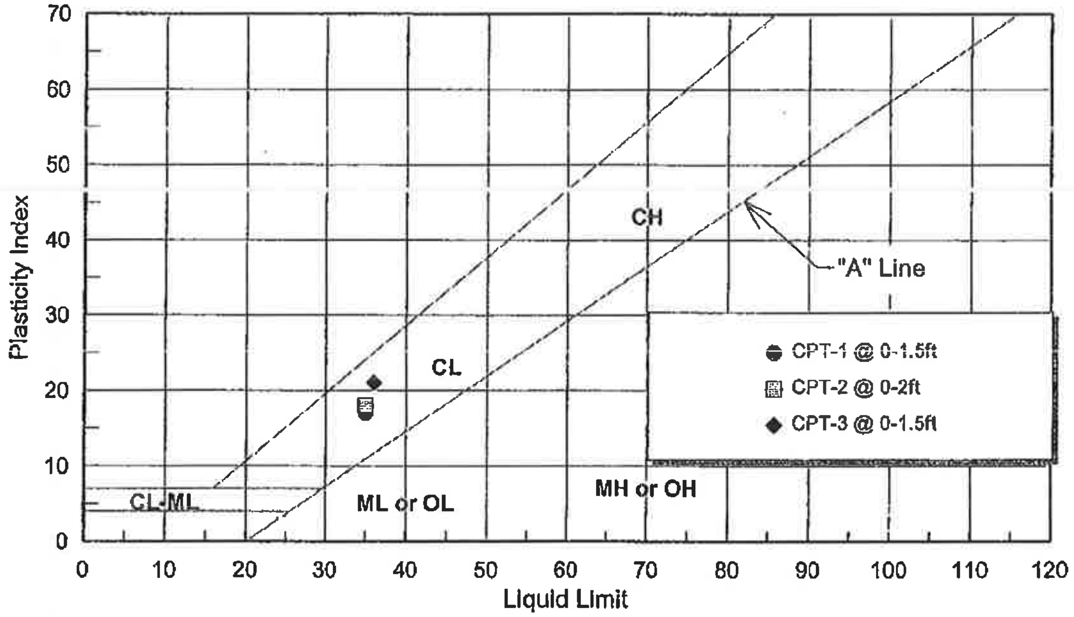
## LANDMARK CONSULTANTS, INC.

**CLIENT:** ORMAT
**PROJECT:** ORMAT Heber 2 Facilities, Heber, CA
**JOB NO:** LE04354
**DATE:** 12/28/04

## ATTERBERG LIMITS (ASTM D4318)

| Sample Location | Sample Depth (ft) | Liquid Limit (LL) | Plastic Limit (PL) | Plasticity Index (PI) | USCS Classif-ation |
|---|---|---|---|---|---|
| CPT-1 | 0-1.5 | 35 | 18 | 17 | CL |
| CPT-2 | 0-2 | 35 | 17 | 18 | CL |
| CPT-3 | 0-1.5 | 36 | 15 | 21 | CL |

### PLASTICITY CHART



**LANDMARK**
Geo-Engineers and Geologists
a DBE/MBE/SBE Company

**Project No: LE04354**

**Atterberg Limits Test Results**

**Plate C-1**

EEC ORIGINAL PKG

## LANDMARK CONSULTANTS, INC.

**CLIENT:** ORMAT
**PROJECT:** ORMAT Heber 2 Facilities, Heber, CA
**JOB NO:** LE04354
**DATE:** 12/28/04

## CHEMICAL ANALYSES

| Boring:<br>Sample Depth, ft: | CPT-1<br>0-1.5 | CPT-1<br>1.5-3 | CPT-2<br>0-2 | CPT-2<br>2-3 | **CalTrans Method** |
|---|---|---|---|---|---|
| pH: | 7.9 | 7.9 | 7.8 | 7.9 | **643** |
| Electrical Conductivity (mmhos): | 2.5 | 1.7 | 1.8 | 0.9 | **424** |
| Resistivity (ohm-cm): | 260 | 1000 | 300 | 1000 | **643** |
| Chloride (Cl), ppm: | 3,040 | 230 | 1,490 | 220 | **422** |
| Sulfate (SO4), ppm: | 2,812 | 3,006 | 1,500 | 1,106 | **417** |

### General Guidelines for Soil Corrosivity

| Material Affected | Chemical Agent | Amount in Soil (ppm) | Degree of Corrosivity |
|---|---|---|---|
| Concrete | Soluble Sulfates | 0 -1000 | Low |
| | | 1000 - 2000 | Moderate |
| | | 2000 - 20,000 | Severe |
| | | > 20,000 | Very Severe |
| Normal Grade Steel | Soluble Chlorides | 0 - 200 | Low |
| | | 200 - 700 | Moderate |
| | | 700 - 1500 | Severe |
| | | > 1500 | Very Severe |
| Normal Grade Steel | Resistivity | 1-1000 | Very Severe |
| | | 1000-2000 | Severe |
| | | 2000-10,000 | Moderate |
| | | 10,000+ | Low |

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*a DBE/MBE/SBE Company*

**Project No:** **LE04354**

**Selected Chemical Analyses Results**

**Plate C-2**

EEC ORIGINAL PKG

## LANDMARK CONSULTANTS, INC.

**CLIENT:** ORMAT
**PROJECT:** ORMAT Heber 2 Facilities, Heber, CA
**JOB NO:** LE04354
**DATE:** 12/28/04

## CHEMICAL ANALYSES

| Boring: | CPT-3 | CPT-3 | CalTrans Method |
|---|---|---|---|
| Sample Depth, ft: | 0-1.5 | 1.5-3 | |
| pH: | 7.9 | 7.8 | 643 |
| Electrical Conductivity (mmhos): | 1.5 | 1.3 | 424 |
| Resistivity (ohm-cm): | 450 | 1000 | 643 |
| Chloride (Cl), ppm: | 570 | 210 | 422 |
| Sulfate (SO4), ppm: | 1,785 | 1,052 | 417 |

### General Guidelines for Soil Corrosivity

| Material Affected | Chemical Agent | Amount in Soil (ppm) | Degree of Corrosivity |
|---|---|---|---|
| Concrete | Soluble Sulfates | 0 -1000 | Low |
| | | 1000 - 2000 | Moderate |
| | | 2000 - 20,000 | Severe |
| | | > 20,000 | Very Severe |
| Normal Grade Steel | Soluble Chlorides | 0 - 200 | Low |
| | | 200 - 700 | Moderate |
| | | 700 - 1500 | Severe |
| | | > 1500 | Very Severe |
| Normal Grade Steel | Resistivity | 1-1000 | Very Severe |
| | | 1000-2000 | Severe |
| | | 2000-10,000 | Moderate |
| | | 10,000+ | Low |

LANDMARK
Geo-Engineers and Geologists
*a DBE/MBE/SBE Company*

**Project No:** LE04354

**Selected Chemical Analyses Results**

**Plate C-3**

# APPENDIX D

EEC ORIGINAL PKG

# REFERENCES

Arango I., 1996, Magnitude Scaling Factors for Soil Liquefaction Evaluations: ASCE Geotechnical Journal, Vol. 122, No. 11.

Bartlett, Steven F. and Youd, T. Leslie, 1995, Empirical Prediction of Liquefaction-Induced Lateral Spread: ASCE Geotechnical Journal, Vol. 121, No. 4.

Blake, T. F., 2000, FRISKSP - A computer program for the probabilistic estimation of seismic hazard using faults as earthquake sources.

Boore, D. M., Joyner, W. B., and Fumal, T. E., 1997, Empirical Near-Source Attenuation Relationships for Horizontal and Vertical Components of Peak Ground Acceleration, Peak Ground Velocity, and Pseudo-Absolute Acceleration Response Spectra: Seismological Research Letters, Vol. 68, No. 1, p. 154-179.

Building Seismic Safety Council (BSSC), 1991, NEHRP recommended provisions for the development of seismic regulations of new buildings, Parts 1, 2 and Maps: FEMA 222, January 1992

California Division of Mines and Geology (CDMG), 1996, California Fault Parameters: available at http://www.consrv.ca.gov/dmg/shezp/fltindex.html.

California Division of Mines and Geology (CDMG), 1962, Geologic Map of California – San Diego-El Centro Sheet: California Division of Mines and Geology, Scale 1:250,000.

Ellsworth, W. L., 1990, Earthquake History, 1769-1989 in: The San Andreas Fault System, California: U.S. Geological Survey Professional Paper 1515, 283 p.

International Conference of Building Officials (ICBO), 1997, Uniform Building Code, 1997 Edition.

Ishihara, K. (1985), Stability of natural deposits during earthquakes, Proc. 11th Int. Conf. On Soil Mech. And Found. Engrg., Vol. 1, A. A. Balkema, Rotterdam, The Netherlands, 321-376.

Jennings, C. W., 1994, Fault activity map of California and Adjacent Areas: California Division of Mines and Geology, DMG Geologic Map No. 6.

Jones, L. and Hauksson, E., 1994, Review of potential earthquake sources in Southern California: Applied Technology Council, Proceedings of ATC 35-1.

Maley, R. P. and Etheredge, E. C., 1981, Strong motion data from the Westmorland, California earthquake of April 26, 1981: U.S. Geological Survey Open File Report 81-1149, 18 p.

Morton, P. K., 1977, Geology and mineral resources of Imperial County, California: California Division of Mines and Geology, County Report No. 7, 104 p.

Mualchin, L. and Jones, A. L., 1992, Peak acceleration from maximum credible earthquakes in California (Rock and Stiff Soil Sites): California Division of Mines and Geology, DMG Open File Report 92-01.

Naeim, F. and Anderson, J. C., 1993, Classification and evaluation of earthquake records for design: Earthquake Engineering Research Institute, NEHRP Report.

National Research Council, Committee of Earthquake Engineering, 1985, Liquefaction of Soils during Earthquakes: National Academy Press, Washington, D.C.

Porcella, R., Etheredge, E., Maley, R., and Switzer, J., 1987, Strong motion data from the Superstition Hills earthquake of November 24, 1987: U.S. Geological Survey Open File Report 87-672, 56 p.

Robertson, P. K. and Wride, C. E., 1996, Cyclic Liquefaction and its Evaluation based on the SPT and CPT, Proceeding of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils, NCEER Technical Report 97-0022, p. 41-88.

Seed, Harry B., Idriss, I. M., and Arango I., 1983, Evaluation of liquefaction potential using field performance data: ASCE Geotechnical Journal, Vol. 109, No. 3.

Seed, Harry B., et al, 1985, Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations: ASCE Geotechnical Journal, Vol. 113, No. 8.

Sharp, R. V., 1982, Tectonic setting of the Imperial Valley region: U.S. Geological Survey Professional Paper 1254, p. 5-14.

Sylvester, A. G., 1979, Earthquake damage in Imperial Valley, California May 18, 1940, as reported by T. A. Clark: Bulletin of the Seismological Society of America, v. 69, no. 2, p. 547-568.

Tokimatsu, K. and Seed H. B., 1987, Evaluation of settlements in sands due to earthquake shaking: ASCE Geotechnical Journal, v. 113, no. 8.

U.S. Geological Survey (USGS), 1982, The Imperial Valley California Earthquake of October 15, 1979: Professional Paper 1254, 451 p.

U.S. Geological Survey (USGS), 1990, The San Andreas Fault System, California, Professional Paper 1515.

U.S. Geological Survey (USGS), 1996, National Seismic Hazard Maps: available at http://gldage.cr.usgs.gov

Working Group on California Earthquake Probabilities (WGCEP), 1992, Future seismic hazards in southern California, Phase I Report: California Division of Mines and Geology.

Working Group on California Earthquake Probabilities (WGCEP), 1995, Seismic hazards in southern California, Probable Earthquakes, 1994-2014, Phase II Report: Southern California Earthquake Center.

Youd, T. Leslie and Garris, C. T., 1995, Liquefaction induced ground surface disruption: ASCE Geotechnical Journal, Vol. 121, No. 11.

Youd, T. L. et. al., 2001, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils: Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, No. 10, p. 817-833.

Zimmerman, R. P., 1981, Soil survey of Imperial County, California, Imperial Valley Area: U.S. Dept. of Agriculture Soil Conservation Service, 112 p.

AIR SCIENCES INC.
DENVER • PORTLAND • LOS ANGELES

TECHNICAL MEMORANDUM

# AIR QUALITY ANALYSIS SUMMARY FOR THE ORMAT HEBER 2 GEOTHERMAL REPOWER PROJECT

| | |
|---|---|
| **PREPARED FOR:** | Ben Pogue, Catalyst Environmental Solutions |
| **PREPARED BY:** | Joel Firebaugh, Air Sciences Inc. |
| **PROJECT NO.:** | 246-2-1 |
| **COPIES:** | Melissa Wendt, ORMAT Nevada Inc. |
| **DATE:** | August 12, 2019 |

The Second Imperial Geothermal Company (SIGC), a wholly owned subsidiary of ORMAT Nevada Inc. (ORMAT), proposes to replace six existing water-cooled ORMAT Energy Converters (OECs) with two new water-cooled OECs at the Heber 2 Geothermal Energy Complex in Imperial County, CA. The project also entails installing three new 10,000 gallon above ground storage tanks to accommodate additional isopentane. The project will affect volatile organic compound (VOC) air emissions at the facility. The proposed changes are not expected to affect emission rates of other regulated pollutant emissions.

## 1.0 Project Description

The Heber 2 Complex is a geothermal power generation facility located on private lands owned by SIGC/ORMAT in southern Imperial County. The facility operates under Imperial County Air Pollution Control District (ICAPCD) Permit to Operate (PTO) #2217A-4. Heber 2 currently consists of six Integrated Two-Level Units (ITLU) which have a gross combined power output rating of 36 megawatts. PTO #2217A-4 also covers two adjacent, connected facilities to Heber 2: Goulds 2 and Heber South. These two facilities each consist of one ORMAT Energy Converter (OEC) with gross outputs of 10 and 12 megawatts, respectively. Ancillary equipment for the combined facilities includes cooling towers, an evacuation skid/vapor recovery maintenance unit (VRMU), motive fluid (MF) storage tanks, and diesel engines for emergency use.

The proposed development would occur entirely on Assessor's Parcel Number (APN) 054-250-031, which is a 39.99-acre property. The address for Heber 2 is 855 Dogwood Road, Heber, CA 92249.

## 1.1 Proposed Development

Development of the proposed project includes the installation of two new OEC units, manufactured by ORMAT, to replace the six existing ITLUs which were also manufactured by ORMAT in 1992. The total disturbance would be approximately 4 acres, entirely within the existing Heber 2 site. The existing ITLUs will either be demolished or abandoned in place. The development site is completely devoid of any vegetation and is actively disturbed as part of ongoing energy generation operations at the Heber 2 Complex. Considering its current condition, site preparation for the installation of the proposed facilities would be limited to light excavation and soil compaction.

### *ORMAT Energy Converter-1 (OEC-1)*

The proposed OEC-1 unit is a two-turbine combined cycle binary unit, operating on a subcritical Rankine cycle, with isopentane as the motive fluid for the system. This system also consists of a generator, vaporizer, water cooled condensers, preheaters and recuperators, with the OEC served by the existing evacuation skid/vapor recovery maintenance unit for purging and maintenance events. The design capacity for the unit is 25.43 MW gross.

### *ORMAT Energy Converter-2 (OEC-2)*

The proposed OEC-2 unit is a two-cycle binary unit, operating on a subcritical Rankine cycle, with isopentane as the motive fluid for the system. This system also consists of a generator, turbines, vaporizers, water cooled condensers and preheaters, with the OEC served by the existing evacuation skid/vapor recovery maintenance unit (VRMU) for purging and maintenance events. The design capacity for the unit is 14.01 MW gross.

### *Three Additional Isopentane Above Ground Storage Tanks*

To support the new OEC units, three new storage tanks for additional isopentane supply would be installed. There are two existing storage tanks at Heber 2 and one at Goulds 2. The new tanks would be sited adjacent to the existing Heber 2 tanks. Each of the new and existing tanks has a capacity of 10,000 gallons.

## 2.0 Existing Air Emissions

The Heber 2 facility is a minor source of air pollution and operates in compliance with all applicable air quality requirements and its permit to operate (PTO #2217A-4). Air emission sources currently at the facility include the geothermal power generating units, cooling towers, VRMU, and emergency diesel equipment.

The existing power generating units (6 ITLUs and 2 OECs) have a combined gross power generating capacity of 58 megawatts. These units generate power by taking geothermal energy (e.g. heat) to vaporize liquid isopentane, which is the motive fluid that powers the turbines to create electricity.

The primary air pollutant from the facility is isopentane, which is a VOC. Isopentane emissions occur due to maintenance, purging, and fugitive leaks. During maintenance, the unit is shut down and the isopentane is evacuated before the system is opened for the necessary work to be performed. To evacuate the system, the liquid isopentane is transferred to storage tanks, and the remaining vapors are passed through the VRMU. The overall recovery rate of isopentane during evacuation is greater than 99.9%. However, trace quantities of vapors as well as liquid collected at low points in the system where the liquid cannot be completely drained result in VOC emissions when the unit is opened to the atmosphere.

Purging is the process by which impurities are removed from the isopentane closed circuit. Contamination of the isopentane causes operating efficiency losses, so purging is performed on a regular basis. Vapors are passed through the VRMU and the isopentane is collected and returned to the system while other gases are removed.

Fugitive losses of isopentane can occur due to failing seals, valves, flanges, etc.

Current permitted emission limits for the facility are provided in Table 1. In addition to isopentane emissions, there are particulate emissions from the cooling towers as well as particulates, $NO_X$, CO, $SO_2$, and VOC emissions from the emergency diesel engines. Potential emissions of $PM_{10}$, $PM_{2.5}$, $NO_X$, CO, $SO_2$ and VOCs from the cooling towers and diesel engines, combined, are less than 2 tons per year for each pollutant.

**Table 1. Facility-wide Isopentane Emission Limits**

| Emission Source | Isopentane Emission Limit |
|---|---|
| 1st Quarter (Jan – Mar) | 185 lbs/day |
| 2nd Quarter (Apr – Jun) | 137 lbs/day |
| 3rd Quarter (Jul – Sep) | 137 lbs/day |
| 4th Quarter (Oct – Dec) | 218 lbs/day |

Emissions are calculated on a quarterly average basis.

## 3.0 Method for Predicting Emissions for Proposed Development

The proposed changes to the facility do not include changes to the cooling towers or emergency diesel equipment. The only expected change to emissions from the proposed development is the isopentane emissions from the geothermal power generating units (OECs and ITLUs).

Future potential isopentane emissions were estimated based on actual emissions from the facility for the previous two years. Isopentane emissions are related to the size of the system, so emissions were estimated by scaling the previous actual emissions according to the change in MF volume at the facility. The existing six ITLUs and two OECs have a combined volume of 120,000 gallons, and the three MF storage tanks have a total capacity of 30,000 gallons. After the proposed development, the combined volume of the existing and new OECs will be 111,000 gallons, and the MF tanks will have 60,000 gallons total capacity.

