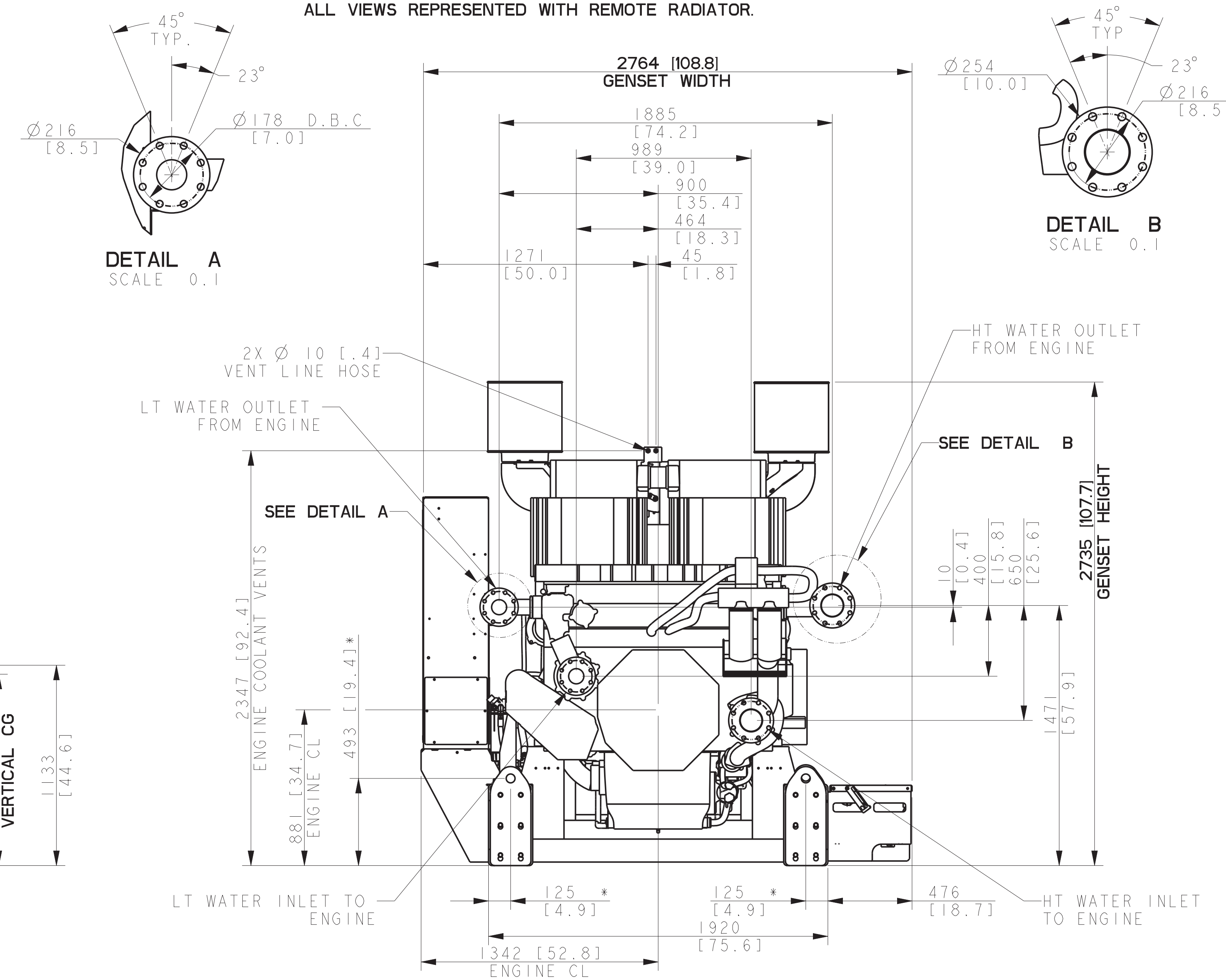
DWG NO. ADV-8925 | D

MODEL	ALTERNATOR	GENSET MAXIMUM WEIGHT (WET) KG [LB]	HORIZONTAL CG (WET) MM [IN]	GENSET LENGTH MM [IN]
KD2000	KH04970TO4D	18487 [40758]	2041 [80.4]	4667 [183.7]
KD2000	KH07080TO4D	21517 [47438]	2359 [92.9]	5410 [213.0]
KD2000/ KD2250	KH05790TO4D	19010 [41910]	2098 [82.6]	4667 [183.7]
KD2000/ KD2250	KH06220TO4D	19006 [41901]	2135 [84.0]	5167 [203.4]
KD2000/ KD2250	KH07630TO4D	21929 [48346]	2389 [94.0]	5167 [203.4]
KD2250/ KD2500	KH07000TO4D	19556 [43114]	2187 [86.1]	5167 [203.4]
KD2250/ KD2500	KH08100TO4D	22953 [50602]	2479 [97.6]	5410 [213.0]
KD2000/ KD2250/ KD2500	KH06930TO4D	19541 [43081]	2145 [84.5]	4667 [183.7]
KD2000/ KD2250/ KD2500	KH07770TO4D	19957 [43998]	2259 [88.9]	5167 [203.4]
KD2000/ KD2250/ KD2500	KH09270TO4D	23103 [50934]	2512 [98.9]	5410 [213.0]
KD2000/ KD2250/ KD2500	KH08430TO4D	20037 [44174]	3840 [151.2]	6715 [264.4]

ALL VIEWS REPRESENTED WITH REMOTE RADIATOR.







* REMOTE RADIATOR GENERATOR LIFT POINTS

KD2000, KD2250, KD2500
KD62V12

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
G	4-4-18	SEE SHEET 4 & 5 [CT186192]	SSS
H	12-5-18	(D-5,6,7) TOP VIEW ADDED, EXHAUST OUTLET	
		DIM. ADDED [CT192176]	ADP
J	1-17-19	SEE SHEET 1 OF 8, (D-1) KH07630TO4D: 5167	
		[203.4] WAS 5410 [213.0] [PR07774]	BGW
K	9APR2019	(A-2) TOLERANCES REMOVED [CT194818]	SUD
L	12-20-19	CONTENTS OF SHEET 3 MOVED TO THIS SHEET, SEE	
		SHEET 1, 2 & 3 [CT200775]	SLR
M	19MAY2020	SEE SHEET 1 & 3 [CT204162]	PAR
N	10AUG2021	SEE SHEET 5 [CT213945]	RVM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-29-16
CHECKED	WDG	11-29-16
APPROVED	WDG	11-29-16

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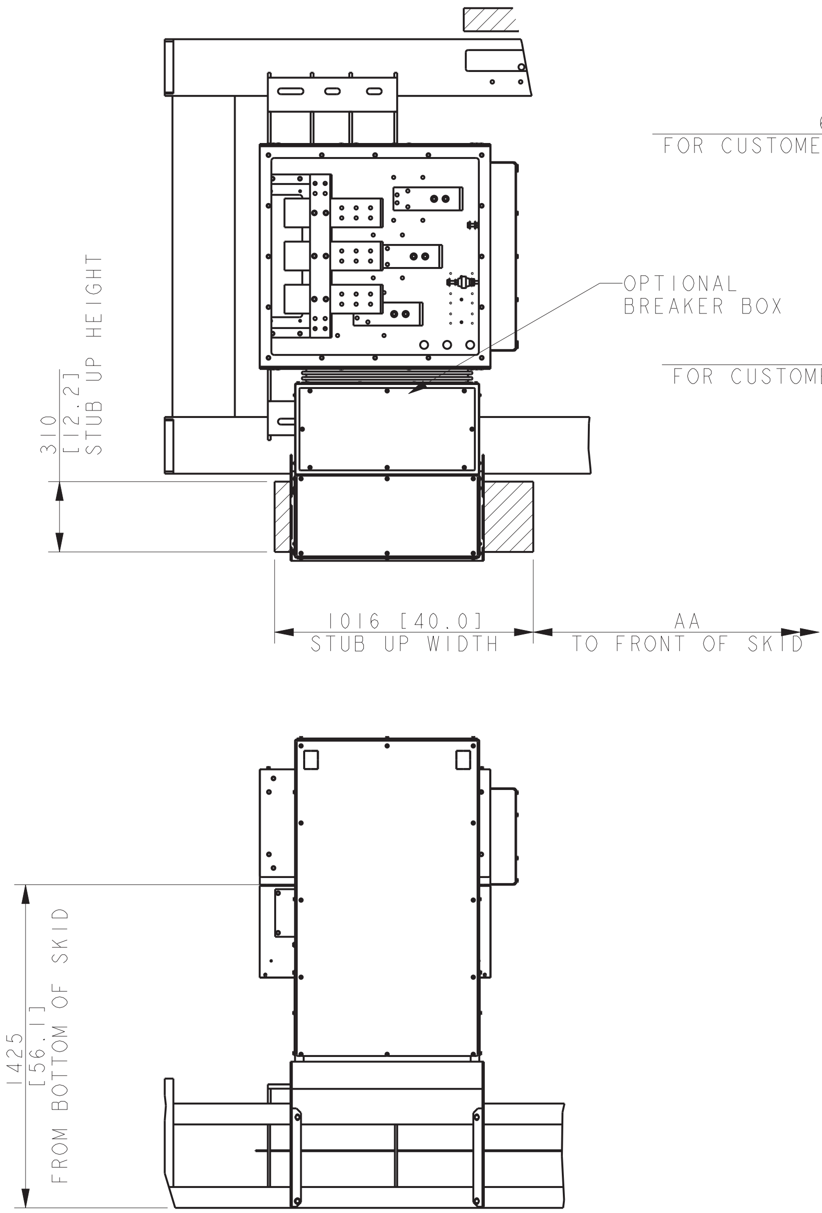
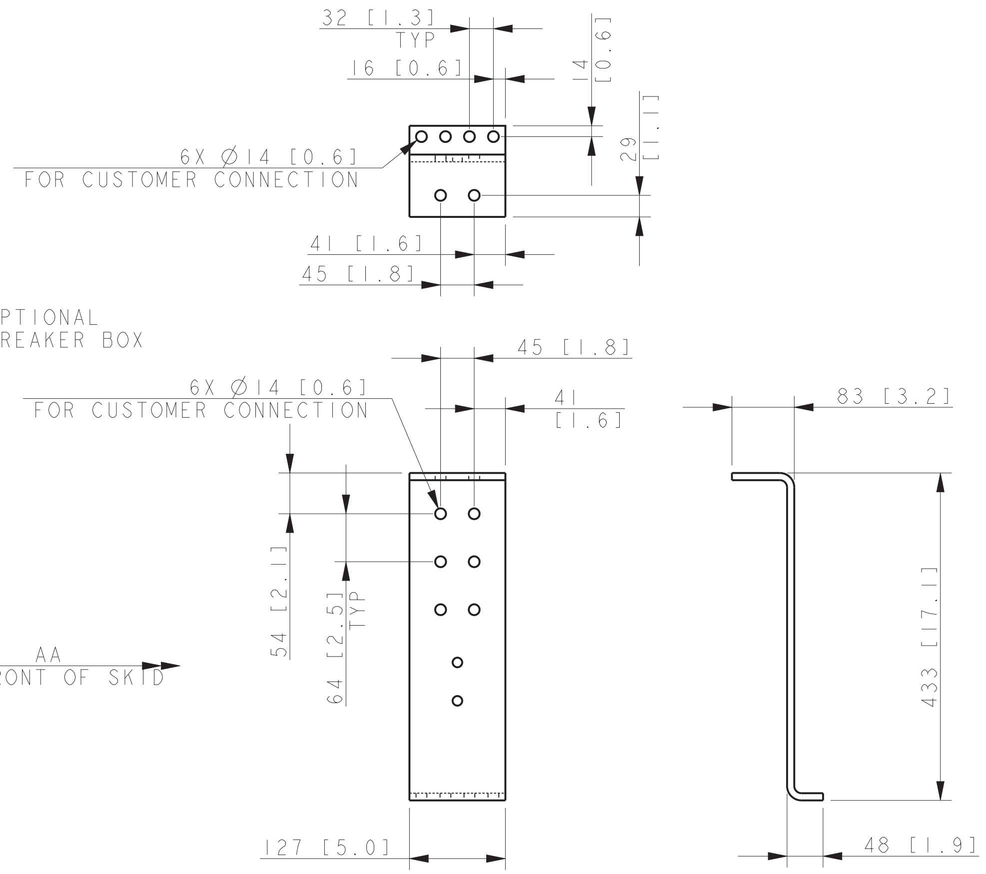
TITLE DIMENSIONAL PRINT, KD2000-2500

SCALE 0.06 | CAD NO. | SHEET 4 of 10

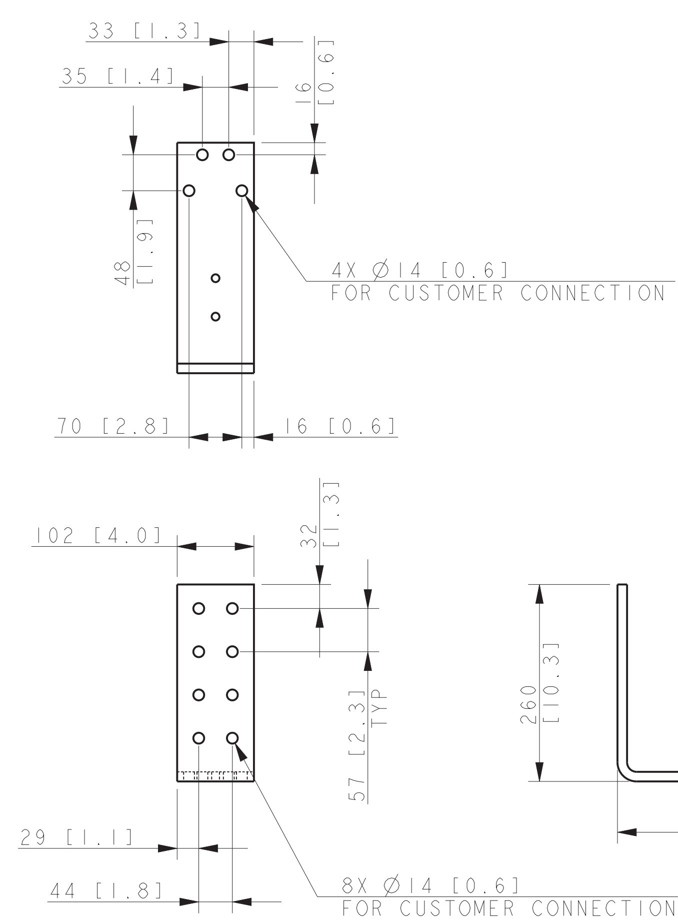
DWG NO. ADV-8925 D

LOW VOLTAGE 380V, 600V		
ALTERNATOR	AA	AB
KH08430TO4D	3556 [140]	1420 [56]

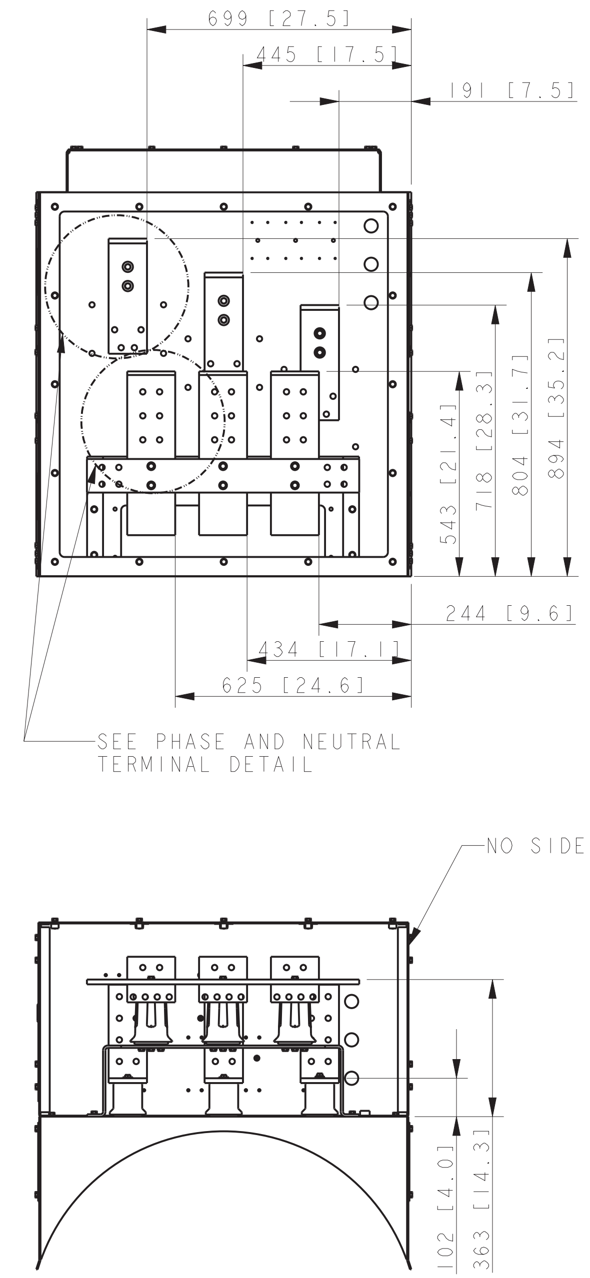


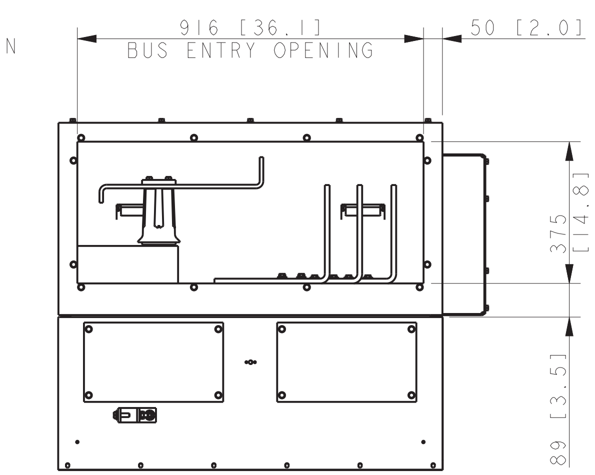


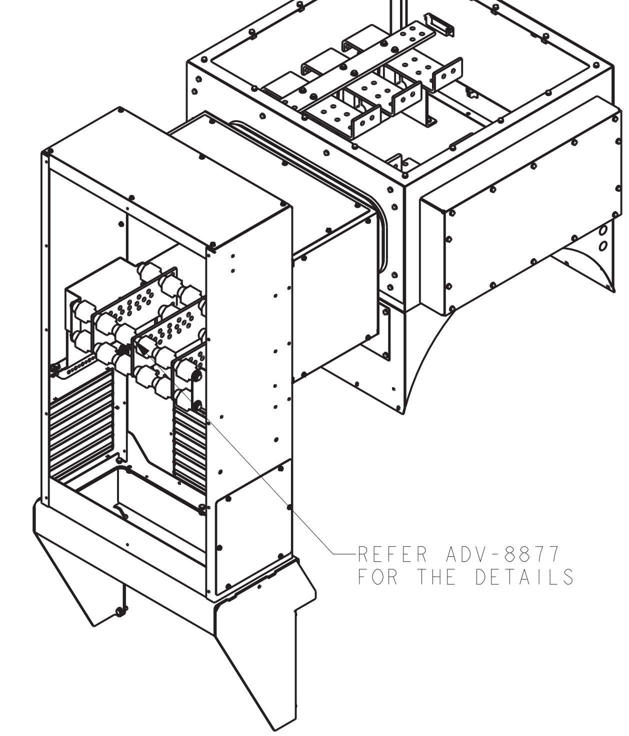
NEUTRAL TERMINAL DETAIL



PHASE TERMINAL DETAIL







OPTIONAL BUS BAR JUNCTION BOX

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
H	12-5-18	SEE SHEET 3 [CT192176]	ADP
J	1-17-19	SEE SHEET 1 & 3 [PR07774]	BGW
K	9APR2019	(A-2) TOLERANCES REMOVED [CT194818]	SUD
L	12-20-19	CONTENTS OF SHEET 4 MOVED TO THIS SHEET, SEE	
		SHEET 1, 2 & 3 [CT200775]	SLR
M	19MAY2020	SEE SHEET 1 & 3 [CT204162]	PAR
N	10AUG2021	LV ALTERNATOR CONNECTION DETAILS ADDED &	
		OPTIONAL BUS BAR J-BOX VIEW ADDED; MV	
		ALTERNATOR VIEWS AND TABLE MOVED TO SHEET 6	
		[CT213945]	RVM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	4-3-18
CHECKED	WDG	4-3-18
APPROVED	WDG	4-3-18

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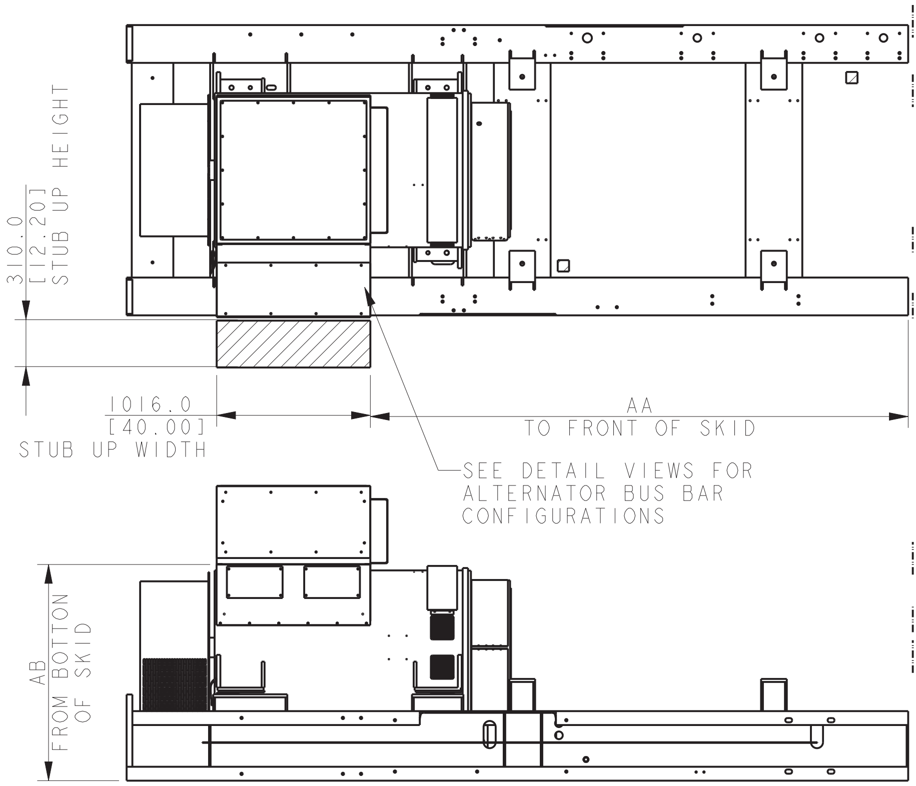
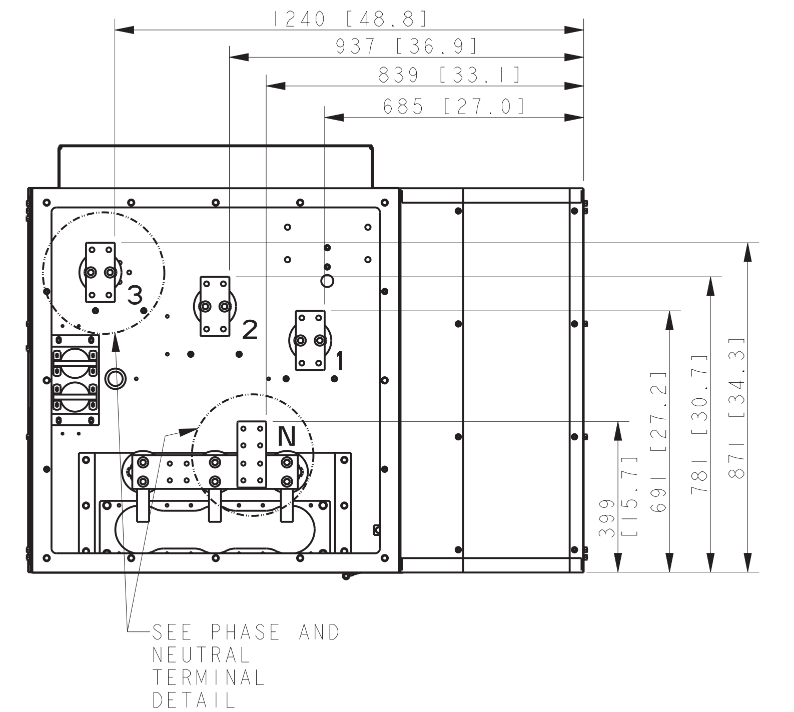
TITLE DIMENSIONAL PRINT, KD2000-2500

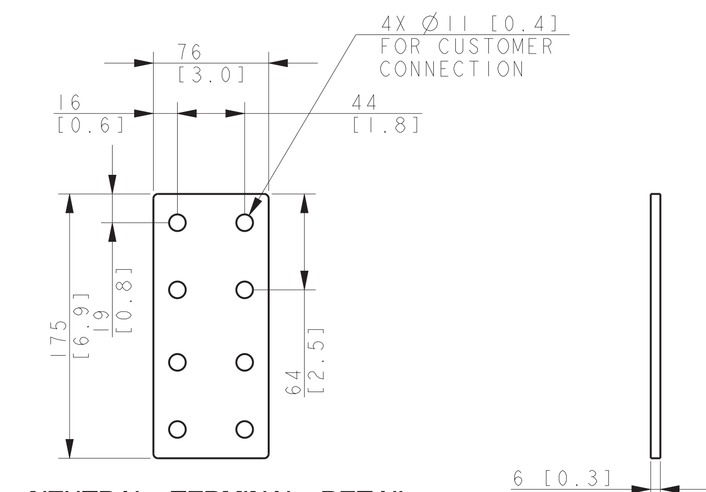
SCALE 0.04 | CAD NO. | SHEET 5 of 10

DWG NO. ADV-8925 | D

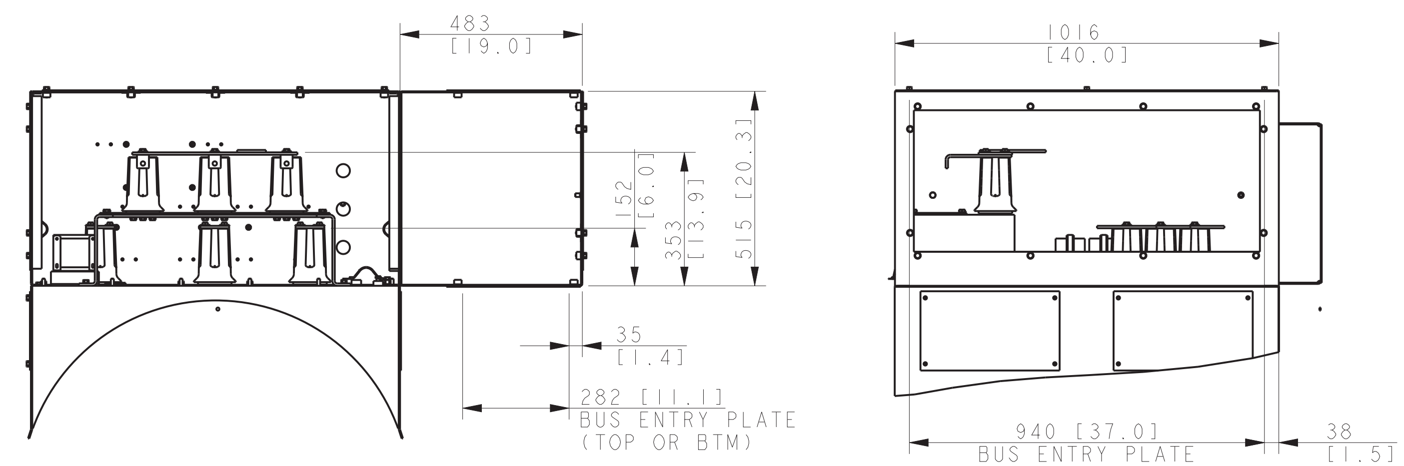


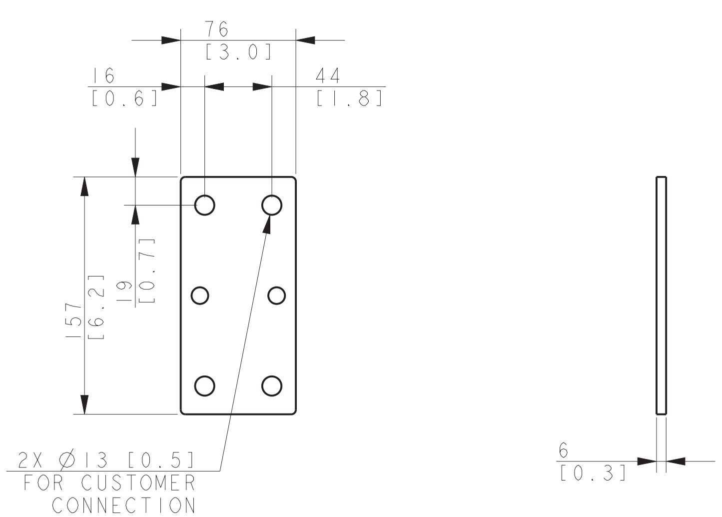
MEDIUM VOLTAGE 3300V, 4160V		
ALTERNATOR	AA	AB
KH07770TO4D	3556 [140]	1420 [56]
KH08430TO4D	3556 [140]	1420 [56]
KH07000TO4D	3416 [134]	1420 [56]
KH06220TO4D	3416 [134]	1420 [56]





NEUTRAL TERMINAL DETAIL





PHASE TERMINAL DETAIL

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
H	12-5-18	SEE SHEET 3 [CT192176]	ADP
J	1-17-19	SEE SHEET 1 & 3 [PR07774]	BGW
K	9APR2019	(A-2) TOLERANCES REMOVED [CT194818]	SUD
L	12-20-19	CONTENTS OF SHEET 5 MOVED TO THIS SHEET, SEE SHEET 1, 2 & 3 [CT200775]	SLR
M	19MAY2020	SEE SHEET 1 & 3 [CT204162]	PAR
N	10AUG2021	ALL CONTENT MOVED TO SHEET 7; SEE SHEET 5 [CT213945]	RVM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-16-17
CHECKED	WDG	11-16-17
APPROVED	WDG	11-16-17

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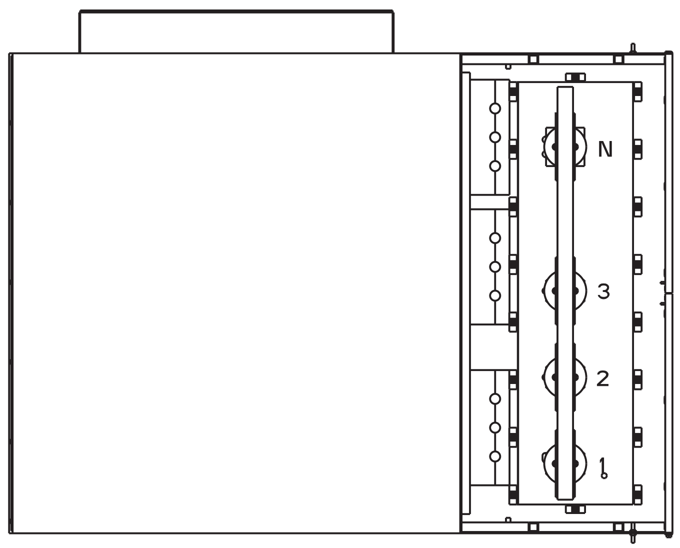
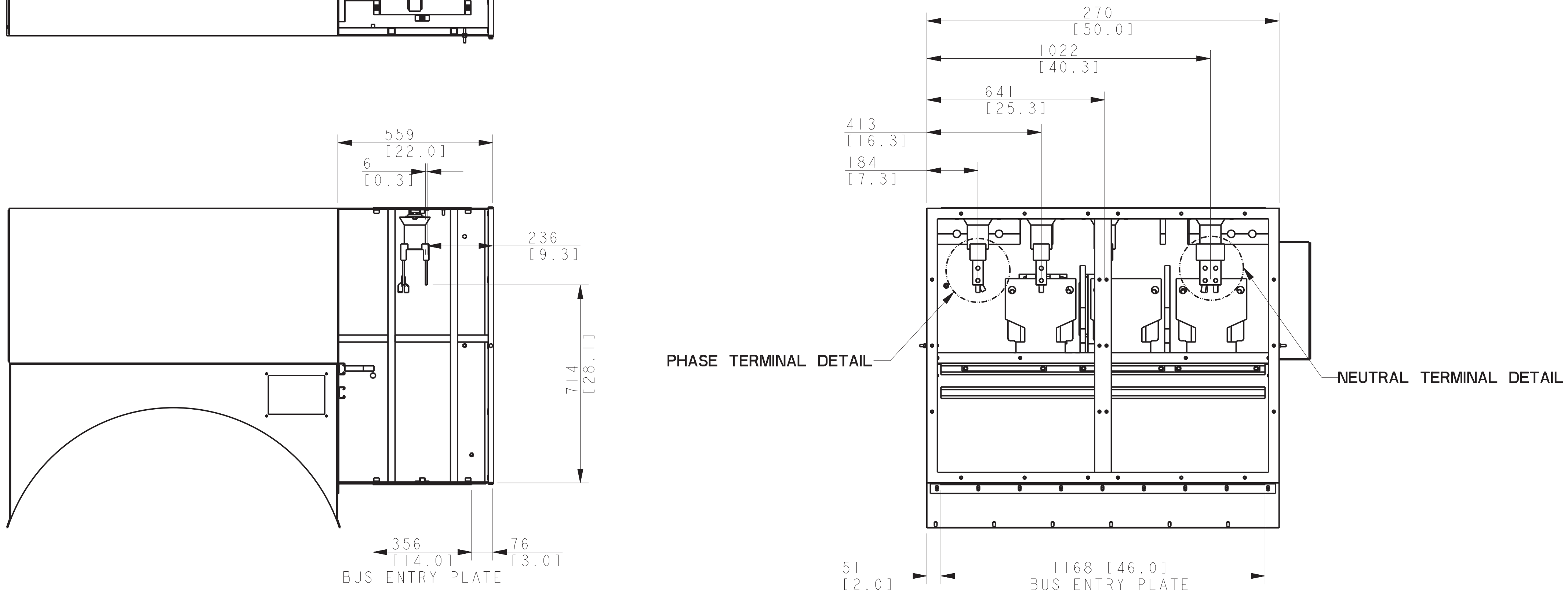
TITLE DIMENSIONAL PRINT, KD2000-2500