Maintenance and fugitive emissions were also adjusted for the decreased complexity of the new units. By replacing six smaller units with two larger units, the number of seals, flanges, pumps valves, etc. is reduced significantly. A 50% emission reduction factor was applied to account for the approximately 50% fewer potential sites for leaks and equipment failure.

Isopentane emissions were estimated as follows:

- Maintenance and purging emissions were estimated based on the worst-case quarterly emissions for maintenance and purging from the previous two years. These emission rates were scaled based on the ratio of the future OEC volume (111,000 gallons) to the existing ITLU plus OEC volume (120,000 gallons). Maintenance emissions were then scaled using the 50% reduction factor described above.

- Fugitive emissions were estimated based on the worst-case quarterly emission rate over the last two years, scaled based on the total system capacity of the system including MF tanks (171,000 gallons proposed versus 150,000 existing). Emissions were then scaled with the 50% reduction factor described above.

This emission estimation method is a reasonably conservative estimate (e.g. an overestimation) of future emissions. The new units benefit from improvements in the design and technology that have occurred during the decades since the existing units were constructed. These improvements reduce fugitive leaks as well as emissions during MF evacuation for maintenance but are not accounted for in the emission estimate. Additionally, these new units are expected to have lower emissions because the units they are replacing have higher maintenance requirements due to their age.

## 4.0 Potential Emissions Summary for Proposed Development

Previous actual isopentane emissions, estimated potential emissions, as well as emission limits in PTO #2217A-4 for the Heber 2 Complex are given below in Table 2. Note that the estimated emissions for the facility after the proposed development remain below the current permitted emission limits. The estimated emissions are reasonably conservative for the reasons described above.

**Table 2. Actual and Potential Emissions for Heber 2 Facility**

| | Facility Total Emissions | |
|---|---|---|
| **Isopentane Emissions** | **lbs / day** | **tons / year** |
| Actual Emissions (2017 – 2018) | 117.5 | 14.9 |
| Estimated Potential Emissions | 64.5 | 11.8 |
| Emissions Increase | -52.9 | -3.1 |
| Current Permit Limit (varies) | 137 - 218 | |
| Proposed Permit Limit (varies) | 137 - 202 | |

The currently permitted isopentane emission limits vary by calendar quarter. In quarters two and three, the limit is 137 pounds per day. In quarters one and four, additional facility maintenance is typically performed, which potentially increase emissions. The current limit for the first quarter is 185 pounds per day and the fourth quarter limit is 218 pounds per day. The proposed reduction in OEC total size from 130,000 to 121,000 will reduce the volume of isopentane that needs to be evacuated for maintenance operations. SIGC is requesting to reduce the isopentane emission limits by an amount equivalent to the reduction in OEC volume (7.5%) for the two quarter with higher maintenance emissions. The proposed limits are 171 and 202 pounds per day for the first and fourth quarters, respectively.

The proposed changes are not expected to affect emissions of other regulated pollutants.

## 5.0 Air Quality Protection Measures

ORMAT has implemented measures to limit air emissions at Heber 2. These measures include but are not limited to the following:

- A water truck is used on site to control fugitive dust emissions.
- A five mile per hour speed limit at the site further reduces fugitive dust emissions.
- During windy conditions, additional watering is conducted to minimize wind-blown fugitive dust.
- Equipment is operated according to best practices and maintained according to design specifications.
- The OECs and ITLUs are inspected for leaks using specialized leak detection equipment during every shift, and leaks are repaired quickly.

- Any breakdown resulting in air emissions is reported to ICAPCD and corrected promptly (within 24 hours when possible).

- The VRMU is tested annually to confirm proper function and high isopentane recovery rates.

# ORMAT, HEBER 2
# GEOTHERMAL POWER GENERATION FACILITY
# HEBER, CALIFORNIA

## Hazard Assessment for Heber 2 Expansion Project

| Revision | Date | Description |
|---|---|---|
| 0.0 | July 10, 2019 | Initial Issue |
| | | |
| | | |

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EEC ORIGINAL PKG

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EEC ORIGINAL PKG

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# 1.0 FACILITY OVERVIEW

This technical assessment was conducted to fulfill the Hazard Assessments Offsite Consequence Analysis (OCA) requirements of the following regulations:

- 40 CFR §68.65 – Environmental Protection Agency (EPA) "Risk Management Plan (RMP)"[1]
- 19 CCR 2750.1 to 2750.9 – California Code of Regulation "California Accidental Release Prevention (CalARP) Program"[2]

This assessment is completed for the **Ormat – Heber 2 Geothermal Complex** Facility located in Heber, California. The facilitie's location at 885 Dogwood Road, Heber, CA 92249 is illustrated in Figure 1 below. The yellow marker depicts the location of the three 10,000 gallon isopentane vessels.

**Figure 1: Aerial View of the Facility Location**

| COVERED PROCESS | FORMAT | LATITUDE | LONGITUDE |
|---|---|---|---|
| Isopentane Vessel 1 | Degrees/Minutes/Seconds | 32°42'51.20"N | 115°32'10.47"W |
| Isopentane Vessel 2 | Degrees/Minutes/Seconds | 32°42'51.38"N | 115°32'10.44"W |

| | | | |
|---|---|---|---|
| Isopentane Vessel 3 | Degrees/Minutes/Seconds | 32°42'51.56"N | 115°32'10.43"W |

## 2.0 COVERED PROCESS

The ***Ormat – Heber 2 Geothermal Complex*** has three geothermal electrical generating plants in Heber, CA operated by Ormat Nevada, Inc. Heber 2 consists of the H2, Gould-2 (G-2), and Heber South binary processes. The projects use the renewable geothermal resources of the Heber Known Geothermal Resource Area (KGRA) to generate electrical power.

The Heber 2 Geothermal Project produces electricity by using a vaporized motive fluid to spin a turbine connected to a generator. In the H2 binary processes, isopentane is the motive fluid.

The covered processes at the facility are listed below.

**Table 1: Ormat—Heber 2 Geothermal Complex Facility Covered Process**

| PLANT | REGULATED SUBSTANCE | INVENTORY IN SINGLE VESSEL (LBS.) | TANK TYPE | LARGEST STORAGE INVENTORY |
|---|---|---|---|---|
| Heber 2 | Isopentane | 51,400 | Storage | 10,000 gallon tank |

This hazard assessment will focus on the regulated substance, isopentane, in Heber 2. The facility is classified as Prevention Program 3 and is regulated by the Environmental Protection Agency's Risk Management Program (EPA RMP) for Chemical Accidental Release Prevention in accordance with the Code of Federal Regulations, Title 40, Chapter I, Subchapter C, Part 68, Subpart B Sections 68.20 to 68.42 (40 CFR §68.20 - 68.42)[1] for isopentane, because it is held on site in excess of 10,000 lbs. The unit is a geothermal power plant and utilizes isopentane as the motive fluid in the generation of electricity.

## 3.0 LEVEL OF CONCERN

To address potential health effects for the worst-case release scenario, the following are the key endpoints of concern for the EPA RMP as defined in Title 40 CFR Section 68.22(2):

*(i)* *Explosion. An overpressure of 1 psi.*

*(ii)* *Radiant heat/exposure time. A radiant heat of 5 kW/m$^2$ for 40 seconds.*

*(iii) Lower flammability limit. A lower flammability limit as provided in NFPA documents or other generally recognized sources.*

The distance from the point of release to the endpoint identified above defines a radius circle of concern for which consequences are reported in the Risk Management Plan.

## 4.0 WORST-CASE SCENARIO

The US EPA RMP determines the worst-case release quantity in Title 40 CFR Part 68.25(b) as follows:

> *The worst-case release quantity shall be the greater of the following:*
>
> *(1) For substances in a vessel, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity;*
>
> *(2) For substances in pipes, the greatest amount in a pipe, taking into account administrative controls that limit the maximum quantity.*

Given the substance released is a flammable, the US EPA RMP gives further guidelines in 68.25 (f):

> *Worst-Case scenario-flammable liquids. The owner or operator shall assume that the quantity of the substance, as determined under paragraph (b) of this section and the provisions below, vaporizes resulting in a vapor cloud explosion. A yield factor of 10 percent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT equivalent methods.*
>
> *(1) For regulated flammable substances that are normally liquids at ambient temperature, the owner or operator shall assume that the entire quantity in the vessel or pipe as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool. For liquids at temperatures below their atmospheric boiling point, the volatilization rate shall be calculated at the condition specified in paragraph (d) of this section.*
>
> *(2) The owner or operator shall assume that the quantity which becomes vapor in the first 10 minutes is involved in the vapor cloud explosion.*

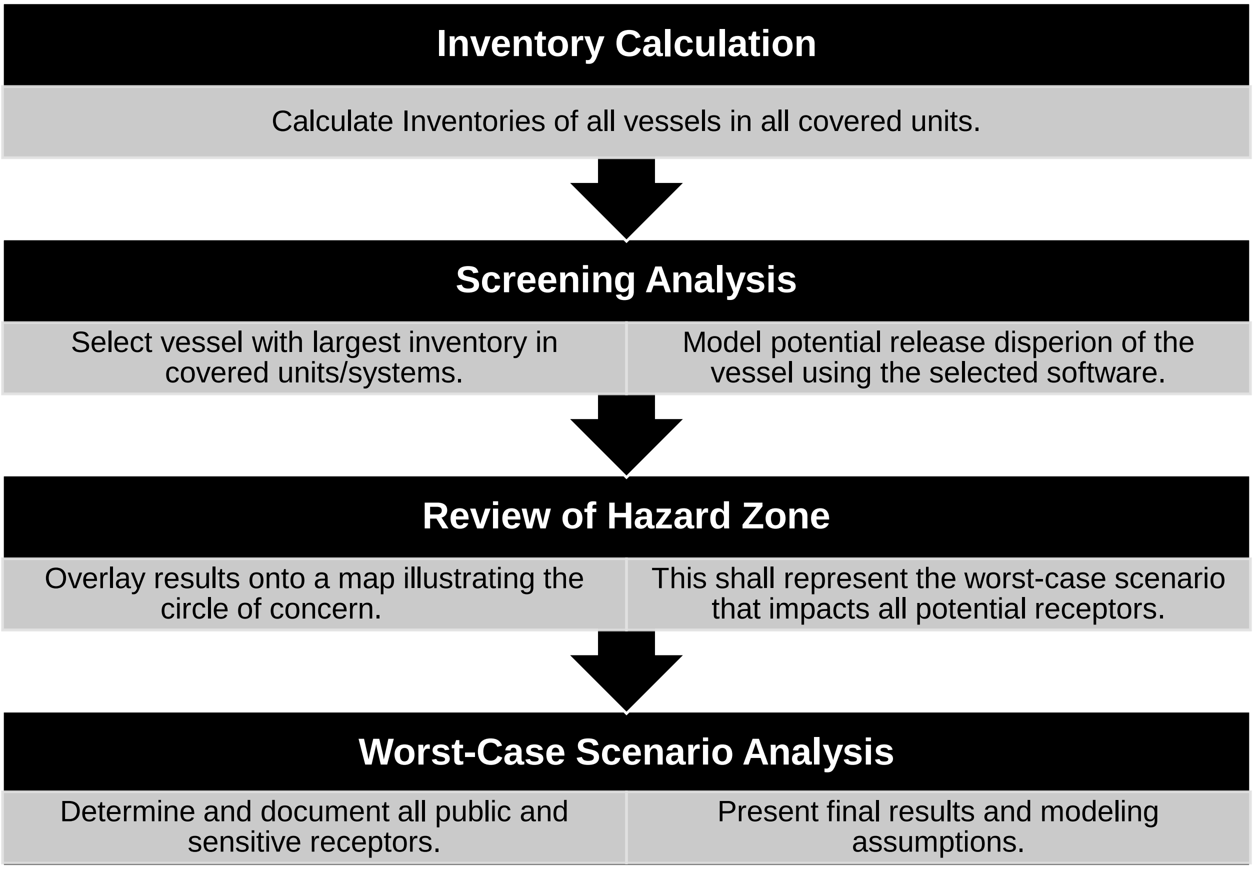
Normally, to develop the worst-case scenario, the covered process is reviewed and a suitable worst-case release analysis is identified through a review of vessels and storage tanks to determine the single vessel with the largest quantity of the regulated substance. However, in this particular Hazard Assessment, the worst-case scenario instead analyzes a release from one of the three new 10,000 gallon isopentane storage vessels. This updated Hazard Assessment was performed to account for the modifications made to Heber 2 as part of the facility's expansion project, and thus, an exclusive examination of the three new 10,000 gallon storage vessels was performed rather than a review of the entire facility.

The 10,000 gallon isopentane storage vessel located closest to the residential neighborhood northeast of the plant was examined as a representative sample for the worst-case release scenario since this vessel has the largest potential to impact the community. EPA's RMP*Comp[3] modeling software was used to determine the distance to the endpoint for the worst-case release scenario analysis. The vulnerability zone resulting from this analysis was then reviewed. A vulnerability zone is defined as a circle whose center is the point of release and its radius is the length of the endpoint, which is predicted by the dispersion model (e.g., RMP*Comp).

## 4.1 Worst-Case Scenario Selection Process

The process of worst-case release scenario identification is summarized as follows. Figure 2 on the following page depicts the steps in this process.

- **Inventory Calculation**: The first step was to perform the inventory calculations for the 10,000 gallon storage vessels in the covered units and systems.
- **Screening Analysis**: The 10,000 gallon isopentane storage vessels' location was screened, and the single vessel that had the greatest potential to impact the community was selected for analysis. Once this vessel was identified, RMP*Comp was used to model the scenarios and determine the dispersion endpoints for the worst-case release scenarios. This was performed to determine the vulnerability zone associated with the worst-case release scenarios.
- **Review of the Vulnerability Zone**: The vulnerability zone resulting from the previous step was reviewed and is representative for the plant's worst-case scenario.
- **Worst-Case Analysis**: To document the worst-case scenario, the potential public receptors within the vulnerability zone were identified. All modeling inputs, calculations and assumptions are documented.



**Inventory Calculation**

Calculate Inventories of all vessels in all covered units.

**Screening Analysis**

Select vessel with largest inventory in covered units/systems.

Model potential release disperion of the vessel using the selected software.

**Review of Hazard Zone**

Overlay results onto a map illustrating the circle of concern.

This shall represent the worst-case scenario that impacts all potential receptors.

**Worst-Case Scenario Analysis**

Determine and document all public and sensitive receptors.

Present final results and modeling assumptions.

**Figure 2: Worst-Case Scenario Selection Process**

## 4.2 Flammable Release Potential Consequences

Several possible consequences of releases of flammable substances are discussed below. It should be noted that the following possible consequences apply to not only worst-case release analysis.

- **Flash Fire**. This event may result from dispersion of a flammable vapor cloud and ignition of the cloud following dispersion. Such a fire could flash back and could represent a severe heat radiation hazard to anyone in the area of the cloud. The lower flammability limit (LFL) endpoint, specified in the rule, would be appropriate for flash fires (vapor cloud fires).
- **Pool Fire**. Spill of a liquid whose boiling point is above ambient temperature may form a liquid pool, which could ignite and form a pool fire. The applicable endpoint specified in the rule is the heat radiation level of 5 kW/$m^2$.

- **BLEVE.** A BLEVE (Boiling Liquid Expanding Vapor Explosion) is a potential release scenario associated with a large quantity of flammable materials kept at below their boiling points. A BLEVE that may lead to a fireball could produce intense heat. This event may occur if a vessel containing flammable material ruptures as a result of exposure to fire. Heat radiation from the fireball is the primary hazard and vessel fragments and overpressure from the explosion are generally considered unlikely. To estimate the distance to a radiant heat level that can cause second degree burns (a heat "dose" equivalent to the specified radiant heat endpoint of 5 $kW/m^2$ for 40 seconds). Consistent with the EPA's "Risk Management Program Guidance for Offsite Consequence Analysis" published guidance, BLEVEs are generally considered unlikely events and were therefore not considered a probable event for the Offsite Consequence Analysis.
- **Vapor Cloud Explosion.** For a vapor cloud explosion to occur, rapid release of a large quantity, turbulent conditions (caused by a turbulent release or congested conditions in the area of the release, or both), and other factors are generally necessary. The endpoint for vapor cloud explosions is 1 psi.
- **Jet Fire.** This may result from the puncture or rupture of a tank or pipeline containing a compressed or liquefied gas under pressure. The gas discharging from the hole can form a jet that "blows" into the air in the direction away from the hole; the jet then may ignite. Jet fires could contribute to BLEVEs and fireballs if they impinge on tanks of flammable substances. A large horizontal jet fire may have the potential to pose an offsite hazard.

For the flammable worst-case release scenario, a vapor cloud explosion was the most appropriate consequence.

## 4.3 Endpoints

As mentioned previously, for flammable materials, the endpoints specified by the EPA RMP are:

- Overpressure of 1 pound per square inch (psi) for vapor cloud explosions
- Radiant heat of 5 kilowatts per square meter ($kW/m^2$) for jet fires
- Lower flammability limit (LFL) for flash fires

The rule specifies endpoints for fires based on the heat radiation level that may cause second degree burns from a 40-second exposure and the LFL, which is the lowest concentration in air at which a substance will burn. For a vapor cloud explosion, the endpoint is 1 psi, which is the force to cause partial demolition of houses with potential serious injuries to people, or shattering glass windows with potential skin laceration from flying glass.

## 4.4 Modeling Assumptions

The EPA RMP regulation imposes several assumptions that were adhered to when performing the offsite consequence analysis of the worst-case release scenario[4]. These are conservative assumptions for weather and release conditions. The distance to the endpoint estimated under worst-case conditions provides an estimate for the maximum possible area that might be affected by these unlikely conditions. It should be noted that EPA's intention for the vulnerability zone representing a worst-case release scenario is to provide a basis for discussion among the regulated industry, emergency responders, and the public, rather than a basis for any specific actions.

- **Meteorological Parameters:** For the worst-case release analysis, RMP*Comp uses the following assumptions. It should be noted that meteorological conditions could have little effect on some scenarios for flammable substances (e.g., vapor cloud explosions).
    - *Atmospheric stability*: F stability (very stable conditions)
    - *Wind speed:* 1.5 meters/second
    - *Ambient Temperature:* 77 °F
    - *Relative Humidity*: The typical relative humidity at the stationary source, which is 50%
- **Dispersion & Impact Modeling Parameters:**
    - *Height of Release:* Ground level, per EPA Rule requirement
    - *Vapor Cloud Explosion Impact:* A TNT-equivalent model has been used assuming that 10 percent of the energy in the cloud would contribute to the explosion
- **Mitigation Systems:** Once a release has occurred, mitigation systems are means (structures, equipment, or activities) that help minimize the transport of material to the atmosphere. Mitigation systems can be characterized as passive or active systems.
    - *Passive mitigation systems do not require activation, an energy source, or movement of components to perform their intended function*

- *Active mitigation systems do require activation, an energy source, and/or movement of components to perform their intended function*

It should be emphasized that the effectiveness of mitigation systems was taken into account when these systems were considered in the offsite consequence analysis. The effectiveness is determined based on how well the systems are designed and their abilities to respond reliably upon demand. The rule permits consideration of only passive mitigation systems for the worst-case release analysis provided that the systems are capable of withstanding the event triggering the release scenario and would still function as intended. For the worst-case release scenario, no passive mitigation measures were considered in the offsite consequence analysis.

## 4.5 Worst-Case Release Scenario

One worst-case scenario (WCS) was developed for the facility. For the worst-case release scenario, one of the new 10,000 gallon storage vessels containing isopentane at the Ormat – Heber 2 Geothermal Complex Facility was considered. The storage vessel is capable of storing a maximum of 10,000 gallons of isopentane. According to the Chevron Philips Chemical Company safety data sheet, the density of isopentane is 5.14 lbs/gal, which yields a total mass of 51,400 pounds of isopentane held in the storage vessel. The worst case scenario considers the catastrophic failure of one of the 10,000 gallon isopentane storage vessels, which would result in a release of the entire contents of the vessel. All dispersion modeling parameters utilized in the worst-case release scenario modeling is listed in Table 2 below. A summary of the scenario is presented in Table 3. Appendix A of this report provides a detailed description of the worst-case release scenario, RMP*Comp modeling output, MARPLOT 5.1.1[5] output with 2010 population estimates, and a map with the vulnerability zone denoted by a circle superimposed on the map.

**Table 2: Worst Case Release Scenario Dispersion Modeling Parameters**

| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| **Isopentane Input Parameters** | | |
| Mass Released | 51,400 lbs | Calculations shown in Appendix A. |
| **Meteorological Parameters** | | |

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| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| Atmospheric Stability | F stability | As per 40 CFR §68.22 (b), “For the worst-case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second and F atmospheric stability class” |
| Wind Speed | 1.5 m/s | |
| Ambient Temperature | 77ºF | As per 40 CFR §68.22 (c), “An owner or operator using the RMP Offsite Consequence Analysis Guidance may use 25 °C and 50 percent humidity as values for these variables” |
| Relative Humidity | 50% | |
| **Dispersion and Impact Modeling Parameters** | | |
| Height of Release | Ground level | |
| Topography | N/A | Topography is not applicable to releases of flammable substances as it does not affect the radius impacted by a vapor cloud explosion. |
| **Isopentane Mitigation System** | | |
| Passive Mitigation | None | |
| Active Mitigation | None | |

**Table 3: Worst-Case Scenario Results Summary**

| RELEASE SCENARIO | REGULATED SUBSTANCE | ENDPOINT | ENDPOINT DISTANCE |
|---|---|---|---|
| WCS: 10,000 gallon Isopentane Storage Vessel Rupture/Release | Isopentane | Overpressure of 1 psi | 0.3 miles |

## 4.6 Worst-Case Analysis Considerations

The worst-case distances to the flammable endpoints are based on a number of very conservative assumptions. The following summarizes the assumptions:

- The likelihood of a vessel rupture is extremely low. As a result, the release of entire inventory of a vessel is an unrealistic assumption.
- An overpressure of 1 psi is unlikely to have serious direct effects on people. This overpressure may cause property damage such as partial demolition of houses, which can result in injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.

## 5.0 ALTERNATIVE RELEASE SCENARIO

Alternative scenarios are potential releases that may result in consequences whose footprints represented by the endpoints could extend beyond the plant boundary. For a release case to be considered an alternative scenario, two conditions must be met:

1. The likelihood of the alternative release scenarios should be higher than that of the worst-case release scenarios.
2. The distance to endpoint from an alternative release scenario must go beyond the plant fence line.

As put forth in Title 40 CFR Section 68.28(a):

> *The owner or operator shall identify and analyze…at least one alternative release scenario to represent all flammable substances held in a covered process*

Title 40 CFR Section 68.28 (b)(2) defines the scenarios typically considered, but not limited to, the following:

> *(i) Transfer hose releases due to splits or sudden hose uncoupling;*

*(ii) Process piping releases from failures at flanges, joints, welds, valves and valve seals, and drains or bleeds*

*(iii) Process vessel or pump release due to cracks, seal failure, or drain, bleed, or plug failure; and*

*(iv) Vessel overfilling and spill, or over pressurization and venting through relief valves or rupture disks.*

*(v) Shipping container mishandling and breakage or puncturing leading to a spill.*

For alternative release scenarios, active mitigation systems, such as interlocks, shutdown systems, pressure relieving devices, flares, emergency isolation systems, and fire water and deluge systems, as well as passive mitigation systems are considered, if they were applicable. In order to be credited, the mitigation systems considered must be capable of withstanding the event that triggers the release while remaining functional.

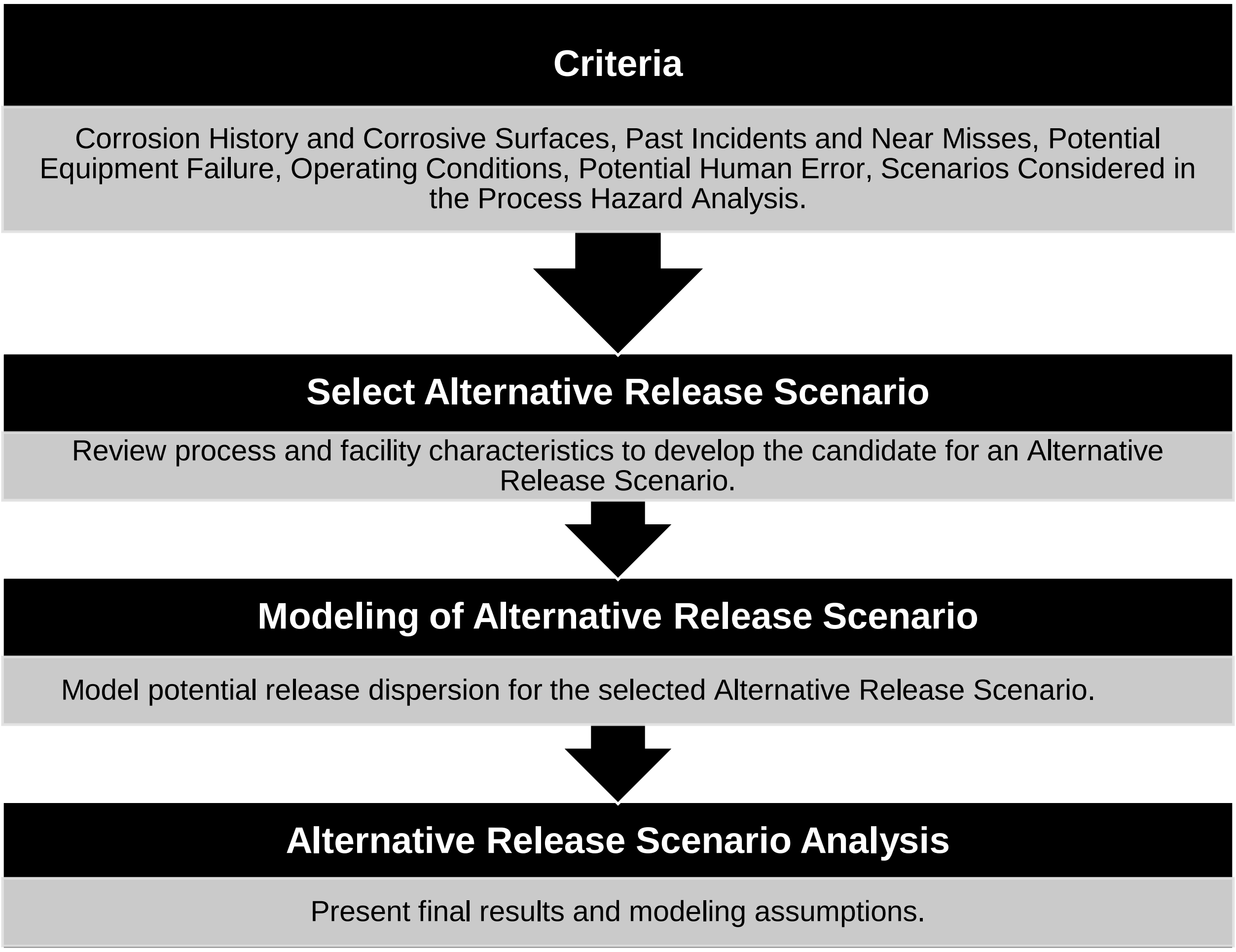
## 5.1 Alternative Release Scenario Selection Process

The process of alternative release scenario identification is summarized as follows and depicted in Figure 3.

- **Selection of Candidate Alternative Release Scenario:** The process of alternative release scenario identification was initiated with the review of the worst-case release case. Additional vessels, containing various quantities of regulated substances, which considered having a higher likelihood of release, were then reviewed. In this process, all covered processes were reviewed and the candidate case for the alternative release scenario analysis was subsequently selected. The following criteria was utilized to identify the potential scenario:
    - Corrosion history and corrosive services
    - Past incidents and near misses
    - Potential equipment failure
    - Operating conditions
    - Potential for human error
    - Consequences considered in the unit Process Hazard Analysis
- **Analysis of the Selected Alternative Release Scenario:** Once the candidate scenario was selected, RMP*Comp was utilized to model the selected scenario. The vulnerability zone resulting from the analysis of the alternative release scenario was then reviewed. The size of release, which was estimated from a hole in the shaft seal on a vertical pump,

was calculated for this scenario. The release duration was primarily based on the length of time needed for operators to stop the release. In general, 10 minutes is a reasonable response time to stop the release based on the presence of monitoring equipment in the vicinity which notify operators of any substantial releases

- **Alternative Release Scenario**: The alternative release scenario for the flammable substance was selected and modeled to evaluate potential offsite impacts. Documentation of this scenario included modeling calculations, parameters and assumptions.



**Criteria**

Corrosion History and Corrosive Surfaces, Past Incidents and Near Misses, Potential Equipment Failure, Operating Conditions, Potential Human Error, Scenarios Considered in the Process Hazard Analysis.

**Select Alternative Release Scenario**

Review process and facility characteristics to develop the candidate for an Alternative Release Scenario.

**Modeling of Alternative Release Scenario**

Model potential release dispersion for the selected Alternative Release Scenario.

**Alternative Release Scenario Analysis**

Present final results and modeling assumptions.

**Figure 3: Alternative Release Scenario Selection Process**

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## 5.2 Modeling Assumptions

The EPA RMP regulation does not impose any mandatory assumptions for the OCA of the alternative release scenario. All dispersion modeling parameters utilized in the alternative release scenario modeling are listed in Table 4. For the alternative release scenario, a release due to a break in the product transfer hose connection during truck loading has been considered. Appendix B of this report provides a detailed description of the worst-case release scenario, RMP*Comp modeling output, MARPLOT 5.1.1 output with 2010 population estimates, and a map with the vulnerability zone denoted by a circle superimposed on the map.

**Table 4: Alternative Release Scenario Dispersion Modeling Parameters**

| Parameter | Input Value | Notes |
|---|---|---|
| **Isopentane Input Parameters** | | |
| Quantity Released | 38,733 lbs | The most likely alternative release scenario involves the uncoupling of a transfer hose during truck loading operations.<br>Calculations shown in Appendix B. |
| Release Rate | 3,873.3 lbs/min | Calculations shown in Appendix B. |
| Release Duration | 10 mins | The reasonable, assumed response time operators require to stop and isolate the leak. |
| **Meteorological Parameters** | | |
| Atmospheric Stability | D stability | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, “this guidance assumes wind speed of 3 meters per second and D stability” |
| Wind Speed | 3.0 m/s | |
| Ambient Temperature | 77$^{o}$F | |

| Parameter | Input Value | Notes |
|---|---|---|
| Relative Humidity | 50% | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, "this guidance assumes 25ºC and 50 percent humidity" |
| **Dispersion and Impact Modeling Parameters** | | |
| Height of Release | Ground Level | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, "this guidance assumes a ground-level release" |
| Topography | N/A | Topography is not applicable to releases of flammable substances as it does not affect the radius impacted by a vapor cloud explosion. |
| **Isopentane Mitigation System** | | |
| Passive Mitigation | None | |
| Active Mitigation | None | |

## 5.3 Alternative Release Scenario

A summary of the alternative release scenario is presented in Table 5. Appendix B of this report provides a detailed description of the alternative release scenarios, RMP*Comp modeling outputs, MARPLOT 5.1.1 outputs with 2010 population estimates, and a map with circles representing the vulnerability zones.

**Table 5: Alternative Release Scenario Result Summary**

| RELEASE SCENARIO | REGULATED SUBSTANCE | ENDPOINT | ENDPOINT DISTANCE |
|---|---|---|---|
| ARS: Transfer Hose uncoupling from 10,000 gallon Isopentane Storage Vessel during Truck Loading Operations | Isopentane | Overpressure of 1 psi | 0.1 miles |

## 5.4 Alternative Release Analysis Considerations

Typically, the same conservative assumptions apply for the alternative release analysis as for the worst-case release analysis. Although the alternative release scenario is intended to be more likely than the worst-case release scenario, the analysis of the alternative release scenario should not be expected to provide a realistic estimate of an area in which off-site impact may occur. The same conservative endpoints have been used for both the worst-case and the alternative release analysis. These endpoints are intended to represent exposure levels below which most members of the public will not experience serious long-term health effects.

# 6.0 OFFSITE IMPACTS

A summary of the off-site impacts from an accidental release, including population and sensitive receptors, is discussed in the following sub-sections.

## 6.1 Impacted Population

In order to determine the impacted population around the facility, the potential for exposure within the endpoint was determined. The furthest endpoint distances reached by the worst-case scenario and alternative release scenario along with the estimated impacted population are summarized in Table 8:

**Table 6: Impacted Population for OCA Scenarios**

| SCENARIO | ENDPOINT DISTANCE (MILES) | ESTIMATED IMPACTED POPULATION |
|---|---|---|
| WCS: 10,000 gallon Isopentane Storage Vessel Rupture/Release | 0.3 | 0 |
| ARS: Transfer Hose uncoupling from 10,000 gallon Isopentane Storage Vessel during Truck Loading Operations | 0.1 | 0 |

The population was estimated using 2010 census tract data with the MARPLOT 5.1.1 software. When calculating population densities for large areas that encompass many tracts, the accuracy is rated as good; however, for small areas that encompass only two or three partial tracts, the population data may be skewed due to the unequal distribution within the tract. The use of MARPLOT 5.1.1 is pursuant to guidance endorsed by the US EPA. MARPLOT 5.1.1 requires the latitude and longitude of the facility in order to calculate the population. The latitude and longitude were estimated using Google Earth GPS[6] software and an aerial photo.

## 6.2 Offsite Sensitive Receptor Data Sources

Table 9 includes a list of websites and software used to locate offsite sensitive receptors. A few sites will perform a distance search in order to determine the eligibility of a possible receptor. For all other sites, a map interpolation determines whether the receptor falls within the circle of concern.

**Table 7: Websites and Software Used**

| SOURCE | RECEPTORS THIS SOURCE IS USED TO IDENTIFY | METHOD OF DETERMINING ELIGIBILITY |
|---|---|---|
| maps.google.com[7] | Used to identify all receptors | Distance search in conjunction with a map interpolation |
| Google Earth | This mapping software is used to locate all receptors. It also | Software will map the location of the receptor. |

| | | |
|---|---|---|
| | incorporates an internet search with the map to locate businesses. | |

## 6.3 Offsite Sensitive Receptors

RMP requirements state that sensitive populations such as schools, hospitals, day-care centers, long-term health care facilities, prisons, residential areas, public use parks/recreational areas, and major commercial facilities, located within the "at risk" area must be identified. These sensitive populations include individuals who could not remove themselves from the exposure area without assistance. The sensitive populations also include industrial installations which may have a hazardous process that cannot be immediately left unattended. Table 8 shows a summary of offsite population receptors and offsite environmental receptors for isopentane, within the circle of concern as determined by the worst-case and alternative release scenarios.

**Table 8: Summary of Sensitive and Environmental Receptors**

| RECEPTOR | WCS (0.3 MI) | ARS (0.1 MI) |
|---|---|---|
| **Population Receptors** | | |
| Schools | No | No |
| Residences | No | No |
| Hospitals | No | No |
| Prisons/Correction Facilities | No | No |
| Recreation Areas | No | No |
| Major Commercial, Office, or Industrial Areas | No | No |
| Child Daycare | No | No |
| Long-term Health Care (e.g., convalescent homes) | No | No |

| RECEPTOR | WCS<br>(0.3 MI) | ARS<br>(0.1 MI) |
|---|---|---|
| Other (Government Buildings) | No | No |
| **Environmental Receptors** | | |
| National or State Parks, Forests, or Monuments | No | No |
| Officially Designated Wildlife Sanctuaries, Preserves, or Refuges | No | No |
| Federal Wilderness Areas | No | No |
| Other (Landmark & Indian Reservations) | No | No |

# 7.0 WORST-CASE RELEASE AND ALTERNATIVE RELEASE SCENARIOS

The following sections outlines a summary of the parameters used for the one worst case release scenario and the one alternative release scenario analyzed for the Heber 2 expansion project.

## 7.1 Worst-Case Scenario

The worst-case scenario evaluated the release of the entire contents of one of the new 10,000 gallon isopentane storage vessels, containing 51,400 pounds of isopentane. The following table provides a summary of the parameters used for the worst-case scenario and the corresponding inputs.

**Table 9: Worst-Case Scenario Parameter/Input Summary**

| Worst-Case Scenario | |
|---|---|
| Chemical | Isopentane |
| Model Used | EPA's RMP*Comp™ |
| Scenario | Vapor Cloud Explosion |
| Quantity Released (lbs) | 51,400 lbs |
| Endpoint Used | Overpressure of 1 psi |
| Distance to Endpoint (miles) | 0.3 |
| Estimated Residential Population within Distance to Endpoint (numbers) | 0 |
| Public Receptors within Distance to Endpoint | |
| Schools | No |
| Residences | No |
| Hospitals | No |
| Prison/Correctional Facilities | No |
| Recreational Areas | No |
| Major Commercial, Office, or Industrial Areas | No |

| Worst-Case Scenario | |
|---|---|
| Other | Local Roads/Highways and Agricultural Land |
| Environmental Receptors within Distance to Endpoint | |
| National or State Parks, Forests, or Monuments | No |
| Officially Designated Wildlife Sanctuaries, Preserves or Refuges | No |
| Federal Wilderness Area | No |
| Other | No |
| Passive Mitigation Considered | |
| Blast Walls | No |
| Other | No |

## 7.2 Alternative Release Scenario

It was determined that a release due to a break in the isopentane transfer hose connection during truck loading, was the most likely release scenario due to human factors associated with manned transfer operations, as well as reliability issues in industry related to hose degradation and coupling failures. The following table provides a summary of the parameters that were used for alternative release scenario and the corresponding inputs.