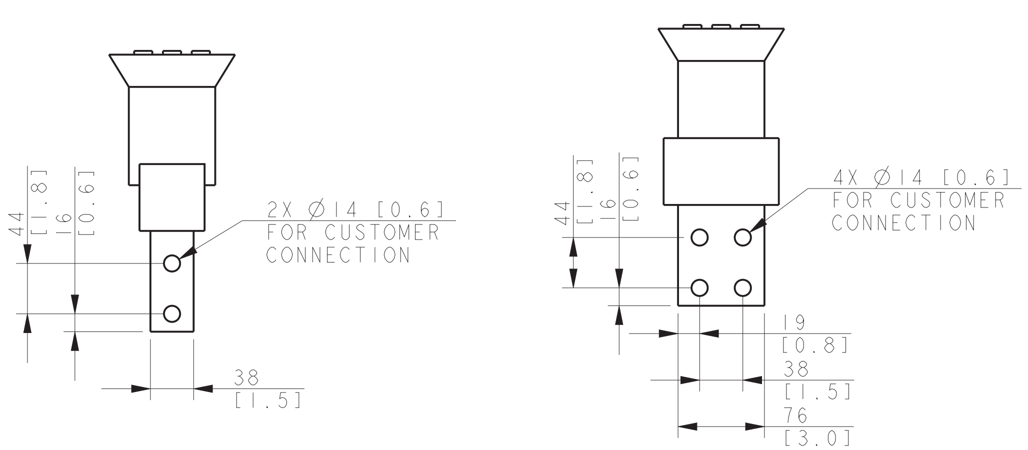
SCALE 0.30 CAD NO. SHEET 6 of 10

DWG NO. ADV-8925 D

ALTERNATOR	VOLTAGE	AA	AB
KH08100TO4D	12470 V, 13200V, 13800V	3445 [136]	1145 [45]
KH09270TO4D	6600V	3546 [140]	1145 [45]
KH09270TO4D	11000V, 12470V, 13200V, 13800V	3546 [140]	1145 [45]
KH08100TO4D	6600V, 11000V	3445 [136]	1145 [45]
KH07630TO4D	6600V	3442 [136]	1145 [45]
KH07630TO4D	11000V, 12470V, 13200V, 13800V	3442 [136]	1145 [45]
KH07080TO4D	6600V	3440 [135]	1145 [45]
KH07080TO4D	11000V, 12470V, 13200V, 13800V	3440 [135]	1145 [45]







PHASE TERMINAL DETAIL

NEUTRAL TERMINAL DETAIL

KD2000, KD2250, KD2500
KD62V12

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
G	4-4-18	CONTENTS OF SHEET 4 MOVED TO THIS SHEET, SEE SHEET 4 & 5 [CT186192]	SSS
H	12-5-18	SEE SHEET 3 [CT192176]	ADP
J	1-17-19	SEE SHEET 1 & 3 [PR07774]	BGW
K	9APR2019	(A-2) TOLERANCES REMOVED [CT194818]	SUD
L	12-20-19	CONTENTS OF SHEET 6 MOVED TO THIS SHEET, SEE SHEET 1, 2 & 3 [CT200775]	SLR
M	19MAY2020	SEE SHEET 1 & 3 [CT204162]	PAR
N	10AUG2021	ALL CONTENT MOVED TO SHEET 8; SEE SHEET 5 [CT213945]	RVM

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UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-29-16
CHECKED	WDG	11-29-16
APPROVED	WDG	11-29-16

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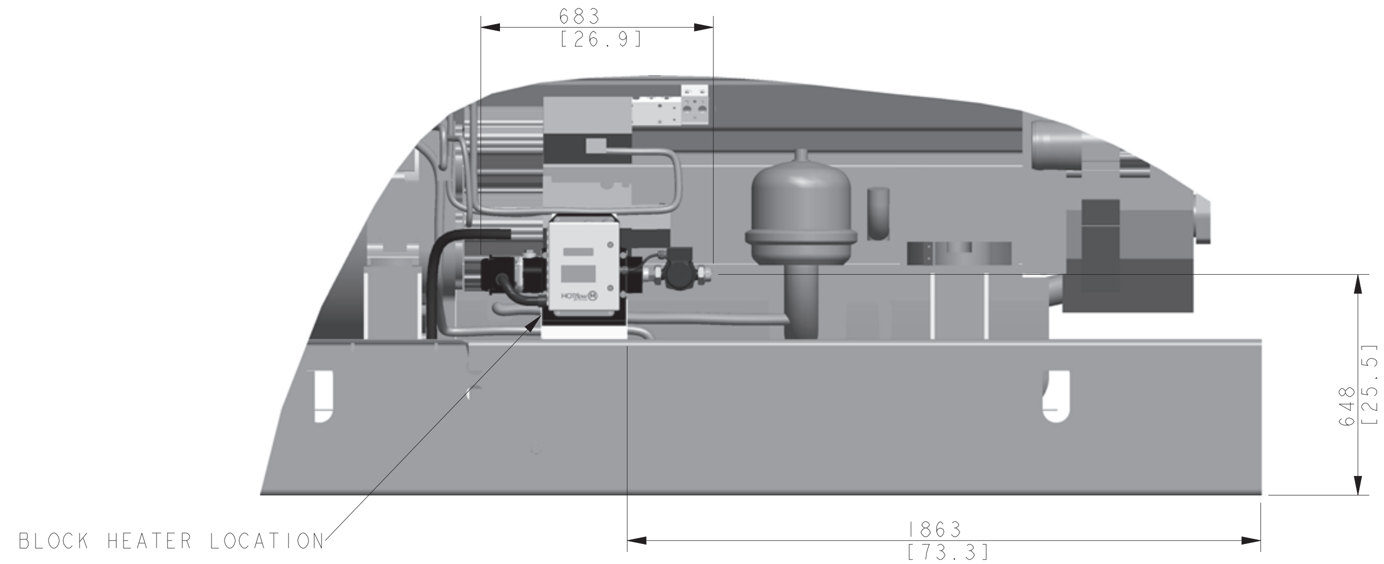
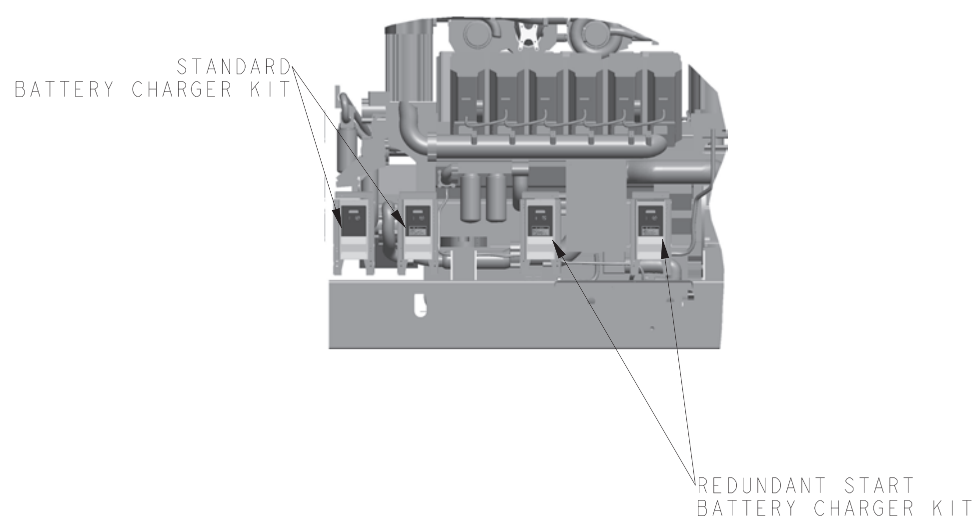
TITLE DIMENSIONAL PRINT, KD2000-2500

SCALE 0.10 | CAD NO. | SHEET 7 of 10

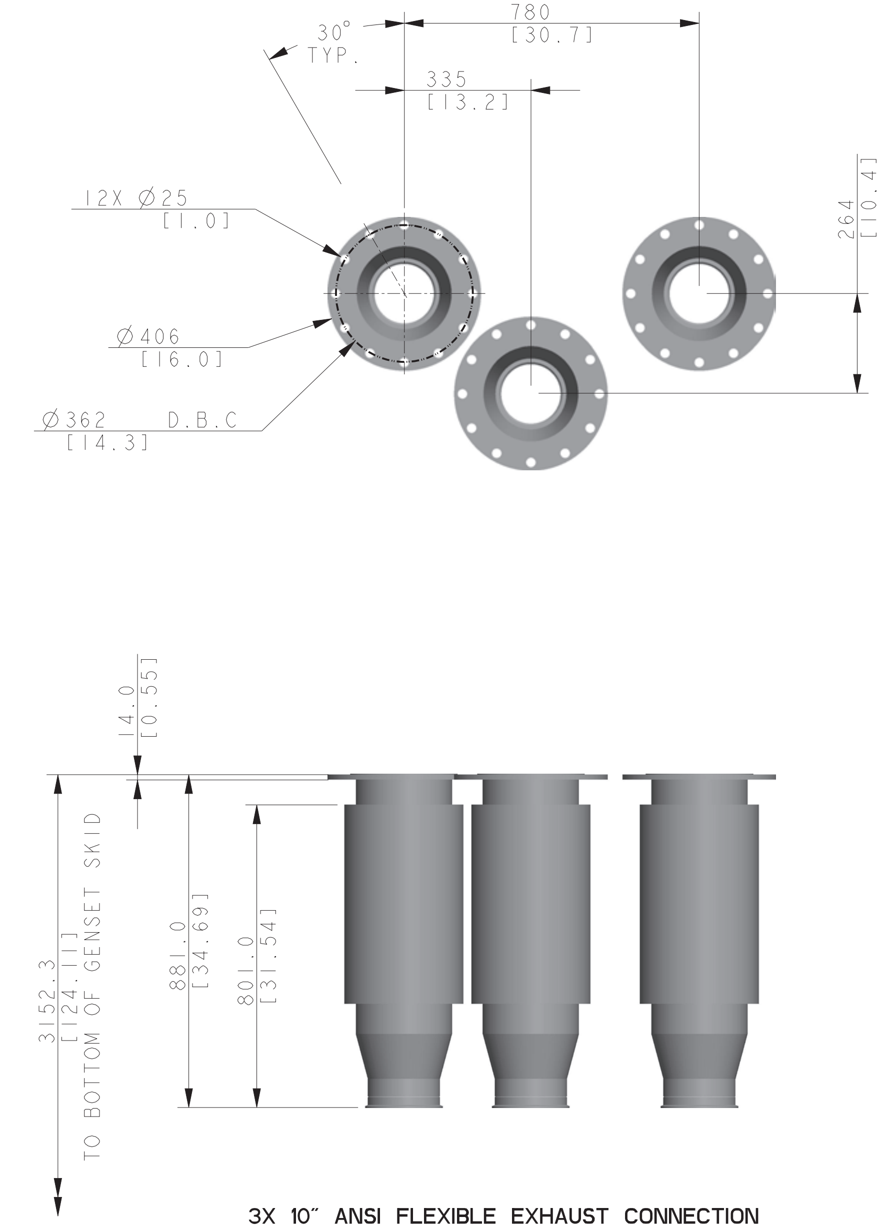
DWG NO. ADV-8925 D



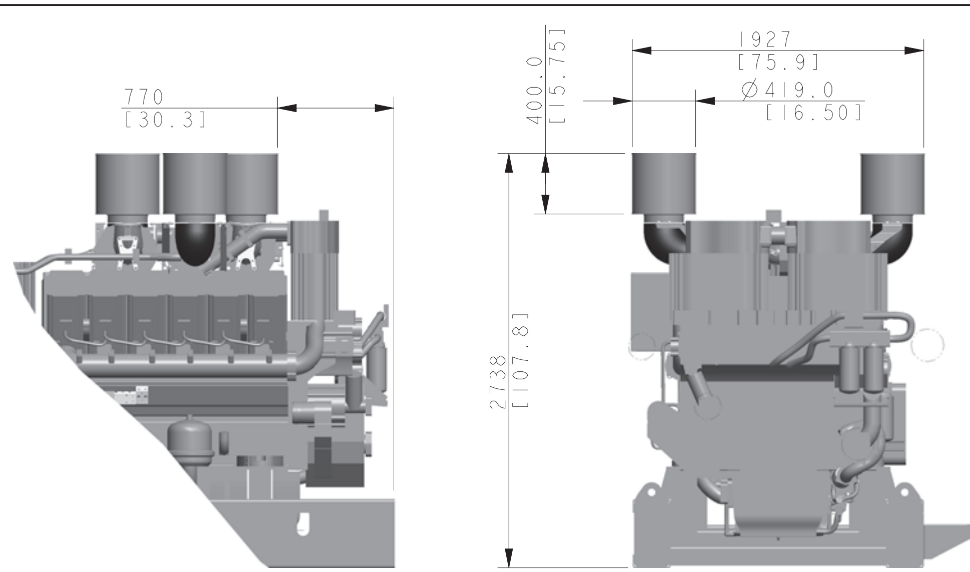
BLOCK HEATER



BATTERY CHARGER KITS



3X 10" ANSI FLEXIBLE EXHAUST CONNECTION



STANDARD DUTY AIR CLEANER

NOTE:
FLEXIBLE EXHAUST TO BE FULLY SUPPORTED BY EXTERNAL STRUCTURE (*ALLOWED BENDING MOMENT AT EXHAUST FLANGE INTERFACE LESS THAN 75Nm*)

KD2000, KD2250, KD2500
KD62V12

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
G	4-4-18	CONTENTS OF SHEET 5 MOVED TO THIS SHEET, SEE	
		SHEET 4 & 5 [CT186192]	SSS
H	12-5-18	SEE SHEET 3 [CT192176]	ADP
J	1-17-19	SEE SHEET 1 & 3 [PR07774]	BGW
K	9APR2019	(A-2) TOLERANCES REMOVED [CT194818]	SUD
L	12-20-19	CONTENTS OF SHEET 7 MOVED TO THIS SHEET, SEE	
		SHEET 1, 2 & 3 [CT200775]	SLR
M	19MAY2020	SEE SHEET 1 & 3 [CT204162]	PAR
N	10AUG2021	ALL CONTENT MOVED TO SHEET 9; SEE SHEET 5	RVM
		[CT213945]	

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-29-16
CHECKED	WDG	11-29-16
APPROVED	WDG	11-29-16

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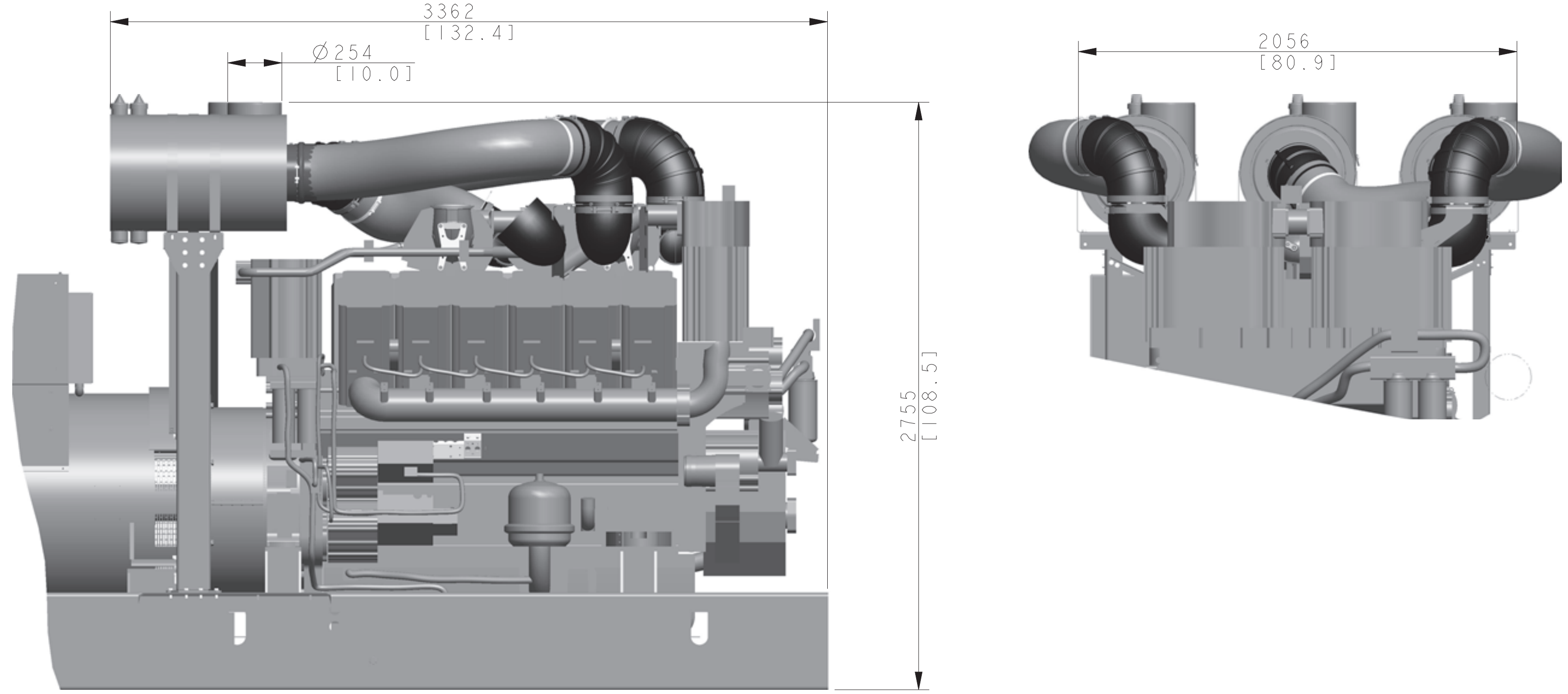
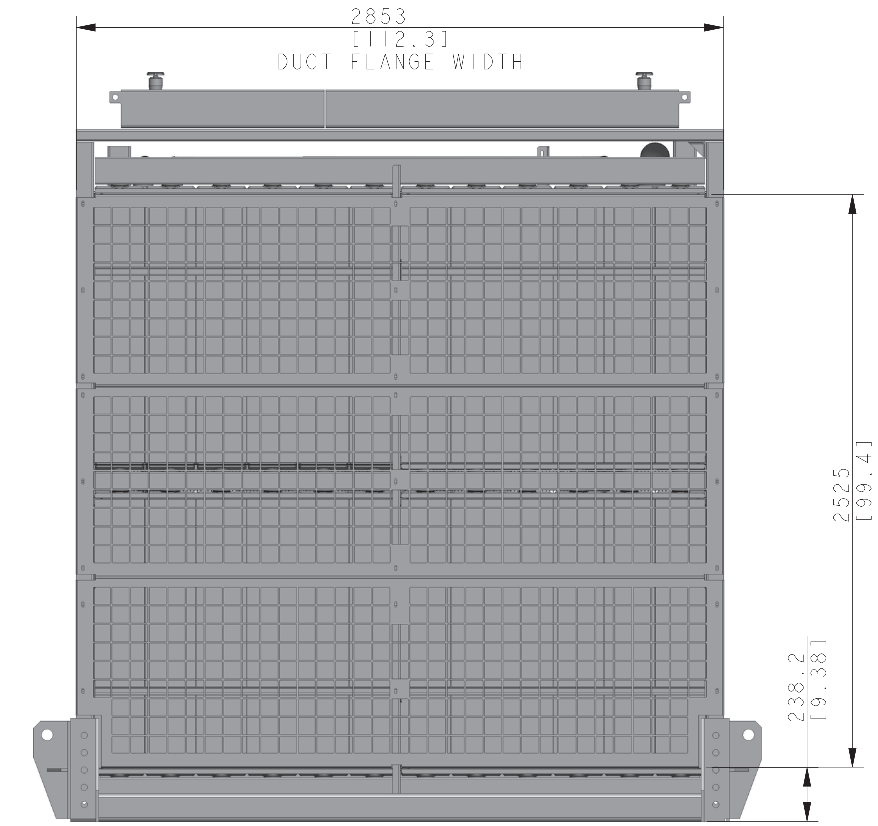
TITLE DIMENSIONAL PRINT, KD2000-2500

SCALE 0.04 | CAD NO. | SHEET 8 of 10

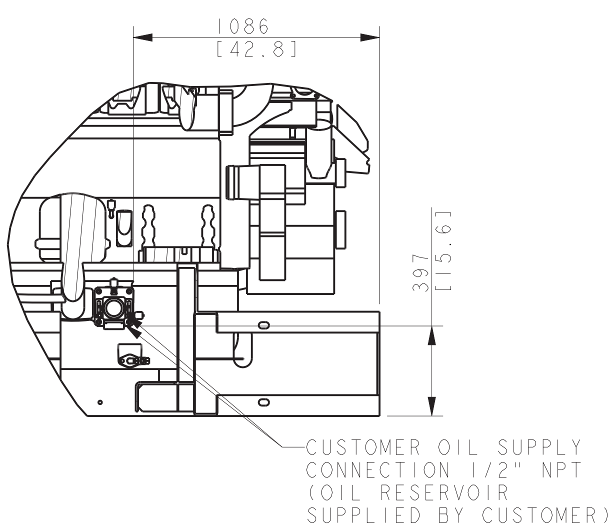
DWG NO. ADV-8925 D



HEAVY DUTY AIR CLEANER

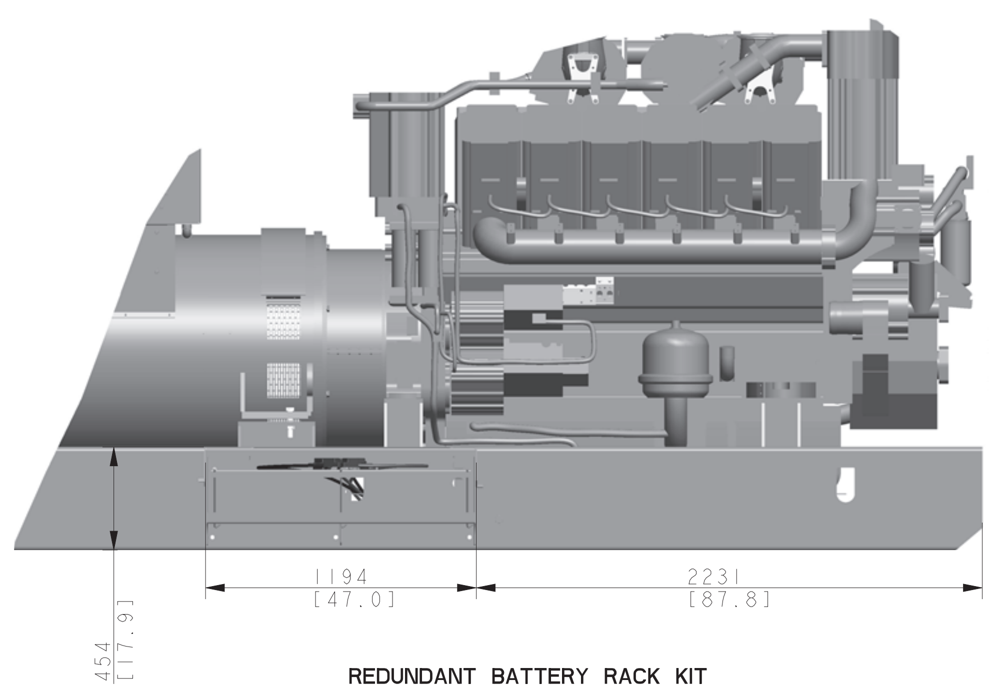


DUCT FLANGE AND STONE GUARD



AUTOMATIC OIL REPLENISHMENT SYSTEM

SECTION OIL-REG-OIL-REG



REDUNDANT BATTERY RACK KIT

KD2000, KD2250, KD2500
KD62V12

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
G	4-4-18	CONTENTS OF SHEET 6 MOVED TO THIS SHEET, SEE	
		SHEET 4 & 5 [CT186192]	SSS
H	12-5-18	SEE SHEET 3 [CT192176]	ADP
J	1-17-19	SEE SHEET 1 & 3 [PR07774]	BGW
K	9APR2019	(A-2) TOLERANCES REMOVED [CT194818]	SUD
L	12-20-19	CONTENTS OF SHEET 8 MOVED TO THIS SHEET, SEE	
		SHEET 1, 2 & 3 [CT200775]	SLR
M	19MAY2020	SEE SHEET 1 & 3 [CT204162]	PAR
N	10AUG2021	ALL CONTENT MOVED TO SHEET 10; SEE SHEET 5	
		[CT213945]	RVM

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UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-29-16
CHECKED	WDG	11-29-16
APPROVED	WDG	11-29-16

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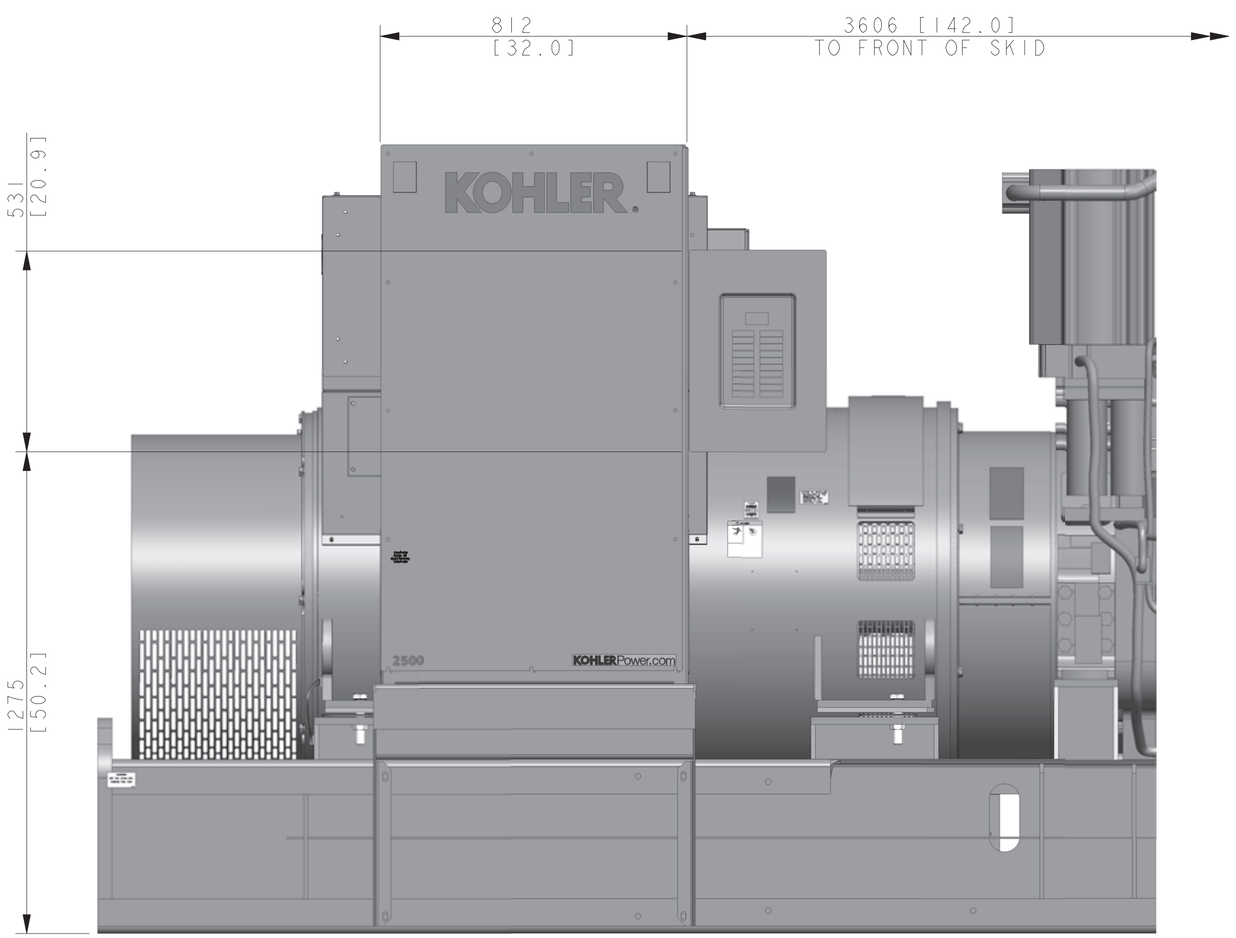
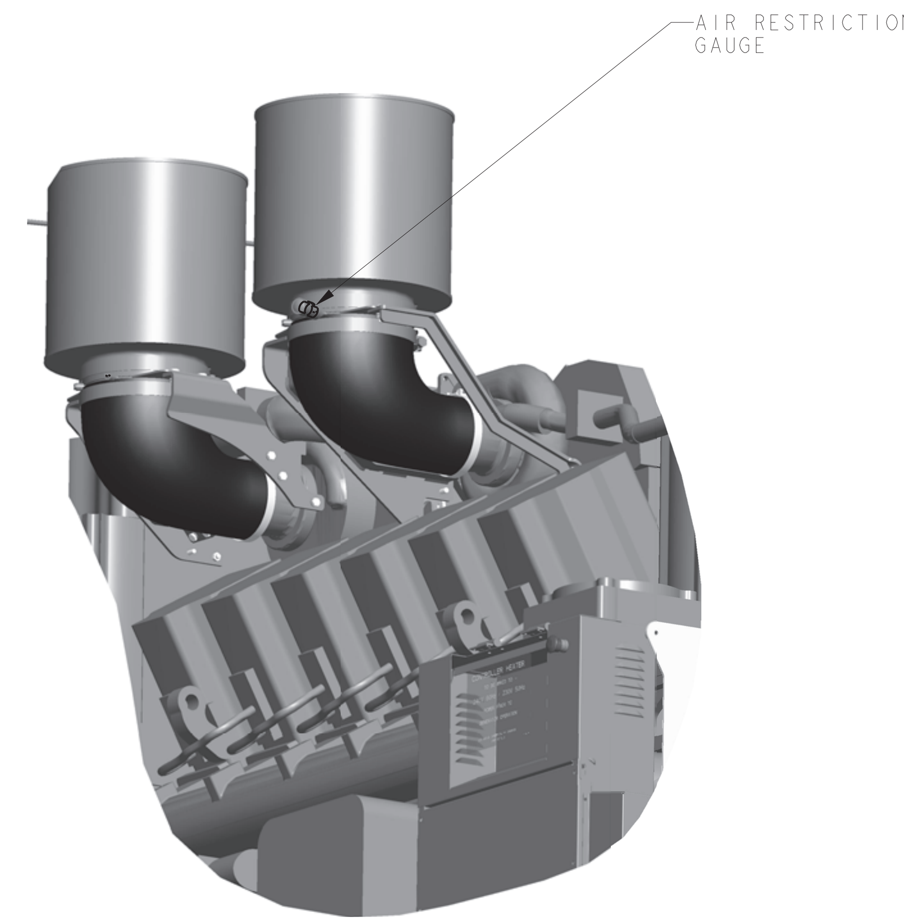
TITLE DIMENSIONAL PRINT, KD2000-2500

SCALE 0.06 | CAD NO. | SHEET 9 of 10

DWG NO. ADV-8925 D



BASIC ELECTRICAL PACKAGE (BEP) LOAD CENTER



AIR FILTER RESTRICTION INDICATOR

KD2000, KD2250, KD2500
KD62V12

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
N	10AUG2021	CONTENT FROM SHEET 9 MOVED TO THIS SHEET;	
		SEE SHEET 5 [CT213945]	RVM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	BGW	11-29-16
CHECKED	WDG	11-29-16
APPROVED	WDG	11-29-16

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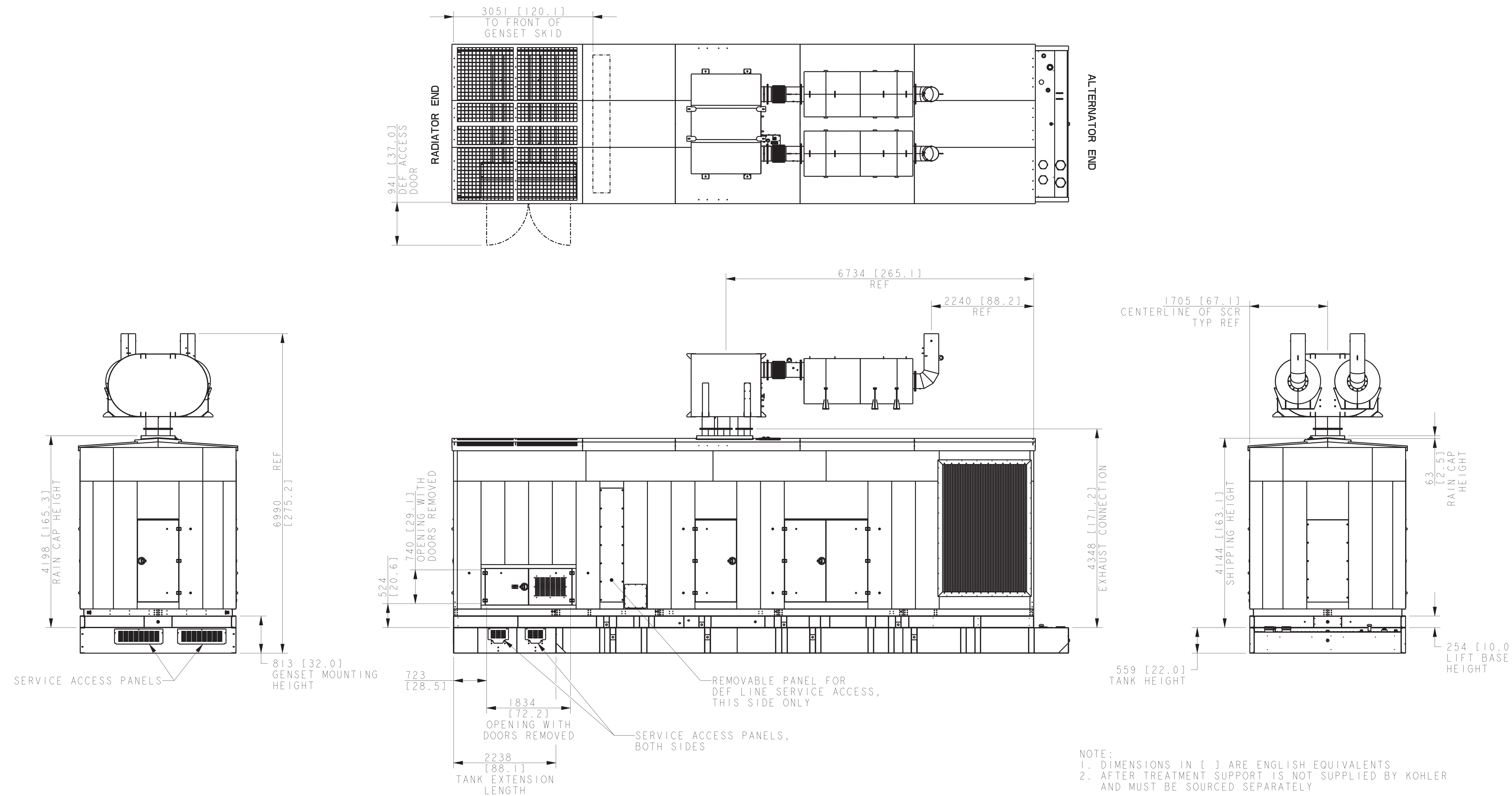
TITLE DIMENSIONAL PRINT, KD2000-2500

SCALE 0.06 | CAD NO. | SHEET 10 of 10

DWG NO. ADV-8925 D



NOTE:
1. DIMENSIONS IN [ ] ARE ENGLISH EQUIVALENTS
2. AFTER TREATMENT SUPPORT IS NOT SUPPLIED BY KOHLER AND MUST BE SOURCED SEPARATELY

*ENCLOSURE WEIGHT DOES NOT INCLUDE EXTERNAL EXHAUST COMPONENTS

ALUM. SL2 ENCLOSURE WEIGHT KG [LBS]	4518 [9960]