**Table 10: Worst-Case Scenario Parameter/Input Summary**

| Alternative Release Scenario | |
|---|---|
| Chemical | Isopentane |
| Model Used | EPA’s RMP*Comp™ |
| Scenario | Vapor Cloud Explosion |
| Quantity Released (lbs) | 38,733 |
| Endpoint Used | 1 psi |
| Distance to Endpoint (miles) | 0.1 |

| **Alternative Release Scenario** | |
|---|---|
| Estimated Residential Population within Distance to Endpoint (numbers) | 0 |
| Public Receptors within Distance to Endpoint | |
| Schools | No |
| Residences | No |
| Hospitals | No |
| Prison/Correctional Facilities | No |
| Recreational Areas | No |
| Major Commercial, Office, or Industrial Areas | No |
| Other | Local Roads/Highways and Agricultural Land |
| Environmental Receptors within Distance to Endpoint | |
| National or State Parks, Forests, or Monuments | No |
| Officially Designated Wildlife Sanctuaries, Preserves or Refuges | No |
| Federal Wilderness Area | No |
| Other | No |
| Passive Mitigation Considered | |
| Blast Walls | No |
| Other | No |
| Active Mitigation Considered | |
| Sprinkler Systems | No |
| Deluge Systems | No |
| Water Curtain | No |
| Excess Flow Valve | No |
| Other | No |

## Alternative Release Scenario

## 8.0 FIVE YEAR ACCIDENT HISTORY

There have been no applicable CalARP/RMP/PSM releases of isopentane at the facility within the last five years, therefore, this section is not applicable.

## 9.0 REFERENCES

1. Code of Federal Regulations (CFR), Title 40, Chapter I, Subchapter C, Part 68, Subpart B, Sections 68.20 to 68.42, “Hazard Assessment”; 2015, January 1.
2. California Code of Regulations (CCR), Title 19, Division 2, Chapter 4.5, Article 4, Sections 2750.1 to 2750.9, “Hazard Assessment”; 2015, January 1.
3. RMP*Comp™ Version 2.01, U.S. Environmental Protection Agency, February 2012. https://cdxnodengn.epa.gov/cdx-rmp-maintain/action/rmp-comp.
4. Risk Management Program Guidance for Offsite Consequence Analysis, U.S. Environmental Protection Agency, March 2009.
5. MARPLOT® 5.1.1 Mapping Software (internet download), National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency. http://www.epa.gov/osweroe1/content/cameo/marplot.htm. October 2015
6. Google ™ Earth, version 7.3.2.5776, Google, Inc. (2019)
7. Google ™ Maps, Google, Inc. (2019)

# APPENDIX A

# WORST-CASE SCENARIO CALCULATIONS

## WORST-CASE SCENARIO (WCS)

The selected worst-case release scenario analyzes the hypothetical rupture of the 10,000 gallon isopentane vessel 3 introduced as part of the Heber 2 facility's expansion project. The vessel being analyzed can store up to 51,400 pounds of isopentane. Additionally, this vessel is located closest to the residential neighborhood northeast of the plant, and therefore the vessel with the largest potential to impact the community. Per requirement of the EPA rule for flammable substances, it was assumed that the whole quantity is instantaneously released.

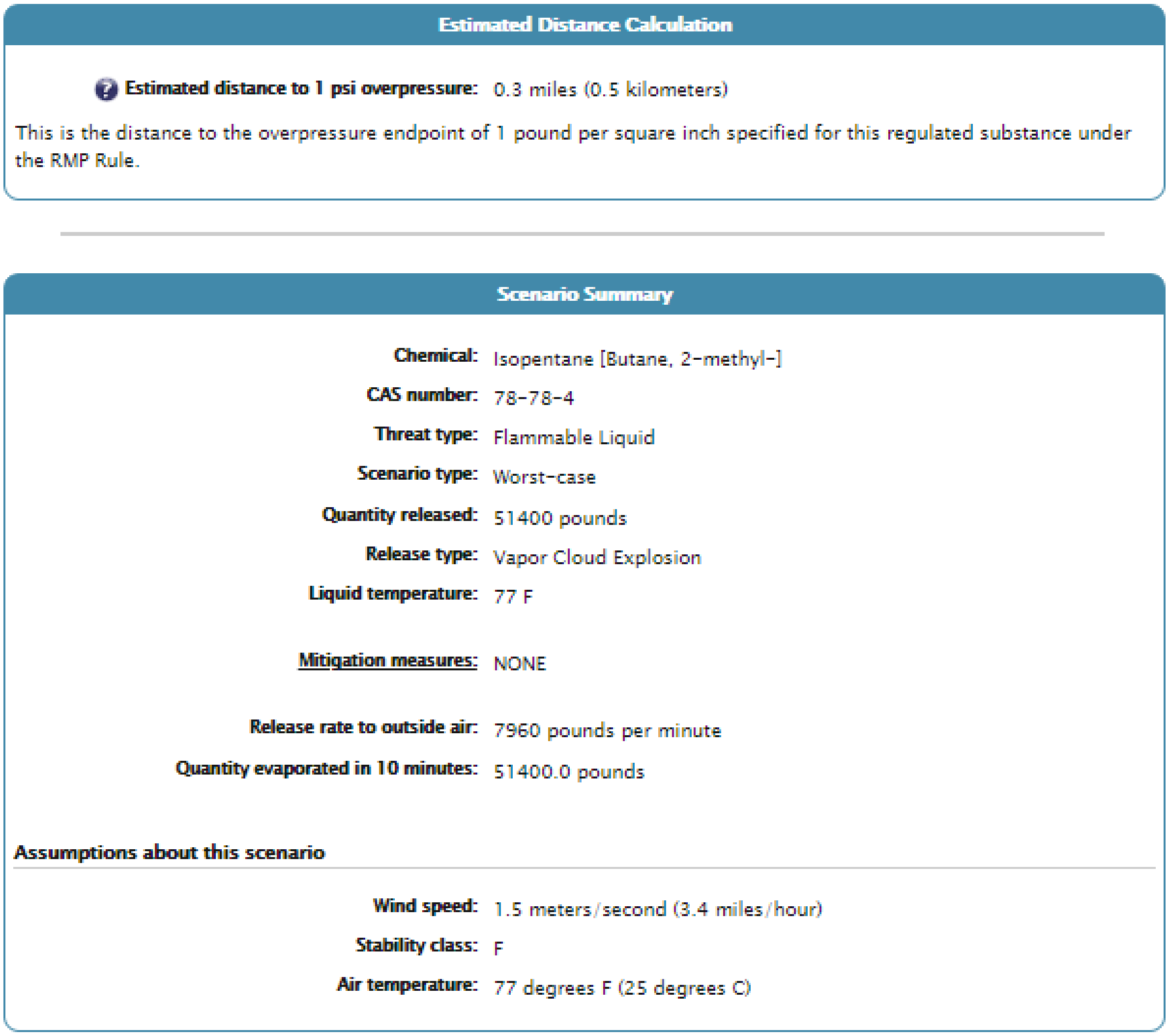
The scenario also assumes that the cloud is ignited with a delay, under which the impact is higher than an immediate ignition. The delayed ignition would allow the air to get entrained in the cloud and form a larger and well-mixed explosive vapor cloud. If this vapor cloud ignited, the resultant blast could generate overpressure damage. A TNT-equivalent model has been used assuming that 10 percent of the energy in the cloud would contribute to the explosion, as required by the EPA Rule.

The RMP*Comp Model calculation predicts that the area impacted by the endpoint, which is an overpressure of 1 psi, is a circle with approximately 0.3 mile radius. According to MARPLOT 5.1.1 using 2010 census data, there are 0 residents in 0 housing units within this vulnerability zone for all three vessels and thus only one is shown below for representation. The table and figures on the following pages illustrate the scenario modeling parameter summary, scenario circle for the release, the RMP*Comp modeling output, as well as the MARPLOT results.

## Table 11: WCS Modeling Parameters

| **WCS Modeling Parameters** | |
|---|---|
| **Regulated Substance** | Isopentane |
| **Vessel** | Isopentane Storage Vessel |
| **Latitude / Longitude** | 32°42'51.56"N / 115°32'10.43"W |
| **Physical State** | Liquefied Gas Under Pressure |
| **Basis Of Results** | RMP*Comp Version 1.07 |
| **Scenario** | Vapor Cloud Explosion |
| **Quantity Released** | 51,400 Pounds |
| **Release Rate** | Instantaneous |
| **Release Duration** | Instantaneous |
| **Wind Speed & Stability Class** | 1.5 m/s & F Stability |
| **Topography** | N/A |
| **Distance to Endpoint** | 0.3 Miles to 1 psi Overpressure |
| **Public & Environmental Receptors** | 0 Residents, 0 Housing Units |
| **Passive Mitigation Considered** | None |

## Figure 4: WCS EPA RMP*Comp Modeling Results



**Estimated Distance Calculation**

**Estimated distance to 1 psi overpressure:** 0.3 miles (0.5 kilometers)

This is the distance to the overpressure endpoint of 1 pound per square inch specified for this regulated substance under the RMP Rule.

**Scenario Summary**

**Chemical:** Isopentane [Butane, 2-methyl-]

**CAS number:** 78-78-4

**Threat type:** Flammable Liquid

**Scenario type:** Worst-case

**Quantity released:** 51400 pounds

**Release type:** Vapor Cloud Explosion

**Liquid temperature:** 77 F

**Mitigation measures:** NONE

**Release rate to outside air:** 7960 pounds per minute

**Quantity evaporated in 10 minutes:** 51400.0 pounds

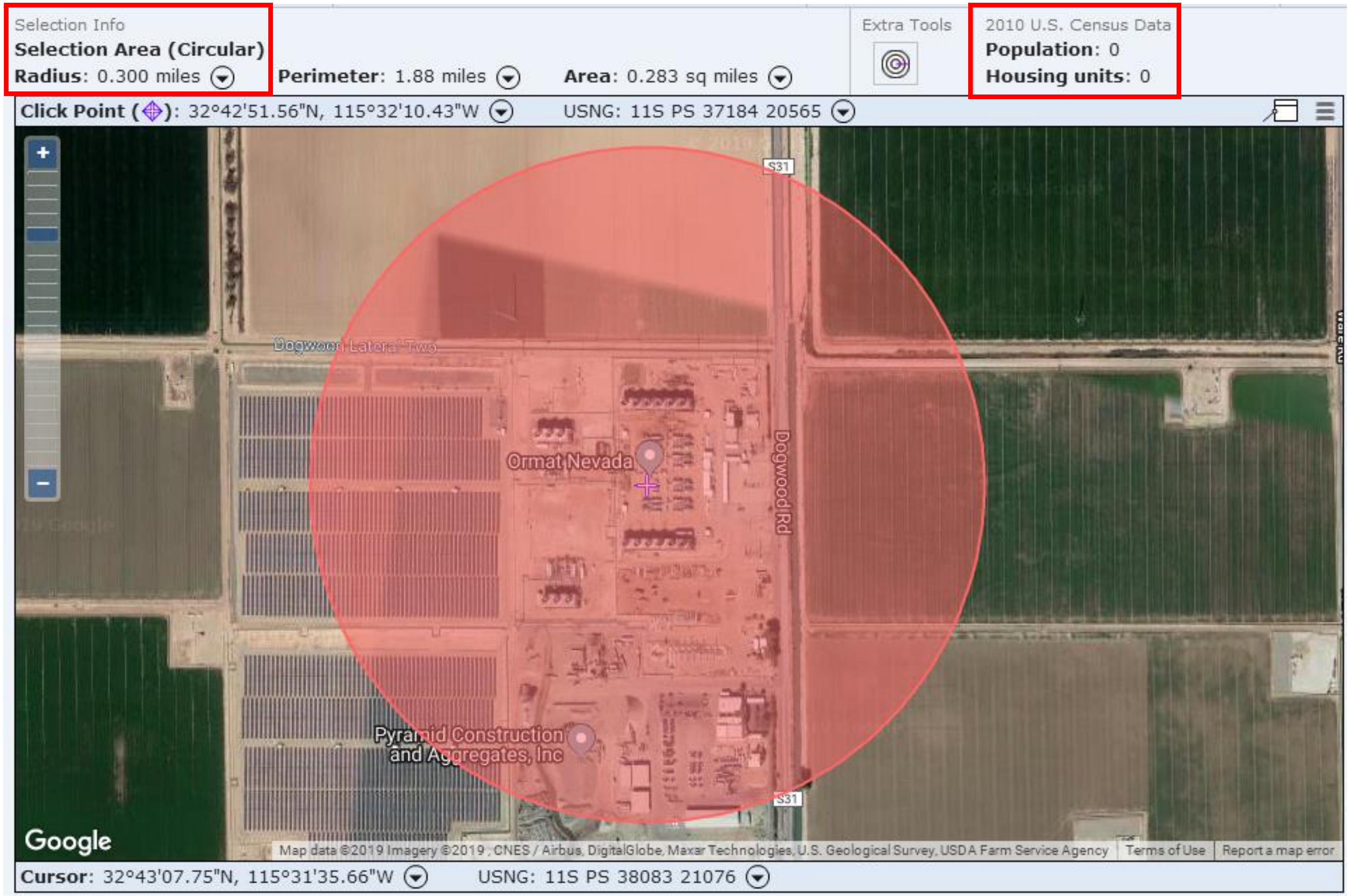
**Assumptions about this scenario**

**Wind speed:** 1.5 meters/second (3.4 miles/hour)

**Stability class:** F

**Air temperature:** 77 degrees F (25 degrees C)

**Figure 5: WCS MARPLOT 5.1.1 Population Estimates**



Selection Info
**Selection Area (Circular)**
**Radius**: 0.300 miles
**Perimeter**: 1.88 miles
**Area**: 0.283 sq miles

Extra Tools

2010 U.S. Census Data
**Population**: 0
**Housing units**: 0

**Click Point** (⌖): 32°42'51.56"N, 115°32'10.43"W
USNG: 11S PS 37184 20565

**Cursor**: 32°43'07.75"N, 115°31'35.66"W
USNG: 11S PS 38083 21076

# APPENDIX B

# ALTERNATIVE SCENARIO CALCULATIONS

## ALTERNATIVE RELEASE SCENARIO (ARS)

The selected alternative release scenario is a release due to a break in the product (isopentane) transfer hose connection during truck loading. This was considered the most likely release scenario due to human factors associated with manned transfer operations, as well as reliability issues in industry related to hose degradation and coupling failures. It is assumed that the transfer hose uncouples during isopentane transfer operations and that it is released through an area of 12.6 square inches. The release duration is assumed to be 10 minutes, which is a conservative assumption considering both the facility operator and truck drivers are in attendance during transfer operations. In the evaluations of this alternative release scenario, no mitigation measures were considered.

In order to calculate the release quantity for a transfer hose rupture, the release rate through the transfer hose must be calculated. The following equation, obtained from the EPA Risk Management Plan Guidance for Offsite Consequence Analysis, illustrates the calculation of the release rate for flammables liquefied under pressure through a transfer hose:

$$\mathrm{QR} = \mathrm{HA} \times 6.82\sqrt{\left(\frac{11.7}{DF^{2}} \times LH + \frac{669}{DF} + P_g\right)}$$

Where:

- QR = Release rate (lb/min)
- HA = Hole or puncture area (square inches)
- DF = Density Factor, dimensionless, obtained from the EPA Risk Management Plan Guidance for Offsite Consequence Analysis
- LH = Height of liquid level above hole (inches)
- $P_g$ = Gauge pressure of the tank (psig)

To calculate the release rate utilizing the above equation, the values for each of the variables were calculated for isopentane:

## Hole Area

The transfer hose used in isopentane filling operations at both plants is 4 inches in diameter. Thus, the hole area is based upon the transfer hose rupturing and calculated using the following:

$$HA = \pi r^2 = 12.6 \text{ in}^2$$

## Density Factor

The Density Factors are obtained from Appendix C of the EPA Risk Management Plan Guidance for Offsite Consequence Analysis. The Density Factor value for isopentane is 0.79.

## Liquid Height

The height of the liquid level above the hole is determined by the nominal liquid level in the vessel. The isopentane transfer point is taken to be at the bottom of the tank. Assuming that the isopentane storage vessel is full of liquid, the liquid height is 60 inches.

## Pressure

The normal operating pressure of the isopentane motive fluid storage tank was identified to be 60 psig.

## Modeling

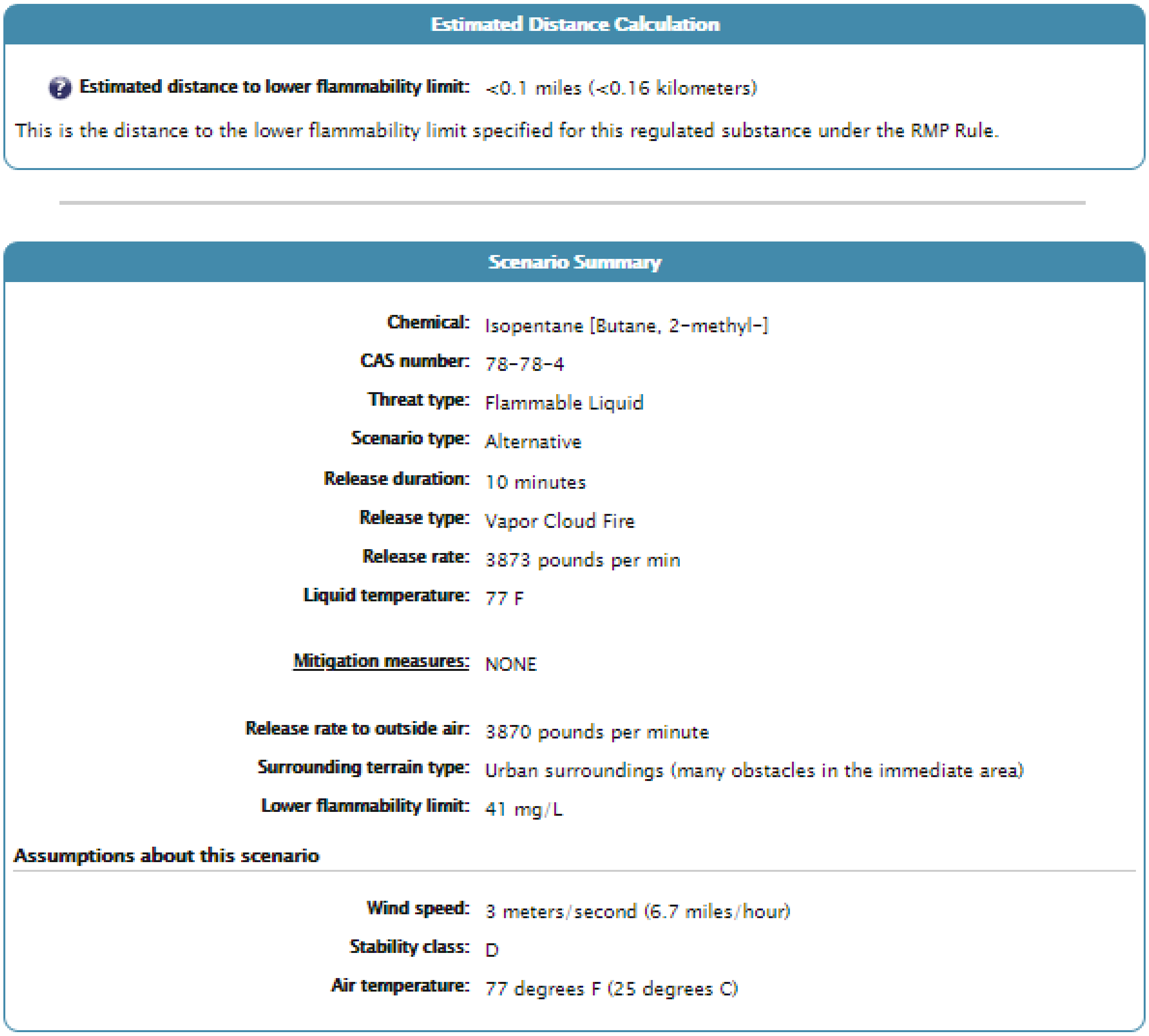
Using these values, the release rate of 3873.3 lbs/min of isopentane is determined. Over the assumed 10 minute release period, this result in a total of 38,733 lbs of isopentane releasing that could potentially form a vapor cloud with the possibility of detonation.

The RMP*Comp Model calculation predicts that the area impacted by the endpoint, which is overpressure of 1 psi, is a circle with approximately a 0.10 mile radius. According to MARPLOT 5.1.1 using 2010 census data, there are 0 residents in 0 housing units within this vulnerability zone. This analysis was performed on the isopentane vessel 3 which is located closest to the residential neighborhood northeast of the plant, and therefore the vessel with the largest potential to impact the community. The table and figures on the following pages illustrate the scenario modeling parameter summary, scenario circle for the release, the RMP*Comp modeling output, as well as the MARPLOT results.

## Table 12: ARS Modeling Parameters

| ARS Modeling Parameters | |
|---|---|
| **Regulated Substance** | Isopentane |
| **Vessel** | Isopentane Storage Vessel |
| **Unit & Location** | Isopentane Tank |
| **Latitude / Longitude** | 32°42'51.56"N / 115°32'10.43"W |
| **Physical State** | Liquefied Gas Under Pressure |
| **Basis Of Results** | RMP*Comp Version 1.07 |
| **Scenario** | Vapor Cloud Explosion |
| **Quantity Released** | 38,733 pounds |
| **Release Rate** | 3873.3 lbs/min |
| **Release Duration** | 10 minutes |
| **Wind Speed & Stability Class** | 3 m/s & D Stabiltiy |
| **Topography** | N/A |
| **Distance To Endpoint** | 0.1 Miles to 1 psi Overpressure |
| **Public & Environmental Receptors** | 0 Residents, 0 Housing Units |
| **Passive Mitigation Considered** | None |

## Figure 6: ARS EPA RMP*Comp Modeling Results



**Estimated distance to lower flammability limit:** <0.1 miles (<0.16 kilometers)

This is the distance to the lower flammability limit specified for this regulated substance under the RMP Rule.

**Chemical:** Isopentane [Butane, 2-methyl-]
**CAS number:** 78-78-4
**Threat type:** Flammable Liquid
**Scenario type:** Alternative
**Release duration:** 10 minutes
**Release type:** Vapor Cloud Fire
**Release rate:** 3873 pounds per min
**Liquid temperature:** 77 F

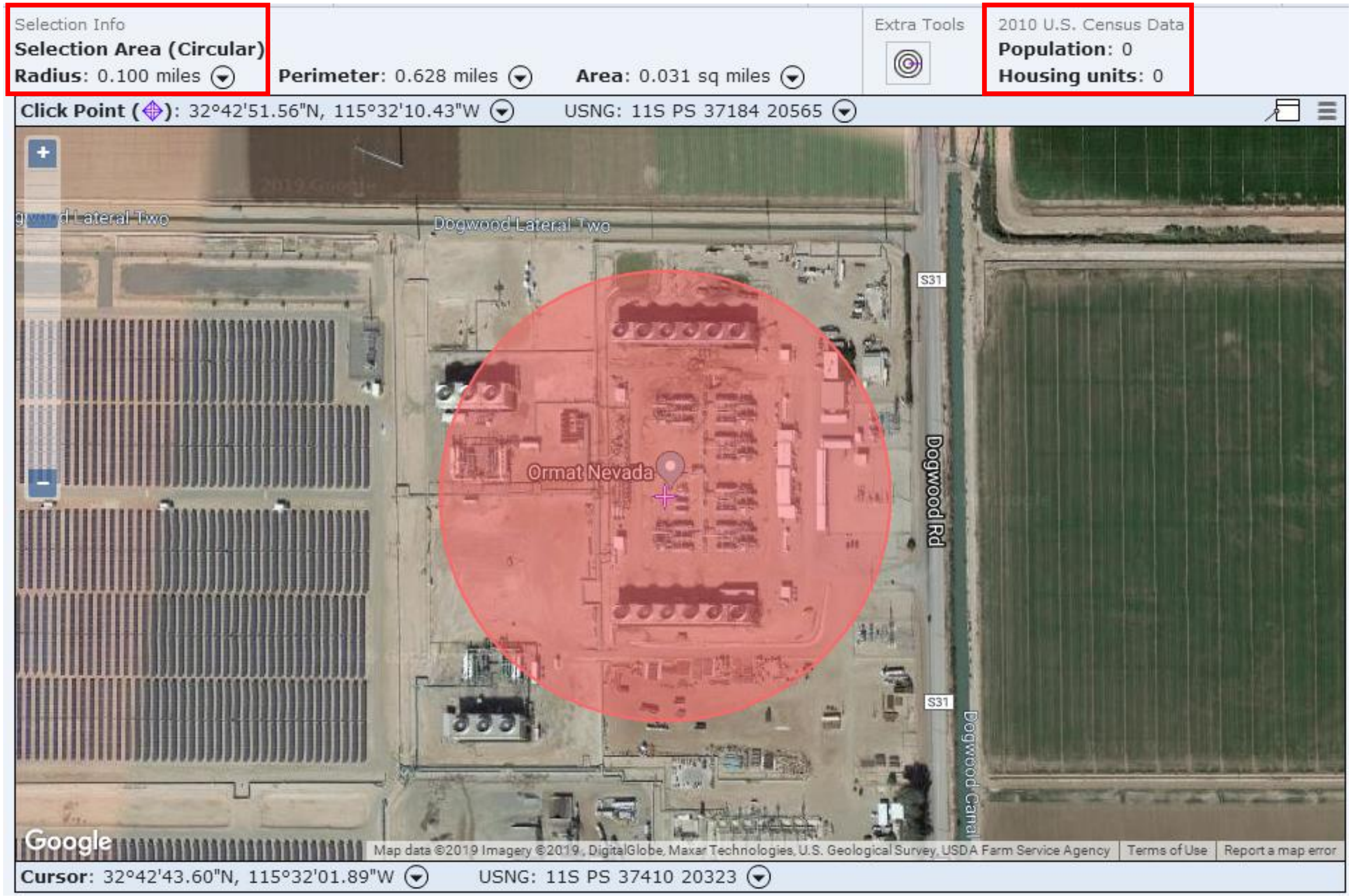
**Mitigation measures:** NONE

**Release rate to outside air:** 3870 pounds per minute
**Surrounding terrain type:** Urban surroundings (many obstacles in the immediate area)
**Lower flammability limit:** 41 mg/L

**Assumptions about this scenario**

**Wind speed:** 3 meters/second (6.7 miles/hour)
**Stability class:** D
**Air temperature:** 77 degrees F (25 degrees C)

**Figure 7: ARS MARPLOT 5.1. Population Estimates**



Selection Info
**Selection Area (Circular)**
**Radius**: 0.100 miles
**Perimeter**: 0.628 miles
**Area**: 0.031 sq miles

Extra Tools

2010 U.S. Census Data
**Population**: 0
**Housing units**: 0

**Click Point** (⌖): 32°42'51.56"N, 115°32'10.43"W    USNG: 11S PS 37184 20565

**Cursor**: 32°42'43.60"N, 115°32'01.89"W    USNG: 11S PS 37410 20323

IMPERIAL COUNTY

**PLANNING & DEVELOPMENT SERVICES DEPARTMENT**

# Reclamation Plan Application

**OWNER, OPERATOR AND AGENT:**

1. Applicant (Name, Mailing Address and Telephone Number):

Second Imperial Geothermal Company
a wholly owned subsidiary of ORMAT Nevada, Inc.
6140 Plumas Street
Reno, Nevada 89519
(775) 356-9029

2. Property Owner (s), or owner of Surface Rights (Name, Mailing Address and Telephone Number): [if different from applicant]

See 1.

3. Owner of Mineral Rights (Name, Mailing Address and Telephone Number): [if different than applicant]

See 1.

5. Lessee (Name, Mailing Address and Telephone Number):

See 1.

6. Operator (Name, Mailing Address and Telephone Number): [if different than applicant]

See 1.

7. Agent of Process (Name, Mailing Address and Telephone Number):

Melissa Wendt
Director, Project Development
6140 Plumas Street
Reno, Nevada 89519
(775) 356-9029

**LOCATION:**

8. Legal Description: (must be full legal)

855 Dogwood Road, Heber, CA (APN 054-250-031)
Tract 44, Township 16 South, Range 14 East, SBB&M

| | |
|---|---|
| Assessor Parcel No.: | 054-250-031 |
| Longitude: | 115°32'15.1W |
| Latitude: | 32°42'52.2N |
| Elevation: | near zero |

9. Size of the land(s) that will be affected by mining operation. Total acreage:

Heber 2 site is approximately 40 acres.

10. Describe existing and proposed access to the mine site: (please be specific)

Via existing ingress/egress. Primary highway access is provided via Interstate-8. Dogwood Road stems off of I-8 and provides immediate access to the site.

**GEOLOGICAL BACKGROUND:**

11. Mineral commodity to be minded:

Geothermal fluids. However, no new wells are proposed.

12. General Geological description of the area:
The site is located within the Piliocene to Holocene, Q Geologic Unit. The Colorado Desert geomorphic province spans central Imperial County, where the site is located, often referred to as the Salton Trough. Low-lying barren desert located between alluvium-covered, active branches of the San Andreas Fault

13. Detailed description of the geology of the actual site in which surface mining is to be conducted:
Site is underlain by Cenozoic sedimentary rocks and alluvial, lacustrine, and eolian deposits. Surface sediments are about 275 feet below sea level. The site contains Holtville silty clays (wet) and Imperial-Glenbar silty clay loams (wet).

14. Brief description of the environmental setting of the site and the surrounding areas. Existing land uses, soil, vegetation, ground water elevation and surface water characteristics.
The site is completly devoid of any vegetation or water resources. Dry lean silty clays dominate the site, extending 4-5 ft. below the surface. The site is comprised of a graded, developed area that consists of exposed soils and gravel. Site within the active geothermal power plant area.

**MINING OPERATION AND PRODUCTION:**

15. Proposed starting date of operation: Plant in production since 1992

Estimated life of operation: 30 years, 2019-2049

Termination Date: 2049

Duration of first phase: ________

Second phase: ________

Third phase: ________

Fourth phase: ________

16. Operation will be (include days and hours of operation):

Continuous: Plant operates 24 hour per day, 7 days per week

Intermittent: ________

Seasonal: ________

17. Maximum anticipated annual production (Tons or Cubic Yards):
N/A

18. Total anticipated production:

| | | | |
|---|---|---|---|
| Minerals: | N/A | cubic yards/tons | 0 |
| Tailings retained on site: | | cubic yards/tons | 0 |
| Tailings disposed off site: | | cubic yards/tons | 0 |

Maximum anticipated depth (indicate on map location of benchmarks to verify mine depth):
N/A - Project does not propose drilling or extraction.

19. Describe mining method:
N/A - no mining is proposed as part of the Project.

20. Describe nature of processing and explain disposal of tailings or waste.
N/A - no tailings will be processed as part of the Project.

21. Do you plan to use cyanide or other toxic materials in your operations?
Three additional above ground storage tanks will be used for isopentane
. storage Site will include two 10,000 gallon tanks and three 10,000 gallon tanks.

Do you plan to use or store petroleum products or other hazardous materials on the site?
Yes.

Describe refueling and maintenance of vehicles.
Construction equipment will be fueled on-site, as necessary. Fuel will be limited to diesel and gasoline, to fuel heavy and light equipment. Repairs to construction equipment will be performed on-site by certified mechanics. Spill prevention BMPs and safe handling techniques will be employed throughout the construction phase.

22. Indicate the quantity of water to be used, source of water, method of conveyance to the mine site, the quantity, quality and method of disposal of used and/or surplus water. Indicate if water well to be used for mine operation (drilling, reactivation, changing use or increasing volume of water well may require Conditional Use Permit approval).

No additional water will be required to support the proposed facilities. Water will be used for dust suppression during ground disturbing activities. A 5,000 gallon water truck is expected to be used. Approximately 20,000 gallons of water are expected to be used. The existing Heber 2 facility will provide the water via existing permits.

23. Describe phases of mining if applicable and concurrent reclamation including time schedule for concurrent activities.

No mining is proposed as part of the Project. Site reclamation would be performed at the end of the facilities' lifecycle (30 years).

24. Describe the types of equipment that will be used in the operation, including the estimated average daily trips (ADT) that will be generated by the operation.

Backhoes, excavators, heavy trucks, light vehicles, compactors, hand tools, welding equipment, water truck, crane.

25. Include the following maps: (NOTE: Without these the application is automatically incomplete.)

(1) Topographic Map with overlay showing proposed area to be mined.

(2) Site Plan showing mine layout and dimensions.

(3) General Vicinity Map showing the location of the mine site in Imperial County.

(4) Cross Section Map. (N/A - no subsurface activities proposed.)

**RECLAMATION:**

26. Indicate by overlay of map of Item No. 24, or by color or symbol on map those areas to be covered by the reclamation plan:

Total acreage: 39.99 acres
APN 054-250-031

27. Describe the ultimate physical condition of the site and specify the proposed use (s) or potential uses of the land after reclamation. Explain if utilities, haul or access roads will be removed or reclaimed.

The site is within a developed area used for geothermal energy generation. The site is completely devoid of any vegetation or water resources. The site consists of exposed soils and gravel. The site would likely be returned to a natural state or agricultural production after geothermal energy production has concluded. No roads would be developed for the Project and access will be provided via existing roads.

28. Describe relationship of the interim uses than mining and the ultimate physical condition to:

(a) Imperial County Zoning Ordinance

(b) Imperial County General Plan

The site is zoned as A-2-G-SPA and is within the Geothermal Overlay Zone, which allows for major geothermal energy projects. The proposed facilities and uses are consistent with the Imperial County Zoning Ordinance and General Plan.

29. Notarized statement that all owners of the possessory interest in the land have been notified of the proposed uses or potential uses identified in Item No. 25 (see Attachment "A").

N/A - The site owner is the applicant (ORMAT) and no other parties have an interest on the subject property.

30. Describe soil conditions and proposed topsoil salvage plan.

The site's soils are comprised of silty clays and loams. The site is arid and presently devoid of any vegetation or water resources. The site's topsoil is low quality. Approximately 18 inches of topsoil will be excavated from the 2.5 acre development site and piled. After gravel is deposited and compacted, the piled topsoil will be used as backfill material.

31. Describe the methods, their sequence and timing, to be used in bringing the reclamation of the land to its end state. Indicate on map (Items Nos. 24 and 25) or on diagrams as necessary. Include discussion of the pertinent items listed below.

(a) Backfilling and grading

(b) Stabilization of slopes

(c) Stabilization of permanent waste dumps, tailings, etc.

(d) Rehabilitation of pre-mining drainage

(e) Removal, disposal or utilization of residual equipment, structure, refuse, etc.

(f) Control and disposal of contaminants, especially with regard to surface runoff and ground water

(g) Treatment of streambeds and streambanks to control erosion and sedimentation

(h) Removal or minimization of residual hazards

(i) Resoiling, revegetation with evidence that selected plants can survive given the site's topography, soil and climate:

See Attachment D (Revegetation Plan)

32. If applicant has selected a short term phasing of his reclamation, describe in detail the specific reclamation to be accomplished during the first phase:

All reclamation activities would occur at the conclusion of the facilities' lifecycle (2049).

33. Describe how reclamation of this site in this manner may affect future mining at this site and in the surrounding area:

Reclamation of the site would remove all facilities from the entire Heber 2 site. Reclamation activities would likely return the land to a natural state or agricultural production. These activities would not affect any future mining or geothermal operations on the site or in the vicinity.