REFERENCE ENCLOSURE & TANK ADV-9075 FOR ADDITIONAL INFORMATION

EXHAUST COMPONENTS SHOWN FOR REFERENCE. REFER TO GENSET ADV-9163 FOR DETAILS

NON-TABLED DIMENSIONS ARE TYPICAL

PACKAGE INFORMATION		
TANK LITERS [GALLONS]	WEIGHT KG [LBS] (NO FUEL)	TANK EXTENSION WEIGHT KG [LBS]
SL2 LIFT BASE	2648 [5,838]	NA
14130 [3733]	8142 [17,952]	409 [901]

TANK EXTENSIONS NOT TO BE LIFTED WITH TANK AND/OR ENCLOSURE

KD2500-4 SL2 TIER 4
ENCLOSURE AND LIFTING BASE
WITH SUB BASE TANK OPTION

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
-	31JAN2020	NEW DRAWING [CT202014]	ZJS
A	14APR2020	(A-8) ADDED TIER 4 GENSET ADV REFERENCE NOTE; (B-7) ADDED GENSET MOUNTING HEIGHT; (D-6) ADDED DIMENSION TO FRONT OF GENSET SKID; (C-2) ADDED DIMENSION TO CENTERLINE OF SCR [CT203358]	ZJS
B	22OCT2020	(B-7) REF DIM 6990 ADDED [CT207157]	CEK
C	23JAN2023	(A-3) NOTE 2 ADDED [CT224851]	APM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN MILLIMETERS GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	ZJS	31JAN2020
CHECKED	KJB	31JAN2020
APPROVED	AJW	31JAN2020

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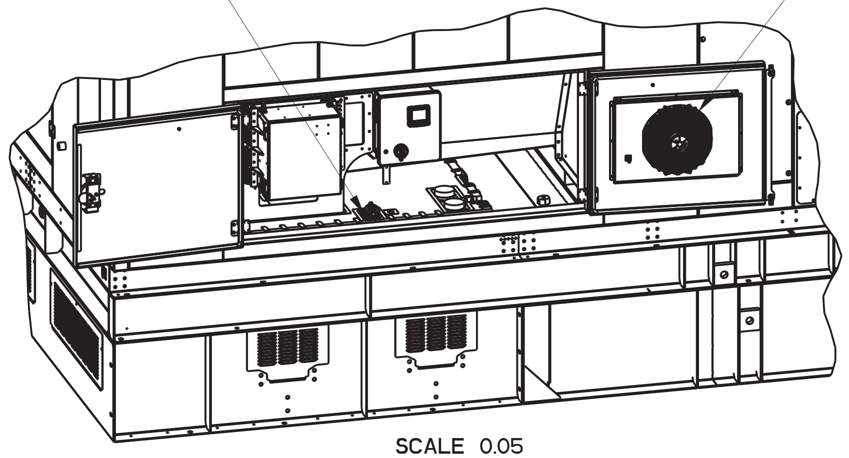
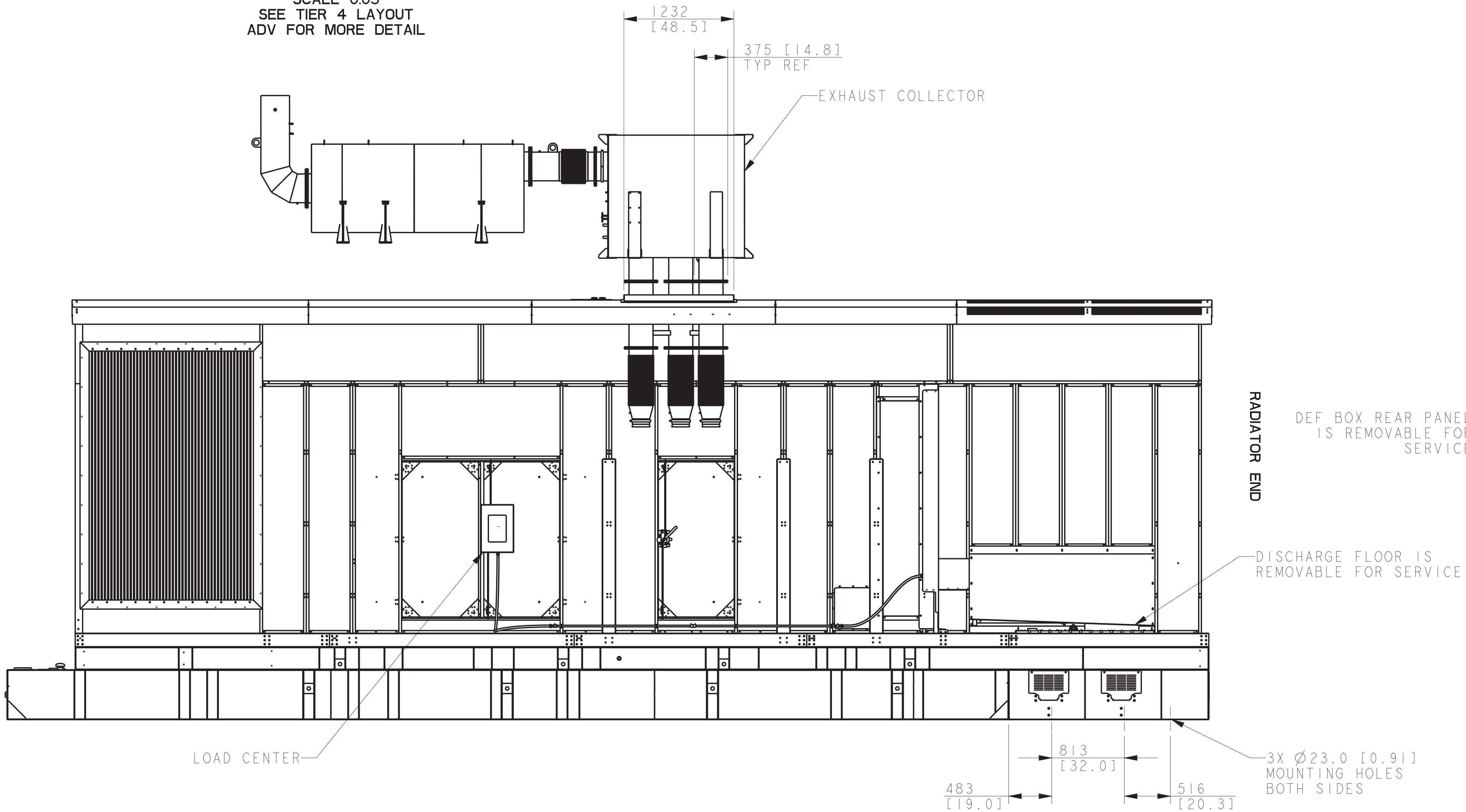
TITLE DIMENSION PRINT KD2500-4 TIER4 ENCL/TANK

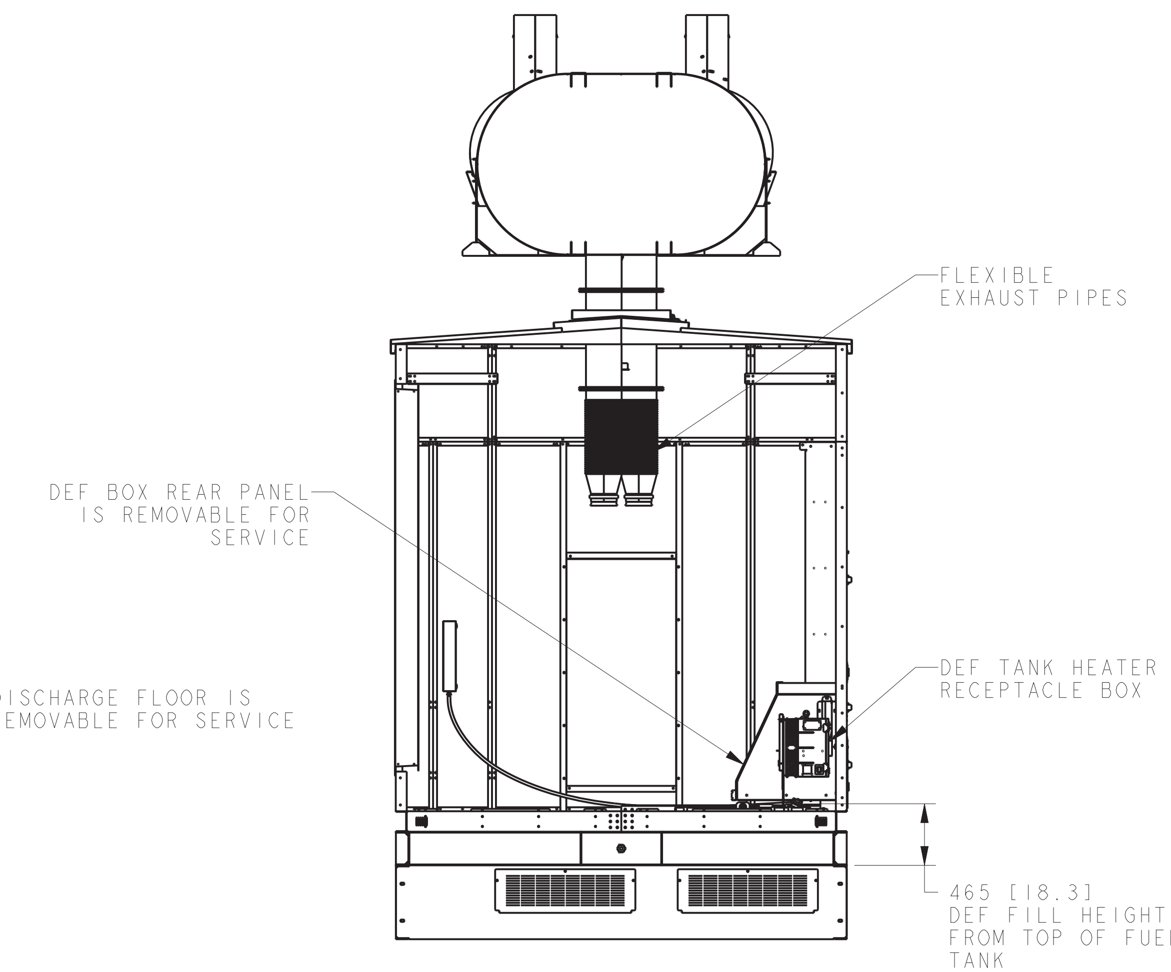
SCALE NA | CAD NO. | SHEET 1 of 3

DWG NO. ADV-9179 | D



SCALE 0.05
SEE TIER 4 LAYOUT
ADV FOR MORE DETAIL





SL2 EXTENSION MOUNTING,
ENCLOSURE COMPONENT LOCATION

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
-	31JAN2020	NEW DRAWING [CT202014]	ZJS
A	14APR2020	SEE SHEET 1 [CT203358]	ZJS
B	22OCT2020	SEE SHEET 1 [CT207157]	CEK
C	23JAN2023	SEE SHEET 1 [CT224851]	APM

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UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	ZJS	31JAN2020
CHECKED	KJB	31JAN2020
APPROVED	AJW	31JAN2020

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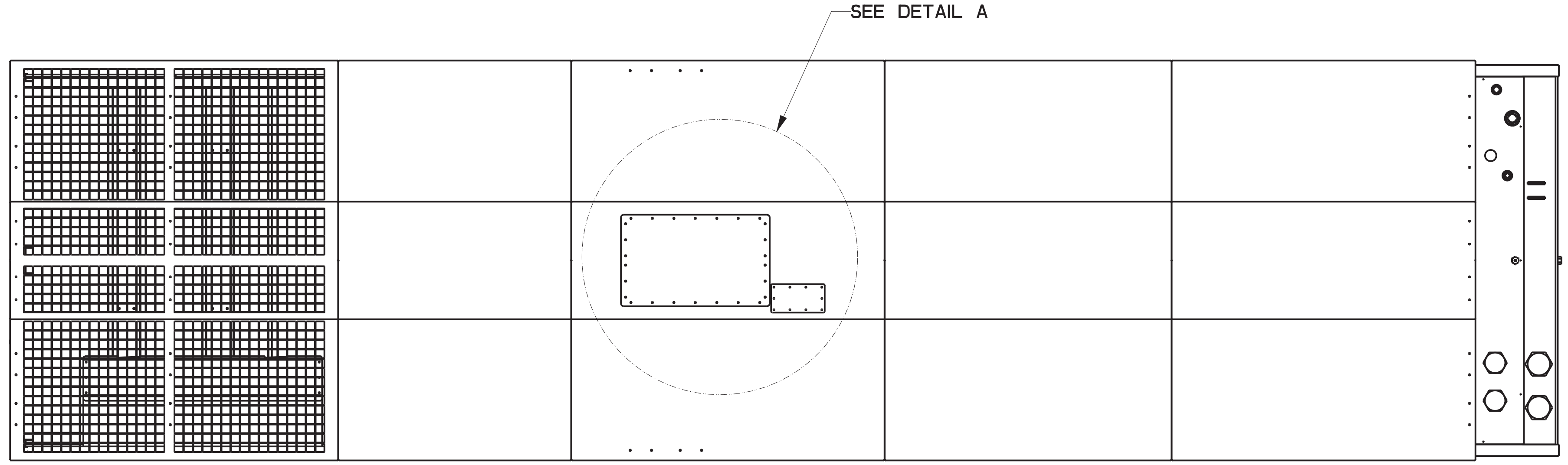
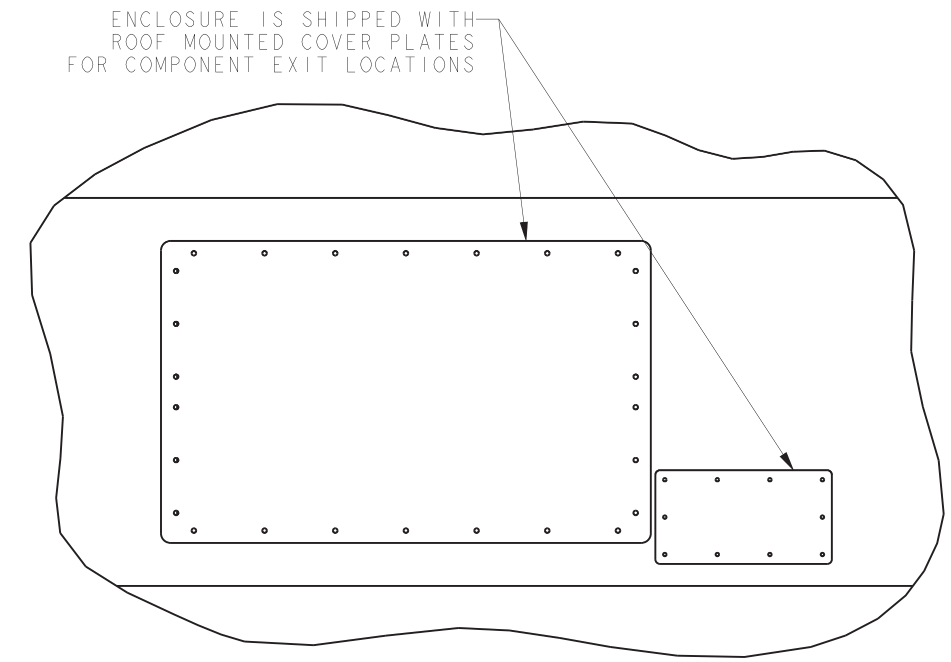
TITLE DIMENSION PRINT KD2500-4
TIER4 ENCL/TANK

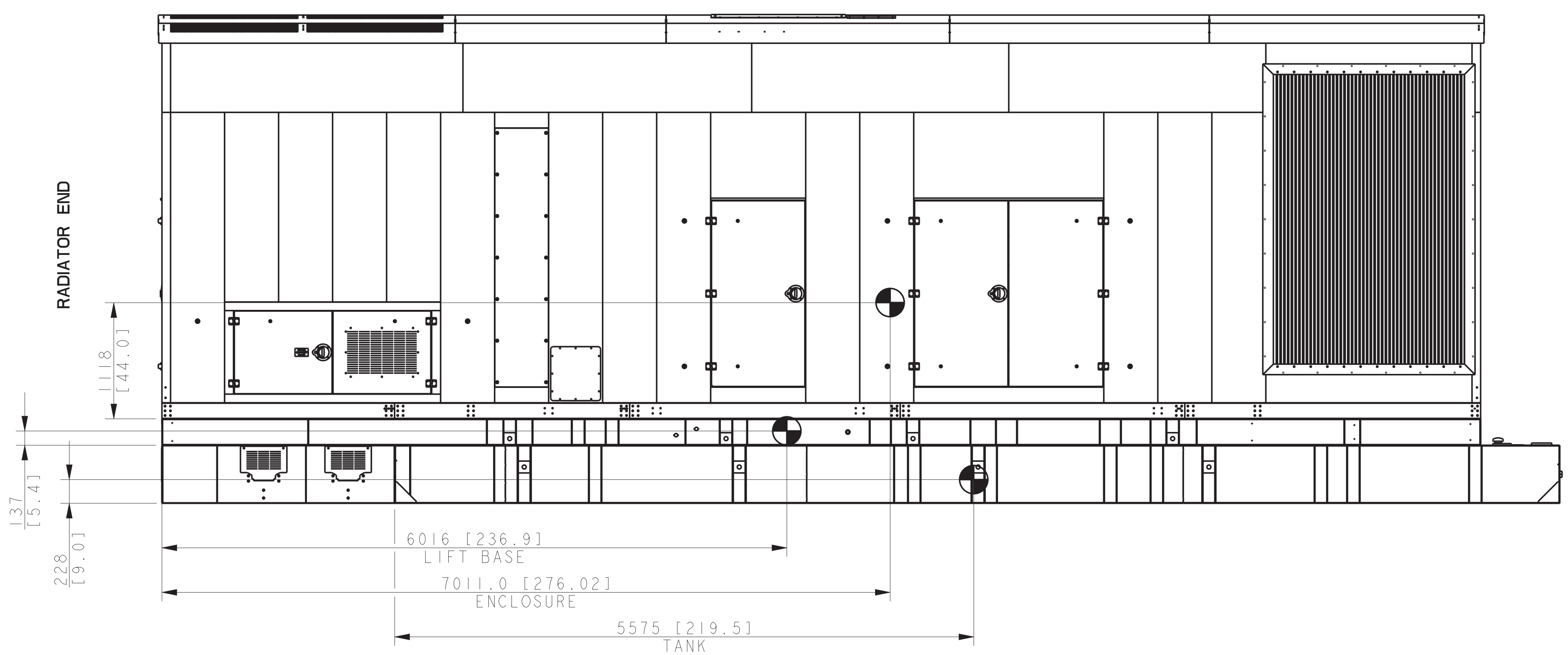
SCALE NA | CAD NO. | SHEET 2 of 3

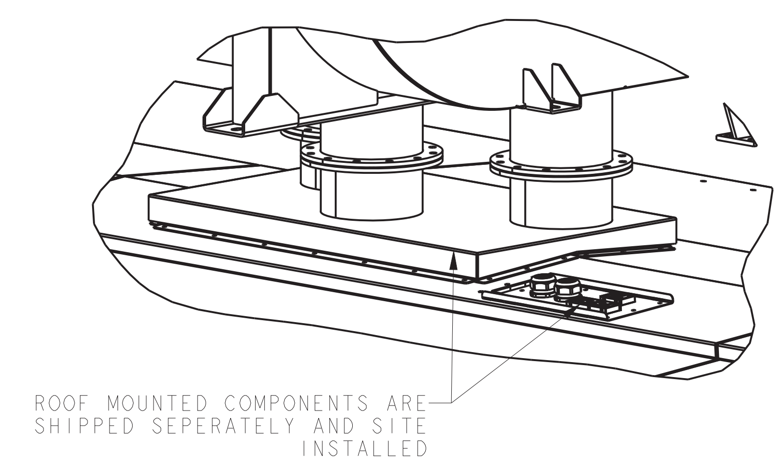
DWG NO. ADV-9179 D





DETAIL A
SCALE 0.10





SCALE 0.10

SL2 CENTER OF GRAVITY POINTS FOR ENCLOSURE, LIFT BASE, AND TANK VARIATIONS

REV	DATE	ON COMPOSITE DWGS, SEE PART NO. FOR REVISION LEVEL	BY
-	31JAN2020	NEW DRAWING [CT202014]	ZJS
A	14APR2020	SEE SHEET 1 [CT203358]	ZJS
B	22OCT2020	SEE SHEET 1 [CT207157]	CEK
C	23JAN2023	SEE SHEET 1 [CT224851]	APM

DO NOT SCALE. REFERENCE THE MODEL FOR ALL UNSPECIFIED DIMENSIONS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
GENERAL TOLERANCES: N/A

THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	ZJS	31JAN2020
CHECKED	KJB	31JAN2020
APPROVED	AJW	31JAN2020

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TITLE DIMENSION PRINT KD2500-4 TIER4 ENCL/TANK

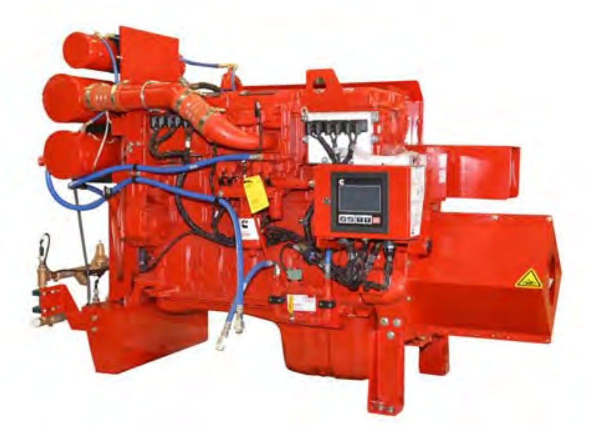
SCALE NA | CAD NO. | SHEET 3 of 3

DWG NO. ADV-9179 | D

Specification sheet

Fire Pump Drive Engine

CFP15E-F10
CFP15EVS-F10



Description

Engine Series - Cummins QSX 15

Exhaust Emissions - EPA Tier 3

With advanced electronics, higher torque, and better speed control, the CFP15E allows for shorter service times, longer maintenance intervals, and increased fuel economy. The speed-range tested CFP15E Industrial model with the Variable Speed Pressure Limiting Control (VSPLC) option is the right choice for the heavy duty engine market.

Features

Control System - The industry-leading, state-of-the-art Fire Pump Digital Panel (FPDP) provides total fire pump drive engine system integration and intuitive operation, including:

- Color touchscreen;
- Dual microprocessors for critical signal redundancy; and
- Standard J1939 parameter and Cummins fault code display.

Variable Speed Pressure Limiting Control (VSPLC) - Cummins' VSPLC-equipped fire pump drive engines are capable of maintaining a constant pump discharge pressure by controlling the engine speed down to 1400 RPM, while still maintaining T3 emissions certification. VSPLC fire pump drive engines provide design flexibility in the fire pump system for high-rise applications; compensate for varying discharge pressure; allow the system architect to apply a larger pump and/or a pump with a steeper curve; and significantly reduce water consumption during the weekly test.

Warranty and Service - Our models are backed by a comprehensive warranty and worldwide distributor network.

Certified Power - The CFP15E-F10 complies with NFPA 20 and is UL 1247-listed and FM 1333-approved. The CFP15EVS-F10 complies with NFPA 20 and is FM 1333-approved.

Ratings in HP (kW)

Operating Speed (RPM)	1470		1760		1900		2100		2250	
CFP15E-F10	382	(285)	460	(343)	488	(364)	488	(364)	380	(283)
CFP15EVS-F10	N/A	N/A	460	(343)	488	(364)	488	(364)	380	(283)

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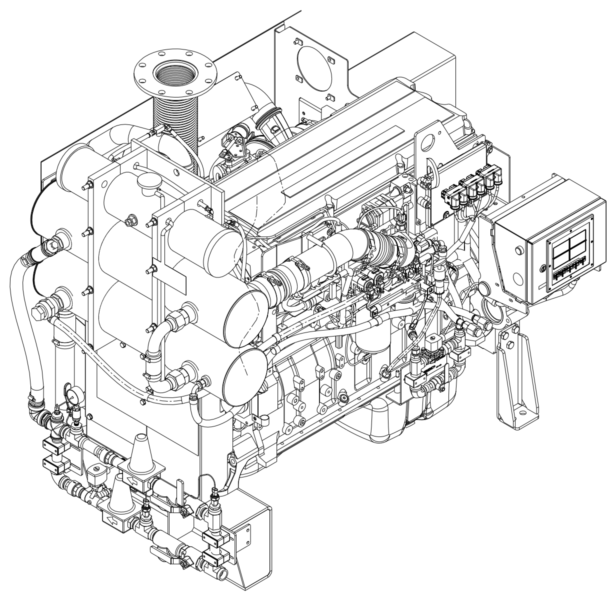
APPROVED - 08/06/2019

PES Doc.: 9927151601-ENG_rev_00

CP-036000-MEC-MAN-01302-00001 - Rev 01 - - Received: 07/19/2019



General Engine Data

Engine Family	Industrial
Engine Type	4 Cycle; In-Line, 6 Cylinder
Aspiration	Turbocharged and Charge-Air Cooled
Bore and Stroke	5.39 x 6.65 in. (137 x 169 mm)
Displacement	915 in^3 (15.0 L)
Rotation	Counterclockwise from flywheel end
Compression Ratio	17.0:1
Valves per Cylinder	Intake - 2 Exhaust - 2
Fuel System	High-pressure Injection (HPI)
Maximum Allowable Bending Moment @ Rear Face of Block	1500 lb.-ft. (2034 N-m)
Estimated Wet Weight*	4850 lbs. (2200 kg)

* Weight includes engine, cooling loop, heat exchanger, dual Electronic Control Modules (ECMs), Fire Pump Digital Panel (FPDP), standard air cleaner, standard exhaust flex, and all fluids.

Equipment	Standard	Optional
Air Cleaner	Disposable; treated for high humidity, indoor service	Heavy-duty, two-stage with replaceable elements
Alternator	24V-DC, 70 amps; includes belt guard	N/A
Cooling Loop (maximum pressure of 300 PSI)	1" diameter for fresh water; includes alarm sensors and FM-approval	Cu Ni construction available for sea water applications; approved loops up to 1 1/4"
Cooling System	Tube and shell type, 60 PSI with NPTF connections	Radiator[1]; sea water tube and shell
Engine Heater	120V-AC, 2250 watts	240V-AC, 2250 watts
Exhaust Protection	Metal guards on manifolds and turbocharger	N/A
Exhaust Flex Connection	Steel, flanged	Stainless steel flex, NPT
Flywheel Power Take-Off	Flywheel	Driveshaft system, stub shaft
Fuel Connections	Fire-resistant flexible supply and return lines	N/A
Fuel Filter	Primary with priming pump	N/A
Governor, Speed	Constant speed, adjustable	VSPLC[2]
Fire Pump Digital Panel (FPDP)	7" color touchscreen; enclosure rated as Type 2/ Type 4X; Imperial and metric values	Optional 316SS construction; custom gauges with digital panel expansion module (DPEM)
Lube Oil Cooler	Engine-water-cooled, plate type	N/A
Lube Oil Filter	Full-flow with by-pass valve	N/A
Lube Oil Pump	Gear-driven	N/A
Manual Start Controls	On FPDP and/or contactors	N/A
Overspeed Controls	Electronic with reset and test on FPDP	N/A
Starter	24V-DC	24V-DC/pneumatic[3]/hydraulic[3]

[1] Not UL-listed and not FM-approved.

[2] FM-approved, but not UL-listed.

[3] Only approved as a secondary starter

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Air Induction System

Maximum Temperature Rise Between Ambient Air and Engine Air Inlet	30 °F (16.7 °C)
Maximum Inlet Restriction with Dirty Filter	25 in. H_2O (635 mm H_2O)
Recommended Air Cleaner Element - (Standard)	K&N Serviceable/Disposable RC-3070
Recommended Air Cleaner Element - (Heavy Duty)	Optional: primary element AF25544; secondary element AF25545

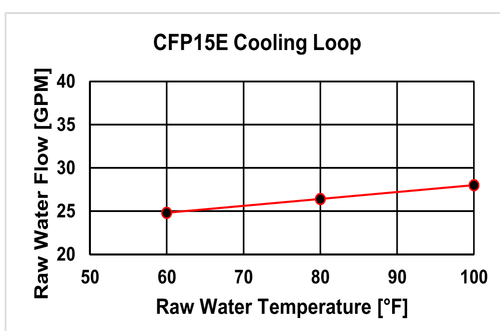
Lubrication System

Oil Pressure Range at Rated	35-40 PSI (242-276 kPa)
Oil Capacity of Pan (High - Low)	48-40 qt. (45-38 L)
Total System Capacity	13 gal. (49 L)
Recommended Lube Oil Filter	Cummins Filtration LF9000

Cooling System

Raw Water Working Pressure Range at Heat Exchanger	60 PSI (413 kPa) MAX
Recommended Minimum Water Supply Pipe Size to Heat Exchanger	1 in. (25.4 mm)
Recommended Minimum Water Discharge Pipe Size From Heat Exchanger	1.25 in. (31.75 mm)
Coolant Water Capacity (Engine Only)	13.9 gal. (52.6 L)
Standard Thermostat - Type	Modulating
Standard Thermostat - Range	180-200 °F (82-93 °C)
Normal Operating Temperature	180-212 °F (82-100 °C)
Minimum Raw Water Flow:	
- with Water Temperatures to 60 °F (16 °C)	24.8 GPM (1.56 L/sec)
- with Water Temperatures to 80 °F (27 °C)	26.4 GPM (1.67 L/sec)
- with Water Temperatures to 100 °F (38 °C)	28 GPM (1.77 L/sec)
Recommended Cooling Water Filter	Cummins Filtration WF2126

* A jacket water heater is mandatory on this engine. The recommended heater wattage is 3000 down to 40 °F (4 °C)



Exhaust System

Maximum Allowable Back Pressure by Complete Exhaust System	40.8 in. H_2O (10.2 kPa)
Exhaust Pipe Size Normally Acceptable	6 in. (152 mm)

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CP-036000-MEC-MAN-01302-00001 - Rev 01 - - Received: 07/19/2019

Noise Emissions - The noise emission values are estimated sound pressure levels at 3.3 ft. (1 m).

Top	97.7 dBa
Right Side	98.3 dBa
Left Side	99.6 dBa
Front	98.9 dBa
Exhaust	120.0 dBa

Fuel Supply/Drain System

Operating Speed in RPM	1470		1760		1900		2100		2250	
Fuel Rate - Gal/hr (L/hr)	19.9	(75)	22.5	(85)	23.6	(90)	24.7	(93)	19.6	(74)

Fuel Type	No. 2 diesel only
Minimum Supply Line Size	0.75 in. (19.05 mm)
Minimum Drain Line Size	0.75 in. (19.05 mm)
Maximum Fuel Height above C/L Fuel Pump	105 in. (2.7 m)
Recommended Fuel Filter - Primary	Cummins Filtration FS1041
Recommended Fuel Filter - Secondary	None
Maximum Restriction @ Lift Pump-Inlet - With Clean Filter	6.0 in. Hg (152 mm Hg)
Maximum Restriction @ Lift Pump-Inlet - With Dirty Filter	10.0 in. Hg (254 mm Hg)
Maximum Return Line Restriction - Without Check Valves	9 in. Hg (229 mm Hg)
Minimum Fuel Tank Vent Capability	70 ft^3/hr (2.1 m^3/hr)
Maximum Fuel Temperature @ Lift Pump Inlet	160 °F (71 °C)

Starting and Electrical System

Min. Recommended Battery Capacity - Cold Soak at 0 °F (-18 °C) or Above	**24V**
Engine Only - Cold Cranking Amperes	1400 CCA*
Engine Only - Reserve Capacity	430 minutes*

*Based on FM requirement for a minimum of 900 CCA and 430 Reserve Capacity Minutes

Battery Cable Size - Minimum of 2/0 AWG and Maximum Cable Length Not to Exceed 6 ft. (1.5 m)	**24V**
Maximum Resistance of Starting Circuit	0.002 Ohms
Typical Cranking Speed	100 RPM
Alternator (Standard), Internally Regulated	70 amps

Operating Conditions

Operating Speed in RPM	1470		1760		1900		2100		2250	
Output - BHP (kW)	382	(285)	460	(343)	488	(364)	488	(364)	380	(283)
Ventilation Air Required - CFM (litre/sec)	970	(458)	1217	(574)	1357	(641)	1469	(693)	1542.5	(728)
Exhaust Gas Flow - CFM (litre/sec)	2500	(1180)	2881	(1360)	3099	(1463)	3308	(1561)	3473.4	(1639)
Exhaust Gas Temperature - °F (°C)	1025	(552)	1025	(552)	1025	(552)	1025	(552)	1025	(552)
Heat Rejection to Coolant - BTU/min. (kW)	6361	(112)	6947	(122)	7730	(136)	8085	(142)	8166	(143)
Heat Rejection to Ambient - BTU/min. (kW)	1423	(25)	1637	(29)	2064	(36)	1905	(33)	1886	(33)

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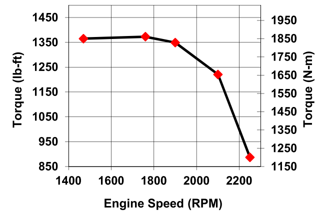
Engine Performance Curve for CFP15E-F10

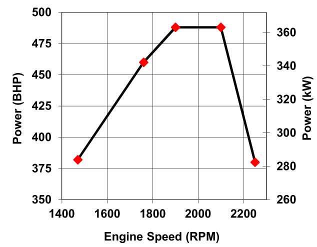
Torque Output

RPM	lb-ft	N-m
1470	1365	1850
1760	1373	1861
1900	1349	1829
2100	1220	1655
2250	887	1203



Horsepower Output

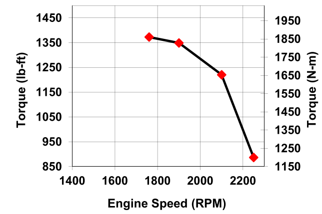
RPM	BHP	kW
1470	382	285
1760	460	343
1900	488	364
2100	488	364
2250	380	283



Engine Performance Curve for CFP15EVS-F10

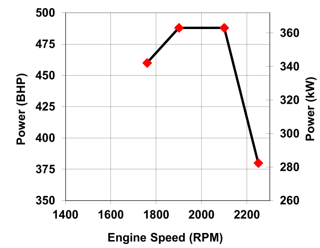
Torque Output

RPM	lb-ft	N-m
1760	1373	1861
1900	1349	1829
2100	1220	1655
2250	887	1203



Horsepower Output

RPM	BHP	kW
1760	460	343
1900	488	364
2100	488	364
2250	380	283



All data is based on the engine operating with a fuel system, water pump, lubricating oil pump, air cleaner, and alternator. The fan, optional equipment, and driven components are not included. Data is based on operation at SAE standard J1394 conditions of 300 ft. (91.4 m) altitude, 29.61 in. (752 mm) Hg dry barometer, and 77 °F (25 °C) intake air temperature, using No.2 diesel fuel only.

Altitude above which output should be limited*:	300 ft. (91.4 m)
Correction factor per 1000 ft. (305 m) above altitude limit:	3%
Temperature above which output should be limited:	77 °F (25 °C)
Correction factor per 10 °F (11 °C) above temperature limit:	1% (2%)

* Above 5,000 feet, contact Cummins for derate information.