34. Notarized statement that the person submitting the plan accepts responsibility for reclaiming the mined lands in accordance with the Reclamation Plan (Attachment “B”):

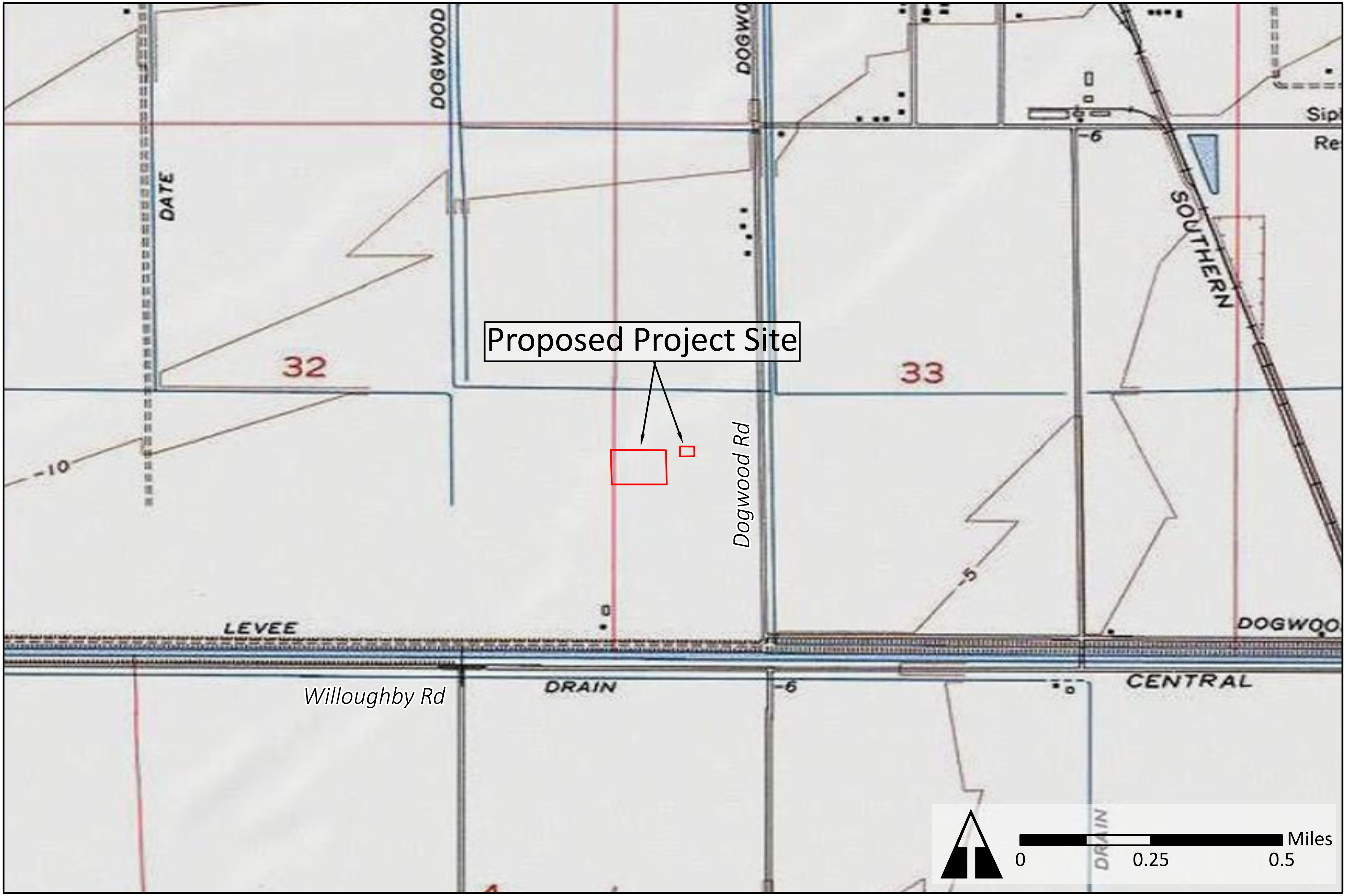
Attached.

35. Include Reclamation Cost Calculations as Attachment “C”:

Attached.

36. Describe proposed Revegetation Plan (attach as “Attachment D” if necessary):

The entire Heber 2 site would be dismantled and removed. All wells would abandoned per DOGGR requirements. Once free of facilities, the site would be disced and seeded with a native mix, per Imperial County's recommendation. See Attachment D.



# TOPOGRAPHIC MAP OF PROJECT SITE

Catalyst
ENVIRONMENTAL SOLUTIONS

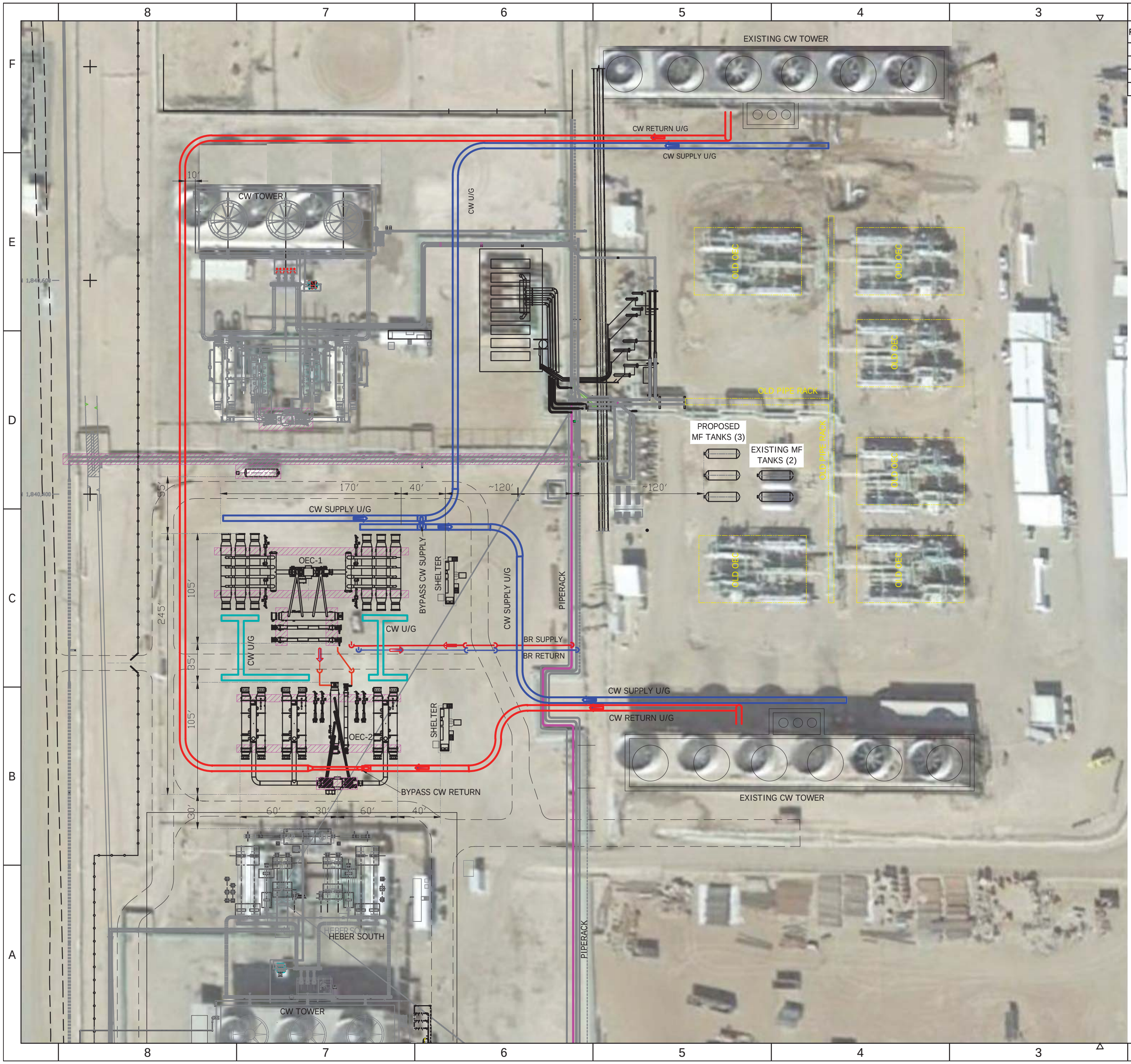
Figure 1

ORMAT

Date: July 2019

EEC ORIGINAL PKG

| REV | DESCRIPTION | DATE | BY | CHK | ENG | PRJ |
|---|---|---|---|---|---|---|
| P6 | UPDATE MODELS OES-1 & OEC-2 | 5.APR.2019 | A.S. | A.N. |  | S.H. |
| P7 | UPDATE MODELS OES-1 | 17.APR.2019 | A.S. | A.N. |  | S.H. |
| P8 | UPDATE OEC-1 & OEC-2 | 27.MAY.2019 | A.S. | A.N. |  | S.H. |
| P9 | UPDATE LOCATION OEC-1 | 18.JULY.2019 | A.S. | A.N. |  | S.H. |

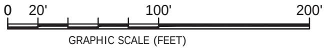


**KEY:**

| | |
|---|---|
| ─•─•─•─ | EXISTING FENCE LINE |
| ═ | PROPOSED UNDERGROUND CW SUPPLY LINE |
| ═ | PROPOSED UNDERGROUND CW RETURN LINE |
| ─ | PROPOSED BR SUPPLY LINE |
| ─ | PROPOSED BR RETURN LINE |
| ▨ | EQUIPMENT TO BE DECOMMISSIONED |
| ─ | EXISTING EQUIPMENT TO REMAIN |
| CW | COOLING WATER |
| U/G | UNDERGROUND |
| BR | GEOTHERMAL BRINE |
| OEC | ORMAT ENERGY CONVERTOR |
| MF | MOTIVE FLUID |

**NOTE:**

1. THE ARRANGEMENT AND SIZES PRESENTED ARE PRELIMINARY AND INDICATIVE ONLY AND SUBJECT TO CHANGED ON DESIGN OPTIMIZATION , DETAILED DESIGN AND ACTUAL EQUIPMENT PURCHASED (MANUFACTURED).
2. DIMENSIONS ARE IN MM [ FEET], ELEVATIONS ARE IN MM FEET]



GRAPHIC SCALE (FEET)

PREPARED BY:
Stantec
PHONE: FAX:

FOR:
Second Imperial Geothermal Company
855 B Dogwood Road
Heber CA 92249

TITLE:
HEBER2 REPOWER
GENERAL ARRANGEMENT
POWER PLANT ON MAP

| | |
|---|---|
| DRAWN BY: KAM | DESIGNED BY: |
| CHECKED BY: | APPROVED BY: |
| PROJECT NUMBER: 01OT.01234.01.0123 | SCALE: AS SHOWN |
| DATE: 04/01/04 | FILE PATH: K:/{CLIENT} OR JOB # |

SHEET:
1 OF 1

EEC ORIGINAL PKG

Legend

- ▭ United States/Mexico Border
- ⌐ ┘ County Line
- ▭ Project Site
- ○ 1-Mile Radius

# PROPOSED PROJECT SITE - HEBER 2

Figure 1

ORMAT

Date: July 2019

Catalyst
ENVIRONMENTAL SOLUTIONS

EEC ORIGINAL PKG

## ATTACHMENT “A”

## STATEMENT OF NOFICATION

I, the undersigned, have notified all owners of the possessory interest in the land of the proposed use (s) or potential uses identified in Item No. 26 of the Reclamation Plan.

Signed this ________________ day

of ___________________, 2005.

__________________________________
Operator or Operator’s Agent

# ATTACHMENT "B"

## STATEMENT OF RESPONSIBILITY

I, the undersigned, hereby agree to accept full responsibility for reclaiming all mined lands as described and submitted herein with any modifications requested by the County of Imperial as conditions of approval.

Signed this 12th day

of August, 2019.

Connie Stechman

Operator or Operator's Agent

Connie Stechman, VP Finance
Ormat Nevada, Inc.

# ATTACHMENT “C”

# RECLAMATION COST ANALYSIS

# Reclamation Cost Estimate for Heber 2 Geothermal Energy Complex

**Date:** July 31, 2019

**RE:** **Reclamation Cost Estimate for the Heber 2 Geothermal Energy Complex**

---

This cost estimate has been prepared for the Heber 2 Geothermal Repower Project and provides a general estimate to perform well abandonment and site reclamation/revegetation for the entire 40-acre Heber 2 Complex site.

## Well Hole Abandonment

- Cost of Abandoning Two Injection Wells

  2 wells x 200 feet[1] x $16.10/foot[2] = **$6,440**

## Site Reclamation and Revegetation

- Cost of Reclaiming 40 acres

  $10,235[2] (first acre) + 219,765 ($5,635/acre[2] for 39 acres) = **$230,000**

**TOTAL COST ESTIMATE: $236,440**

## References

[1] California Department of Conservation Oil, Gas, and Geothermal Resources. April 2019. California Code of Regulations, Section 1723. Available online at: https://www.conservation.ca.gov/index/Documents/DOGGR-SR-1%20Web%20Copy.pdf

[2] New Mexico Energy, Minerals, and Natural Resources Department. 2013. Guidance for Estimating Reclamation Costs. Available online at: http://www.emnrd.state.nm.us/MMD/MARP/documents/MMD_Part3FAGuidelines_Sept2013.pdf

Reclamation estimates provided in this document were increased by 15% to account for six years of inflation and potential contingency costs.

# ATTACHMENT “D”

# REVEGATION PLAN

**(REVISED MARCH 25, 2005)**
**JH/lh/S:/forms_lists/reclamation plan aplication**

# Revegetation Plan for Heber 2 Geothermal Energy Complex

**Date:** July 31, 2019

**From:** Catalyst Environmental Solutions

**RE:** **Revegetation Plan for the Heber 2 Geothermal Repower Project**

---

## INTRODUCTION

The Second Imperial Geothermal Company (SIGC), a wholly owned subsidiary of ORMAT Nevada, Inc (ORMAT), owns and operates the Heber 2 Geothermal Energy Complex (Heber 2). ORMAT proposes to amend CUP No. 06-0006 to allow for the installation of two new air cooled ORMAT Energy Converters (OECs); three additional above ground storage tanks (ABSTs); and, additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex (hereinafter, "Project"). All proposed facilities would be developed within the existing Heber 2 Complex and fence line. This application also proposes to renew the permitted life of the entire Heber 2 facility (including the Goulds 2 and Heber South geothermal energy facilities) to 30 years (2019-2049).

This Revegetation Plan has been prepared in support of the Reclamation Plan Application as part of the CUP amendment application for the Heber 2 Geothermal Repower Project.

### *Project Location*

The Heber 2 Complex is located on private lands owned by ORMAT in southern Imperial County (**Figure 1)**. The proposed development would occur entirely on Assessor's Parcel Number (APN) 054-250-031, which is a 39.99-acre property. The address for Heber 2 is 855 Dogwood Road, Heber, CA 92249.

### *Reclamation, Abandonment, and Revegetation Schedule*

Reclamation, abandonment, and revegetation activities would commence at the closure of the Heber 2 Geothermal Energy Complex in 2049, if the CUP amendment application is approved by Imperial County. Activities would commence after two injection wells have been plugged and the dismantlement and removal/disposal of the energy facilities. If necessary, reseeding would be held off until the appropriate season (e.g. fall, spring). Activities would take approximately 6 months to complete.

### *Site Preparation*

After all wells have been plugged and facilities are removed from the site, any soil piles or grades will be evened out by an excavator. The site is near zero elevation and is very flat and absent of topography. Reclamation activities will mimic the existing grade of the site and not introduce a new gradient/slope to the area. The site will then be rolled with a soil aerator/loosener. After site reclamation, topsoil will be transported to the site and deposited evenly across the site.

### *Selection of Plant Materials*

The Heber 2 Complex site is completely devoid of vegetation, as the site is used for geothermal energy generation and contains industrial equipment that should not have vegetation under/around the facilities. See **Appendix A** of the CUP application for Site Photographs. The surrounding area is dominated by agricultural production and no natural areas are in the immediate vicinity of the Project Site. SIGC/ORMAT will reseed the entire 40-acre site with a seed mix approved by Imperial County.

### *Irrigation and Maintenance*

Revegetation of the site will be maintained by a contractor every two weeks to conduct weeding, watering, and removing trash/debris. The site will be irrigated by water truck as necessary to establish the new vegetation.

ORMAT

# ORMAT, HEBER 2
# GEOTHERMAL POWER GENERATION FACILITIES
# HEBER, CALIFORNIA

## Hazard Assessment

| Revision | Date | Description |
|---|---|---|
| 0.0 | October 16, 2020 | Initial Issue – Concrete Secondary Containment Area and Relocating New Storage Vessels |
| | | |
| | | |

RMP
**Risk Management Professionals, Inc.**
Two Venture Plaza, Suite 500, Irvine, California 92618
Phone: 949-282-0123 – E-mail: Client.Services@RMPCorp.com

# TABLE OF CONTENTS

## LIST OF TABLES

EEC ORIGINAL PKG

## LIST OF FIGURES

## LIST OF APPENDICES

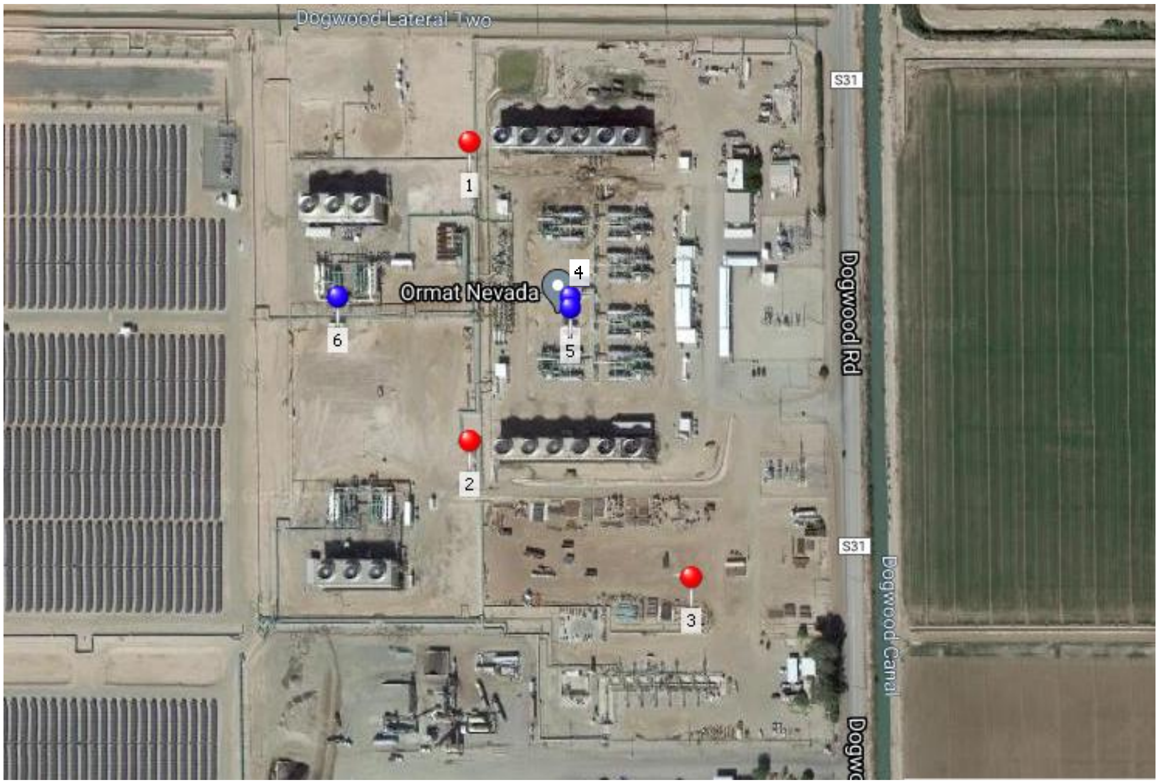
# 1.0 FACILITY OVERVIEW

This technical assessment was conducted to fulfill the Hazard Assessment Offsite Consequence Analysis (OCA) requirements of the following regulations:

- 40 CFR §68.65 – Environmental Protection Agency (EPA) "Risk Management Plan (RMP)"[1]
- 19 CCR 2750.1 to 2750.9 – California Code of Regulation "California Accidental Release Prevention (CalARP) Program"[2]

This assessment is completed for the **Ormat– Heber 2 Geothermal Complex** Facility located in Heber, California. The facility's location at 855 Dogwood Road, Heber, CA 92249 is illustrated in Figure 1 below. The blue markers depict the locations of the three existing 10,000-gallon vessels and red markers for three new 10,000-gallon isopentane vessels that are being added to the facility as part of the Repower project. The coordinates for each vessel's location are presented in Table 1 and Table 2 on the following page.

**Figure 1: Aerial View of the Facility Location**



The following page presents a closer view of the facility's storage vessel locations, as well as tables displaying the approximate locations of the three new and three existing storage vessels.

## Figure 2: Aerial View of the Storage Vessel Locations

## Table 1: Ormat—Heber 2 New Storage Vessel Coordinates

| NEW VESSELS | FORMAT | LATITUDE | LONGITUDE |
|---|---|---|---|
| Isopentane Vessel 1 | Degrees/Minutes/Seconds | 32°42'54.66"N | 115°32'12.54"W |
| Isopentane Vessel 2 | Degrees/Minutes/Seconds | 32°42'48.40"N | 115°32'12.55"W |
| Isopentane Vessel 3 | Degrees/Minutes/Seconds | 32°42'45.55"N | 115°32'07.03"W |

## Table 2: Ormat—Heber 2 Existing Storage Vessel Coordinates

| EXISTING VESSELS | FORMAT | LATITUDE | LONGITUDE |
|---|---|---|---|
| Isopentane Vessel 4 | Degrees/Minutes/Seconds | 32°42'51.42"N | 115°32'10.02"W |
| Isopentane Vessel 5 | Degrees/Minutes/Seconds | 32°42'51.21"N | 115°32'10.02"W |
| Isopentane Vessel 6 | Degrees/Minutes/Seconds | 32°42'51.42"N | 115°32'15.82"W |

## 2.0 COVERED PROCESS

The ***Ormat – Heber 2 Geothermal Complex*** has three geothermal electrical generating plants in Heber, CA. Heber 2 consists of the H2, Gould-2 (G-2), and Heber South binary processes. The projects use the renewable geothermal resources of the Heber Known Geothermal Resource Area (KGRA) to generate electrical power.

The Heber 2 Geothermal Project produces electricity by using a vaporized motive fluid to spin a turbine connected to a generator. In the H2 binary processes, isopentane is the motive fluid.

The covered processes at the facility are listed below.

**Table 3: Ormat—Heber 2 Geothermal Complex Facility Covered Process**

| PLANT | REGULATED SUBSTANCE | MAXIMUM INVENTORY IN SINGLE VESSEL (GAL)[A] | TANK TYPE | VESSEL STORAGE INVENTORY |
|---|---|---|---|---|
| Heber 2 | Isopentane | 9,000 | Storage | 10,000-gallon tank |

[A] This value represents the maximum amount stored in a single vessel, taking into account administrative controls, which are in place to limit the quantity stored.

This hazard assessment will focus on the regulated substance, isopentane, in Heber 2. The facility is classified as Prevention Program 3 and is regulated by the Environmental Protection Agency's Risk Management Program (EPA RMP) for Chemical Accidental Release Prevention in accordance with the Code of Federal Regulations, Title 40, Chapter I, Subchapter C, Part 68, Subpart B Sections 68.20 to 68.42 (40 CFR §68.20 - 68.42)[1] for isopentane, because it is held on site in excess of 10,000 lbs. The geothermal power plant utilizes isopentane as the motive fluid in the generation of electricity.

## 3.0 LEVEL OF CONCERN

To address potential health effects for the worst-case release scenario, the following are the key endpoints of concern for the EPA RMP as defined in Title 40 CFR Section 68.22(2):

*(i)* *Explosion. An overpressure of 1 psi.*

*(ii)* *Radiant heat/exposure time. A radiant heat of 5 kW/m$^2$ for 40 seconds.*

*(iii)* *Lower flammability limit. A lower flammability limit as provided in NFPA documents or other generally recognized sources.*

The distance from the point of release to the endpoint identified above defines a radius circle of concern for which consequences are reported in the Risk Management Plan.

## 4.0 WORST-CASE SCENARIO

The US EPA RMP determines the worst-case release quantity in Title 40 CFR Part 68.25(b) as follows:

> *The worst-case release quantity shall be the greater of the following:*
>
> *(1) For substances in a vessel, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity;*
>
> *(2) For substances in pipes, the greatest amount in a pipe, taking into account administrative controls that limit the maximum quantity.*

Given the substance released is a flammable, the US EPA RMP gives further guidelines in 68.25 (f):

> *Worst-Case scenario-flammable liquids. The owner or operator shall assume that the quantity of the substance, as determined under paragraph (b) of this section and the provisions below, vaporizes resulting in a vapor cloud explosion. A yield factor of 10 percent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT equivalent methods.*
>
> *(1) For regulated flammable substances that are normally liquids at ambient temperature, the owner or operator shall assume that the entire quantity in the vessel or pipe as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool. For liquids at temperatures below their atmospheric boiling point, the volatilization rate shall be calculated at the condition specified in paragraph (d) of this section.*
>
> *(2) The owner or operator shall assume that the quantity which becomes vapor in the first 10 minutes is involved in the vapor cloud explosion.*

Furthermore, vapor cloud explosions are considered a conservative analysis as Chapter 4: OCA of the General Risk Management Program Guidance states:

> *As in the case of the worst-case release analysis for toxic substances, the worst-case distance to the endpoint for flammable substances is based on a number of very*

> *conservative assumptions. Release of the total quantity of a flammable substance in a vessel or pipe into a vapor cloud generally would be highly unlikely. Vapor cloud explosions are also unlikely events; in an actual release, the flammable gas or vapor released to air might disperse without ignition, or it might burn instead of exploding, with more limited consequences. The endpoint of 1 psi is intended to be conservative and protective; it does not define a level at which severe injuries or death would be commonly expected. An overpressure of 1 psi is unlikely to have serious direct effects on people; this overpressure may cause property damage such as partial demolition of houses, which can result in injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.*

To develop the worst-case scenario, the largest storage vessel was selected. As stated in 19°CCR §2750.3, the worst-case release quantity is the greatest amount held in a single vessel, taking into account inventory procedures and limits.

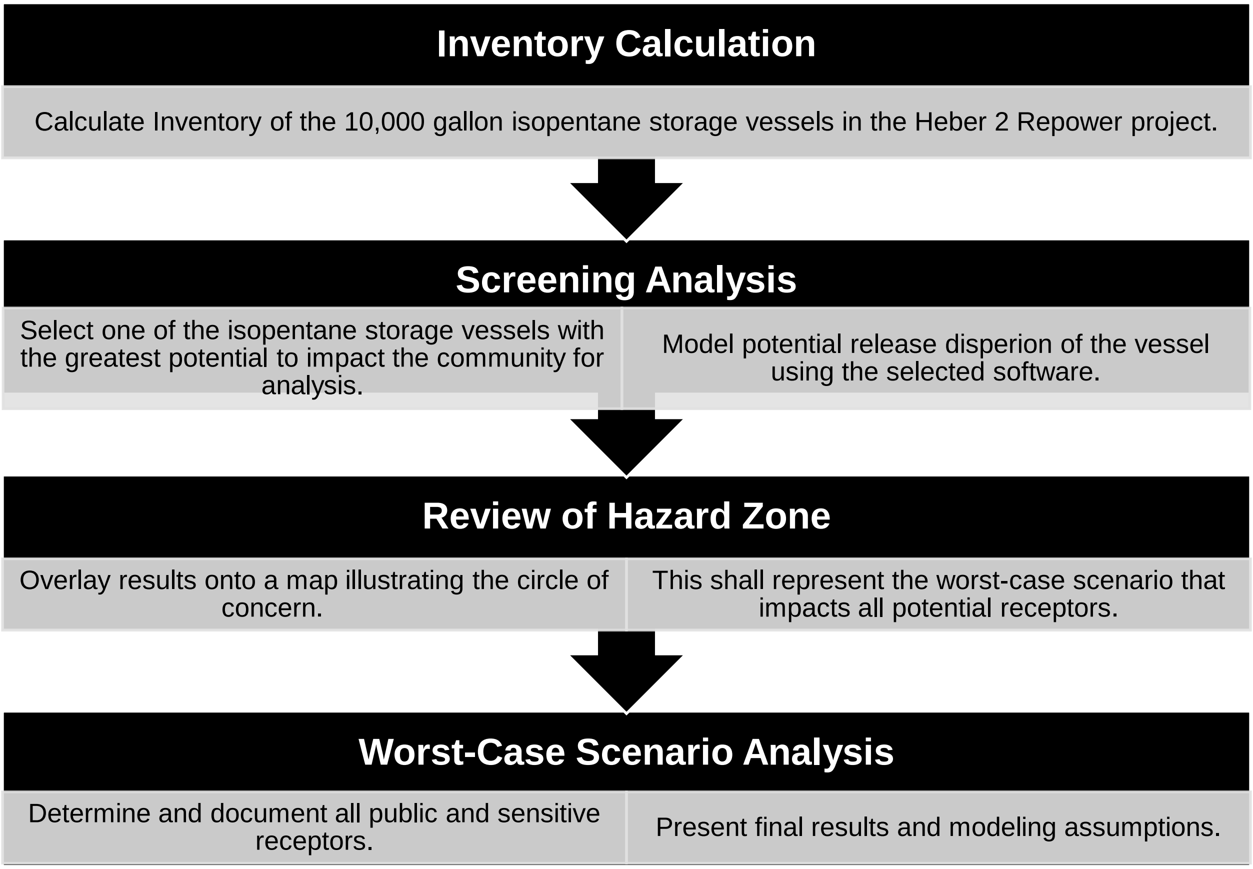
The Areal Locations of Hazardous Atmospheres (ALOHA)[3] modeling software was used to determine the distance to the endpoint for the worst-case release scenario analysis. The vulnerability zone resulting from this analysis was then reviewed. A vulnerability zone is defined as a circle whose center is the point of release and its radius is the length of the endpoint, which is predicted by the dispersion model (e.g., ALOHA).

## 4.1 Worst-Case Scenario Selection Process

The process of worst-case release scenario identification is summarized as follows. Figure 3 on the following page depicts the steps in this process.

- **Inventory Calculation**: The first step was to perform the inventory calculations for the 10,000-gallon storage vessels in the covered units and systems.
- **Screening Analysis**: The 10,000-gallon isopentane storage vessels' location was screened. ALOHA modeling software was used to model the scenario and determine the dispersion endpoints for the worst-case release scenario. This was performed to determine the vulnerability zone associated with the worst-case release scenario.
- **Review of the Vulnerability Zone**: The vulnerability zone resulting from the previous step was reviewed and is representative for the plant's worst-case scenario.
- **Worst-Case Analysis**: To document the worst-case scenario, the potential public receptors within the vulnerability zone were identified. All modeling inputs, calculations and assumptions are documented.

**Figure 3: Worst-Case Scenario Selection Process**



**Inventory Calculation**

Calculate Inventory of the 10,000 gallon isopentane storage vessels in the Heber 2 Repower project.

**Screening Analysis**

Select one of the isopentane storage vessels with the greatest potential to impact the community for analysis.

Model potential release disperion of the vessel using the selected software.

**Review of Hazard Zone**

Overlay results onto a map illustrating the circle of concern.

This shall represent the worst-case scenario that impacts all potential receptors.

**Worst-Case Scenario Analysis**

Determine and document all public and sensitive receptors.

Present final results and modeling assumptions.

## 4.2 Flammable Release Potential Consequences

Several possible consequences of releases of flammable substances are discussed below. It should be noted that the following possible consequences apply to not only worst-case release analysis.

- **Flash Fire**. This event may result from dispersion of a flammable vapor cloud and ignition of the cloud following dispersion. Such a fire could flash back and could represent a severe heat radiation hazard to anyone in the area of the cloud. The lower flammability limit (LFL) endpoint, specified in the rule, would be appropriate for flash fires (vapor cloud fires).
- **Pool Fire**. Spill of a liquid whose boiling point is above ambient temperature may form a liquid pool, which could ignite and form a pool fire. The applicable endpoint specified in the rule is the heat radiation level of 5 kW/m$^2$.

- **BLEVE.** A BLEVE (Boiling Liquid Expanding Vapor Explosion) is a potential release scenario associated with a large quantity of flammable materials kept at below their boiling points. A BLEVE that may lead to a fireball could produce intense heat. This event may occur if a vessel containing flammable material ruptures as a result of exposure to fire. Heat radiation from the fireball is the primary hazard and vessel fragments and overpressure from the explosion are generally considered unlikely. To estimate the distance to a radiant heat level that can cause second degree burns (a heat “dose” equivalent to the specified radiant heat endpoint of 5 kW/m$^2$ for 40 seconds). Consistent with the EPA’s “Risk Management Program Guidance for Offsite Consequence Analysis” published guidance, BLEVEs are generally considered unlikely events and were therefore not considered a probable event for the Offsite Consequence Analysis.
- **Vapor Cloud Explosion.** For a vapor cloud explosion to occur, rapid release of a large quantity, turbulent conditions (caused by a turbulent release or congested conditions in the area of the release, or both), and other factors are generally necessary. The endpoint for vapor cloud explosions is 1 psi.
- **Jet Fire.** This may result from the puncture or rupture of a tank or pipeline containing a compressed or liquefied gas under pressure. The gas discharging from the hole can form a jet that "blows" into the air in the direction away from the hole; the jet then may ignite. Jet fires could contribute to BLEVEs and fireballs if they impinge on tanks of flammable substances. A large horizontal jet fire may have the potential to pose an offsite hazard.

For the flammable worst-case release scenario, a vapor cloud explosion was the most appropriate consequence, as defined by the EPA RMP rule.

## 4.3 Endpoints

As mentioned previously, for flammable materials, the endpoints specified by the EPA RMP are:

- Overpressure of 1 pound per square inch (psi) for vapor cloud explosions
- Radiant heat of 5 kilowatts per square meter (kW/m$^2$) for jet fires
- Lower flammability limit (LFL) for flash fires

The rule specifies endpoints for fires based on the heat radiation level that may cause second degree burns from a 40-second exposure and the LFL, which is the lowest concentration in air at which a substance will burn. For a vapor cloud explosion, the endpoint is 1 psi, which is the force to cause partial demolition of houses with potential serious injuries to people, or shattering glass windows with potential skin laceration from flying glass.

## 4.4 Modeling Assumptions

The EPA RMP regulation imposes several assumptions that were adhered to when performing the offsite consequence analysis of the worst-case release scenario. These are conservative assumptions for weather and release conditions. The distance to the endpoint estimated under worst-case conditions provides an estimate for the maximum possible area that might be affected by these unlikely conditions. It should be noted that EPA's intention for the vulnerability zone representing a worst-case release scenario is to provide a basis for discussion among the regulated industry, emergency responders, and the public, rather than a basis for any specific actions. The EPA RMP regulations, in conjunction with the RMP Guidance for Offsite Consequence Analysis[4], were used to model the worst-case release scenario and prescribe these atmospheric parameters.

- **Meteorological Parameters:** For the worst-case release analysis, the following assumptions were entered into ALOHA, as specific by the EPA RMP regulations / RMP Guidance for Offsite Consequence Analysis.
    - *Atmospheric stability*: F stability (very stable conditions)
    - *Wind speed:* 1.5 meters/second
    - *Ambient Temperature:* 77 °F
    - *Relative Humidity*: The typical relative humidity at the stationary source, which is 50%
- **Dispersion & Impact Modeling Parameters:**
    - *Height of Release:* Ground level, per EPA Rule requirement
    - *Surface Roughness:* Open Country, meaning there are no obstacles in the immediate area; obstacles including buildings or trees, as defined by the EPA RMP regulations
    - *Vapor Cloud Explosion Impact:* A Vapor Cloud Explosion has been modeled with an endpoint of 1 psi

- **Mitigation Systems:** Once a release has occurred, mitigation systems are means (structures, equipment, or activities) that help minimize the transport of material to the atmosphere. Mitigation systems can be characterized as passive or active systems.
    - *Passive mitigation systems do not require activation, an energy source, or movement of components to perform their intended function*
    - *Active mitigation systems do require activation, an energy source, and/or movement of components to perform their intended function*

It should be emphasized that the effectiveness of mitigation systems was taken into account when these systems were considered in the offsite consequence analysis. The effectiveness is determined based on how well the systems are designed and their abilities to respond reliably upon demand. The rule permits consideration of only passive mitigation systems for the worst-case release analysis provided that the systems are capable of withstanding the event triggering the release scenario and would still function as intended. For the worst-case release scenario, the secondary containment area built with concrete for each of the six isopentane vessels was considered as a passive mitigation measure in the offsite consequence analysis.

## 4.5 Worst-Case Release Scenario

One worst-case scenario (WCS) was developed for the facility. For the worst-case release scenario, one of the six 10,000-gallon storage vessels containing isopentane at the Ormat – Heber 2 Geothermal Complex Facility was considered. The storage vessel is capable of storing a maximum of 9,000 gallons of isopentane, taking into account administrative controls. According to the Chevron Philips Chemical Company safety data sheet, the density of isopentane is 5.14 lbs./gal, which yields a total mass of 46,260 pounds of isopentane held in the storage vessel. The worst-case scenario considers the catastrophic failure of one of the 10,000-gallon isopentane storage vessels, which would result in a release of the entire contents of the vessel, into the secondary containment area. All dispersion modeling parameters utilized in the worst-case release scenario modeling is listed in Table 4 below. A summary of the scenario is presented in Table 5. Appendix A of this report provides a detailed description of the worst-case release scenario, ALOHA modeling output, MARPLOT 5.1.1[5] output with population estimates, and maps displaying the vulnerability zone for a release from each tank, denoted by a circle superimposed on the map.