US EPA NSPS Tier 3 Emissions Compliance

	D2 Cycle Exhaust Emissions*									
Fuel Percentage of Sulfur	Grams per BHP - HR					Grams per kW - HR				
	NMHC	NO_x	NMHC + NO_x	CO	PM	NMHC	NO_x	NMHC + NO_x	CO	PM
15 PPM Diesel Fuel	0.086	2.565	2.651	0.671	0.078	0.116	3.439	3.555	0.900	0.105
300-4000 PPM Diesel Fuel	0.104	2.781	2.886	0.671	0.089	0.14	3.730	3.870	0.900	0.120

*The emissions values above are based on CARB approved calculations for converting EPA (500 ppm) fuel to CARB (15 ppm) fuel.

Refer to the engine data tag for the EPA Standard Engine Family.

No special options are needed to meet current regulation emissions for all fifty states.
Tests conducted using alternate test methods, instrumentation, fuel, or reference conditions can yield different results.

Diesel Fuel Specifications:

- Cetane Number: 40-48
- Reference: ASTM D975 No. 2-D

Reference Conditions:

- Air Inlet Temperature: 25 ˚C (77 ˚F)
- Fuel Inlet Temperature: 40 ˚C (104 ˚F)
- Barometric Pressure: 100 kPa (29.53 in Hg)
- Humidity: 107 g H_2O/kg (75 grains H_2O/lb) of dry air; required for NO_x correction
- Intake Restriction set to a maximum allowable limit for clean filter
- Exhaust Back Pressure set to maximum allowable limit

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Fire Pump Digital Panel (FPDP)

The Cummins FPDP is an integrated microprocessor-based control system that provides full digital technology with enhanced accuracy and built-in redundancy.

Reliable design - Designed and tested with isolated mounting to minimize vibration for longer life and durability, the Cummins FPDP proves reliable in harsh environments.

Advanced control methodology - The Cummins FPDP allows for Input/Output (I/O) expansion and remote monitoring capabilities, as well as automatic Electronic Control Module (ECM) switching for electronic engines.

Certified Quality - The Cummins FPDP is UL 1247-listed and FM 1333-approved.

Operator Panel Features

Operator/Display Panel

- 7” TFT LCD (thin-film-transistor liquid-crystal display) - color, 24-bit, 800x480 (WVGA).
- Auto, manual, start, stop, and fault reset.
- Assembly enclosure that meets Type 2 and Type 4X design requirements and is water, corrosion, fire, and impact-resistant.

Electronic Engine Communications - SAE J1939 protocol.

- Comprehensive full-authority engine (FAE) data: oil pressure and temperature; coolant temperature; and intake manifold pressure and temperature.
- Cummins fault code display.
- Sensor failure indication.
- Optional RS-485 serial - Modbus® RTU/Modbus® TCP/IP.

Variable Speed Pressure Limiting Control (VSPLC) Capabilities

- Display indicates when VSPLC is active.
- Pump discharge pressure display.
- Ability to run the engine at fixed speed from the FPDP at start-up for commissioning.

Other Control Features

- Digital Panel Expansion Module (DPEM) for additional analog/digital inputs and configurable dry relay contact output.
- Ability to idle at start-up for commissioning of electronic engines.
- Idle cool down for electronic engines.
- DC voltage.

Functional

- Configurable display units for temperature in degrees Fahrenheit or Celsius and pressure in PSI or kPa.
- Manual ECM selector switch on electronic engines.
- Ability to crank the fire pump drive engine from Battery A, Battery B, or both.
- Fixed engine speed adjustments in +/- 10 RPM increments.
- Overspeed shutdown.

Environmental

- Operating temperature - 4 to 158 °F (minus 20 to 70 °C).
- Storage temperature - minus 22 to 176 °F (minus 30 to 80 °C).
- Meets CISPR 11 Class B radiated emissions.
- Vibration: 7 G_{PEAK}; three-axis.

Electrical

- 8-30 VDC operating voltage.
- Reverse polarity protected.
- Spring cage terminal block interface.
- Built-in dual micro controllers for increased reliability.

Mechanical

- 1 3/8” pre-cut customer conduit knockout for easy field installation.
- Simplified internal design for efficiency and ease of customer connections.
- 16GA ASTM A366 material - 316 stainless steel optional.
- RAL3001 red powder coat finish.

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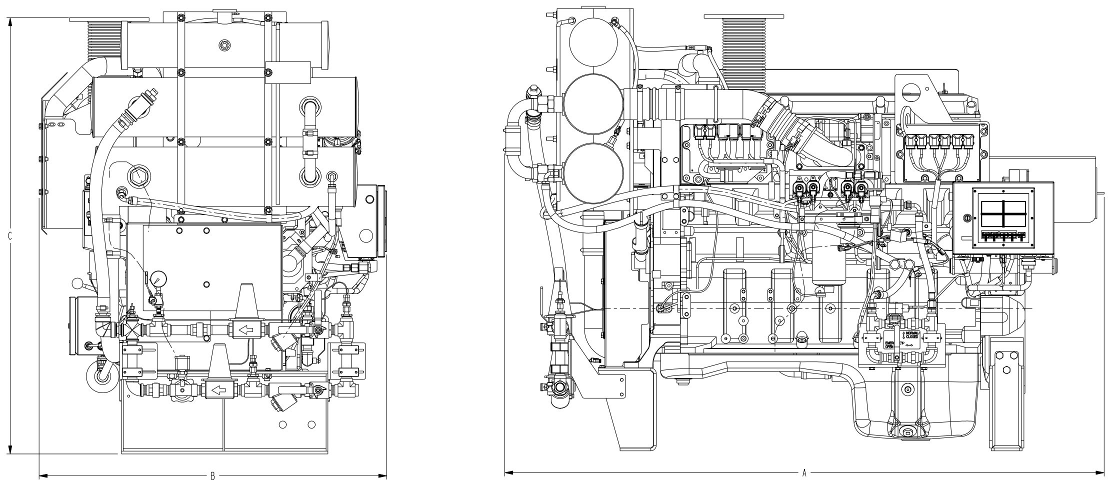

This outline drawing is for reference only.
Do not use for installation design.

	Dim "A" in. (mm)	Dim "B" in. (mm)	Dim "C" in. (mm)
CFP15E F10-F30	83 (2101)	48 (1219)	60 (1530)

NOTE: Consult drawings or contact the factory for additional information.

This product has been manufactured under the controls established by a Bureau Veritas Certification approved management system that conforms with ISO 9001:2015.

NOTE: Codes or standards compliance may not be available with all model configurations - consult factory for availability. Specifications are subject to change without notice.

For more information, contact firepumpsales@cummins.com.

Cummins Sales and Service
875 Lawrence Drive
DePere, Wisconsin 54115
1 920 337 9750

power.cummins.com/fire-power

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APPENDIX 5.1D

Operations and Construction Impact Analysis Support Data (Including Federal Conformity Analysis)

Appendix 5.1D

Impact Analysis Support Data

Table 5.1D-1 Operations Air Quality Impact Results – No Berm Option

Pollutant	Averaging Time	Maximum Concentration (µg/m³)	Background (µg/m³)	Total (µg/m³)	Ambient Air Quality Standards (µg/m³)	
					CAAQS	NAAQS
NO_2	1-hour (highest)	121.2	97.9	219.1	339	-
	1-hour (98th percentile) [a]	3.1	75.91	79.0	-	188
	Annual Maximum	0.3	15.7	16.0	57	100
CO	1-hour (highest)	501.6	1,832	2,333.6	23,000	40,000
	8-hour (highest)	59.3	1,260	1,319.3	10,000	10,000
SO_2	1-hour (highest)	1.0	11.2	12.2	655	--
	1-hour (99th percentile)	.04	10.5	10.5	--	196
	24-hour (highest)	.03	8.9	8.9	105	--
	Annual	.003	4.6	4.6	105	--
PM10	24-hour (highest)	0.1	351	351.1	50	--
	24-hour (6th highest)	0.1	112	112.1	-	150
	Annual maximum	0.02	32.7	32.7	20	-
PM2.5	24-hour (98th percentile)	0.08	27.0	27.1	-	35
	5-year average annual	0.01	6.3	6.3	9.0*	9.0*

Source: Appendix 5.1E.
a Modeling for 1-hour NO_2 NAAQS utilized the annual emissions to assess the 98th percentile concentrations as these units are emergency generators and are, therefore, classified as "intermittent," U.S. EPA Memorandum, March 1, 2011.
µg/m³ = micrograms per cubic meter; CAAQS = California Ambient Air Quality Standards; CO = carbon monoxide; NO_2 = nitrogen dioxide; NAAQS = National Ambient Air Quality Standards; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns SO_2 = sulfur dioxide, - = not applicable, *EPA has recently lowered the annual PM2.5 standard from 12 ug/m3 down to 9 ug/m3: * = the current form of the annual PM2.5 standard is 12.0 ug/m³ but is expected to decrease to 9.0 ug/m³ within the next 90 days. The new standard was used for this analysis.

Table 5.1D-2 Construction Air Quality Impact Results – Berm Option

Pollutant	Averaging Time	Maximum Concentration ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Ambient Air Quality Standards ($\mu g/m^3$)	
					CAAQS	NAAQS
NO_2	1-hr (highest)	237.51	97.9	335.4	339	-
	1-hr (98th percentile)	131.16	75.91	207.1	-	188
	Annual Maximum	13.77	15.7	29.47	57	100
CO	1-hr (highest)	511.04	1,832	2,343.04	23,000	40,000
	8-hr (highest)	120.22	1,260	1,380.2	10,000	10,000
SO_2	1-hr (highest)	0.94	11.2	12.14	655	--
	1-hr (99th percentile)	0.80	10.5	11.3	--	196
	24-hr (highest)	0.13	8.9	9.03	105	--
	Annual	0.036	4.6	4.64	105	--
PM10	24-hr (highest)	23.94	351	374.9	50	--
	24-hr (6th highest)	19.37	112	131.4	-	150
	Annual maximum	5.99	32.7	38.5	20	-
PM2.5	24-hr (98th percentile)	6.18	27.0	33.2	-	35
	3-year average annual	2.52	6.3	8.82	9*	9*

Source: Appendix 5.1D

$\mu g/m^3$ = micrograms per cubic meter; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns; SO_2 = sulfur dioxide; - = Not Applicable; * = the current form of the annual PM2.5 standard is 12.0 ug/m³ but is expected to decrease to 9.0 ug/m³ within the next 90 days. The new standard was used for this analysis.

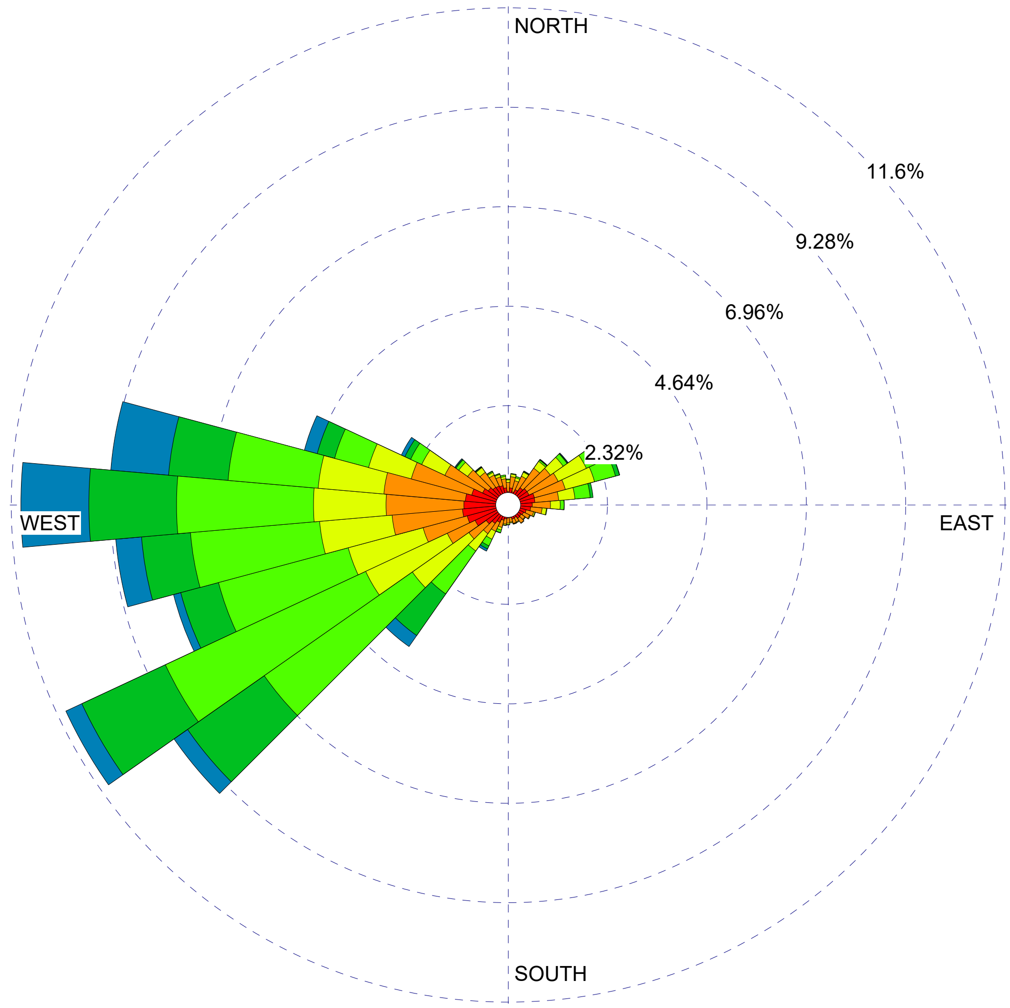
Table 5.1D-3 Construction Air Quality Impact Results – No-Berm Option

Pollutant	Averaging Time	Maximum Concentration (µg/m^3)	Background (µg/m^3)	Total (µg/m^3)	Ambient Air Quality Standards (µg/m^3)	
					CAAQS	NAAQS
NO_2	1-hr (highest)	469.21	97.9	567.1	339	-
	1-hr (98th percentile)	190.38	75.91	266.3	-	188
	Annual Maximum	7.54	15.7	23.2	57	100
CO	1-hr (highest)	1,285.86	1,832	3,117.9	23,000	40,000
	8-hr (highest)	263.74	1,260	1,523.7	10,000	10,000
SO_2	1-hr (highest)	4.32	11.2	15.5	655	--
	1-hr (99th percentile)	2.28	10.5	12.8	--	196
	24-hr (highest)	0.43	8.9	9.3	105	--
	Annual	0.038	4.6	4.6	105	--
PM10	24-hr (highest)	28.97	351	380.0	50	--
	24-hr (6th highest)	20.63	112	132.6	-	150
	Annual maximum	5.21	32.7	37.9	20	-
PM2.5	24-hr (98th percentile)	3.77	27.0	30.8	-	35
	3-year average annual	1.44	6.3	7.74	9*	9*

Source: Appendix 5.1D.

µg/m^3 = micrograms per cubic meter; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns; - = Not Applicable: * = the current form of the annual PM2.5 standard is 12.0 ug/m^3 but is expected to decrease to 9.0 ug/m^3 within the next 90 days. The new standard was used for this analysis.

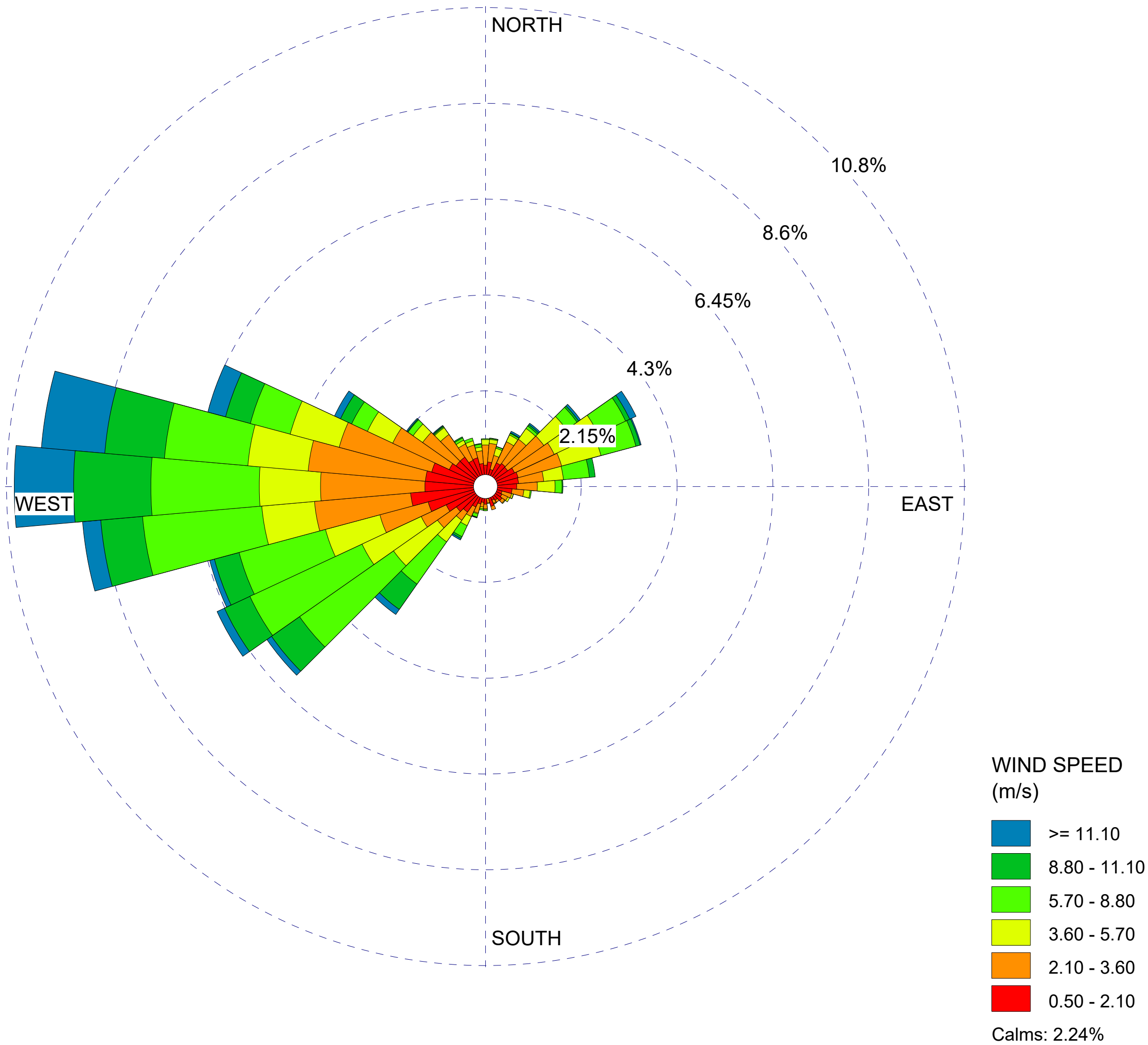
WIND ROSE PLOT:		DISPLAY:
Annual Wind Rose **WRESC**	Figure 5.1D-1	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Lancaster/Fox Field Airport 2018-2012	**Start Date: 1/1/2018 - 00:00** **End Date: 12/31/2022 - 23:59**	**Atmospheric Dynamics, Inc.**	
		MODELER:	
	CALM WINDS: **2.34%**	TOTAL COUNT: **43580 hrs.**	
	AVG. WIND SPEED: **5.28 m/s**	DATE: **1/20/2024**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:		DISPLAY:
Winter Wind Rose **WRESC**	Figure 5.1D-2	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Lancaster/Fox Field Airport 2018-2022	**Start Date: 1/1/2018 - 00:00** **End Date: 3/31/2022 - 23:59**	**Atmospheric Dynamics, Inc.**	
		MODELER:	
	CALM WINDS: **2.24%**	TOTAL COUNT: **10799 hrs.**	
	AVG. WIND SPEED: **4.61 m/s**	DATE: **1/20/2024**	PROJECT NO.:

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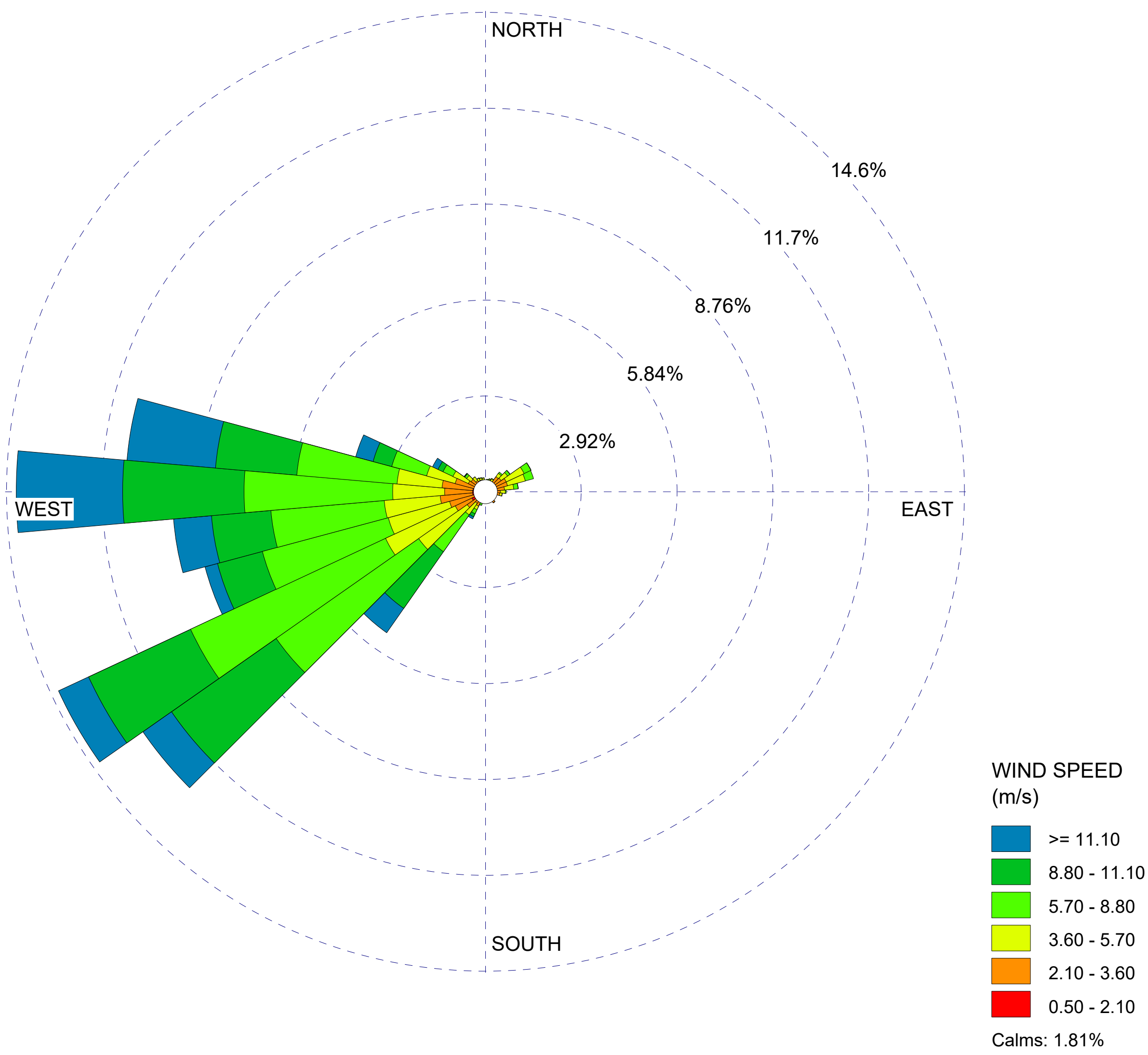
WIND ROSE PLOT:		DISPLAY:
Spring Wind Rose **WRESC**	Figure 5.1D-3	**Wind Speed** **Direction (blowing from)**



COMMENTS:

Lancaster/Fox Field Airport
2018-2022

DATA PERIOD:

Start Date: 4/1/2018 - 00:00
End Date: 6/30/2022 - 23:59

COMPANY NAME:

Atmospheric Dynamics, Inc.

MODELER:

CALM WINDS:

1.81%

TOTAL COUNT:

10788 hrs.

AVG. WIND SPEED:

6.90 m/s

DATE:

1/20/2024

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

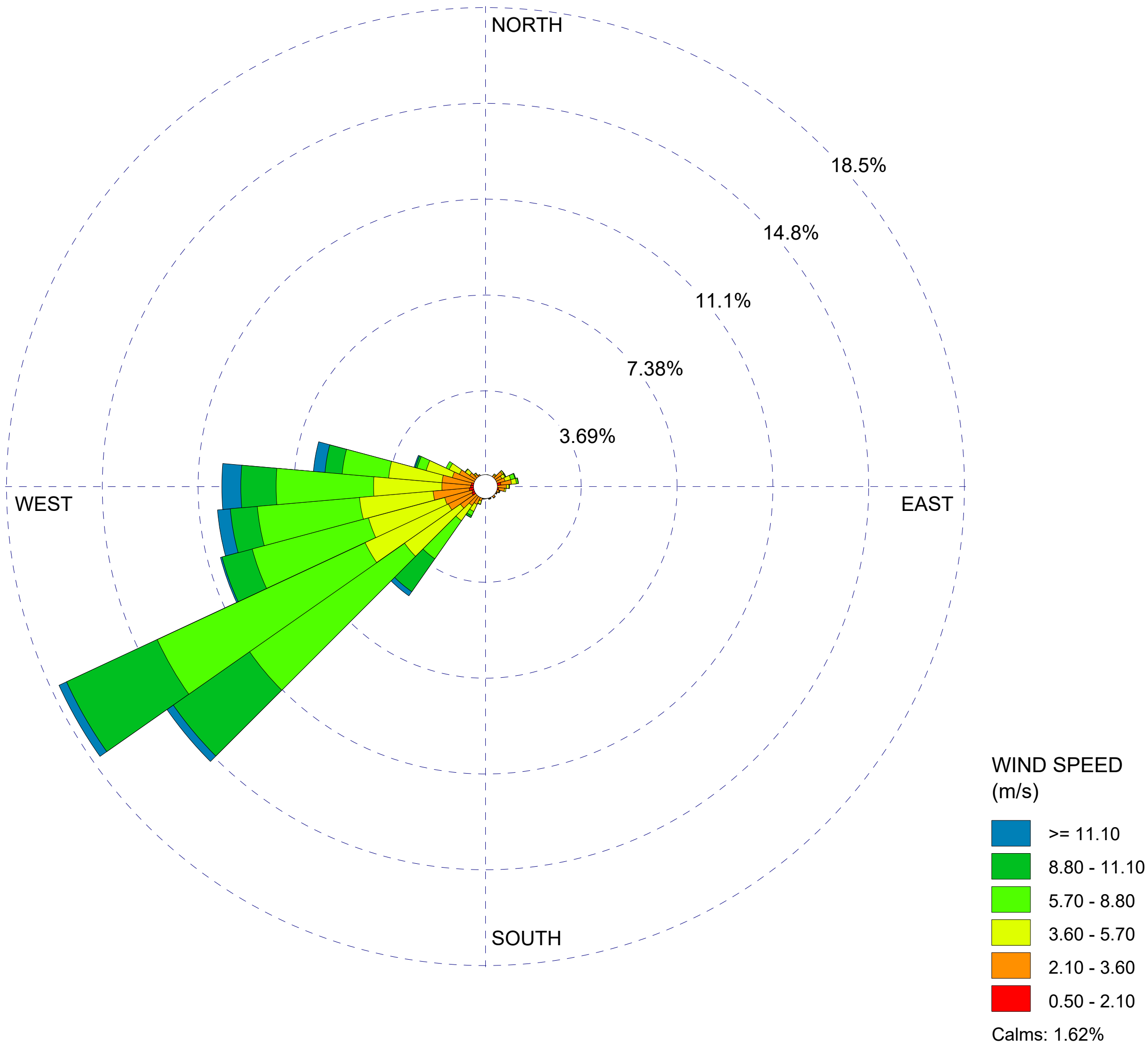
WIND ROSE PLOT:

Summer Wind Rose
WRESC

Figure 5.1D-4

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Lancaster/Fox Field Airport 2018-2022	**Start Date: 7/1/2018 - 00:00** **End Date: 9/30/2022 - 23:59**	**Atmospheric Dynamics, Inc.**	
		MODELER:	
	CALM WINDS: **1.62%**	TOTAL COUNT: **10987 hrs.**	
	AVG. WIND SPEED: **5.62 m/s**	DATE: **1/20/2024**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

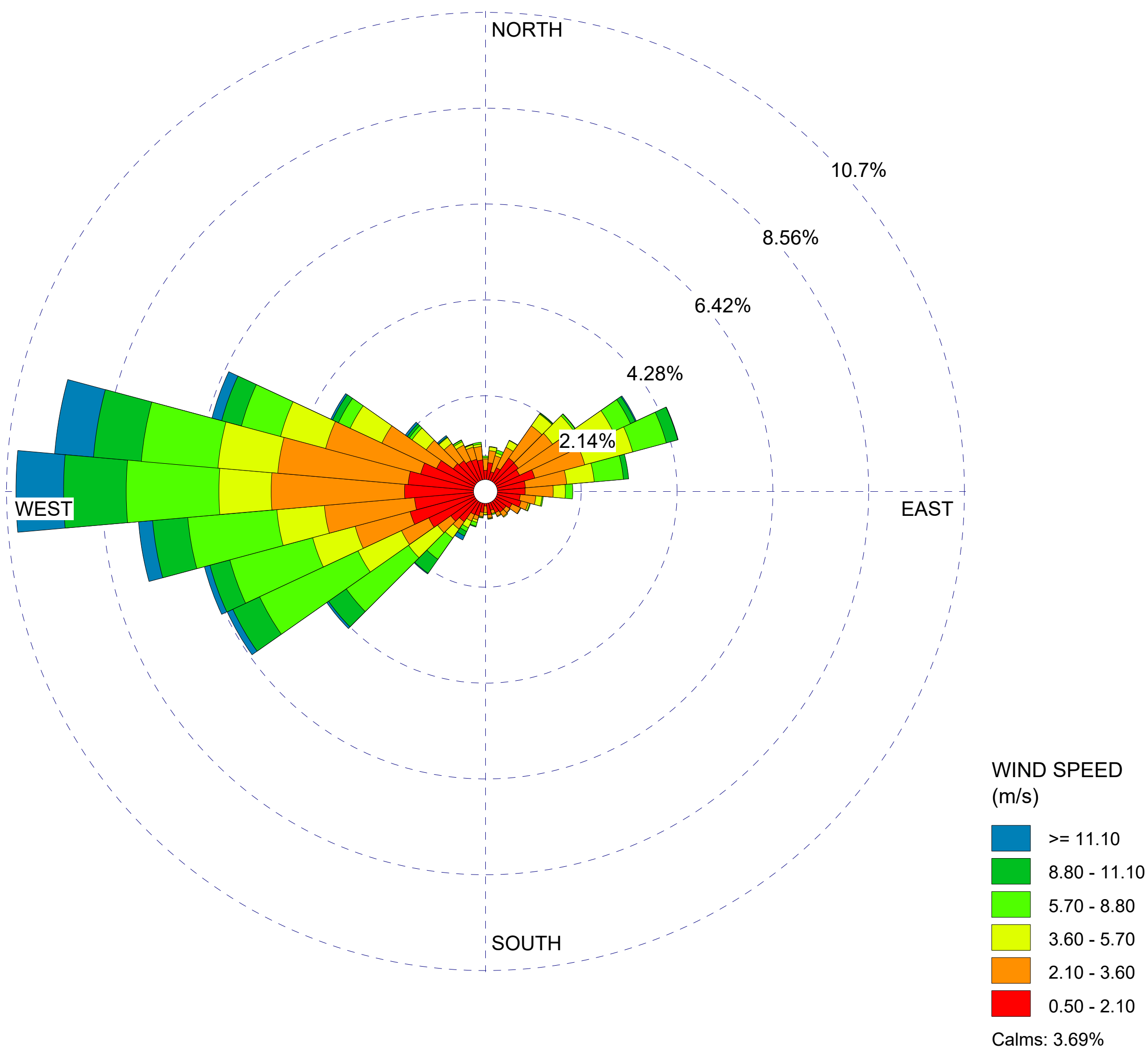
WIND ROSE PLOT:

Fall Wind Rose
WRESC

Figure 5.1D-5

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Lancaster/Fox Field Airport
2018-2022

DATA PERIOD:

Start Date: 10/1/2018 - 00:00
End Date: 12/31/2022 - 23:59

COMPANY NAME:

Atmospheric Dynamics, Inc.

MODELER:

CALM WINDS:

3.69%

TOTAL COUNT:

11006 hrs.

AVG. WIND SPEED:

4.00 m/s

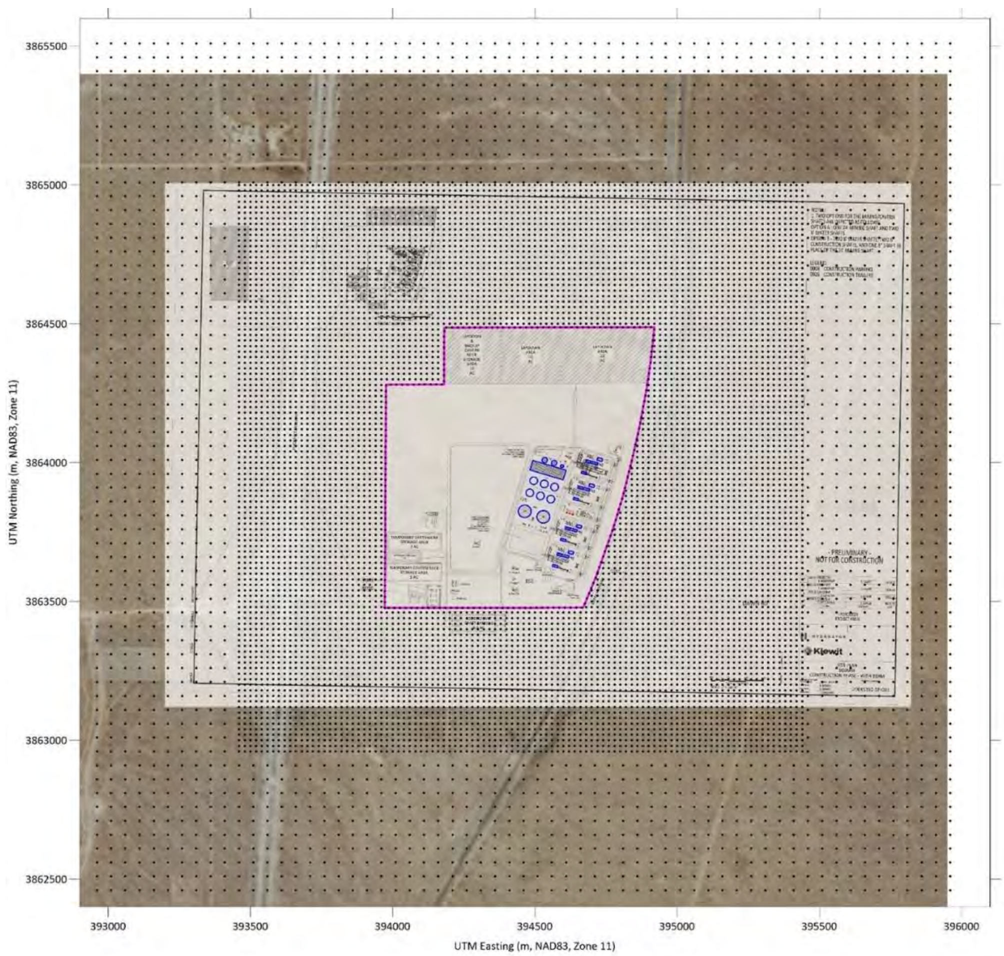
DATE:

1/20/2024

PROJECT NO.:

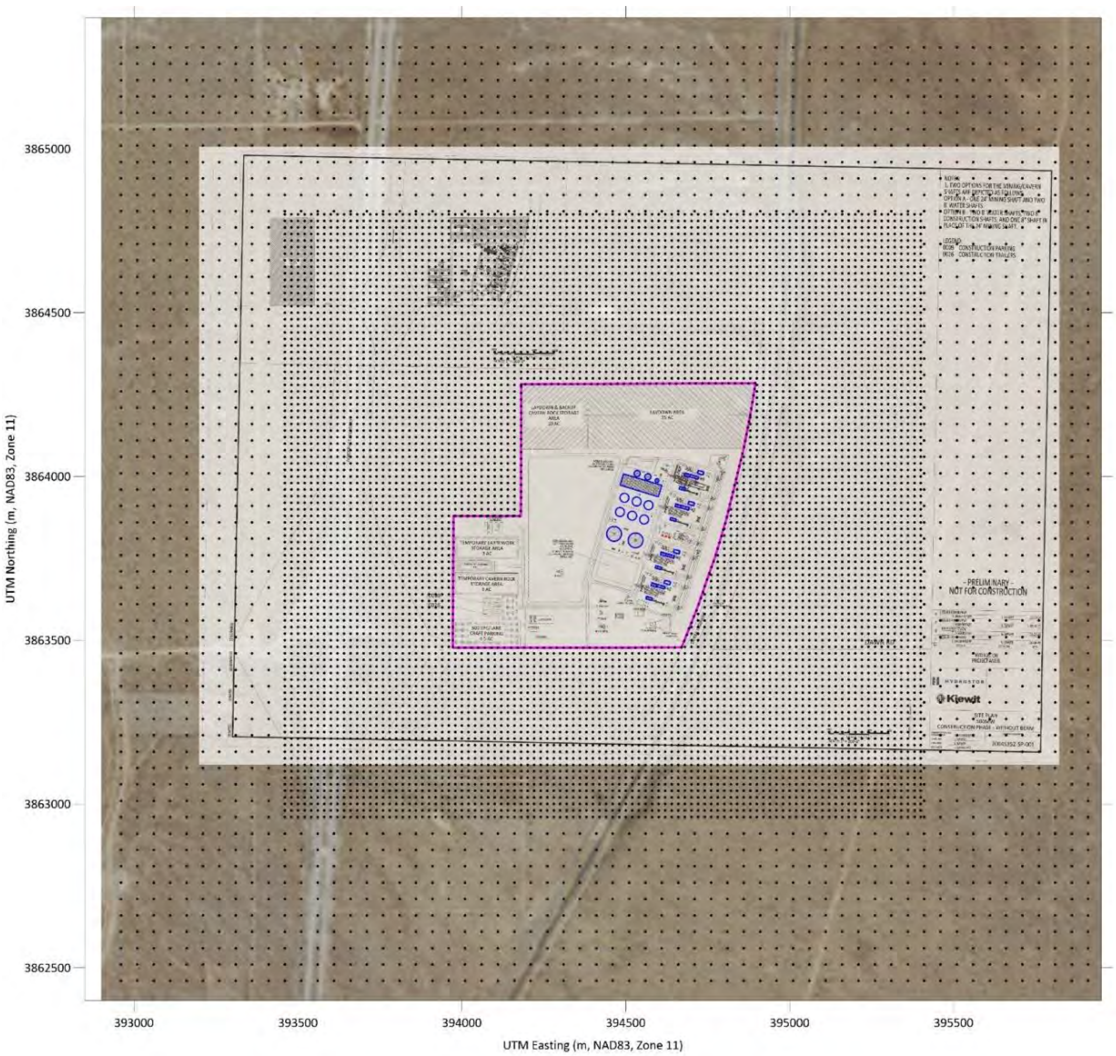
WRPLOT View - Lakes Environmental Software

Figure 5.1D-6 Receptors for Construction with Berm



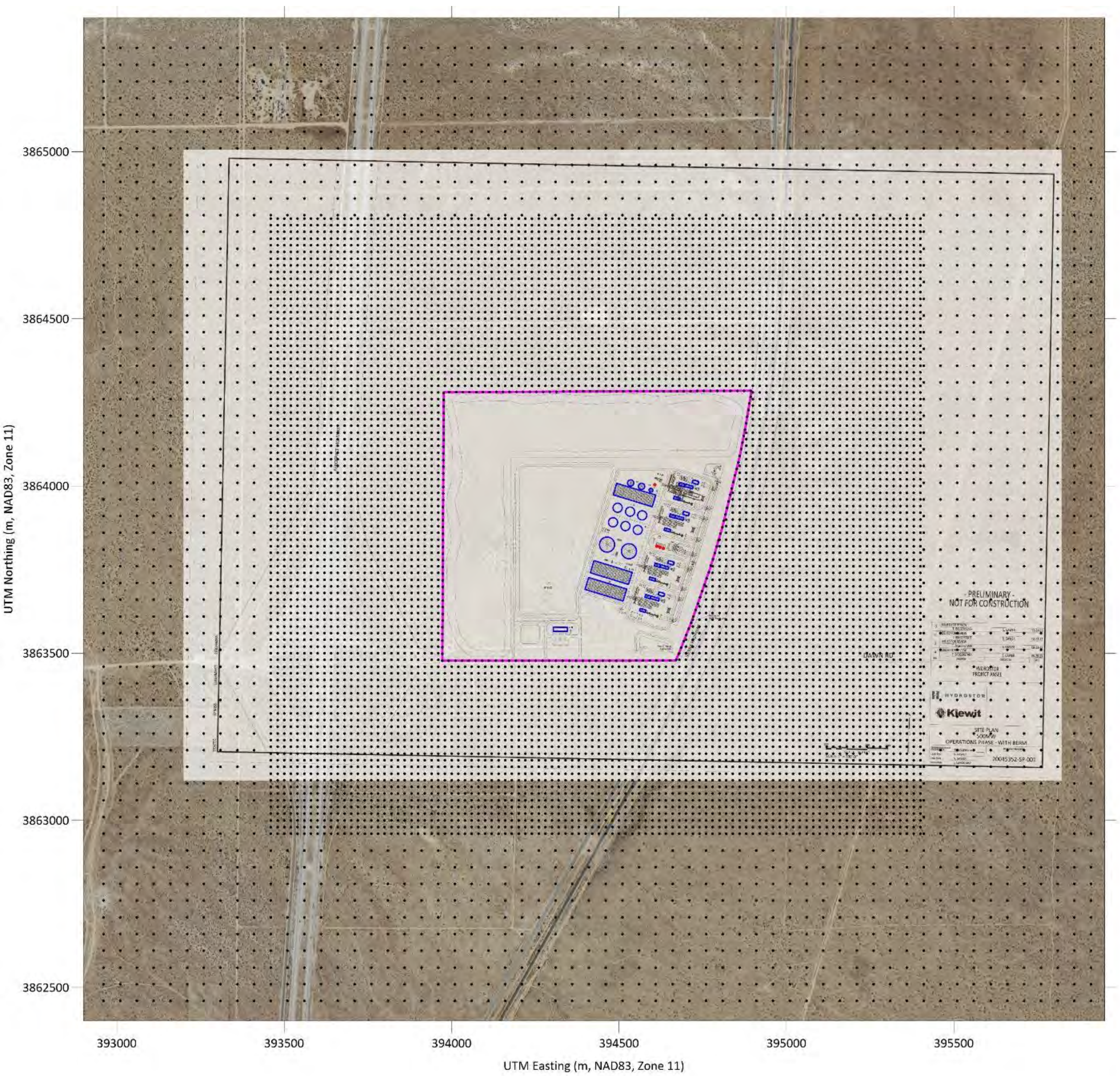
Hydrostor - Construction
20 m and 50 m Receptors
With Berm

5.1D-7 Receptors for Construction with No Berm



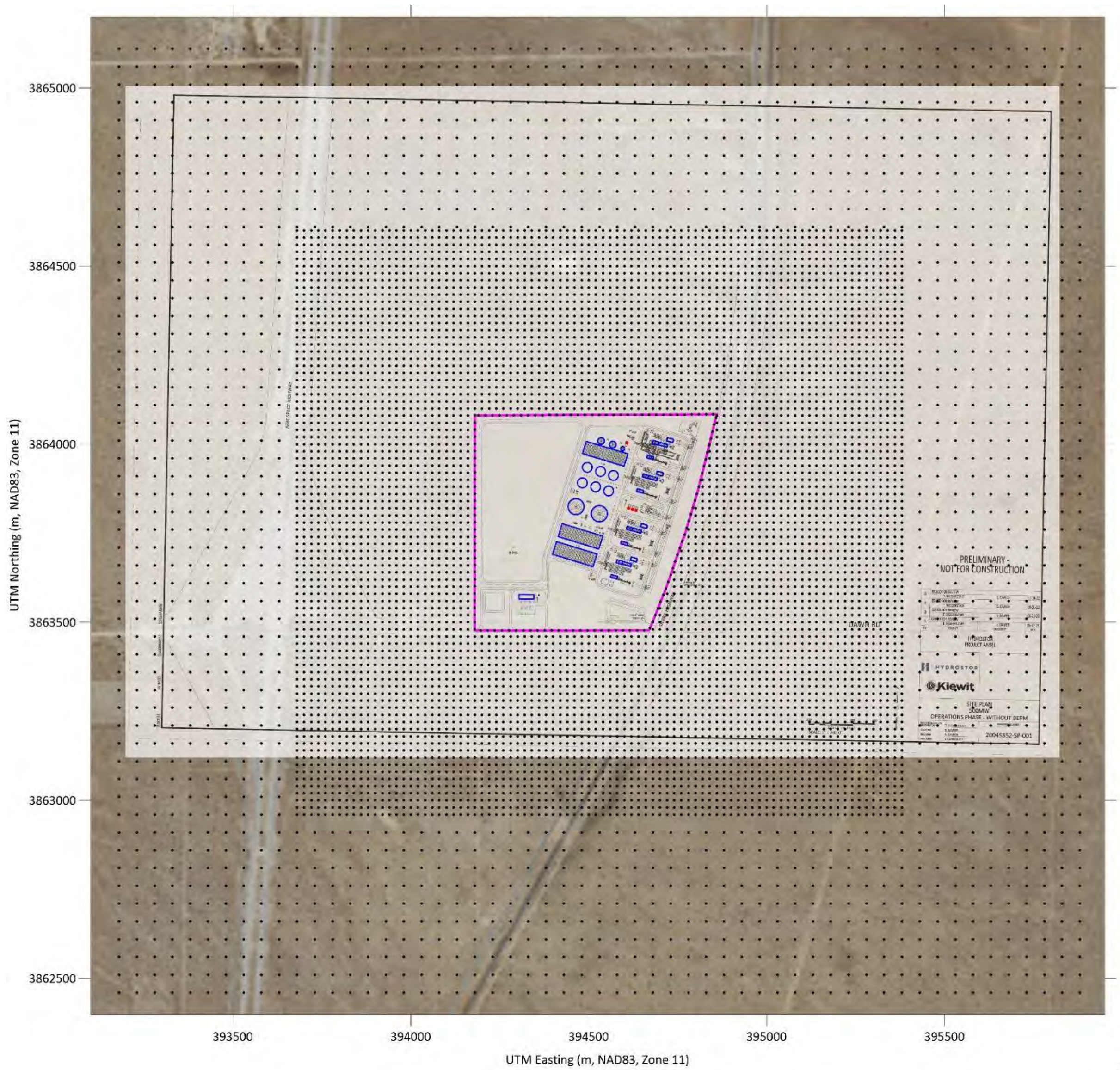
Hydrostor - Construction
20 m and 50 m Receptors
Without Berm

5.1D-8 Receptors for Operations with Berm



Hydrostor - Operations
20 m and 50 m Receptors
With Berm

5.1D-9 Receptors for Operations with No Berm



Hydrostor - Operations
20 m and 50 m Receptors
Without Berm

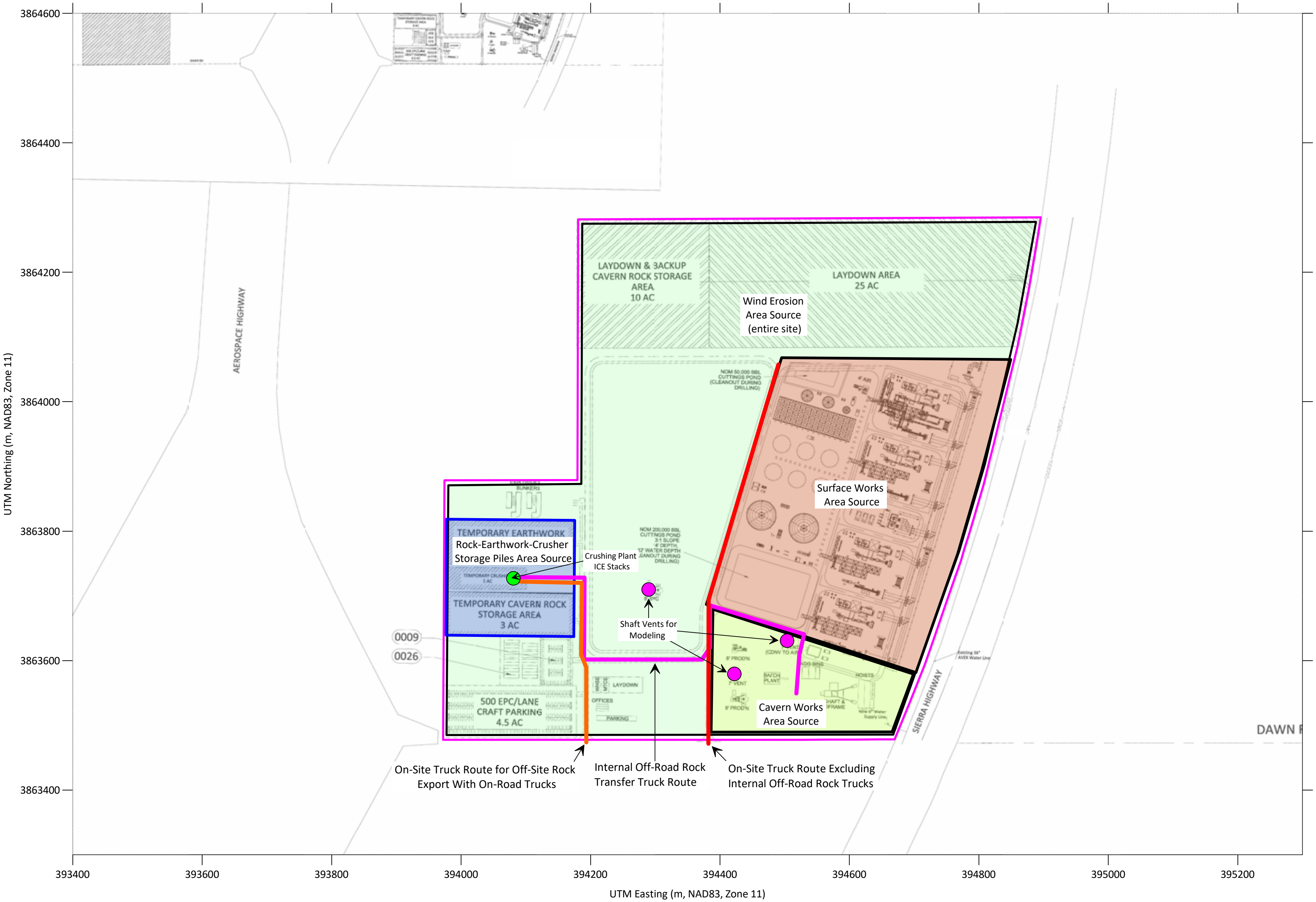


Figure 5.1D-10 No Berm Construction Emissions Areas

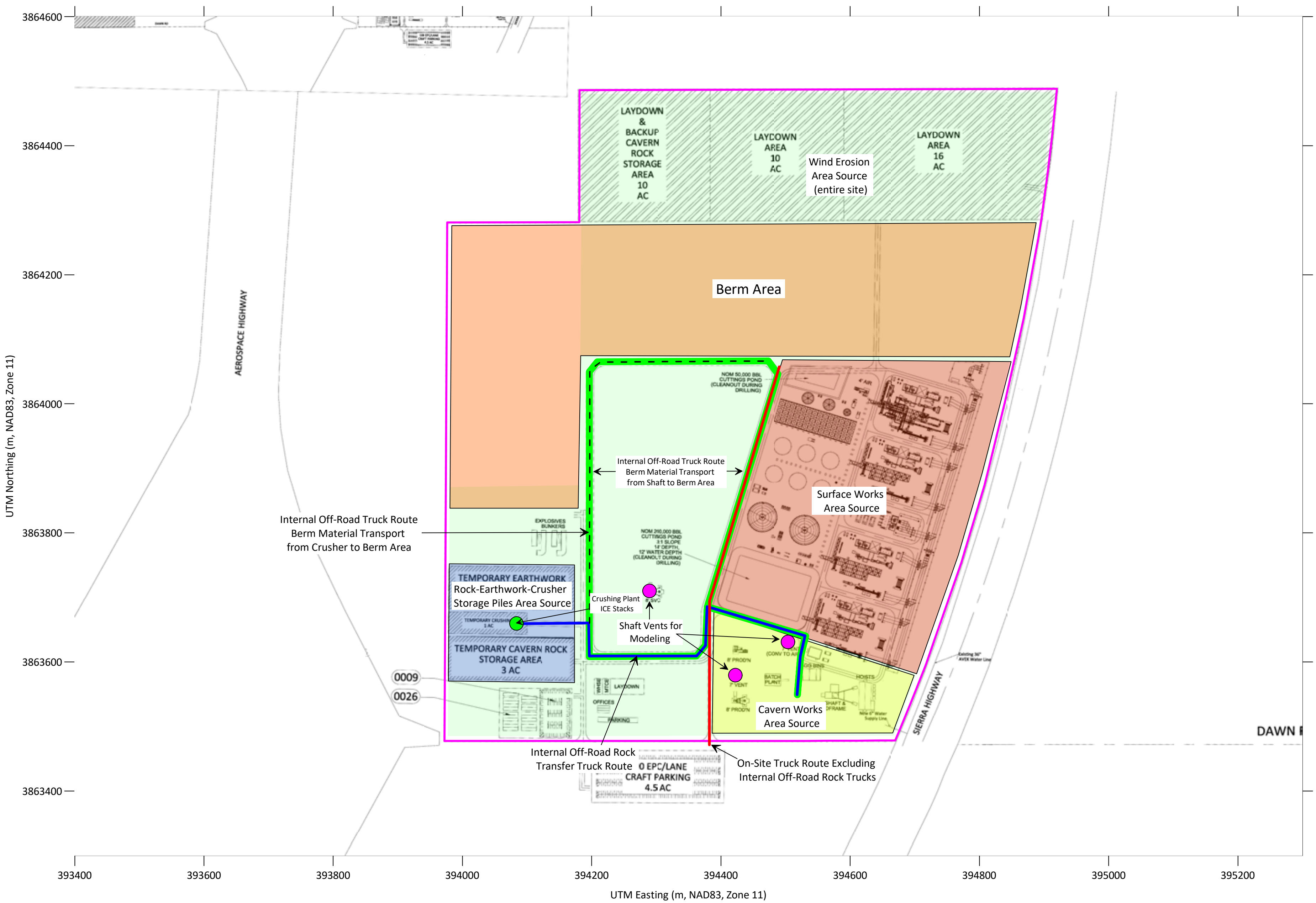


Figure 5.1D-11 Berm Construction Emissions Areas

Attachment 5.1D-1

Construction Modeling Emissions Tables – No Berm Option

M-1 to M-8

TABLE M-1
MODELED ON-SITE TRUCK TRAVEL PM10 AND PM2.5 EMISSIONS AND SOURCE iNFORMATION FOR LINE-VOLUME SOURCES
CONSTRUCTION PHASE - WITHOUT BERM

Hydrostor WRESC

PM10 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length		Road Lanes Width	Modeled Road Width		Initial[a] Vertical Height	Release[a] Height	Percent Trucks	Daily[b] Operation Hours	On-Site Truck Travel PM10 Emissions: Unpaved Road Fugitive Dust		Vehicle Exhaust		Vehicle Tire & Brake Wear		Vehicle Total PM10		Model Hourly
			(ft)	(m)	(ft)	(ft)	(m)	(m)	(m)			(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)	(g/s)
Total PM10 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher	Total PM10	T_WRB1	2,436	742	12	31.7	9.7	6.8	3.4	100%	10	5.57	3.0504	0.7278	0.3988	0.0169	0.0093	6.31	3.46	4.36E-01
Internal Road -Waste Rock Export Trucks-OnSite Travel	Total PM10	T_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	100%	10	1.08	0.5921	0.0002	0.0001	0.0033	0.0018	1.08	0.59	7.48E-02
Internal Road for All Trucks Except Rock Trucks	Total PM10	T_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	1.60	0.8742	0.0003	0.0002	0.0042	0.0023	1.60	0.88	1.10E-01
Exhaust PM10 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher	Exhaust PM10	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	100%	10	--	--	0.7278	0.3988	--	--	--	--	5.02E-02
Internal Road -Waste Rock Export Trucks-OnSite Travel	Exhaust PM10	ET_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	100%	10	--	--	0.0002	0.0001	--	--	--	--	1.07E-05
Internal Road for All Trucks Except Rock Trucks	Exhaust PM10	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	--	--	0.0003	0.0002	--	--	--	--	2.20E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

PM2.5 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length		Road Lanes Width	Modeled Road Width		Initial[a] Vertical Height	Release[a] Height	Percent Trucks	Daily[b] Operation Hours	On-Site Truck Travel PM2.5 Emissions: Unpaved Road Fugitive Dust		Vehicle Exhaust		Vehicle Tire & Brake Wear		Vehicle Total PM10		Model Hourly
			(ft)	(m)	(ft)	(ft)	(m)	(m)	(m)			(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)	(g/s)
Total PM2.5 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher	Total PM2.5	T_WRB1	2,436	742	12	31.7	9.7	6.8	3.4	100%	10	0.56	0.3050	0.7278	0.3988	0.0056	0.0030	1.29	0.71	8.91E-02
Internal Road -Waste Rock Export Trucks-OnSite Travel	Total PM2.5	T_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	100%	10	0.11	0.0592	0.0001	0.0001	0.0011	0.0006	0.11	0.06	7.55E-03
Internal Road for All Trucks Except Rock Trucks	Total PM2.5	T_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	0.16	0.0874	0.0003	0.0002	0.0014	0.0008	0.16	0.09	1.11E-02
Exhaust PM2.5 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher	Exhaust PM2.5	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	100%	10	--	--	0.7278	0.3988	--	--	--	--	5.02E-02
Internal Road -Waste Rock Export Trucks-OnSite Travel	Exhaust PM2.5	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	100%	10	--	--	0.0001	0.0001	--	--	--	--	1.03E-05
Internal Road for All Trucks Except Rock Trucks	Exhaust PM2.5	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	--	--	0.0003	0.0002	--	--	--	--	2.06E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

TABLE M-2
MODELED ON-SITE TRUCK TRAVEL NOx, CO, AND SO2 ANNUAL AND SHORT TERM EMISSIONS AND SOURCE iNFORMATION FOR LINE-VOLUME SOURCES
CONSTRUCTION PHASE - WITHOUT BERM

Hydrostor WRESC

Annual NOx from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Annual NOx Emissions: Vehicle Exhaust (tons/yr)	Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
NOx Sources														
Internal Road - Waste Rock Trucks-Shaft to Crushe	Exhaust NOx	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	100%	10	20.5299	11.2493	1.42E+00
Internal Road -Waste Rock Export Trucks-OnSite T	Exhaust NOx	ET_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	100%	10	0.0982	0.0538	6.78E-03
Internal Road for All Trucks Except Rock Trucks	Exhaust NOx	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	0.1066	0.0584	7.36E-03

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Short Term NOx from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Hourly NOx: Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
NOx Sources													
Internal Road - Waste Rock Trucks-Shaft to Crushe	Exhaust NOx	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	100%	10	11.281	1.42E+00
Internal Road -Waste Rock Export Trucks-OnSite T	Exhaust NOx	ET_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	100%	10	0.054	6.78E-03
Internal Road for All Trucks Except Rock Trucks	Exhaust NOx	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	0.058	7.36E-03

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Short Term CO from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Hourly CO: Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
CO Sources													
Internal Road - Waste Rock Trucks-Shaft to Crushe	Exhaust CO	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	100%	10	12.1973	1.54E+00
Internal Road -Waste Rock Export Trucks-OnSite T	Exhaust CO	ET_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	100%	10	0.0039	4.94E-04
Internal Road for All Trucks Except Rock Trucks	Exhaust CO	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	0.0364	4.59E-03

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Annual SO2 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Annual SO2 Emissions: Vehicle Exhaust (tons/yr)	Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
SO2 Sources														
Internal Road - Waste Rock Trucks-Shaft to Crushe	Exhaust SO2	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	0.0231	0.0126	1.59E-03
Internal Road -Waste Rock Export Trucks-OnSite T	Exhaust SO2	ET_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	25%	10	0.0001	0.0001	6.82E-06
Internal Road for All Trucks Except Rock Trucks	Exhaust SO2	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	0.0005	0.0003	3.62E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Short Term SO2 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Hourly SO2: Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
SO2 Sources													
Internal Road - Waste Rock Trucks-Shaft to Crushe	Exhaust SO2	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	100%	10	0.0507	6.39E-03
Internal Road -Waste Rock Export Trucks-OnSite T	Exhaust SO2	ET_WRB2	1,134	346	12	31.7	9.7	6.8	3.4	100%	10	0.0002	2.73E-05
Internal Road for All Trucks Except Rock Trucks	Exhaust SO2	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	0.0003	3.62E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

TABLE M-3
MODELED PM-10 EMISSIONS AND SOURCE DIMENSIONS FOR AREA SOURCES
CONSTRUCTION PHASE - WITHOUT BERM
Hydrostor WRESC

Sources Included in Area Sources	Description	Units	Emissions of Modeled Area Sources						
			CWAEXH Cavern Works - Exhaust Emissions	**CWAFUG** Cavern Works - Fugitive Emissions	**SWAEXH** Surface Works - Exhaust Emissions	**SWAFUG** Surface Works - Fugitive Emissions	**RECAEXH** Rock-Earth-Crusher Storage Pile Area Exhaust Emissions	**RECAFUG** Rock-Earth-Crusher Storage Pile Area Fugitive Emissions	**SAFUG** Overall Site Area - Wind Erosion Emissions
Emissions Basis - PM10									
Emissions from Non-Road Engines									
EXH-1	Indirects (5 days/week)	ton/yr	--		0.111		--	--	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--		0.039		--	--	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--		0.067		--	--	--
EXH-4	Structural (5 days/week)	ton/yr	--		0.000		--	--	--
EXH-5	Piping (5 days/week)	ton/yr	--		0.044		--	--	--
EXH-6	Mechanical (5 days/week)	ton/yr	--		0.027		--	--	--
EXH-7	Cavern Rock Moving and Hauling (7 days/week)	ton/yr	0.025		--		--	--	--
EXH-8	Site Prep (5 days/week)	ton/yr	--		--		--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/week)	ton/yr	--		--		--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	0.038		--		--	--	--
EXH-11	Underground Equipment (7 days/week)-Emissions vented to sur	ton/yr	--		--		--	--	--
Material Transfer Operations									
TA1	Clearing and Stripping -Truck unloading	ton/yr	--	0.027	--	--	--	--	--
TB1	Mining-Drop to Surface	ton/yr	--	0.112	--	--	--	--	--
TB2	Mining-Load at shaft storage and haul to rock crusher	ton/yr	--	0.223	--	--	--	--	--
TB3	Mining-Transfer from WR Storage to trucks for export	ton/yr	--	--	--	--	--	0.223	--
TD1	Site clearing - Truck loading	ton/yr	--	--	--	0.020	--	--	--
TD2	Excavations Activities - Truck loading	ton/yr	--	--	--	0.007	--	--	--
Bulldozing									
BD1	Foundation and Compaction - Surface Works	ton/yr	--	--	--	--	--	--	--
BD2	Mining Surface	ton/yr	--	--	--	--	--	--	--
Grading									
GD1	Foundation and Compaction	ton/yr	--	--	--	0.429	--	--	--
Wind Erosion of Exposed Surface Areas									
WE1	Clearing& Stripping	ton/yr	--	--	--	--	--	--	2.043
WE2	Temporary Cavern Rock Storage Area	ton/yr	--	--	--	--	--	0.143	--
WE3	Temporary Earthwork Storage Area	ton/yr	--	--	--	--	--	0.143	--
WE4	Temporary Crushing Plant Storage Area	ton/yr	--	--	--	--	--	0.048	--
Wind Erosion of Stock Piles									
WS1	Shaft Cutting	ton/yr	--	0.218	--	--	--	--	--
WS2	Site Clearing	ton/yr	--	--	--	0.881	--	--	--
WS3	Excavations	ton/yr	--	--	--	0.533	--	--	--
Rock Crushing Plant									
RC1	Rock Crushing System	ton/yr	--	--	--	--	0.248	--	--
RC2	Generator Sets	ton/yr					0.138		
	Total PM10 Emission	ton/yr	0.0629	0.5801	0.2871	1.8694	0.3861	0.5558	2.0425
	Total PM10 Emission	lb/h	0.0144	0.1324	0.0655	0.4268	0.0882	0.1269	0.4663
	Total PM10 Emission	g/s	0.0018	0.0167	0.0083	0.0538	0.0111	0.0160	0.0588
Emission Source Information									
Modeled source type			Area	Area	Area	Area	Area	Area	Area
Vertical dimension									
Elevation		m	780.3	780.3	780.3	780.3	783.3	783.3	781.8
Modeled release height		m	6	2	6	2	6	2	2
Initial vertical dimension[b] (sz_0)		m	2.79	0.93	2.79	0.93	2.79	0.93	0.93
Horizontal dimension									
Area		m^2	41,996	41,996	156,145	156,145	35,425	35,425	560,186
Modeled Emissions Information									
Model ID			**CWAEXH**	**CWAFUG**	**SWAEXH**	**SWAFUG**	**RECAEXH**	**RECAFUG**	**SAFUG**
Modeled Emission Rate, PM10		$g/s/m^2$	4.31E-08	3.97E-07	5.29E-08	3.44E-07	3.14E-07	4.51E-07	1.05E-07

TABLE M-4
MODELED PM-2.5 EMISSIONS AND SOURCE DIMENSIONS FOR AREA SOURCES
CONSTRUCTION PHASE - WITHOUT BERM
Hydrostor WRESC

Sources Included in Area Sources	Description	Units	Emissions of Modeled Area Sources						
			CWAEXH Cavern Works - Exhaust Emissions	CWAFUG Cavern Works - Fugitive Emissions	SWAEXH Surface Works - Exhaust Emissions	SWAFUG Surface Works - Fugitive Emissions	RECAEXH Rock-Earth-Crusher Storage Pile Area Exhaust Emissions	RECAFUG Rock-Earth-Crusher Storage Pile Area Fugitive Emissions	SAFUG Overall Site Area - Wind Erosion Emissions
Emissions Basis - PM2.5									
Emissions from Non-Road Engines									
EXH-1	Indirects (5 days/week)	ton/yr	--		0.111		--	--	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--		0.039		--	--	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--		0.067		--	--	--
EXH-4	Structural (5 days/week)	ton/yr	--		0.000		--	--	--
EXH-5	Piping (5 days/week)	ton/yr	--		0.044		--	--	--
EXH-6	Mechanical (5 days/week)	ton/yr	--		0.027		--	--	--
EXH-7	Cavern Rock Moving and Hauling (7 days/week)	ton/yr	0.025		--		--	--	--
EXH-8	Site Prep (5 days/week)	ton/yr	--		--		--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/week)	ton/yr	--		--		--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	0.038		--		--	--	--
EXH-11	Underground Equipment (7 days/week)-Emissions vented to surfa	ton/yr	--		--		--	--	--
Material Transfer Operations									
TA1	Clearing and Stripping -Truck unloading	ton/yr	--	0.004	--	--	--	--	--
TB1	Mining-Drop to Surface	ton/yr	--	0.017	--	--	--	--	--
TB2	Mining-Load at shaft storage and haul to rock crusher	ton/yr	--	0.034	--	--	--	--	--
TB3	Mining-Transfer from WR Storage to trucks for export	ton/yr	--	--	--	--	--	0.034	--
TD1	Site clearing - Truck loading	ton/yr	--	--	--	0.003	--	--	--
TD2	Excavations Activities - Truck loading	ton/yr	--	--	--	0.001	--	--	--
Bulldozing									
BD1	Foundation and Compaction - Surface Works	ton/yr	--	--	--	--	--	--	--
BD2	Mining Surface	ton/yr	--	--	--	--	--	--	--
Grading									
GD1	Foundation and Compaction	ton/yr	--	--	--	0.035	--	--	--
Wind Erosion of Exposed Surface Areas									
WE1	Clearing& Stripping	ton/yr	--	--	--	--	--	--	1.021
WE2	Temporary Cavern Rock Storage Area	ton/yr	--	--	--	--	--	0.071	--
WE3	Temporary Earthwork Storage Area	ton/yr	--	--	--	--	--	0.071	--
WE4	Temporary Crushing Plant Storage Area	ton/yr	--	--	--	--	--	0.024	--
Wind Erosion of Stock Piles									
WS1	Shaft Cutting	ton/yr	--	0.033	--	--	--	--	--
WS2	Site Clearing	ton/yr	--	--	--	0.132	--	--	--
WS3	Excavations	ton/yr	--	--	--	0.080	--	--	--
Rock Crushing Plant									
RC1	Rock Crushing System	ton/yr	--	--	--	--	0.248	--	--
RC2	Generator Sets	ton/yr					0.138		
	Total PM2.5 Emission	ton/yr	0.0629	0.0875	0.2871	0.2509	0.3861	0.2001	1.0213
	Total PM2.5 Emission	lb/h	0.0144	0.0200	0.0655	0.0573	0.0882	0.0457	0.2332
	Total PM2.5 Emission	g/s	0.0018	0.0025	0.0083	0.0072	0.0111	0.0058	0.0294
Emission Source Information									
Modeled source type			Area	Area	Area	Area	Area	Area	Area
Vertical dimension									
Elevation		m	780.3	780.3	780.3	780.3	783.3	783.3	781.8
Modeled release height		m	6	2	6	2	6	2	2
Initial vertical dimension[b] (sz_0)		m	2.79	0.93	2.79	0.93	2.79	0.93	0.93
Horizontal dimension									
Area		m^2	41,996	41,996	156,145	156,145	35,424	35,424	709,269
Modeled Emissions Information									
Model ID			**CWAEXH**	**CWAFUG**	**SWAEXH**	**SWAFUG**	**RECAEXH**	**RECAFUG**	**SAFUG**

Modeled Emission Rate, PM2.5	$g/s/m^2$	4.31E-08	6.00E-08	5.29E-08	4.62E-08	3.14E-07	1.62E-07	4.14E-08

TABLE M-5
MODELED Nox, CO, AND SO2 EMISSIONS AND SOURCE DIMENSIONS FOR AREA SOURCES
CONSTRUCTION PHASE - WITHOUT BERM
Hydrostor WRESC

Sources Included in Area Sources	Description	Units	Emissions of Modeled Area Sources		
			CWAEXH Cavern Works - Exhaust Emissions	SWAEXH Surface Works - Exhaust Emissions	RECAEXH Rock-Earth-Crusher Storage Pile Area Exhaust Emissions
Emissions Basis - NOx					
Emissions from Non-Road Engines					
EXH-1	Indirects (5 days/week)	ton/yr	--	0.111	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--	0.039	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--	0.067	--
EXH-4	Structural (5 days/week)	ton/yr	--	0.000	--
EXH-5	Piping (5 days/week)	ton/yr	--	0.044	--
EXH-6	Mechanical (5 days/week)	ton/yr	--	0.027	--
EXH-7	Cavern Rock Moving and Hauling (7 days/wee	ton/yr	0.674	--	--
EXH-8	Site Prep (5 days/week)	ton/yr	--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/we	ton/yr	--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	1.060	--	--
EXH-11	Underground Equipment (7 days/week)-Emissi	ton/yr	--	--	--
Rock Crushing Plant					
RC1	Rock Crushing System	ton/yr	--	--	
RC2	Generator Sets	ton/yr	--	--	3.448
	Annual NOx Emission	ton/yr	1.7339	0.2871	3.4477
	Total NOx Emission	lb/h	0.3959	0.0655	0.7871
	Total NOx Emission	g/s	0.0499	0.0083	0.0992
Emissions Basis - CO					
Emissions from Non-Road Engines					
EXH-1	Indirects (5 days/week)	ton/yr	--	4.464	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--	1.252	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--	2.302	--
EXH-4	Structural (5 days/week)	ton/yr	--	0.000	--
EXH-5	Piping (5 days/week)	ton/yr	--	2.406	--
EXH-6	Mechanical (5 days/week)	ton/yr	--	0.671	--
EXH-7	Cavern Rock Moving and Hauling (7 days/wee	ton/yr	0.583	--	--
EXH-8	Site Prep (5 days/week)	ton/yr	--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/we	ton/yr	--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	1.146	--	--
EXH-11	Underground Equipment (7 days/week)-Emissi	ton/yr	--	--	--
Rock Crushing Plant					
RC1	Rock Crushing System	ton/yr	--	--	--
RC2	Generator Sets	ton/yr	--	--	17.928
	Annual CO Emission	ton/yr	1.7287	11.0947	17.9280
	Total CO Emission	lb/h	0.3947	2.5330	4.0932
	Total CO Emission	g/s	0.0497	0.3192	0.5157
Emissions Basis - SO2					
Emissions from Non-Road Engines					
EXH-1	Indirects (5 days/week)	ton/yr	--	0.009	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--	0.002	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--	0.004	--
EXH-4	Structural (5 days/week)	ton/yr	--	0.000	--
EXH-5	Piping (5 days/week)	ton/yr	--	0.004	--
EXH-6	Mechanical (5 days/week)	ton/yr	--	0.001	--
EXH-7	Cavern Rock Moving and Hauling (7 days/wee	ton/yr	0.002	--	--
EXH-8	Site Prep (5 days/week)	ton/yr	--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/we	ton/yr	--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	0.005	--	--
EXH-11	Underground Equipment (7 days/week)-Emissi	ton/yr	--	--	--
Rock Crushing Plant					
RC1	Rock Crushing System	ton/yr	--	--	--
RC2	Generator Sets	ton/yr	--	--	0.0345
	Annual SO2 Emission	ton/yr	0.0070	0.0203	0.0345
	Total SO2 Emission	lb/h	0.0016	0.0046	0.0079
	Total SO2 Emission	g/s	0.0002	0.0006	0.0010
Modeled source type			Area	Area	Area
Vertical dimension					
Elevation		m	780.3	780.3	783.3
Modeled release height		m	6	6	6
Initial vertical dimension[b] (sz_0)		m	2.79	2.79	2.79
Horizontal dimension					
Area		m^2	41,996	156,145	35,424
Modeled Emissions Information					
Model ID			**CWAEXH**	**SWAEXH**	**RECAEXH**
Modeled Emission Rate, NOx		$g/s/m^2$	1.19E-06	5.29E-08	2.80E-06
Modeled Emission Rate, CO		$g/s/m^2$	1.18E-06	2.04E-06	1.46E-05
Modeled Emission Rate, SO2		$g/s/m^2$	4.80E-09	3.75E-09	2.80E-08

TABLE M-6
MODELED EMISSIONS AND SOURCE DIMENSIONS FOR POINT SOURCES
CONSTRUCTION WITHOUT BERM
Underground Equipment Vented to Surface - All Equipment Except Loaders/Haul/Dump Source

Description	Units		VENT1A	VENT2A	VENT3A	Assumption/Comment
		Total for All Vents	**8 ft Vent - Service/Water Shaft**	**7 ft Vent Shaft - North**	**7 ft Vent Shaft - South**	
	ton/yr	0.265	0.105	0.080	0.080	10 hours/day operation
	lb/hr	0.145	0.057	0.044	0.044	
PM-10	g/s	0.0183	0.0072	0.0055	0.0055	
	ton/yr	0.265	0.105	0.080	0.080	10 hours/day operation
	lb/hr	0.145	0.057	0.044	0.044	
PM-2.5	g/s	0.0183	0.0072	0.0055	0.0055	
	ton/yr	4.085	1.614	1.236	1.236	10 hours/day operation
	lb/hr	2.238	0.884	0.677	0.677	
Annual NOx	g/s	0.2820	0.1114	0.0853	0.0853	
	lb/hr	2.338	0.924	0.707	0.707	Maximum 1-hour operation
NOx Max 1-hour Emission Rate	g/s	0.2946	0.1164	0.0891	0.0891	
	lb/hr	2.683	1.060	0.811	0.811	
CO Max 1-hour Emission Rate	g/s	0.3380	0.1335	0.102	0.102	Maximum 1-hour operation
	ton/yr	0.007	0.003	0.002	0.002	10 hours/day operation
	lb/hr	0.004	0.001	0.001	0.001	
Annual SO2	g/s	0.0005	0.0002	0.0001	0.0001	
	lb/hr	0.004	0.002	0.0012	0.0012	
SO2 Max 1-hour Emission Rate	g/s	0.0005	0.0002	0.0001	0.0001	Maximum 1-hour operation
Emission Source Information						
Modeled source type			Point	Point	Point	
Stack Parameters						
Release height	ft	-	10.0	10.0	10.0	10 ft assumed, based on applicant information
Stack diameter	ft	-	8.0	7.0	7.0	Provided by applicant
Stack Area	ft^2	-	50.3	38.5	38.5	
Stack exhaust temperature	F	-	ambient	ambient	ambient	Ambient conditions assumed
Stack exhaust flow rate	ft^3/min	300,000	118,519	90,741	90,741	total 300,000 acfm all vents. Distributed by vent areas
Fraction of total exhaust flow	-	1.000	0.395	0.302	0.302	
Modeled Emissions Information						
Source ID			**VENT1A**	**VENT2A**	**VENT3A**	
Stack Parameters						
Release height	m	-	3.0	3.0	3.0	
Stack diameter	m	-	2.4	2.1	2.1	
Stack exhaust temperature	K	-	0.0	0.0	0.0	Ambient conditions assumed
Stack exhaust velocity	m/s	-	12.0	12.0	12.0	Calculated

TABLE M-7
MODELED EMISSIONS AND SOURCE DIMENSIONS FOR POINT SOURCES
CONSTRUCTION WITHOUT BERM
Underground Equipment Vented to Surface - Loaders/Haul/Dump Source

Description	Units	Total for All Vents	VENT1B 8 ft Vent - Service/Water Shaft	VENT2B 7 ft Vent Shaft - North	VENT3B 7 ft Vent Shaft - South	Assumption/Comment
	ton/yr	0.121	0.048	0.037	0.037	24 hours/day operation
	lb/hr	0.028	0.026	0.020	0.020	
PM-10	g/s	0.0035	0.0033	0.0025	0.0025	
	ton/yr	0.121	0.048	0.037	0.037	24 hours/day operation
	lb/hr	0.028	0.026	0.020	0.020	
PM-2.5	g/s	0.0035	0.0033	0.0025	0.0025	
	ton/yr	3.206	1.267	0.970	0.970	24 hours/day operation
	lb/hr	0.732	0.289	0.221	0.221	
Annual NOx	g/s	0.0922	0.0364	0.0279	0.0279	
	lb/hr	0.918	0.362	0.278	0.278	Maximum 1-hour operation
NOx Max 1-hour Emission Rate	g/s	0.1156	0.0457	0.0350	0.0350	
	lb/hr	0.800	0.316	0.242	0.242	
CO Max 1-hour Emission Rate	g/s	0.1009	0.0398	0.031	0.031	Maximum 1-hour operation
	ton/yr	0.011	0.004	0.003	0.003	24 hours/day operation
	lb/hr	0.0025	0.0010	0.0008	0.0008	
Annual SO2	g/s	0.0003	0.0001	0.0001	0.0001	
	lb/hr	0.0032	0.001	0.0010	0.0010	
SO2 Max 1-hour Emission Rate	g/s	0.0004	0.0002	0.0001	0.0001	Maximum 1-hour operation
Emission Source Information						
Modeled source type		Total for All Vents	Point	Point	Point	
Stack Parameters						
Release height	ft	-	10.0	10.0	10.0	10 ft assumed, based on applicant information
Stack diameter	ft	-	8.0	7.0	7.0	Provided by applicant
Stack Area	ft^2	-	50.3	38.5	38.5	
Stack exhaust temperature	F	-	ambient	ambient	ambient	Ambient conditions assumed
Stack exhaust flow rate	ft^3/min	300,000	118,519	90,741	90,741	total 300,000 acfm all vents. Distributed by vent areas
Fraction of total exhaust flow	-	1.000	0.395	0.302	0.302	
Modeled Emissions Information						
Source ID			**VENT1B**	**VENT2B**	**VENT3B**	
Stack Parameters						
Release height	m	-	3.0	3.0	3.0	
Stack diameter	m	-	2.4	2.1	2.1	
Stack exhaust temperature	K	-	0.0	0.0	0.0	Ambient conditions assumed
Stack exhaust velocity	m/s	-	12.0	12.0	12.0	Calculated

TABLE M-8
MODELED EMISSIONS AND SOURCE DIMENSIONS FOR POINT SOURCES
CONSTRUCTION WITHOUT BERM
Rock Crushing Plant - Diesel Engines for Generators

Description	**Units**	**RPGENS**	**Assumption/Comment**
		Rock Crushing Plant Generators (2)	
	ton/yr	0.138	10 hours/day operation
	lb/hr	0.076	
PM-10	g/s	0.0095	
	ton/yr	0.138	10 hours/day operation
	lb/hr	0.076	
PM-2.5	g/s	0.0095	
	ton/yr	3.448	10 hours/day operation
	lb/hr	1.889	
Annual NOx	g/s	0.2380	
	lb/hr	1.717	Maximum 1-hour
NOx Max 1-hour Emission Rate	g/s	0.2164	
	lb/hr	8.931	
CO Max 1-hour Emission Rate	g/s	1.1252	Maximum 1-hour
	ton/yr	0.034	10 hours/day operation
	lb/hr	0.019	
Annual SO2	g/s	0.0024	
	lb/hr	0.017	
SO2 Max 1-hour Emission Rate	g/s	0.0022	Maximum 1-hour
Emission Source Information			
Modeled source type		Point	
Base Elevation	ft	2570	
Stack Parameters			
Release height	ft	10.0	10 ft assumed, based on applicant information
Stack diameter	ft	0.5	
Stack Area	ft^2	0.2	
Stack exhaust temperature	F	890	
Stack exhaust flow rate	ft^3/min	4,300	
Modeled Emissions Information			
Source ID		**RPGENS**	
Base Elevation		783.3	
Stack Parameters			
Release height	m	3.0	
Stack diameter	m	0.15	
Stack exhaust temperature	K	749.8	
Stack exhaust velocity	m/s	111.3	Calculated

Attachment 5.1D-2

Construction Modeling Emissions Tables – Berm Option

M-1 to M-8

TABLE M-1
MODELED ON-SITE TRUCK TRAVEL PM10 AND PM2.5 EMISSIONS AND SOURCE iNFORMATION FOR LINE-VOLUME SOURCES
CONSTRUCTION PHASE - WITH BERM

Hydrostor WRESC

PM10 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	On-Site Truck Travel PM10 Emissions: Unpaved Road Fugitive Dust (tons/yr)	Unpaved Road Fugitive Dust (lb/hr)	Vehicle Exhaust (tons/yr)	Vehicle Exhaust (lb/hr)	Vehicle Tire & Brake Wear (tons/yr)	Vehicle Tire & Brake Wear (lb/hr)	Vehicle Total PM10 (tons/yr)	Vehicle Total PM10 (lb/hr)	Model Hourly (g/s)
Total PM10 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%)	Total PM10	T_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	1.50	0.8231	0.0237	0.0130	0.0046	0.0025	1.53	0.84	1.06E-01
Internal Road -Waste Rock Trucks-Crusher to Berm (25%)	Total PM10	T_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	1.50	0.8231	0.0237	0.0130	0.0046	0.0025	1.53	0.84	1.06E-01
Internal Road for Waste Rock Trucks-Shaft to Berm Loop (	Total PM10	T_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	4.51	2.4694	0.0711	0.0389	0.0137	0.0075	4.59	2.52	3.17E-01
Internal Road - Berm Material Truck-Berm to Soil Storage	Total PM10	T_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	1.05	0.5728	0.0002	0.0001	0.0032	0.0017	1.05	0.57	7.24E-02
Internal Road for All Trucks Except Rock & Berm Trucks	Total PM10	T_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	1.75	0.9562	0.0004	0.0002	0.0045	0.0024	1.75	0.96	1.21E-01
Exhaust PM10 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%)	Exhaust PM10	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	--	--	0.0237	0.0130	--	--	--	--	1.64E-03
Internal Road -Waste Rock Trucks-Crusher to Berm (25%)	Exhaust PM10	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	--	--	0.0237	0.0130	--	--	--	--	1.64E-03
Internal Road for Waste Rock Trucks-Shaft to Berm Loop (	Exhaust PM10	ET_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	--	--	0.0711	0.0389	--	--	--	--	4.91E-03
Internal Road - Berm Material Truck-Berm to Soil Storage	Exhaust PM10	ET_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	--	--	0.0002	0.0001	--	--	--	--	1.04E-05
Internal Road for All Trucks Except Rock & Berm Trucks	Exhaust PM10	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	--	--	0.0004	0.0002	--	--	--	--	2.44E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

PM2.5 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	On-Site Truck Travel PM2.5 Emissions: Unpaved Road Fugitive Dust (tons/yr)	Unpaved Road Fugitive Dust (lb/hr)	Vehicle Exhaust (tons/yr)	Vehicle Exhaust (lb/hr)	Vehicle Tire & Brake Wear (tons/yr)	Vehicle Tire & Brake Wear (lb/hr)	Vehicle Total PM10 (tons/yr)	Vehicle Total PM10 (lb/hr)	Model Hourly (g/s)
Total PM2.5 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%)	Total PM2.5	T_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	0.15	0.0823	0.0237	0.0130	0.0015	0.0008	0.18	0.10	1.21E-02
Internal Road -Waste Rock Trucks-Crusher to Berm (25%)	Total PM2.5	T_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	0.15	0.0823	0.0237	0.0130	0.0015	0.0008	0.18	0.10	1.21E-02
Internal Road for Waste Rock Trucks-Shaft to Berm Loop (	Total PM2.5	T_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	0.45	0.2469	0.0711	0.0389	0.0045	0.0025	0.53	0.29	3.63E-02
Internal Road - Berm Material Truck-Berm to Soil Storage	Total PM2.5	T_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	0.10	0.0573	0.0001	0.0001	0.0010	0.0006	0.11	0.06	7.30E-03
Internal Road for All Trucks Except Rock & Berm Trucks	Total PM2.5	T_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	0.17	0.0956	0.0003	0.0002	0.0015	0.0008	0.18	0.10	1.22E-02
Exhaust PM2.5 Sources																				
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%)	Exhaust PM2.5	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	--	--	0.0237	0.0130	--	--	--	--	1.64E-03
Internal Road -Waste Rock Trucks-Crusher to Berm (25%)	Exhaust PM2.5	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	--	--	0.0237	0.0130	--	--	--	--	1.64E-03
Internal Road for Waste Rock Trucks-Shaft to Berm Loop (	Exhaust PM2.5	ET_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	--	--	0.0711	0.0389	--	--	--	--	4.91E-03
Internal Road - Berm Material Truck-Berm to Soil Storage	Exhaust PM2.5	ET_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	--	--	0.0001	0.0001	--	--	--	--	9.95E-06
Internal Road for All Trucks Except Rock & Berm Trucks	Exhaust PM2.5	ET_Main	1,943	592	12	31.7	9.7	2.6	1.3	100%	10	--	--	0.0003	0.0002	--	--	--	--	2.29E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

TABLE M-2
MODELED ON-SITE TRUCK TRAVEL NOx, CO, AND SO2 ANNUAL AND SHORT TERM EMISSIONS AND SOURCE iNFORMATION FOR LINE-VOLUME SOURCES
CONSTRUCTION PHASE - WITH BERM

Hydrostor WRESC

Annual NOx from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Annual NOx Emissions: Vehicle Exhaust (tons/yr)	Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
NOx Sources														
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%	Exhaust NOx	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	0.7988	0.4377	5.51E-02
Internal Road -Waste Rock Trucks-Crusher to Berm (25%	Exhaust NOx	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	0.7988	0.4377	5.51E-02
Internal Road for Waste Rock Trucks-Shaft to Berm Loop	Exhaust NOx	ET_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	2.3963	1.3130	1.65E-01
Internal Road - Berm Material Truck-Berm to Soil Storage	Exhaust NOx	ET_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	0.0950	0.0521	6.56E-03
Internal Road for All Trucks Except Rock & Berm Trucks	Exhaust NOx	ET_Main	1,920	585	12	31.7	9.7	2.6	1.3	100%	10	0.1089	0.0597	7.52E-03

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Short Term NOx from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Hourly NOx: Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
NOx Sources													
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%	Exhaust NOx	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	0.4387	5.53E-02
Internal Road -Waste Rock Trucks-Crusher to Berm (25%	Exhaust NOx	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	0.4387	5.53E-02
Internal Road for Waste Rock Trucks-Shaft to Berm Loop	Exhaust NOx	ET_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	1.3161	1.66E-01
Internal Road - Berm Material Truck-Berm to Soil Storage	Exhaust NOx	ET_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	0.0521	6.56E-03
Internal Road for All Trucks Except Rock & Berm Trucks	Exhaust NOx	ET_Main	1,920	585	12	31.7	9.7	2.6	1.3	100%	10	0.0597	7.52E-03

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Short Term CO from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Hour: Vehicle Exhaust (lb/hr)	Truck Travel: Model Hourly (g/s)
CO Sources													
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%	Exhaust CO	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	0.3989	5.03E-02
Internal Road -Waste Rock Trucks-Crusher to Berm (25%	Exhaust CO	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	0.3989	5.03E-02
Internal Road for Waste Rock Trucks-Shaft to Berm Loop	Exhaust CO	ET_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	1.1967	1.51E-01
Internal Road - Berm Material Truck-Berm to Soil Storage	Exhaust CO	ET_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	0.0038	4.78E-04
Internal Road for All Trucks Except Rock & Berm Trucks	Exhaust CO	ET_Main	1,920	585	12	31.7	9.7	2.6	1.3	100%	10	0.0433	5.46E-03

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Annual SO2 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Annual NOx Emissions: Vehicle Exhaust (tons/yr)	Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
SO2 Sources														
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%	Exhaust SO2	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	0.0035	0.0019	2.43E-04
Internal Road -Waste Rock Trucks-Crusher to Berm (25%	Exhaust SO2	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	0.0035	0.0019	2.43E-04
Internal Road for Waste Rock Trucks-Shaft to Berm Loop	Exhaust SO2	ET_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	0.0106	0.0058	7.30E-04
Internal Road - Berm Material Truck-Berm to Soil Storage	Exhaust SO2	ET_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	0.0004	0.0002	2.64E-05
Internal Road for All Trucks Except Rock & Berm Trucks	Exhaust SO2	ET_Main	1,920	585	12	31.7	9.7	2.6	1.3	100%	10	0.0006	0.0003	3.82E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

Short Term SO2 from On-Site Truck Travel

Road Segment	Pollutant Type	Road Segment ID	Road Length (ft)	Road Length (m)	Road Lanes Width (ft)	Modeled Road Width (ft)	Modeled Road Width (m)	Initial[a] Vertical Height (m)	Release[a] Height (m)	Percent Trucks	Daily[b] Operation Hours	Truck Travel Hourly SO2: Vehicle Exhaust (lb/hr)	Model Hourly (g/s)
SO2 Sources													
Internal Road - Waste Rock Trucks-Shaft to Crusher (25%	Exhaust SO2	ET_WRB1	2,149	655	12	31.7	9.7	6.8	3.4	25%	10	0.0019	2.44E-04
Internal Road -Waste Rock Trucks-Crusher to Berm (25%	Exhaust SO2	ET_WRB2	2,199	670	12	31.7	9.7	6.8	3.4	25%	10	0.0019	2.44E-04
Internal Road for Waste Rock Trucks-Shaft to Berm Loop	Exhaust SO2	ET_WRB3	6,153	1876	12	31.7	9.7	6.8	3.4	75%	10	0.0058	7.32E-04
Internal Road - Berm Material Truck-Berm to Soil Storage	Exhaust SO2	ET_SB1	2,199	670	12	31.7	9.7	2.6	1.3	100%	10	0.0002	2.64E-05
Internal Road for All Trucks Except Rock & Berm Trucks	Exhaust SO2	ET_Main	1,920	585	12	31.7	9.7	2.6	1.3	100%	10	0.0003	3.82E-05

[a] Line-volume source parameters based on EPA 2015
[b] Operation assumed to occur from 7 a.m. to 5 p.m.

TABLE M-3
MODELED PM-10 EMISSIONS AND SOURCE DIMENSIONS FOR AREA SOURCES
CONSTRUCTION PHASE - WITH BERM
Hydrostor WRESC

Sources Included in Area Sources	Description	Units	Emissions of Modeled Area Sources CWAEXH Cavern Works - Exhaust Emissions	CWAFUG Cavern Works - Fugitive Emissions	SWAEXH Surface Works - Exhaust Emissions	SWAFUG Surface Works - Fugitive Emissions	BAEXH Berm Area - Exhaust Emissions	BAFUG Berm Area - Fugitive Emissions	RECAEXH Rock-Earth-Crusher Storage Pile Area Exhaust Emissions	RECAFUG Rock-Earth-Crusher Storage Pile Area Fugitive Emissions	SAFUG Overall Site Area - Wind Erosion Emissions
Emissions Basis - PM10											
Emissions from Non-Road Engines											
EXH-1	Indirects (5 days/week)	ton/yr	--		0.190		--		--	--	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--		0.039		--		--	--	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--		0.075		--		--	--	--
EXH-4	Structural (5 days/week)	ton/yr	--		0.000		--		--	--	--
EXH-5	Piping (5 days/week)	ton/yr	--		0.044		--		--	--	--
EXH-6	Mechanical (5 days/week)	ton/yr	--		0.027		--		--	--	--
EXH-7	Cavern Rock Moving and Berming (7 days/wee	ton/yr	--		--		0.078		--	--	--
EXH-8	Site Prep (5 days/week)	ton/yr	--		--		--		--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/we	ton/yr	--		--		--		--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	0.038		--		--		--	--	--
EXH-11	Underground Equipment (7 days/week)-Emissic	ton/yr	--		--		--		--	--	--
Material Transfer Operations											
TA1	Clearing and Stripping -Truck unloading	ton/yr	--	0.027	--	--	--	--	--	--	--
TB	Mining Activities -Total TB1 -TB4	ton/yr	--	0.614	--	--	--	--	--	--	--
TC	Berm- Overburden Total TC1 - TC2	ton/yr	--	--	--	--	--	0.076	--	--	--
TD1	Site clearing -overburden - Truck loading	ton/yr	--	--	--	0.020	--	--	--	--	--
TD2	Civil & Foudation Excavations - Truck loading	ton/yr	--	--	--	0.007	--	--	--	--	--
Bulldozing											
BD1	Cavern Rock Moving and Berming	ton/yr	--	--	--	--	--	1.267			
BD2	Mining Surface	ton/yr	--	--	--	--	--	--	--	--	--
Grading											
GD1	Foundation and Compaction	ton/yr	--	--	--	0.429	--	--	--	--	--
Wind Erosion of Exposed Surface Areas											
WE1	Clearing& Stripping	ton/yr	--	--	--	--	--	--	--	--	2.043
WE2	Temporary Cavern Rock Storage Area	ton/yr	--	--	--	--	--	--	--	0.143	--
WE3	Temporary Earthwork Storage Area	ton/yr	--	--	--	--	--	--	--	0.143	--
WE4	Temporary Crushing Plant Storage Area	ton/yr	--	--	--	--	--	--	--	0.048	--
WE5	Berm Area -Construction	ton/yr	--	--	--	--	--	2.660			
Wind Erosion of Stock Piles											
WS1	Shaft Cutting	ton/yr	--	0.218	--	--	--	--	--	--	--
WS2	Site Clearing	ton/yr	--	--	--	0.881	--	--	--	--	--
WS3	Excavations	ton/yr	--	--	--	0.533	--	--	--	--	--
Rock Crushing Plant											
RC1	Rock Crushing System	ton/yr	--	--	--	--	--	--	0.022	--	--
RC2	Generator Set	ton/yr							0.038		
	Total PM10 Emission	ton/yr	0.0376	0.8599	0.3746	1.8694	0.0783	4.0029	0.0600	0.3325	2.0425
	Total PM10 Emission	lb/h	0.0086	0.1963	0.0855	0.4268	0.0179	0.9139	0.0137	0.0759	0.4663
	Total PM10 Emission	g/s	0.0011	0.0247	0.0108	0.0538	0.0023	0.1151	0.0017	0.0096	0.0588
Emission Source Information											
Modeled source type			Area	Area	Area	Area	Area	Area	Area	Area	Area
Vertical dimension											
Elevation		m	780.3	780.3	780.3	780.3	791.0	791.0	783.3	783.3	781.8
Modeled release height		m	6	2	6	2	6	2	6	2	2
Initial vertical dimension[b] (sz_0)		m	2.79	0.93	2.79	0.93	2.79	0.93	2.79	0.93	0.93
Horizontal dimension											
Area		m^2	41,996	41,996	156,145	156,145	228,170	228,170	35,424	35,424	709,269
Modeled Emissions Information											
Model ID			**CWAEXH**	**CWAFUG**	**SWAEXH**	**SWAFUG**	**BAEXH**	**BAFUG**	**RECAEXH**	**RECAFUG**	**SAFUG**
Modeled Emission Rate, PM10		$g/s/m^2$	2.57E-08	5.89E-07	6.90E-08	3.44E-07	9.87E-09	5.05E-07	4.87E-08	2.70E-07	8.28E-08

TABLE M-4
MODELED PM-2.5 EMISSIONS AND SOURCE DIMENSIONS FOR AREA SOURCES
CONSTRUCTION PHASE - WITH BERM
Hydrostor WRESC

Sources Included in Area Sources	Description	Units	Emissions of Modeled Area Sources								
			CWAEXH Cavern Works - Exhaust Emissions	CWAFUG Cavern Works - Fugitive Emissions	SWAEXH Surface Works - Exhaust Emissions	SWAFUG Surface Works - Fugitive Emissions	BAEXH Berm Area - Exhaust Emissions	BAFUG Berm Area - Fugitive Emissions	RECAEXH Rock-Earth-Crusher Storage Pile Area Exhaust Emissions	RECAFUG Rock-Earth-Crusher Storage Pile Area Fugitive Emissions	SAFUG Overall Site Area - Wind Erosion Emissions
<u>**Emissions Basis - PM2.5**</u>											
Emissions from Non-Road Engines											
EXH-1	Indirects (5 days/week)	ton/yr			0.190		--		--	--	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--		0.039		--		--	--	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--		0.075		--		--	--	--
EXH-4	Structural (5 days/week)	ton/yr	--		0.000		--		--	--	--
EXH-5	Piping (5 days/week)	ton/yr	--		0.044		--		--	--	--
EXH-6	Mechanical (5 days/week)	ton/yr	--		0.027		--		--	--	--
EXH-7	Cavern Rock Moving and Berming (7 days/week	ton/yr	--		--		0.078		--	--	--
EXH-8	Site Prep (5 days/week)	ton/yr	--		--		--		--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/weel	ton/yr	--		--		--		--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	0.038		--		--		--	--	--
EXH-11	Underground Equipment (7 days/week)-Emissior	ton/yr	--		--		--		--	--	--
Material Transfer Operations											
TA1	Clearing and Stripping -Truck unloading	ton/yr	--	0.004	--	--	--	--	--	--	--
TB	Mining Activities -Total TB1 -TB4	ton/yr	--	0.093	--	--	--	--	--	--	--
TC	Berm- Overburden Total TC1 - TC2	ton/yr	--	--	--	--	--	0.011	--	--	--
TD1	Site clearing -overburden - Truck loading	ton/yr	--	--	--	0.003	--	--	--	--	--
TD2	Civil & Foudation Excavations - Truck loading	ton/yr	--	--	--	0.001	--	--	--	--	--
Bulldozing											
BD1	Cavern Rock Moving and Berming	ton/yr	--	--	--	--	--	0.624			
BD2	Mining Surface	ton/yr	--	--	--	--	--	--	--	--	--
Grading											
GD1	Foundation and Compaction	ton/yr	--	--	--	0.035	--	--	--	--	--
Wind Erosion of Exposed Surface Areas											
WE1	Clearing& Stripping	ton/yr	--	--	--	--	--	--	--	--	1.021
WE2	Temporary Cavern Rock Storage Area	ton/yr	--	--	--	--	--	--	--	0.071	--
WE3	Temporary Earthwork Storage Area	ton/yr	--	--	--	--	--	--	--	0.071	--
WE4	Temporary Crushing Plant Storage Area	ton/yr	--	--	--	--	--	--	--	0.024	--
WE5	Berm Area -Construction	ton/yr						1.330			
Wind Erosion of Stock Piles											
WS1	Shaft Cutting	ton/yr	--	0.033	--	--	--	--	--	--	--
WS2	Site Clearing	ton/yr	--	--	--	0.132	--	--	--	--	--
WS3	Excavations	ton/yr	--	--	--	0.080	--	--	--	--	--
Rock Crushing Plant											
RC1	Rock Crushing System	ton/yr	--	--	--	--	--	--	0.007	--	--
RC2	Generator Set	ton/yr							0.038		
	Total PM2.5 Emission	ton/yr	0.0376	0.1299	0.3746	0.2509	0.0783	1.9658	0.0442	0.1663	1.0213
	Total PM2.5 Emission	lb/h	0.0086	0.0297	0.0855	0.0573	0.0179	0.4488	0.0101	0.0380	0.2332
	Total PM2.5 Emission	g/s	0.0011	0.0037	0.0108	0.0072	0.0023	0.0566	0.0013	0.0048	0.0294
Emission Source Information											
Modeled source type			Area	Area	Area	Area	Area	Area	Area	Area	Area
Vertical dimension							(2585+10)*0.3048				
Elevation		m	780.3	780.3	780.3	780.3	791.0	791.0	783.3	783.3	781.8
Modeled release height		m	6	2	6	2	6	2	6	2	6
Initial vertical dimension[b] (sz_0)		m	2.79	0.93	2.79	0.93	2.79	0.93	2.79	0.93	2.79
Horizontal dimension											
Area		m^2	41,996	41,996	156,145	156,145	228,170	228,170	35,424	35,424	709,269
Modeled Emissions Information											
Model ID			**CWAEXH**		**SWAEXH**	**SWAFUG**	**BAEXH**	**BAFUG**	**RECAEXH**	**RECAFUG**	**SAFUG**
Modeled Emission Rate, PM2.5		$g/s/m^2$	2.57E-08	8.90E-08	6.90E-08	4.62E-08	9.87E-09	2.48E-07	3.59E-08	1.35E-07	4.14E-08

TABLE M-5
MODELED Nox, CO, AND SO2 EMISSIONS AND SOURCE DIMENSIONS FOR AREA SOURCES
CONSTRUCTION PHASE - WITH BERM
Hydrostor WRESC

Sources Included in Area Sources	Description	Units	Emissions of Modeled Area Sources			
			CWAEXH Cavern Works - Exhaust Emissions	SWAEXH Surface Works - Exhaust Emissions	BAEXH Berm Area - Exhaust Emissions	RECAEXH Rock-Earth-Crusher Storage Pile Area Exhaust Emissions
Emissions Basis - NOx						
Emissions from Non-Road Engines						
EXH-1	Indirects (5 days/week)	ton/yr	--	7.089	--	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--	0.734	--	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--	2.284	--	--
EXH-4	Structural (5 days/week)	ton/yr	--	0.000	--	--
EXH-5	Piping (5 days/week)	ton/yr	--	1.628	--	--
EXH-6	Mechanical (5 days/week)	ton/yr	--	0.748	--	--
EXH-7	Cavern Rock Moving and Berming (7 days/we	ton/yr	--	--	2.010	--
EXH-8	Site Prep (5 days/week)	ton/yr	--	--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/we	ton/yr	--	--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	1.060	--	--	--
EXH-11	Underground Equipment (7 days/week)-Emissi	ton/yr	--	--	--	--
Rock Crushing Plant						
RC1	Rock Crushing System	ton/yr	--	--	--	-
RC2	Generator Set	ton/yr	--	--	--	0.940
	Annual NOx Emission	ton/yr	1.0596	12.4824	2.0099	0.9403
	Total NOx Emission	lb/h	0.2419	2.8499	0.4589	0.2147
	Total NOx Emission	g/s	0.0305	0.3591	0.0578	0.0270
Emissions Basis - CO						
Emissions from Non-Road Engines						
EXH-1	Indirects (5 days/week)	ton/yr	--	7.653	--	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--	1.292	--	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--	2.609	--	--
EXH-4	Structural (5 days/week)	ton/yr	--	0.000	--	--
EXH-5	Piping (5 days/week)	ton/yr	--	2.406	--	--
EXH-6	Mechanical (5 days/week)	ton/yr	--	0.671	--	--
EXH-7	Cavern Rock Moving and Berming (7 days/we	ton/yr	--	--	1.745	--
EXH-8	Site Prep (5 days/week)	ton/yr	--	--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/we	ton/yr	--	--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	1.146	--	--	--
EXH-11	Underground Equipment (7 days/week)-Emissi	ton/yr	--	--	--	--
Rock Crushing Plant						
RC1	Rock Crushing System	ton/yr	--	--	--	--
RC2	Generator Set	ton/yr	--	--	--	4.8895
	Annual CO Emission	ton/yr	1.1457	14.6310	1.7446	4.8895
	Total CO Emission	lb/h	0.2616	3.3404	0.3983	1.1163
	Total CO Emission	g/s	0.0330	0.4209	0.0502	0.1407
Emissions Basis - SO2						
Emissions from Non-Road Engines						
EXH-1	Indirects (5 days/week)	ton/yr	--	0.015	--	--
EXH-2	Civil & Fdns (5 days/week)	ton/yr	--	0.002	--	--
EXH-3	Turbine Hall (5 days/week)	ton/yr	--	0.005	--	--
EXH-4	Structural (5 days/week)	ton/yr	--	0.000	--	--
EXH-5	Piping (5 days/week)	ton/yr	--	0.004	--	--
EXH-6	Mechanical (5 days/week)	ton/yr	--	0.001	--	--
EXH-7	Cavern Rock Moving and Berming (7 days/we	ton/yr	--	--	0.006	--
EXH-8	Site Prep (5 days/week)	ton/yr	--	--	--	--
EXH-9	Drilling - Conventionally Sunk Shaft (7 days/we	ton/yr	--	--	--	--
EXH-10	Surface Equipment (7 days/week)	ton/yr	0.005	--	--	--
EXH-11	Underground Equipment (7 days/week)-Emissi	ton/yr	--	--	--	--
Rock Crushing Plant						
RC1	Rock Crushing System	ton/yr	--	--	--	--
RC2	Generator Set	ton/yr	--	--	--	0.0094
	Annual SO2 Emission	ton/yr	0.0048	0.0272	0.0062	0.0094
	Total SO2 Emission	lb/h	0.0011	0.0062	0.0014	0.0021
	Total SO2 Emission	g/s	0.0001	0.0008	0.0002	0.0003
Modeled source type			Area	Area	Area	Area
Vertical dimension						
	Elevation	m	780.3	780.3	791.0	783.3
	Modeled release height	m	6	6	6	6
	Initial vertical dimension[b] (sz_0)	m	2.79	2.79	2.79	2.79
Horizontal dimension						
	Area	m^2	41,996	156,145	228,170	35,424
Modeled Emissions Information						
Model ID			**CWAEXH**	**SWAEXH**	**BAEXH**	**RECAEXH**
Modeled Emission Rate, NOx		$g/s/m^2$	7.26E-07	2.30E-06	2.53E-07	7.64E-07
Modeled Emission Rate, CO		$g/s/m^2$	7.85E-07	2.70E-06	2.20E-07	3.97E-06
Modeled Emission Rate, SO2		$g/s/m^2$	3.26E-09	5.01E-09	7.88E-10	7.64E-09

TABLE M-6
MODELED EMISSIONS AND SOURCE DIMENSIONS FOR POINT SOURCES
CONSTRUCTION WITH BERM
Underground Equipment Vented to Surface - All Equipment Except Loaders/Haul/Dump Source

Description	Units		VENT1A	VENT2A	VENT3A	Assumption/Comment
		Total for All Vents	8 ft Vent - Service/Water Shaft	7 ft Vent Shaft - North	7 ft Vent Shaft - South	
	ton/yr	0.265	0.105	0.080	0.080	10 hours/day operation
	lb/hr	0.145	0.057	0.044	0.044	
PM-10	g/s	0.0183	0.0072	0.0055	0.0055	
	ton/yr	0.265	0.105	0.080	0.080	10 hours/day operation
	lb/hr	0.145	0.057	0.044	0.044	
PM-2.5	g/s	0.0183	0.0072	0.0055	0.0055	
	ton/yr	4.085	1.614	1.236	1.236	10 hours/day operation
	lb/hr	2.238	0.884	0.677	0.677	
Annual NOx	g/s	0.2820	0.1114	0.0853	0.0853	
	lb/hr	2.338	0.924	0.707	0.707	Maximum 1-hour
NOx Max 1-hour Emission Rate	g/s	0.2946	0.1164	0.0891	0.0891	
	lb/hr	2.683	1.060	0.811	0.811	
CO Max 1-hour Emission Rate	g/s	0.3380	0.1335	0.102	0.102	Maximum 1-hour
	ton/yr	0.007	0.003	0.002	0.002	10 hours/day operation
	lb/hr	0.004	0.001	0.001	0.001	
Annual SO2	g/s	0.0005	0.0002	0.0001	0.0001	
	lb/hr	0.004	0.002	0.0012	0.0012	
SO2 Max 1-hour Emission Rate	g/s	0.0005	0.0002	0.0001	0.0001	Maximum 1-hour
Emission Source Information						
Modeled source type			Point	Point	Point	
Base Elevation	ft		2515	2562	2562	
Stack Parameters						
Release height	ft	-	10.0	10.0	10.0	10 ft assumed, based on applicant information
Stack diameter	ft	-	8.0	7.0	7.0	Provided by applicant
Stack Area	ft^2	-	50.3	38.5	38.5	
Stack exhaust temperature	F	-	ambient	ambient	ambient	Ambient conditions assumed
Stack exhaust flow rate	ft^3/min	300,000	118,519	90,741	90,741	total 300,000 acfm all vents. Distributed by vent areas
Fraction of total exhaust flow	-	1.000	0.395	0.302	0.302	
Modeled Emissions Information						
Source ID			**VENT1A**	**VENT2A**	**VENT3A**	
Base Elevation			766.6	780.9	780.9	
Stack Parameters						
Release height	m	-	3.0	3.0	3.0	
Stack diameter	m	-	2.4	2.1	2.1	
Stack exhaust temperature	K	-	0.0	0.0	0.0	Ambient conditions assumed
Stack exhaust velocity	m/s	-	12.0	12.0	12.0	Calculated

TABLE M-7
MODELED EMISSIONS AND SOURCE DIMENSIONS FOR POINT SOURCES
CONSTRUCTION WITH BERM
Underground Equipment Vented to Surface - Loaders/Haul/Dump Source

Description	Units	Total for All Vents	VENT1B 8 ft Vent - Service/Water Shaft	VENT2B 7 ft Vent Shaft - North	VENT3B 7 ft Vent Shaft - South	Assumption/Comment
PM-10	ton/yr	0.121	0.048	0.037	0.037	24 hours/day operation
	lb/hr	0.028	0.026	0.020	0.020	
	g/s	0.0035	0.0033	0.0025	0.0025	
PM-2.5	ton/yr	0.121	0.048	0.037	0.037	24 hours/day operation
	lb/hr	0.028	0.026	0.020	0.020	
	g/s	0.0035	0.0033	0.0025	0.0025	
Annual NOx	ton/yr	3.206	1.267	0.970	0.970	24 hours/day operation
	lb/hr	0.732	0.694	0.531	0.531	
	g/s	0.0922	0.0874	0.0670	0.0670	
NOx Max 1-hour Emission Rate	lb/hr	0.918	0.362	0.278	0.278	Maximum 1-hour
	g/s	0.1156	0.0457	0.0350	0.0350	
CO Max 1-hour Emission Rate	lb/hr	0.800	0.316	0.242	0.242	
	g/s	0.1009	0.0398	0.031	0.031	Maximum 1-hour
Annual SO2	ton/yr	0.011	0.004	0.003	0.003	24 hours/day operation
	lb/hr	0.0025	0.002	0.002	0.002	
	g/s	0.0003	0.0003	0.0002	0.0002	
SO2 Max 1-hour Emission Rate	lb/hr	0.0032	0.001	0.0010	0.0010	
	g/s	0.0004	0.0002	0.0001	0.0001	Maximum 1-hour

Emission Source Information

Modeled source type		Total for All Vents	Point	Point	Point	
Base Elevation	ft		2515	2562	2562	
Stack Parameters						
Release height	ft	-	10.0	10.0	10.0	10 ft assumed, based on applicant information
Stack diameter	ft	-	8.0	7.0	7.0	Provided by applicant
Stack Area	ft^2	-	50.3	38.5	38.5	
Stack exhaust temperature	F	-	ambient	ambient	ambient	Ambient conditions assumed
Stack exhaust flow rate	ft^3/min	300,000	118,519	90,741	90,741	total 300,000 acfm all vents. Distributed by vent areas
Fraction of total exhaust flow	-	1.000	0.395	0.302	0.302	

Modeled Emissions Information

Source ID			**VENT1B**	**VENT2B**	**VENT3B**	
Base Elevation			766.6	780.9	780.9	
Stack Parameters						
Release height	m	-	3.0	3.0	3.0	
Stack diameter	m	-	2.4	2.1	2.1	
Stack exhaust temperature	K	-	0.0	0.0	0.0	Ambient conditions assumed
Stack exhaust velocity	m/s	-	12.0	12.0	12.0	Calculated

TABLE M-8
MODELED EMISSIONS AND SOURCE DIMENSIONS FOR POINT SOURCES
CONSTRUCTION WITH BERM
Rock Crushing Plant - Diesel Engines for Generators

Description	Units	RPGENS	Assumption/Comment
		Rock Crushing Plant Generators (2)	
	ton/yr	0.038	10 hours/day operation
	lb/hr	0.021	
PM-10	g/s	0.0026	
	ton/yr	0.038	10 hours/day operation
	lb/hr	0.021	
PM-2.5	g/s	0.0026	
	ton/yr	0.940	10 hours/day operation
	lb/hr	0.515	
Annual NOx	g/s	0.0649	
	lb/hr	1.717	Maximum 1-hour
NOx Max 1-hour Emission Rate	g/s	0.2164	
	lb/hr	8.931	
CO Max 1-hour Emission Rate	g/s	1.1252	Maximum 1-hour
	ton/yr	0.009	10 hours/day operation
	lb/hr	0.005	
Annual SO2	g/s	0.0006	
	lb/hr	0.017	
SO2 Max 1-hour Emission Rate	g/s	0.0022	Maximum 1-hour
Emission Source Information			
Modeled source type		Point	
Base Elevation	ft	2570	
Stack Parameters			
Release height	ft	10.0	10 ft assumed, based on applicant information
Stack diameter	ft	0.5	
Stack Area	ft^2	0.2	
Stack exhaust temperature	F	890	
Stack exhaust flow rate	ft^3/min	4,300	
Modeled Emissions Information			
Source ID		**RPGENS**	
Base Elevation		783.3	
Stack Parameters			
Release height	m	3.0	
Stack diameter	m	0.15	
Stack exhaust temperature	K	749.8	
Stack exhaust velocity	m/s	111.3	Calculated

Attachment 5.1D-3

Preliminary Federal Conformity Analysis

General Conformity Discussion

Applicability

For applicable actions, a Federal agency must make a determination that a Federal action conforms to the applicable implementation plan in accordance with the General Conformity Rule before the action is taken. To determine whether conformity requirements apply to an action, the agency must consider the following criteria: the nonattainment and maintenance status of the area; exemptions from and presumptions to conformity; the project's emissions in comparison to threshold levels; and the regional significance of the project's emissions.

Nonattainment and Maintenance Areas. The current conformity rule only applies to nonattainment areas and maintenance areas. The *CAA* establishes air quality standards (the NAAQS) for pollutants, called criteria pollutants. A nonattainment area (NAA) is any geographic area of the United States that is in violation of any NAAQS and, therefore, has been designated as nonattainment under the *CAA*. States are required to develop revised State Implementation Plans (SIPs) for such areas, with adequate control measures to achieve attainment within specified deadlines. A maintenance area (MA) is any geographic area of the United States previously designated nonattainment pursuant to the *CAA Amendments of 1990* and subsequently redesignated to attainment, subject to the requirement to develop a maintenance plan under the *CAA*. Such an area must develop a maintenance plan, which is a revision to the applicable implementation plan, meeting the requirements of the *CAA*. Unclassifiable ("Cannot be classified") areas are not subject to the current conformity rules.

Exemptions and Presumptions. The rule contains exemptions from and presumptions to conformity. Federal actions for which it is necessary to perform a thorough air quality analysis in order to comply with other statutory requirements (e.g., actions subject to the New Source Review program, remedial activities under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)) are considered to conform with the applicable SIP. Federal actions that would result in no emissions increase or a *de minimis* emissions increase are exempt from the conformity process. The rule identifies a list of actions that would result in no emissions increase or an increase in emissions that is clearly *de minimis*. Examples include air traffic control activities and adopting approach, departure, and enroute procedures for air operations; routine installation and operation of aviation and maritime navigational aids; participating in "air shows" and "fly-over" by military aircraft; routine monitoring and /or sampling of air, water, soils, effluent, etc.; continuing and recurring activities such as permit renewals where activities currently being conducted; rulemaking and policy development and issuance; routine movement of mobile assets such as aircraft; routing operation of facilities, mobile assets and requirement; routing maintenance and repair activities; administrative actions; and, land transfers. See Determining Conformity of General Federal Actions to State or Federal Implementation Plans, 58 Fed. Reg. 63214, 63229 (November 30, 1993). However, actions that are exempt or presumed to conform still must evaluate whether the emissions are considered "regionally significant," discussed below.

Threshold Emission Levels. Annual threshold rates of emissions were established in the General Conformity Rule to focus conformity requirements on those Federal actions with the potential to have significant air quality impacts. Threshold levels are established in Title 40 §93.153(b) and vary according to the type of pollutant and the severity of the nonattainment/ maintenance area. The project's emissions (proposed project emissions minus no action emissions) are compared to these threshold levels. Table 3 and Table 4 list the threshold levels applicable to nonattainment areas and maintenance areas, respectively. Conformity emission thresholds refer to the total of direct and indirect emissions, which "means the sum of direct and indirect emissions increases and decreases caused by the Federal action; i.e., the 'net' emissions considering all direct and indirect emissions."

Direct emissions are those caused by or initiated by the Federal action, and that occur at the same time and place as the action. Indirect emissions are those (a) "caused by the Federal action, but may occur later in time and/or may be farther removed in distance from the action itself but are still reasonably foreseeable" and (b) that "the Federal agency can practicably control and will maintain control over due to a continuing program responsibility of the Federal agency."[7] Examples of "controlling" or regulating emissions are through the use of emissions control equipment on a boiler (direct control) or through the implementation of regulations or conditions on the nature of activity that may be established in permits or approvals or by the design of the action (indirect control). A Federal agency controlling the level of vehicle emissions by controlling the size of the parking facility and setting requirements for employee trip reductions is an example of one such situation. Mitigation measures in this scenario may include reducing commuting through ride-sharing, flexible work hours, vanpooling, free transit passes, parking surcharges, or telecommuting. The portion of emissions which are exempt or presumed to conform under Title 40 §93.153 (c), (d), (e), or (f) are not included in the "total of direct and indirect emissions." Temporary emissions (e.g., project construction emissions) also must be included in the emissions calculations for a conformity determination. However, these emissions only have to be accounted for during the construction phase and not over the time frame of the project.

A conformity determination is required when the annual net total of direct and indirect emissions from a Federal action occurring in a nonattainment or maintenance area equals or exceeds the annual threshold levels. If a Federal action's emissions are below threshold levels, then the action does not need a conformity determination and is presumed to conform with the applicable SIP, as long as the action is not regionally significant (described below).

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[7] *Caused by* means emissions that would not otherwise occur in the absence of the Federal action. *Reasonably foreseeable* emissions are "projected future indirect emissions that are identified at the time the conformity determination is made; the location of such emissions is known and the emissions are quantifiable." *Control* means the ability to regulate (directly or indirectly) the emissions from the Federal action.

- **Regional Significance.** If a Federal action does not exceed the threshold levels or is presumed to conform, it may still be subject to a general conformity determination. If the total of direct and indirect emissions of any pollutant from a Federal action represent 10 percent or more of a maintenance or non-attainment area's total emissions of that pollutant, the action is considered to be a "regionally significant" activity and conformity rules apply. If an action in a nonattainment area is below the thresholds or presumed to conform and <u>not</u> regionally significant, then the conformity requirements do not apply and no official reporting is required. Parts of the overall Federal action that are exempt from conformity requirements (e.g., emission sources covered by New Source Review) should not be included in the analysis. The purpose of the regionally significant requirement is to capture those Federal actions that fall below threshold levels, but have the potential to impact the air quality of a region. *It is unlikely that an airport or air base action that is presumed to conform would be regionally significant.*

Analysis

The general conformity rule requires that each Federal agency taking an action subject to this rule must make its own conformity determination and be able to justify its application of the conformity requirements. When a project involves multiple Federal agencies, a Federal agency has the option of using the conformity analysis of another Federal agency, if the action and the impacts analyzed are the same as those for the project for which a conformity determination is required. The Federal agency must consider comments from any interested parties.

The analysis must be based on the latest planning assumptions derived from population, employment, and travel data acquired from the local metropolitan planning organization (MPO) in the area where the Federal action is planned to occur. The latest and most accurate emission estimation techniques must be applied, unless written approval to employ modifications or substitutions is obtained from the EPA regional administrator. These emissions estimation techniques include motor vehicle emission models used to prepare or revise the SIP, and emission factors for non-motor vehicle sources, databases, and models specified and approved by the EPA. It is recommended that the Federal agency consult with State and local air quality officials early in the conformity decision-making process to determine the appropriate criteria to use. Consultation also will assure that the most up-to-date models, emission factors, and population estimates are being used, as well as identify the MPOs from which to obtain any traffic or demographic data needed for the regional significance analysis.

Additionally, the EPA encourages Federal agencies to notify State and local air quality officials of any project that needs a conformity determination so that it can be specifically included in an attainment demonstration or emissions budget. This is one straightforward method of determining conformity. Other common, straightforward criteria for demonstrating conformity are: (1) determining that the total direct and indirect emissions from the action for the future years do not increase emissions with respect to the baseline emissions if the state does not have an EPA approved revision to the relevant SIP attainment or maintenance demonstration since 1990; and (2) obtaining a state's written commitment to review the SIP in the future to accommodate the emissions from a Federal action. Conditional general conformity determinations are not permitted under the regulations. A combination of criteria may be used to demonstrate conformity (e.g., one criteria may be used to show conformity for ozone and another criteria for other pollutants). If mitigation measures, in combination with emissions offsets, are selected as the conformity criteria option, measures and offsets should result in no net increase in emissions (i.e., it is not enough to offset emissions to the threshold levels). Emission offsets have to occur at the same time as the emission increases for which the offsets are necessary. All offsets must be quantifiable, consistent with the applicable SIP attainment and reasonable further progress (RFP) demonstrations, surplus to reductions required by and credited to other applicable

SIP provisions, enforceable at both the State and Federal levels, and permanent within the time frame specified by the program.

Procedure

A conformity determination for an action is a Federal responsibility. No documentation or public participation is required if an applicability analysis finds emissions are not reasonably foreseeable, cannot be controlled and maintained by the Federal Agency, or exempt, or are below the threshold and not regionally significant, or presumed to conform and not regionally significant, than no conformity determination or public participation is required. It is advisable to note any *de minimis* finding in the EA or EIS. For actions that require a conformity determination, certain documentation and public participation is required. The Federal agency must provide a 30-day notice of the Federal action and draft conformity determination to the appropriate EPA region and State and local air control agencies. The Federal agency must make public its draft conformity determination by placing a notice by prominent advertisement in a daily newspaper of general circulation in the area affected by the action and by providing 30 days for written public comment prior to taking any formal action on the draft determination. The same requirement also applies to the final conformity determination.

Conformity Steps Summary

The following is a summary of the steps taken when addressing conformity.

- Define the scope of the Federal action to include timing and location,
- Determine if the action is in a nonattainment or maintenance area
- Determine if the action is exempt or presumed to conform
- Determine criteria pollutants of concern based on the attainment status of the Air Quality Control Region,
- Calculate emissions based on the scope,
- Review net emission changes for threshold levels and regional significance, and
- Determine conformity for applicable criteria pollutants.

Conformity and *NEPA*

The conformity process is separate from the *NEPA* process. It is up to each agency to determine the best ways to integrate the conformity and *NEPA* processes. However, the conformity analysis can be completed concurrently with the *NEPA* analysis, and linkage between the two is allowed. This may be an efficient and convenient approach. There are certain requirements for *NEPA* that are not required under conformity. For example, *NEPA* requires the development of reasonable alternative actions, whereas conformity does not (conformity only requires analysis of the proposed alternative). In this case, it may be a more realistic approach to perform a conformity analysis for only the one alternative selected instead of for all alternatives. At a minimum, when the specific alternative is selected in the *NEPA* process, the conformity air quality analyses should be performed as appropriate. A joint notification and public participation process also is possible, as long as the requirements for each regulation are met.

General Conformity and NSR Threshold Levels for Nonattainment and Maintenance Areas

Non-attainment Status	VOCs (Ozone Nonattainment Areas)	NO_x (Ozone Nonattainment Areas)	Carbon Monoxide (CO)	Sulfur or Nitrogen Oxides (SO_2 or NO_x)	Particulate Matter (PM)
Extreme	10	10	NA	NA	NA
Severe	25	25	NA	NA	NA
Serious	50	50	100	NA	70
Marginal (inside an ozone transport region)	50	100	NA	NA	NA
Marginal (outside an ozone transport region)	100	100	NA	NA	NA
Moderate (inside an ozone transport region)	50	100	100	100	100
Moderate (outside an ozone transport region)	100	100	100	100	100
Maintenance (inside an ozone transport region)	50	100	100	100	100
Maintenance (outside an ozone transport region)	100	100	100	100	100

Criteria Pollutant	Nonattainment Status	Tons/Year
Ozone (VOCs or NO_x)	Serious NAAs	50
	Severe NAAs	25
	Extreme NAAs	10
	Other ozone NAAs outside an ozone transport region (OTR)	100
	Marginal and Moderate NAAs inside an OTR: VOC NO_x	 50 100
CO	All NAAs	100
SO_2	All NAAs	100
NO_2	All NAAs	100
PM-10	Moderate NAAs	100
	Serious NAAs	70
Lead	All NAAs	25

Threshold Levels For Nonattainment Areas (NAAs) *

Criteria Pollutant	Nonattainment Status	Tons/Year
Ozone (VOCs)	MAs inside an ozone transport region (OTR)	50
	MAs outside an OTR	100
Ozone (NO_x)	All MAs	100
CO	All MAs	100
SO_2	All MAs	100
No_x	All MAs	100
PM-10	All MAs	100
Lead	All MAs	25

Threshold Levels For Maintenance Areas (MAs)

Preliminary Federal Conformity Analysis

For

The Willow Rock Energy Storage Center

The conformity analysis for the Willow Rock Energy Storage Center (WRESC) is based on the project description in Section 2.0 and the air quality and emissions analysis presented in Section 5.1 of the WRESC Application for Certification (AFC). This analysis is structured per the conformity steps noted in the general conformity discussion presented above.

Step 1 – Determine the scope of the Federal action to include timing and location.

Section 2.0 on the WRESC AFC contains a detailed discussion of the project description, project location, and project timing. This section is incorporated by reference into this analysis.

Step 2 – Determine if the action is in a nonattainment or maintenance area.

Pursuant to Table 5.1-1 (Air Quality Section 5.1) and data provided by the Eastern Kern APCD the project area is classified as follows with respect to federal air quality standards.

Table 1 Attainment Status for Eastern Kern APCD

Eastern Kern APCD Attainment Status

Pollutant	Designation/Classification			
	National Ambient Air Quality Standards (NAAQS)			State Ambient Air Quality Standards
	EKAPCD	Kern River /Cummings Valleys[1,2]	Indian Wells Valley[3,4,5]	
Ozone - 1 Hour	Attainment[6,7]	Part of EKAPCD Area	Part of EKAPCD Area	Nonattainment
Ozone - 8 Hour[8]	Severe Nonattainment	Part of EKAPCD Area	Attainment	Nonattainment
PM10	Unclassifiable/Attainment	Serious Nonattainment	Attainment Maintenance	Nonattainment
PM2.5	Unclassifiable/Attainment	Part of EKAPCD Area	Part of EKAPCD Area	Unclassified
Carbon Monoxide	Unclassifiable/Attainment	Part of EKAPCD Area	Part of EKAPCD Area	Unclassified
Nitrogen Dioxide	Unclassified	Part of EKAPCD Area	Part of EKAPCD Area	Attainment
Sulfur Dioxide	Unclassified	Part of EKAPCD Area	Part of EKAPCD Area	Attainment
Lead Particulates	Unclassifiable/Attainment	Part of EKAPCD Area	Part of EKAPCD Area	Attainment

[1] Kern River Valley, Bear Valley, and Cummings Valley were previously included in the federally designated San Joaquin Valley PM10 Serious Nonattainment Area, but were made a separate nonattainment area in 2008.

[2] Kern River Valley, Bear Valley, and Cummings Valley are included in EKAPCD for all NAAQS other than PM10.

[3] Indian Wells Valley is a separate planning area from the rest of EKAPCD for PM10 NAAQS.

[4] Indian Wells Valley is a separate area for the 1997, 2008, and 2015, 8-hour ozone NAAQS (80, 75, & 70 ppb).

[5] Indian Wells Valley is included in EKAPCD for all NAAQS other than PM10 and 8-hour ozone.

[6] 1-hour ozone NAAQS was revoked effective June 15, 2004.

[7] EKAPCD was in attainment for 1-hour ozone NAAQS at time of revocation; the proposed Attainment Maintenance designation's effective date was June 21, 2004, therefore it did not become effective.

[8] Attainment for 1997, 8-hour Ozone NAAQS (80 ppb), Severe Nonattainment for 2008 (75 ppb) and 2015 (70 ppb) Nonattainment for State 8-hour standard (70 ppb).

The pollutant specific conformity emissions threshold values are as follows:

- Ozone (severe nonattainment), therefore the NOx and VOC emissions threshold value is 25 tons per year respectively (note that NO2 is an attainment pollutant).
- PM10 (attainment maintenance-inside an ozone transport area), therefore the PM10 emissions threshold value is 100 tons per year.

Step 3 – Determine if the action is exempt or presumed to conform.

Presently, the Applicant does not believe that the WRESC project is exempt, nor is the project presumed to conform. (The purpose of this analysis is to show conformance.)

Step 4 – Determine which criteria pollutants are of concern based on the attainment status of the Air Quality Control Region (AQCR).

Per Step 2 above, the pollutants of concern are NOx, VOC, and PM10.

Step 5 – Calculate emissions based on the project scope.

The estimated emissions of NOx, VOC, and PM10 from the proposed project are delineated below. Emissions are provided for the facility operations phase followed by the facility construction phase. The construction phase emissions include onsite and offsite emissions for both of the construction options, i.e., Berm and No Berm. Since the project site is vacant land with no emissions sources, the pre-project emissions for NOx, VOC, and PM10 will be “zero” for purposes of this analysis.

Operational emissions are derived from the use of three (3) proposed emergency electrical generator sets (diesel engines), and the proposed emergency fire pump engine (diesel engine). These engines, per the EKAPCD, will be permitted for a maximum annual runtime of 200 hours per year (each), with 50 hours per year of operation included in the 200 hour per year limit for maintenance and readiness testing. Also included are the fugitive evaporative emissions from the engine diesel fuel storage tanks.

Table 2 Operational Emissions

Engine ID	**NOx, tpy**	**VOC, tpy**	**PM10, tpy**
EGEN 1	0.3991	0.1118	0.0160
EGEN 2	0.3991	0.1118	0.0160
EGEN 3	0.3991	0.1118	0.0160
FP	0.2890	0.0152	0.0152
Fuel Storage Tanks	-	0.00103	-
Total Emissions	***1.486***	***0.352***	***0.063***

Onsite and offsite construction emissions are comprised of the following typical activities for both the Berm and No Berm options:

Onsite:

- Onsite earth and rock movement activities (including stockpile uses)
- Onsite land preparation (grading, scraping, leveling, etc.)
- Onsite shaft and cavern drilling, blasting, excavation, etc.
- Onsite equipment exhaust
- Onsite vehicle travel (truck hauling, deliveries and take-aways)
- Onsite construction of the power blocks and associated tanks and buildings
- Onsite rock crushing plant operation
- Onsite concrete batch plant operation

Offsite:

- Offsite vehicle travel (worker travel)
- Offsite truck hauling travel (deliveries and take-aways)
- Paved roadway fugitives
- Offsite T-line equipment exhaust
- Offsite T-line pole site fugitives

The construction period for both options is 60 months or 5 years. For purposes of the construction emissions summary, emissions from the highest expected 12-month period were used for both emissions reporting and the construction air quality impact analysis. These emissions (NOx, VOC, and PM10) are as follows:

Table 3 On and Offsite Construction Emissions

Parameter	**NOx, tpy**	**VOC, tpy**	**PM10, tpy**
BERM Option			
Onsite Emissions	27.13	3.37	15.54
Offsite Emissions	1.4	0.6	2.9
Total Emissions	***28.53***	***3.97***	***18.44***
No BERM Option			
Onsite Emissions	42.7	6.47	14.6
Offsite Emissions	9.5	1.6	7.8
Total Emissions	***52.2***	***8.07***	***22.4***

Table 4 presents the total emissions from operations, indirect, and direct emissions along with the comparisons to the Federal Conformity Threshold (FCT) values.

Table 4 Emissions and Federal Conformity Threshold Value Comparison

Parameter	NOx, tpy	VOC, tpy	PM10, tpy
BERM Option			
Operation Emissions	1.486	0.352	0.063
Onsite Emissions	27.13	3.37	15.54
Offsite Emissions	1.4	0.6	2.9
Total Emissions	***30.02***	***4.32***	***18.50***
FCT, tpy	25	25	100
FCT Exceeded	Yes	No	No
No BERM Option			
Operation Emissions	1.486	0.352	0.063
Onsite Emissions	42.7	6.47	14.6
Offsite Emissions	9.5	1.6	7.8
Total Emissions	***53.69***	***8.42***	***22.46***
FCT, tpy	25	25	100
FCT Exceeded	Yes	No	No

Step 6 – Review net emissions changes for threshold levels and regional significance.

Based on Table 4 above, NOx is the only nonattainment pollutant that exceeds a FCT value for the combined operational and construction emissions scenario for both construction options, i.e., Berm and No Berm.

Table 5 presents data on the comparison of the projects total emissions as compared to the most current available emissions inventory (EPAM 2019 v.1.03 Emissions Projection Data, CARB Base Inventory Year 2017).

Table 5 Regional Significance Data

Parameter	NOx, tpy	VOC, tpy	PM10, tpy
BERM Option			
Operation Emissions	1.486	0.352	0.063
Onsite Emissions	27.13	3.37	15.54
Offsite Emissions	1.4	0.6	2.9
Total Emissions	***30.02***	***4.32***	***18.50***
CARB 2017 Data*	11300	37610	5439
10% of CARB Data	1130	3761	544
Regionally Significant	No	No	No
No BERM Option			
Operation Emissions	1.486	0.352	0.063
Onsite Emissions	42.7	6.47	14.6
Offsite Emissions	9.5	1.6	7.8
Total Emissions	***53.69***	***8.42***	***22.46***

CARB 2017 Data*	11300	37610	5439
10% of CARB Data	1130	3761	544
Regionally Significant	No	No	No

*The following District Air Quality Attainment and Maintenance Plans relied upon the CARB 2017 emissions inventory.
(1) Indian Wells Valley 2nd PM10 Maintenance Plan 2020 (5/2020).
(2) 2023 Attainment Plan for the 2008 and 2015 Ozone NAAQS (5/2023)
(3) The existing regulations in 40 CFR 93.152 define ''regionally significant'' as ''a federal action for which the direct and indirect emissions of any pollutant represent 10 percent or more of a nonattainment or maintenance area's emissions inventory.'' 40 CFR 93.153(i) and (j) require conformity determinations for all regionally significant actions, regardless of any exemptions or presumptions of conformity based on other provisions in the regulations.

Step 7 – Determine conformity for applicable pollutants.

Based on the analysis presented above, the Applicant notes the following with respect to the total emissions, i.e., operations plus construction emissions (direct and indirect):

- NOx emissions during operation do not exceed the Federal Conformity Threshold value of 25 tpy.
- NOx emissions only during construction exceed the Federal Conformity Threshold value of 25 tpy for both the Berm and No Berm options, but NOx emissions are not regionally significant.
- VOC emissions during both construction and operation phases of the project do not exceed the Federal Conformity Threshold value of 25 tpy for both the Berm and No Berm options, and VOC emissions are not regionally significant.
- PM10 emissions during both construction and operation phases of the project do not exceed the Federal Conformity Threshold value of 100 tpy for both the Berm and No Berm options, and PM10 emissions are not regionally significant.

Conclusions

1. NOx emissions exceed the FCT value for <u>construction only</u> (Berm and No Berm options).
2. NOx is not regionally significant.
3. NOx emissions are solely derived from onsite and offsite construction equipment and motor vehicle use, both of which are anticipated and accounted for in the current emissions inventory and SIP for Eastern Kern County.
4. Pursuant to the project application reviews by the CEC and the local APCD, numerous conditions will be placed on both the construction and operations phases of the facility to control and limit emissions from all pollutants, including NOx.
5. NOx emissions from construction represent 95-97% of all estimated NOx emissions from the proposed facility, and these construction emissions are temporary in nature.
6. The air quality impact analysis per Section 5.1 of the AFC indicates that NOx emissions from neither construction nor operation will result in any significant impacts on ambient air quality within the project region.

Based on the foregoing, the Applicant believes that the construction and operation of the proposed facility is, and will be, in compliance with the General Conformity provisions, will conform to the purpose of the approved SIP, and is consistent with all applicable SIP requirements.

end

APPENDIX 5.1E

Air Quality Data Summary and Support Data

Appendix 5.1E
Air Quality Data

Appendix 5.1E

Ambient Air Quality Summary and Support Data

Measured Ambient Air Quality (Background)

Pollutant	Basis	Averaging Time	Concentration	Units	Measured Background ($\mu g/m^3$)	Site	Data Years
O_3	CAAQS-1st High	1-hr	0.094	ppm	184.5	Kern 58 Business	2020-2022
	CAAQS-1st High	8-hr	0.084	ppm	164.9	Kern 58 Business	2020-2022
	NAAQS-4th High	8-hr	0.079	ppm	155.1	Kern 58 Business	2020-2022
NO_2	CAAQS-1st High	1-hr	52	ppb	97.9	Lancaster Division St	2020-2022
	NAAQS-98th percentile	1-hr	40.33	ppb	75.91	Lancaster Division St	2020-2022
	CAAQS/NAAQS	Annual	8.35	ppb	15.7	Lancaster Division St	2020-2022
CO	CAAQS/NAAQS -1st High	1-hr	1.6	ppm	1832	Lancaster Division St	2019-2021
	CAAQS/NAAQS -1st High	8-hr	1.1	ppm	1260	Lancaster Division St	2019-2021
SO_2	CAAQS/NAAQS -1st High	1-hr	4.3	ppb	11.2	Victorville Park Ave	2019-2021
	CAAQS/NAAQS -1st High	24-hr	3.4	ppb	8.9	Victorville Park Ave	2019-2021
	CAAQS/NAAQS	Annual	1.74	ppb	4.6	Victorville Park Ave	2019-2021
PM10	CAAQS-1st High	24-hr	351	$\mu g/m^3$	351	Kern 58 Business	2020-2022
	NAAQS -2nd High	24-hr	112	$\mu g/m^3$	112	Kern 58 Business	2020-2022
	CAAQS	Annual	32.7	$\mu g/m^3$	32.7	Kern 58 Business	2020-2022
PM2.5	NAAQS-98th percentile	24-hr	27	$\mu g/m^3$	27	Kern 58 Business	2021-2023
	CAAQS/NAAQS	Annual	6.3	$\mu g/m^3$	6.3	Kern 58 Business	2021-2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: Ozone
Year: 2020
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.11	0.103	0.101	0.101	79	366	359	98	0.131	0.129	2	2	366	361	3	None	1	060290007	Johnson Farm, Edison, Ca. 93320	Not in a City	Kern	CA	09
0.095	0.095	0.091	0.091	38	366	305	83	0.122	0.112	0	0	366	304	1	None	1	060290008	755 Stanislaus St., Maricopa Ca 93352	Maricopa	Kern	CA	09
0.1	0.094	0.094	0.093	15	366	198	54	0.108	0.104	0	0	366	198	2	None	1	060290011	923 Poole Street Mojave, Ca 93501	Mojave	Kern	CA	09
0.098	0.094	0.085	0.083	25	366	363	99	0.11	0.107	0	0	366	363	3	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
0.075	0.074	0.071	0.069	3	366	90	25	0.079	0.077	0	0	366	92	0	None	1	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
0.096	0.096	0.085	0.083	23	366	361	99	0.109	0.107	0	0	366	361	3	None	1	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09
0.101	0.097	0.091	0.088	38	366	333	91	0.118	0.115	0	0	366	335	7	None	1	060292012	2000 South Union Ave. Bakersfield Ca 93307	Bakersfield	Kern	CA	09
0.104	0.101	0.096	0.092	70	366	207	57	0.133	0.119	1	1.8	366	207	1	None	1	060295002	19405 Buena Vista Blvd, Arvin, Ca., 93203	Arvin	Kern	CA	09
0.098	0.091	0.089	0.087	34	366	360	98	0.116	0.108	0	0	366	361	2	None	1	060296001	548 Walker St., Shafter, Ca., 93263	Shafter	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: Ozone
Year: 2021
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.098	0.096	0.094	0.094	66	365	362	99	0.116	0.112	0	0	365	361	4	None	1	060290007	Johnson Farm, Edison, Ca. 93320	Not in a City	Kern	CA	09
0.077	0.076	0.075	0.073	10	365	283	78	0.083	0.082	0	0	365	281	3	None	1	060290008	755 Stanislaus St., Maricopa Ca 93352	Maricopa	Kern	CA	09
0.08	0.079	0.079	0.077	11	365	361	99	0.09	0.087	0	0	365	361	4	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
0.084	0.08	0.079	0.079	19	365	363	99	0.094	0.091	0	0	365	364	1	None	1	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
0.095	0.094	0.087	0.086	43	365	354	97	0.107	0.102	0	0	365	356	3	None	1	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09
0.09	0.088	0.088	0.085	29	365	346	95	0.1	0.096	0	0	365	349	6	None	1	060292012	2000 South Union Ave. Bakersfield Ca 93307	Bakersfield	Kern	CA	09
0.095	0.088	0.087	0.084	48	365	356	98	0.106	0.105	0	0	365	358	1	None	1	060295002	19405 Buena Vista Blvd, Arvin, Ca., 93203	Arvin	Kern	CA	09
0.085	0.082	0.079	0.076	15	365	364	100	0.104	0.093	0	0	365	365	0	None	1	060296001	548 Walker St., Shafter, Ca., 93263	Shafter	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: Ozone
Year: 2022
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.096	0.091	0.091	0.087	61	365	364	100	0.126	0.116	1	1	365	362	1	None	1	060290007	Johnson Farm, Edison, Ca. 93320	Not in a City	Kern	CA	09
0.077	0.075	0.075	0.075	17	365	361	99	0.081	0.081	0	0	365	363	2	None	1	060290008	755 Stanislaus St., Maricopa Ca 93352	Maricopa	Kern	CA	09
0.076	0.073	0.072	0.071	4	365	356	98	0.093	0.083	0	0	365	357	4	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
0.075	0.075	0.074	0.073	8	365	359	98	0.091	0.085	0	0	365	360	5	None	1	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
0.09	0.086	0.086	0.085	51	365	354	97	0.106	0.097	0	0	365	354	6	None	1	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09
0.086	0.085	0.084	0.084	45	365	345	95	0.108	0.102	0	0	365	348	8	None	1	060292012	2000 South Union Ave. Bakersfield Ca 93307	Bakersfield	Kern	CA	09
0.091	0.09	0.088	0.085	66	365	341	93	0.11	0.11	0	0	365	344	3	None	1	060295002	19405 Buena Vista Blvd, Arvin, Ca., 93203	Arvin	Kern	CA	09
0.081	0.079	0.078	0.077	21	365	360	99	0.095	0.09	0	0	365	359	4	None	1	060296001	548 Walker St., Shafter, Ca., 93263	Shafter	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: Ozone
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.091	0.09	0.089	0.089	47	365	268	73	0.107	0.107	0	0	365	267	1	None	1	060290007	Johnson Farm, Edison, Ca. 93320	Not in a City	Kern	CA	09
0.072	0.072	0.069	0.068	2	365	146	40	0.076	0.075	0	0	365	149	1	None	1	060290008	755 Stanislaus St., Maricopa Ca 93352	Maricopa	Kern	CA	09
0.079	0.078	0.078	0.075	7	365	269	74	0.088	0.083	0	0	365	271	2	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
0.046	0.045	0.042	0.041	0	365	43	12	0.05	0.047	0	0	365	43	0	None	1	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
0.077	0.077	0.076	0.075	12	365	206	56	0.086	0.085	0	0	365	207	5	None	1	060290020	3200 Pat Avenue	Mojave	Kern	CA	09
0.082	0.077	0.076	0.075	10	365	196	54	0.089	0.088	0	0	365	197	0	None	1	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09
0.084	0.083	0.081	0.079	14	365	203	56	0.094	0.089	0	0	365	204	2	None	1	060292012	2000 South Union Ave. Bakersfield Ca 93307	Bakersfield	Kern	CA	09
0.095	0.093	0.09	0.088	41	365	261	72	0.109	0.108	0	0	365	262	3	None	1	060295002	19405 Buena Vista Blvd, Arvin, Ca., 93203	Arvin	Kern	CA	09
0.079	0.078	0.075	0.073	5	365	265	73	0.09	0.089	0	0	365	267	1	None	1	060296001	548 Walker St., Shafter, Ca., 93263	Shafter	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: Ozone
Year: 2020
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.122	0.11	0.107	0.106	74	366	349	95	0.148	0.144	10	10.4	366	349	3	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
0.083	0.08	0.08	0.079	8	366	286	78	0.099	0.096	0	0	366	288	5	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: Ozone
Year: 2021
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.103	0.1	0.099	0.097	61	365	360	99	0.125	0.119	1	1	365	361	4	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
0.079	0.076	0.074	0.07	3	365	308	84	0.086	0.086	0	0	365	315	6	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: Ozone
Year: 2022
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.114	0.098	0.097	0.095	66	365	355	97	0.129	0.116	1	1	365	356	2	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
0.082	0.082	0.082	0.081	33	365	336	92	0.098	0.097	0	0	365	339	7	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: Ozone
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)

First Max 8hr	Second Max 8hr	Third Max 8hr	Fourth Max 8hr	Days 8hr Max >STD	Required Days 8hr	Valid Days 8hr	Percent Days 8hr	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Est Days 1hr Max >STD	Required Days 1hr	Valid Days 1hr	Missing Days 1hr	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
0.11	0.105	0.103	0.102	62	365	269	74	0.155	0.139	9	12.1	365	271	1	None	1	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
0.066	0.065	0.064	0.063	0	365	268	73	0.088	0.087	0	0	365	266	7	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
0.082	0.078	0.075	0.075	5	365	270	74	0.097	0.093	0	0	365	269	2	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
0.096	0.09	0.088	0.087	23	365	250	68	0.104	0.103	0	0	365	253	1	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
0.07	0.07	0.067	0.067	0	365	267	73	0.082	0.08	0	0	365	265	5	None	1	060371302	700 North Bulis Road	Compton	Los Angeles	CA	09
0.09	0.075	0.075	0.072	5	365	253	69	0.12	0.106	0	0	365	254	9	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
0.113	0.101	0.098	0.095	47	365	266	73	0.147	0.133	3	4.1	365	264	3	None	1	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
0.09	0.089	0.086	0.086	25	365	272	75	0.109	0.109	0	0	365	271	2	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
0.065	0.064	0.063	0.059	0	365	271	74	0.079	0.074	0	0	365	270	3	None	1	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
0.096	0.092	0.085	0.084	20	365	270	74	0.12	0.112	0	0	365	271	2	None	1	060374010	10659 W. Delano Street	Los Angeles	Los Angeles	CA	09
0.115	0.112	0.103	0.103	52	365	265	73	0.133	0.125	2	2.7	365	268	1	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
0.088	0.074	0.072	0.072	6	365	261	72	0.112	0.087	0	0	365	264	2	None	1	060379035	2551 W. Avenue H Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: NO2
Year: 2020
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max 1hr	Second Max 1hr	98th Percentile	Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
8366	65	63	54	13.51	None	2	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
8694	50	50	42	8.47	None	1	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
8605	77	55	44	10.53	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
8346	62	62	56	17.79	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8636	58	58	52	16.94	None	3	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8443	50	47	45	10.77	None	2	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
8654	72	68	61	14.42	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
8728	69	65	58	17.83	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
8526	68	63	60	18.34	None	2	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
8433	61	55	50	13.7	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
8349	100	99	86	22.97	None	1	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
8504	75	72	56	12.73	None	1	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
8611	60	59	52	14.55	None	1	060374010	10659 W. Delano Street	Los Angeles	Los Angeles	CA	09
8692	60	58	51	9.48	None	1	060375005	7201 W. Westchester Parkway	Los Angeles	Los Angeles	CA	09
8645	46	42	36	9.44	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
8215	52	45	40	8.35	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: NO_2
Year: 2021
Exceptional Events: Excluded (if any)

Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max 1hr	Second Max 1hr	98th Percentile	Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
8575	78	70	51	14.76	None	2	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
8472	69	66	48	10.25	None	1	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
8620	61	45	42	10	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
8484	78	77	57	17.66	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8302	72	72	53	15.89	None	3	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8678	54	54	43	10.44	None	2	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
8660	68	67	56	14.03	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
8641	72	67	55	17.49	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
8670	71	66	56	17.95	None	2	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
8697	77	66	52	13.59	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
8407	92	90	76	25.16	None	1	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
8627	59	59	55	12.76	None	1	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
8610	65	63	49	13.87	None	1	060374010	10659 W. Delano Street	Los Angeles	Los Angeles	CA	09
6119	63	60	48	7.18*	None	1	060375005	7201 W. Westchester Parkway	Los Angeles	Los Angeles	CA	09
8695	57	41	35	9.93	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
8229	46	46	42	8.26	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>

Generated: August 18, 2023

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: NO2
Year: 2022
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max 1hr	Second Max 1hr	98th Percentile	Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
6245	48	47	44	12.95*	None	2	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
8712	54	42	36	7.92	None	1	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
8676	51	51	45	11.44	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
8699	75	70	57	18.48	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8664	68	65	52	16.45	None	3	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8702	55	49	42	10.19	None	2	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
8688	65	62	55	14.39	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
8657	65	63	54	17.04	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
8637	58	57	50	16.96	None	2	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
8716	66	58	50	13.3	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
8703	95	90	76	25.13	None	1	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
8660	58	55	48	12.77	None	1	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
8683	54	53	47	12.9	None	1	060374010	10659 W. Delano Street	Los Angeles	Los Angeles	CA	09
8698	52	42	33	9.13	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
7985	44	43	39	8.1	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: NO2
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)

Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max 1hr	Second Max 1hr	98th Percentile	Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
6504	88	64	29	8.04*	None	1	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
6502	43	40	38	8.11*	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
6496	64	52	48	14.04*	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
6496	57	48	44	12.70*	None	3	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
6377	42	38	36	8.46*	None	2	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
6429	49	48	44	10.38*	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
6439	50	50	46	13.02*	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
6479	62	54	49	14.49*	None	2	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
6518	46	45	41	9.65*	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
6524	69	61	59	19.06*	None	1	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
6498	48	47	44	8.94*	None	1	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
6512	47	42	39	9.79*	None	1	060374010	10659 W. Delano Street	Los Angeles	Los Angeles	CA	09
6518	29	29	28	8.05*	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
6115	35	34	28	2.93*	None	1	060379035	2551 W. Avenue H Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: CO
Year: 2019
Exceptional Events: Excluded (if any)

Obs	First Max 8hr	Second Max 8hr	Days 8hr Max >STD	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
8588	1.1	1	0	1.6	1.6	0	None	1	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
8514	0.8	0.7	0	1.2	1.1	0	None	2	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
8657	1.2	1.1	0	1.9	1.8	0	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
8624	1.6	1.5	0	2	1.9	0	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
3191	1.6	1.4	0	2	1.8	0	None	9	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8599	2.2	1.8	0	2.6	2.5	0	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
8564	3.2	2.9	0	3.8	3.8	0	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
8672	1.5	1.4	0	1.9	1.8	0	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
8680	1.3	1.2	0	1.7	1.6	0	None	1	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
8581	1.2	1.1	0	1.5	1.5	0	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
7999	2.1	1.8	0	3	2.4	0	None	1	060374006	2425 Webster St., Long Beach, Ca	Long Beach	Los Angeles	CA	09
8655	1.3	1.3	0	1.8	1.7	0	None	1	060375005	7201 W. Westchester Parkway	Los Angeles	Los Angeles	CA	09
8510	1.2	1	0	1.5	1.3	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
8162	0.9	0.8	0	1.4	1.4	0	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: CO
Year: 2020
Exceptional Events: Excluded (if any)

Obs	First Max 8hr	Second Max 8hr	Days 8hr Max >STD	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
8423	2	1.9	0	2.4	2.3	0	None	1	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
7538	1.9	1.6	0	2.3	2.2	0	None	2	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
8701	1.2	1.2	0	2	1.8	0	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
8511	1.6	1.6	0	2.1	1.9	0	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
4888	1.4	1.4	0	1.8	1.6	0	None	9	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8376	1.7	1.7	0	2	2	0	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
8698	3.1	2.8	0	4.5	3.7	0	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
8656	1.7	1.6	0	3.1	2.3	0	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
8697	1.1	1.1	0	1.5	1.4	0	None	1	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
8601	2.2	1.8	0	2.6	2.5	0	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
8692	1.3	1.2	0	1.6	1.5	0	None	1	060375005	7201 W. Westchester Parkway	Los Angeles	Los Angeles	CA	09
8678	0.8	0.8	0	1.2	1	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
8033	1.1	1.1	0	1.6	1.5	0	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: CO
Year: 2021
Exceptional Events: Excluded (if any)

Obs	First Max 8hr	Second Max 8hr	Days 8hr Max >STD	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
8535	1.4	1.3	0	1.5	1.4	0	None	1	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
8503	0.9	0.9	0	1.4	1.2	0	None	2	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
4153	1	0.9	0	1.5	1.5	0	None	1	060370113	Va Hospital, West Los Angeles	West Los Angeles	Los Angeles	CA	09
8674	1.6	1.5	0	2	1.9	0	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
6255	1.5	1.5	0	1.9	1.8	0	None	9	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8699	1.9	1.9	0	2.6	2.2	0	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
8661	3.7	3.4	0	4.3	4.3	0	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
8664	1.5	1.5	0	1.8	1.7	0	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
8447	1.3	1.3	0	1.7	1.6	0	None	1	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
8695	1.6	1.5	0	1.9	1.8	0	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
5993	1.3	1.2	0	1.7	1.6	0	None	1	060375005	7201 W. Westchester Parkway	Los Angeles	Los Angeles	CA	09
8694	0.7	0.7	0	1	0.9	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
8202	1.1	1	0	1.4	1.4	0	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: CO
Year: 2022
Exceptional Events: Excluded (if any)

Obs	First Max 8hr	Second Max 8hr	Days 8hr Max >STD	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
6245	0.9	0.8	0	1.3	1.2	0	None	1	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
8644	0.6	0.6	0	0.9	0.8	0	None	2	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
8700	1.5	1.4	0	1.7	1.6	0	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8560	1.4	1.4	0	1.5	1.5	0	None	9	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
8701	1.8	1.8	0	2.2	2.2	0	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
8571	3	2.7	0	3.4	3.4	0	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
8515	1.5	1.4	0	1.6	1.5	0	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
8654	1.1	1.1	0	1.6	1.5	0	None	1	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
8716	1.3	1.2	0	1.6	1.5	0	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
8699	0.6	0.6	0	1.5	1.1	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: CO
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)

Obs	First Max 8hr	Second Max 8hr	Days 8hr Max >STD	First Max 1hr	Second Max 1hr	Days 1hr Max >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
6485	0.5	0.5	0	0.7	0.7	0	None	2	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
6495	1.1	1.1	0	1.3	1.3	0	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
6506	1.1	1	0	1.2	1.2	0	None	9	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
6229	1.4	1.2	0	1.8	1.8	0	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
6430	2.6	2.3	0	3.1	2.9	0	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
6309	1.3	1.2	0	1.8	1.5	0	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
6262	1.3	1.1	0	1.4	1.3	0	None	1	060371701	924 N. Garey Ave., Pomona	Pomona	Los Angeles	CA	09
6518	0.9	0.8	0	1.1	1	0	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
6518	0.5	0.4	0	1	0.9	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: San Bernardino County, CA
Pollutant: SO2
Year: 2019
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs 1hr	First Max 1hr	Second Max 1hr	99th Percentile	Obs 24hr	First Max 24hr	Second Max 24hr	Days >STD	Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
8265	4.3	4.2	4	355	3.4	3.3	0	1.74	None	1	060710306	14306 Park Ave., Victorville, Ca	Victorville	San Bernardino	CA	09
7913	9.4	8.8	7	336	3.6	3.1	0	1.65	None	1	060711234	Corner Of Athol And Telescope, Trona	Searles Valley	San Bernardino	CA	09
8319	2.4	2.4	2	346	0.9	0.9	0	0.41	None	1	060712002	14360 Arrow Blvd., Fontana	Fontana	San Bernardino	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: San Bernardino County, CA
Pollutant: SO_2
Year: 2020
Exceptional Events: Excluded (if any)

Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs 1hr	First Max 1hr	Second Max 1hr	99th Percentile	Obs 24hr	First Max 24hr	Second Max 24hr	Days >STD	Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
8318	3.6	3.5	3	355	2.2	2.2	0	1.01	None	1	060710306	14306 Park Ave., Victorville, Ca	Victorville	San Bernardino	CA	09
8215	5.5	5.3	5	356	2.6	2.6	0	0.73	None	1	060711234	Corner Of Athol And Telescope, Trona	Searles Valley	San Bernardino	CA	09
8663	2.5	1.9	2	363	0.9	0.8	0	0.41	None	1	060712002	14360 Arrow Blvd., Fontana	Fontana	San Bernardino	CA	09

Get detailed information about this report, including column descriptions, at https://www.epa.gov/outdoor-air-quality-data/about-air-data-reports#mon

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: San Bernardino County, CA
Pollutant: SO2
Year: 2021
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs 1hr	First Max 1hr	Second Max 1hr	99th Percentile	Obs 24hr	First Max 24hr	Second Max 24hr	Days >STD	Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
7678	3.4	2.7	3	328	1.8	1.7	0	0.90*	None	1	060710306	14306 Park Ave., Victorville, Ca	Victorville	San Bernardino	CA	09
7915	9.3	8.6	6	348	2.4	2.3	0	0.81	None	1	060711234	Corner Of Athol And Telescope, Trona	Searles Valley	San Bernardino	CA	09
8663	5	3.7	2	364	0.9	0.8	0	0.24	None	1	060712002	14360 Arrow Blvd., Fontana	Fontana	San Bernardino	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM10
Year: 2020
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
61	45	152	95	0	0	None	2	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
366	357	226	169	2	2	None	3	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
61	45	83	54	0	0	None	2	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
61	45	68	59	0	0	None	2	060374004	1305 E. Pacific Coast Hwy., Long Beach	Long Beach	Los Angeles	CA	09
61	14	61	54	0	0	None	1	060374006	2425 Webster St., Long Beach, Ca	Long Beach	Los Angeles	CA	09
61	40	55	43	0	0	None	1	060375005	7201 W. Westchester Parkway	Los Angeles	Los Angeles	CA	09
61	39	67	48	0	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
366	356	192	121	1	1.1	None	2	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM10
Year: 2021
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
61	61	79	79	0	0	None	2	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
365	358	121	113	0	0	None	3	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
61	60	64	63	0	0	None	2	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
61	60	48	44	0	0	None	2	060374004	1305 E. Pacific Coast Hwy., Long Beach	Long Beach	Los Angeles	CA	09
61	31	33	29	0	0	None	1	060375005	7201 W. Westchester Parkway	Los Angeles	Los Angeles	CA	09
61	60	47	39	0	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
365	358	411	99	1	1	None	2	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM10
Year: 2022
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
61	43	98	97	0	0	None	2	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
365	358	83	77	0	0	None	3	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
61	61	43	40	0	0	None	2	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
365	359	60	59	0	0	None	3	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
61	20	48	48	0	0	None	2	060374004	1305 E. Pacific Coast Hwy., Long Beach	Long Beach	Los Angeles	CA	09
365	358	128	92	0	0	Excluded	3	060374006	2425 Webster St., Long Beach, Ca	Long Beach	Los Angeles	CA	09
365	363	57	52	0	0	None	3	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
61	61	36	36	0	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
365	348	76	74	0	0	None	2	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM10
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
365	260	126	77	0	0	None	3	060370016	840 Laurel, Glendora	Glendora	Los Angeles	CA	09
60	45	33	31	0	0	None	2	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
365	267	57	46	0	0	None	3	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
60	5	34	28	0	0	None	4	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
365	268	148	90	0	0	None	3	060374006	2425 Webster St., Long Beach, Ca	Long Beach	Los Angeles	CA	09
365	270	53	47	0	0	None	3	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
60	39	38	37	0	0	None	1	060376012	22224 Placerita Canyon Rd, Santa Clarita	Santa Clarita	Los Angeles	CA	09
365	270	121	69	0	0	None	1	060379035	2551 W. Avenue H Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM10
Year: 2020
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
61	57	146	143	0	0	None	1	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
366	234	111	109	0	0	None	2	060290011	923 Poole Street, Mojave, Ca 93501	Mojave	Kern	CA	09
61	51	193	131	1	8.4	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
31	28	115	106	0	0	None	2	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
366	345	169	127	1	1.1	None	2	060290017	3147 Highway 178, Canebrake	Not in a City	Kern	CA	09
366	360	401	139	1	1	None	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
366	91	114	108	0	0	None	2	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
366	343	277	236	14	16.4	None	3	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM10
Year: 2021
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
61	54	175	134	1	6.1	None	1	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
365	332	437	185	3	3	None	7	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
365	336	191	148	1	1.4	None	2	060290017	3147 Highway 178, Canebrake	Not in a City	Kern	CA	09
365	362	285	242	3	3	None	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
365	365	351	112	1	1	None	2	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
365	349	421	163	2	2.2	None	3	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM10
Year: 2022
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
61	2	64	46	0	0	None	1	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
365	313	168	138	1	1.1	None	3	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
365	357	134	128	0	0	None	7	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
365	307	128	87	0	0	None	2	060290017	3147 Highway 178, Canebrake	Not in a City	Kern	CA	09
365	358	243	152	1	1	Excluded	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
365	355	121	66	0	0	None	2	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
365	361	148	118	0	0	None	3	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM10
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)

Required Days	Valid Days	First Max	Second Max	Days >STD	Est Days >STD	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
365	118	83	79	0	0	None	3	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
365	265	96	83	0	0	None	7	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
365	268	51	49	0	0	None	2	060290017	3147 Highway 178, Canebrake	Not in a City	Kern	CA	09
365	270	62	58	0	0	Excluded	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
365	43	39	21	0	0	None	2	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
365	198	62	53	0	0	None	2	060290020	3200 Pat Avenue	Mojave	Kern	CA	09
365	235	77	68	0	0	None	3	060290232	3311 Manor St, Oildale Ca 93308	Oildale	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 13, 2024

Top 4 Summary: Highest 4 Daily 24-Hour PM10 Averages

iADAM

KERN

at Mojave-CA 58 Business

	2020		2021		2022	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Oct 8	114.8	Oct 11	352.0	Jun 13	121.5
Second High:	Oct 5	108.6	Sep 28	112.8	Oct 26	66.9
Third High:	Nov 6	87.2	Sep 19	110.5	Sep 1	62.0
Fourth High:	Oct 25	86.0	Sep 26	101.2	May 27	61.8
California:						
First High:	Oct 8	104.5	Oct 11	330.6	Jun 13	110.2
Second High:	Oct 5	99.2	Sep 28	104.4	Oct 26	62.5
Third High:	Oct 25	80.3	Sep 19	101.4	May 27	55.8
Fourth High:	Nov 6	80.1	Sep 26	91.5	May 29	54.5
National:						
Estimated # Days > 24-Hr Std:		*		1.0		0.0
Measured # Days > 24-Hr Std:		0		1		0
3-Yr Avg Est # Days > 24-Hr Std:		*		*		*
Annual Average:		32.7		29.9		25.2
3-Year Average:		*		*		29
California:						
Estimated # Days > 24-Hr Std:		*		33.2		*
Measured # Days > 24-Hr Std:		13		33		7
Annual Average:		*		27.8		*
3-Year Maximum Annual Average:		*		28		28
Year Coverage:		0		0		0

Top 4 Summary: Highest 4 Daily 24-Hour PM10 Averages

iADAM

at Lancaster-43301 Division Street

	2020		2021		2022	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Sep 8	192.3	Oct 11	411.2	Jun 13	76.2
Second High:	Sep 7	121.1	Sep 29	99.7	Sep 9	74.7
Third High:	Aug 18	111.7	Jan 19	81.0	May 29	68.3
Fourth High:	Oct 26	91.4	Aug 16	77.7	Jan 21	66.9
California:						
First High:		*		*		*
Second High:		*		*		*
Third High:		*		*		*
Fourth High:		*		*		*
National:						
Estimated # Days > 24-Hr Std:		1.1		1.0		0.0
Measured # Days > 24-Hr Std:		1		1		0
3-Yr Avg Est # Days > 24-Hr Std:		1.0		1.0		1.0
Annual Average:		30.6		29.6		26.0
3-Year Average:		26		28		29
California:						
Estimated # Days > 24-Hr Std:		*		*		*
Measured # Days > 24-Hr Std:		*		*		*
Annual Average:		*		*		*
3-Year Maximum Annual Average:		*		*		*
Year Coverage:		0		0		0

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM2.5
Year: 2020
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
60	102.7	36	25.3	22.1	36	12.7	None	1	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
61	78.2	53.1	50.3	33	53	13.7	None	21	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
357	175	90.2	47.3	42.5	35	13.1	Excluded	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
59	33.7	28	25.4	24.2	28	12.9	Excluded	2	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
119	73.8	36.4	36	27.6	36	11	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
364	67.5	64.4	63	59.3	43	14.7	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
59	39.8	30.9	26.3	26	31	13.1	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
60	39.9	30.7	26.3	26.1	31	13.2	Excluded	2	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
58	82.9	46.8	35.4	30.5	47	15.4	Excluded	21	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
119	67.7	60	34.9	34.5	35	11.9	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
6	23.3	13.7	13.3	9.5	23	11.5*	None	2	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
121	66	48.3	45.7	38.3	46	12.5	None	1	060374002	3648 N. Long Beach Blvd., Long Beach	Long Beach	Los Angeles	CA	09
358	63.7	59.3	49.8	49.5	39	12.1	None	1	060374004	1305 E. Pacific Coast Hwy., Long Beach	Long Beach	Los Angeles	CA	09
352	72.6	66.5	61.8	55.9	46	15.2	None	3	060374004	1305 E. Pacific Coast Hwy., Long Beach	Long Beach	Los Angeles	CA	09
361	65.7	60.8	48.7	47.6	42	13.8	None	1	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
335	74.1	64.6	55.4	54.4	45	15.5	None	3	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
362	74.7	73.9	59.3	48.6	40	9.3	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

Get detailed information about this report, including column descriptions, at https://www.epa.gov/outdoor-air-quality-data/about-air-data-reports#mon

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 12, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM2.5
Year: 2021
Exceptional Events: Excluded (if any)

Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
59	61.9	36.1	32.2	30.3	36	12	None	1	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
61	54.5	20.8	17.4	15.8	21	10.8	None	21	060370002	803 N. Loren Ave., Azusa	Azusa	Los Angeles	CA	09
363	61	59	55.1	51.3	45	12.8	Excluded	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
57	61.1	40.6	37.8	20	41	13.1	None	2	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
120	55.5	52	36.1	21.1	36	10.1	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
349	102.1	53.9	49.4	48.7	43	13.4	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
61	66	47.9	35.3	29.3	48	13.2	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
61	66.1	48.5	35.5	29.2	49	13.3	None	2	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
61	61.9	29.7	24.9	23.9	30	12.9	None	21	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
119	63.6	56.8	29.9	26.5	30	10.7	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
119	41.2	33.6	31.2	30.5	31	10.9	None	1	060374002	3648 N. Long Beach Blvd., Long Beach	Long Beach	Los Angeles	CA	09
356	42.9	42.8	42.1	39.4	33	11.3	None	1	060374004	1305 E. Pacific Coast Hwy., Long Beach	Long Beach	Los Angeles	CA	09
356	51.3	46.3	38.1	36.8	34	13.8	None	3	060374004	1305 E. Pacific Coast Hwy., Long Beach	Long Beach	Los Angeles	CA	09
360	84.6	48.4	42.9	40.8	35	13	None	1	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
336	103.2	43.1	33.5	32.2	31	13.6*	None	3	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
359	35.7	34.9	32	29	21	8.1	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 12, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM2.5
Year: 2022
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
271	26.7	24	20.8	20.3	19	8.7*	None	3	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
348	15.1	15	14.6	14.2	14	7.5	None	1	060379033	43301 Division St., Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 12, 2024

Monitor Values Report

Geographic Area: Los Angeles County, CA
Pollutant: PM2.5
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)

Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
265	30.6	25.2	24.9	24.2	24	9.8*	None	1	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
43	18.9	18.5	17.9	17.4	19	9.8*	None	2	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
269	31.9	30.8	29.4	26.3	25	11.9*	None	3	060371103	1630 N Main St, Los Angeles	Los Angeles	Los Angeles	CA	09
90	21.9	19.2	18.2	17.5	19	8.6*	None	1	060371201	18330 Gault St., Reseda	Reseda	Los Angeles	CA	09
265	31.7	27	25.6	24.8	24	10.1*	None	1	060371302	700 North Bullis Road	Compton	Los Angeles	CA	09
87	60.7	23.8	17.2	16.5	24	9.8*	None	1	060371602	4144 San Gabriel River Pkwy, Pico Rivera	Pico Rivera	Los Angeles	CA	09
91	52	22.2	17.2	17	22	9.3*	None	1	060372005	752 S. Wilson Ave., Pasadena	Pasadena	Los Angeles	CA	09
255	26.5	25.4	23.4	22.7	22	9.7*	None	1	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
271	33.8	30.9	29	27	25	13.8*	None	3	060374008	5895 Long Beach Blvd.	Long Beach	Los Angeles	CA	09
22	18.1	15.5	11	10.8	18	9.0*	None	1	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
270	27	25	23.3	23.1	19	9.3*	None	3	060374009	1710 E. 20th Street	Signal Hill	Los Angeles	CA	09
273	12.4	11.2	10.9	9.4	9	3.5*	None	1	060379035	2551 W. Avenue H Lancaster, Ca	Lancaster	Los Angeles	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 12, 2024

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM2.5
Year: 2020
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
101	50.1	45.4	36.8	34.9	37	15.8	Excluded	1	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
234	72.8	71.3	62.4	59.3	33	8.4*	None	3	060290011	923 Poole Street, Mojave, Ca 93501	Mojave	Kern	CA	09
312	141.9	61.6	48.9	48.5	45	16.6	Excluded	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
30	143.9	49	44.5	43.7	144	22.5	None	2	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
110	82.4	81.4	57.1	47.6	57	19.2	Excluded	1	060290016	410 E. Planz Rd. Bakersfield, Ca 93307	Bakersfield	Kern	CA	09
361	125.4	79.8	63.3	58.7	48	7.7	None	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
91	67	51.7	51.3	47.3	52	10.1*	None	3	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM2.5
Year: 2021
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
336	63.3	59.1	59.1	57	50	16.9	Excluded	4	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
337	72.3	69.4	66.4	59.5	57	16.6	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
22	48.7	47.1	47	34.3	49	16.1*	None	2	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
112	70.5	55.8	54.8	52.7	55	20	None	1	060290016	410 E. Planz Rd. Bakersfield, Ca 93307	Bakersfield	Kern	CA	09
353	178	116.6	105.7	99.9	47	8.3	None	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
365	50.7	43.6	38.8	35.1	27	7.5	None	3	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM2.5
Year: 2022
Exceptional Events: Excluded (if any)

Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
310	58.6	54.7	54	53.6	49	15.8*	None	3	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
19	53.9	48.9	44.4	44.1	54	31.4*	None	4	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
334	58.1	54.7	52.9	52.2	49	15.8	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
22	56.3	47.5	46.1	42	56	14.6*	None	2	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
114	55.6	50.2	45.7	45.5	46	16.1	None	1	060290016	410 E. Planz Rd. Bakersfield, Ca 93307	Bakersfield	Kern	CA	09
360	32.3	20.7	20.5	14.7	11	4	None	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
355	10.9	10.9	10.7	10.6	10	5.2	None	3	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: August 18, 2023

Monitor Values Report

Geographic Area: Kern County, CA
Pollutant: PM2.5
Year: 2023 (Annual statistics for 2023 are not final until May 1, 2024)
Exceptional Events: Excluded (if any)
Note: The * indicates the mean does not satisfy minimum data completeness criteria.

Obs	First Max	Second Max	Third Max	Fourth Max	98th Percentile	Weighted Annual Mean	Exc Events	Monitor Number	Site ID	Address	City	County	State	EPA Region
177	35.2	35.2	32.8	31	31	10.0*	None	3	060290010	2820 M St., Bakersfield, Ca 93301	Bakersfield	Kern	CA	09
348	63.7	55.5	42.5	41.2	37	12	None	1	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
30	40.9	39.4	34.4	19.9	41	11.6	None	2	060290014	5558 California Ave., Bakersfield Ca 93309	Bakersfield	Kern	CA	09
119	58.8	46	37.5	33.9	38	12.5	None	1	060290016	410 E. Planz Rd. Bakersfield, Ca 93307	Bakersfield	Kern	CA	09
261	13.3	13	12.7	12.1	12	5.1*	None	1	060290018	2051 Ward, Ridgecrest Ca	Ridgecrest	Kern	CA	09
43	7.4	6	4.9	4.4	7	3.1*	None	3	060290019	1773 Ca-58 Bus	Mojave	Kern	CA	09
198	15.3	13.2	13.1	12.2	12	6.1*	None	3	060290020	3200 Pat Avenue	Mojave	Kern	CA	09

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Source: U.S. EPA AirData <https://www.epa.gov/air-data>
Generated: February 12, 2024

APPENDIX 5.1F

Electronic Files Submittal

Appendix 5.1F
Electronic Files

Air Quality Impact Modeling Input and Output Files

(These files have been supplied to CEC staff as a separate submittal.)