**Table 4: Worst Case Release Scenario Dispersion Modeling Parameters**

| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| **Isopentane Input Parameters** | | |
| Quantity Released | 9,000 gallons | Entire contents of isopentane storage vessel assumed to be released and form an evaporating puddle in secondary containment area, which is involved in a vapor cloud explosion. |
| **Meteorological Parameters** | | |
| Atmospheric Stability | F stability | As per 40 CFR §68.22 (b), "For the worst-case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second and F atmospheric stability class" |
| Wind Speed | 1.5 m/s | |
| Wind Direction | W | Wind Direction from the west based on the Wind Rose plot for Imperial, CA (closest city with wind rose plot available). Since the endpoint distance and circle of interest is presented in this report, the wind direction does not impact the analysis/distance to endpoint and instead is a generic input that ALOHA modeling software requires. |
| Measurement Height above Ground | 10 m | Wind speed is assumed to be measured at this elevation, as this is the standard height at which the National Weather Service usually reports wind speed. |
| Ambient Temperature | 77ºF (25°C) | As per 40 CFR §68.22 (c), "An owner or operator using the RMP Offsite |

| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| Relative Humidity | 50% | Consequence Analysis Guidance may use 25 °C and 50 percent humidity as values for these variables" |
| Ground temperature | 122ºF | As per 40 CFR §68.22 (g), "for worst case, [it] shall be considered to be released at the highest daily maximum temperature, based on data for the previous three years appropriate for the stationary source." Temperature data was sourced from Weather Underground [6] for Imperial, CA (closest available city with temperature history) and the highest daily maximum temperature from the previous 3 years was identified. |
| **Dispersion and Impact Modeling Parameters** | | |
| Height of Release | Ground level | As per 40 CFR §68.22(d), "you must assume a ground level release" and as per the RMP Offsite Consequence Analysis Guidance Document, "this guidance assumes a ground-level release" |
| Topography/Surface Roughness | Open Country | Open Country, meaning there are no obstacles in the immediate area; obstacles including buildings or trees, as defined by the EPA RMP regulations. |

| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| Level of Congestion | Congested | The level of congestion was assumed to be congested, which is a conservative assumption since greater turbulence (greater congestion) allows the flame front to accelerate, thereby generating a more powerful blast wave (i.e., greater overpressure). The immediate area within the facility is also considered to be congested with piping and equipment. |
| **Isopentane Mitigation System** | | |
| Passive Mitigation | Secondary Containment Area | The volume released from a single Isopentane Storage Vessel is assumed to release into a concrete secondary containment area, which is contained around each storage vessel. The secondary containment area dimensions are 40 ft length, 12 ft width, 3.5 ft depth (Surface area = 480 $ft^2$). |

**Table 5: Worst-Case Scenario Results Summary**

| RELEASE SCENARIO | REGULATED SUBSTANCE | ENDPOINT | ENDPOINT DISTANCE |
|---|---|---|---|
| WCS: 10,000-gallon Isopentane Storage Vessel Rupture/Release | Isopentane | Overpressure of 1 psi | 92 yd / 276 ft / 0.052 mi |

## 4.6 Worst-Case Analysis Considerations

The worst-case distances to the flammable endpoints are based on a number of very conservative assumptions. The following summarizes the assumptions:

- The likelihood of a vessel rupture is extremely low. As a result, the release of entire inventory of a vessel is an unrealistic assumption.
- An overpressure of 1 psi is unlikely to have serious direct effects on people. This overpressure may cause property damage such as partial demolition of houses, which can result in injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.

## 5.0 ALTERNATIVE RELEASE SCENARIO

Alternative scenarios are potential releases that may result in consequences whose footprints represented by the endpoints could extend beyond the plant boundary. For a release case to be considered an alternative scenario, two conditions must be met:

1. The likelihood of the alternative release scenarios should be higher than that of the worst-case release scenarios.
2. The distance to endpoint from an alternative release scenario must go beyond the plant fence line.

As put forth in Title 40 CFR Section 68.28(a):

> *The owner or operator shall identify and analyze…at least one alternative release scenario to represent all flammable substances held in a covered process*

Title 40 CFR Section 68.28 (b)(2) defines the scenarios typically considered, but not limited to, the following:

> *(i) Transfer hose releases due to splits or sudden hose uncoupling;*
>
> *(ii) Process piping releases from failures at flanges, joints, welds, valves and valve seals, and drains or bleeds*
>
> *(iii) Process vessel or pump release due to cracks, seal failure, or drain, bleed, or plug failure; and*
>
> *(iv) Vessel overfilling and spill, or over pressurization and venting through relief valves or rupture disks.*
>
> *(v) Shipping container mishandling and breakage or puncturing leading to a spill.*

For alternative release scenarios, active mitigation systems, such as interlocks, shutdown systems, pressure relieving devices, flares, emergency isolation systems, and fire water and deluge systems, as well as passive mitigation systems are considered, if they were applicable. In order to be credited, the mitigation systems considered must be capable of withstanding the event that triggers the release while remaining functional.

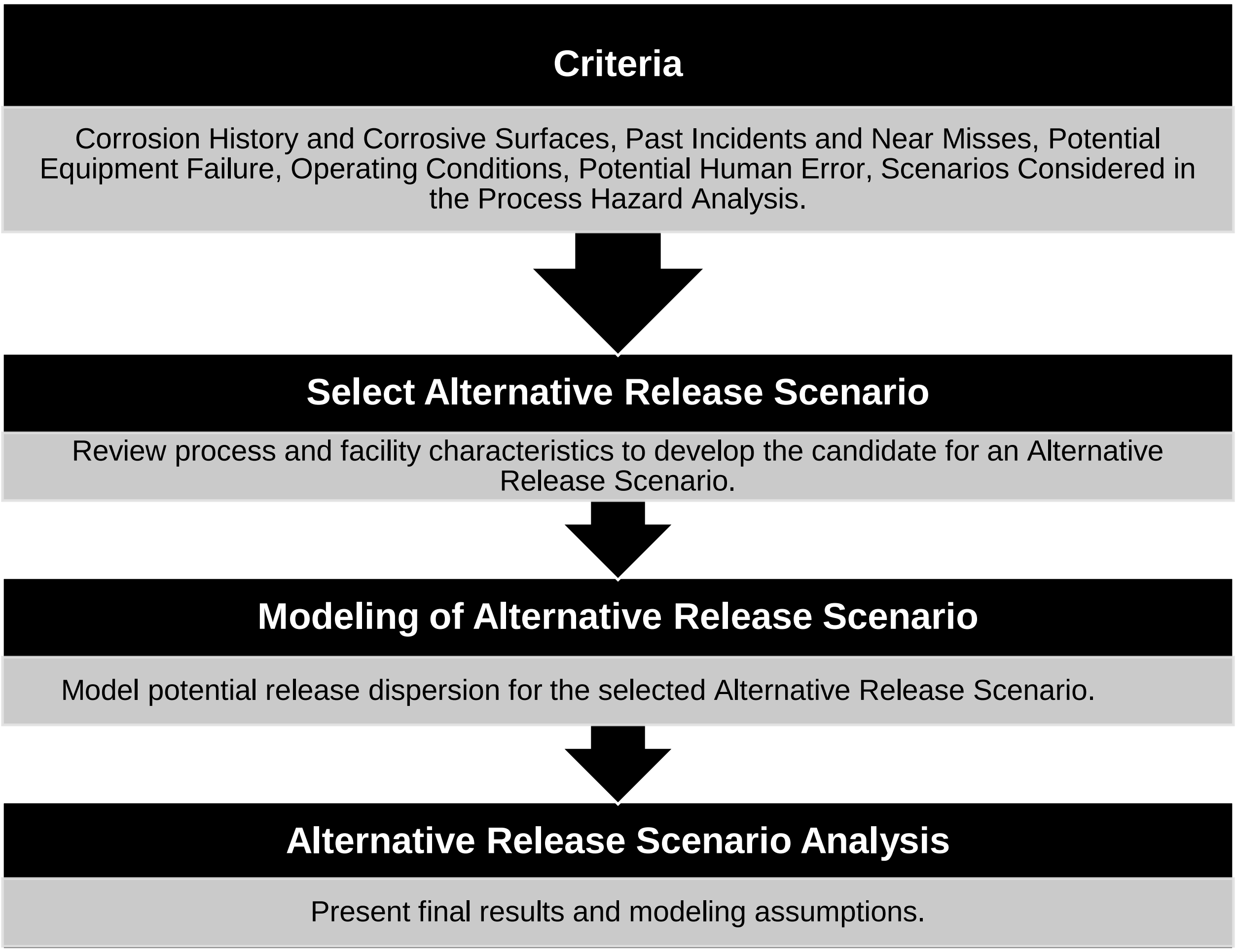
## 5.1 Alternative Release Scenario Selection Process

The process of alternative release scenario identification is summarized as follows and depicted in Figure 4.

- **Selection of Candidate Alternative Release Scenario:** The process of alternative release scenario identification was initiated with the review of the worst-case release case. Additional vessels, containing various quantities of regulated substances, which considered having a higher likelihood of release, were then reviewed. In this process, all covered processes were reviewed and the candidate case for the alternative release scenario analysis was subsequently selected. The following criteria was utilized to identify the potential scenario:
    - Corrosion history and corrosive services
    - Past incidents and near misses
    - Potential equipment failure
    - Operating conditions
    - Potential for human error
    - Consequences considered in the unit Process Hazard Analysis
- **Analysis of the Selected Alternative Release Scenario:** Once the candidate scenario was selected, ALOHA was utilized to model the selected scenario. The vulnerability zone resulting from the analysis of the alternative release scenario was then reviewed. The release duration was limited by the length of time to release the entire contents of the single Isopentane Storage Vessel.

- **Alternative Release Scenario**: The alternative release scenario for the flammable substance was selected and modeled to evaluate potential offsite impacts. Documentation of this scenario included modeling calculations, parameters and assumptions.

**Figure 4: Alternative Release Scenario Selection Process**



## 5.2 Modeling Assumptions

The EPA RMP regulation does not impose any mandatory assumptions for the OCA of the alternative release scenario. All dispersion modeling parameters utilized in the alternative release scenario modeling are listed in Table 6. For the alternative release scenario, a release due to a break in the product transfer hose connection during truck loading has been considered. Appendix B of this report provides a detailed description of the worst-case release scenario, ALOHA modeling output, MARPLOT 5.1.1 output with population estimates, and a map with the vulnerability zone denoted by a circle superimposed on the map.

**Table 6: Alternative Release Scenario Dispersion Modeling Parameters**

| Parameter | Input Value | Notes |
|---|---|---|
| **Isopentane Input Parameters** | | |
| Quantity Released | 46,260 lbs. | The most likely alternative release scenario involves the uncoupling of a transfer hose during truck loading operations.<br>Calculations shown in Appendix B. |
| Release Rate | 19,468 lbs./min | Calculations shown in Appendix B. |
| Release Duration | 2.4 mins | The release duration is limited by the quantity stored in a single Isopentane Storage Vessel (9,000 gallons). |
| **Meteorological Parameters** | | |
| Atmospheric Stability | D stability | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, "this guidance assumes wind speed of 3 meters per second and D stability" |
| Wind Speed | 3.0 m/s | |
| Wind Direction | W | Wind Direction from the west based on the Wind Rose plot for Imperial, CA (closest city with wind rose plot available). Since the endpoint distance and circle of interest is presented in this report, the wind direction does not impact the analysis/distance to endpoint and instead is a generic input that ALOHA modeling software requires. |

| Parameter | Input Value | Notes |
|---|---|---|
| Measurement Height above Ground | 10 m | Wind speed is assumed to be measured at this elevation, as this is the standard height at which the National Weather Service usually reports wind speed. |
| Ambient Temperature | 77ºF (25°C) | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, "this guidance assumes 25ºC and 50 percent humidity" |
| Relative Humidity | 50% | |
| **Dispersion and Impact Modeling Parameters** | | |
| Height of Release | Ground Level | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, "this guidance assumes a ground-level release" |
| Topography/Surface Roughness | Open Country | Open Country, meaning there are no obstacles in the immediate area; obstacles including buildings or trees, as defined by the EPA RMP regulations. |
| Level of Congestion | Congested | The level of congestion was assumed to be congested, which is a conservative assumption since greater turbulence (greater congestion) allows the flame front to accelerate, thereby generating a more powerful blast wave (i.e., greater overpressure). The immediate area within the facility is also considered to be congested with piping and equipment. |

| Parameter | Input Value | Notes |
|---|---|---|
| **Isopentane Mitigation System** | | |
| Passive Mitigation | Secondary Containment Area | The amount released from the alternative release scenario is assumed to release into a concrete secondary containment area, which is contained around each storage vessel. The secondary containment area dimensions are 40 ft length, 12 ft width, 3.5 ft depth (Surface area = 480 ft$^2$). |
| Active Mitigation | None | |

## 5.3 Alternative Release Scenario

A summary of the alternative release scenario is presented in Table 7. Appendix B of this report provides a detailed description of the alternative release scenario, ALOHA modeling outputs, MARPLOT 5.1.1 outputs with population estimates, and a map with circles representing the vulnerability zones.

**Table 7: Alternative Release Scenario Result Summary**

| RELEASE SCENARIO | REGULATED SUBSTANCE | ENDPOINT | ENDPOINT DISTANCE |
|---|---|---|---|
| ARS: Transfer Hose uncoupling from 10,000-gallon Isopentane Storage Vessel during Truck Loading Operations | Isopentane | Overpressure of 1 psi | 57 yd / 171 ft / 0.032 mi |

### 5.4 Alternative Release Analysis Considerations

Typically, the same conservative assumptions apply for the alternative release analysis as for the worst-case release analysis. Although the alternative release scenario is intended to be more likely than the worst-case release scenario, the analysis of the alternative release scenario should not be expected to provide a realistic estimate of an area in which off-site impact may occur. The same conservative endpoints have been used for both the worst-case and the alternative release analysis. These endpoints are intended to represent exposure levels below which most members of the public will not experience serious long-term health effects.

## 6.0 OFFSITE IMPACTS

A summary of the off-site impacts from an accidental release, including population and sensitive receptors, is discussed in the following sub-sections.

### 6.1 Impacted Population

In order to determine the impacted population around the facility, the potential for exposure within the endpoint was determined. The furthest endpoint distances reached by the worst-case scenario and alternative release scenario along with the estimated impacted population are summarized in Table 8:

**Table 8: Impacted Population for OCA Scenarios**

| SCENARIO | ENDPOINT DISTANCE | ESTIMATED IMPACTED POPULATION |
|---|---|---|
| WCS: 10,000-gallon Isopentane Storage Vessel Rupture/Release | 92 yd / 276 ft / 0.052 mi | 0 |
| ARS: Transfer Hose uncoupling from 10,000-gallon Isopentane Storage Vessel during Truck Loading Operations | 57 yd / 171 ft / 0.032 mi | 0 |

The population was estimated using 2010 census tract data with the MARPLOT 5.1.1 software. When calculating population densities for large areas that encompass many tracts, the accuracy is rated as good; however, for small areas that encompass only two or three partial tracts, the population data may be skewed due to the unequal distribution within the tract. The use of MARPLOT 5.1.1 is pursuant to guidance endorsed by the US EPA. MARPLOT 5.1.1 requires the latitude and longitude of the facility in order to calculate the population. The latitude and longitude were estimated using Google Earth GPS[7] software and an aerial photo. In consideration of the unique case of bystanders along facility boarders during a vapor cloud explosion, vessels are placed far enough within company fencing that surrounding walkways and streets are free of severe impacts.

## 6.2 Offsite Sensitive Receptor Data Sources

Table 9 includes a list of websites and software used to locate offsite sensitive receptors. A few sites will perform a distance search in order to determine the eligibility of a possible receptor. For all other sites, a map interpolation determines whether the receptor falls within the circle of concern.

**Table 9: Websites and Software Used**

| SOURCE | RECEPTORS THIS SOURCE IS USED TO IDENTIFY | METHOD OF DETERMINING ELIGIBILITY |
|---|---|---|
| Google Maps[8] | Used to identify all receptors | Distance search in conjunction with a map interpolation |
| Google Earth | This mapping software is used to locate all receptors. It also incorporates an internet search with the map to locate businesses. | Software will map the location of the receptor. |

## 6.3 Offsite Sensitive Receptors

RMP requirements state that sensitive populations such as schools, hospitals, day-care centers, long-term health care facilities, prisons, residential areas, public use parks/recreational areas, and major commercial facilities, located within the "at risk" area must be identified. These sensitive populations include individuals who could not remove themselves from the exposure area without assistance. The sensitive populations also include industrial installations which may have a hazardous process that cannot be immediately left unattended. According to the EPA's General Risk Management Plan Guidance [9], "The basic test for identifying a public receptor is thus whether an area is a place where it is reasonable to expect that members of the public will routinely gather at least some of the time. Roads and parking lots are not included as such in the definition of 'public receptor.' Neither are places where people typically gather; instead, they are used to travel from one place to another or to park a vehicle while attending an activity elsewhere." Table 10 shows a summary of offsite population receptors and offsite environmental receptors for isopentane, within the circle of concern as determined by the worst-case and alternative release scenarios.

**Table 10: Summary of Sensitive and Environmental Receptors**

| RECEPTOR | WCS (0.052 MI) | ARS (0.032 MI) |
|---|---|---|
| **Population Receptors** | | |
| Schools | No | No |
| Residences | No | No |
| Hospitals | No | No |
| Prisons/Correction Facilities | No | No |
| Recreation Areas | No | No |
| Major Commercial, Office, or Industrial Areas | No | No |
| Child Daycare | No | No |
| Long-term Health Care (e.g., convalescent homes) | No | No |
| Other (Government Buildings) | No | No |
| **Environmental Receptors** | | |

| RECEPTOR | WCS (0.052 MI) | ARS (0.032 MI) |
|---|---|---|
| National or State Parks, Forests, or Monuments | No | No |
| Officially Designated Wildlife Sanctuaries, Preserves, or Refuges | No | No |
| Federal Wilderness Areas | No | No |
| Other (Landmark & Indian Reservations) | No | No |

## 7.0 WORST-CASE RELEASE AND ALTERNATIVE RELEASE SCENARIO SUMMARY

The following sections outlines a summary of the parameters used for the one worst case release scenario and the one alternative release scenario analyzed for the Heber 2 Repower project.

### 7.1 Worst-Case Scenario

The worst-case scenario evaluated the release of the entire contents of one of the six 10,000-gallon isopentane storage vessels, containing 9,000 gallons of isopentane. The following table provides a summary of the parameters used for the worst-case scenario and the corresponding inputs.

**Table 3: Worst-Case Scenario Parameter/Input Summary**

| Worst-Case Scenario | |
|---|---|
| Chemical | Isopentane |
| Model Used | ALOHA |
| Scenario | Vapor Cloud Explosion |
| Quantity Released (gal) | 9,000 gallons |
| Endpoint Used | Overpressure of 1 psi |
| Distance to Endpoint | 92 yd / 276 ft / 0.052 mi |

| **Worst-Case Scenario** | |
|---|---|
| Estimated Residential Population within Distance to Endpoint (numbers) | 0 |
| Public Receptors within Distance to Endpoint | |
| Schools | No |
| Residences | No |
| Hospitals | No |
| Prison/Correctional Facilities | No |
| Recreational Areas | No |
| Major Commercial, Office, or Industrial Areas | No |
| Other | None |
| Environmental Receptors within Distance to Endpoint | |
| National or State Parks, Forests, or Monuments | No |
| Officially Designated Wildlife Sanctuaries, Preserves or Refuges | No |
| Federal Wilderness Area | No |
| Other | No |
| Passive Mitigation Considered | |
| Secondary Containment Area | Yes |
| Other | No |

## 7.2 Alternative Release Scenario

It was determined that a release due to a break in the isopentane transfer hose connection during truck loading, was the most likely release scenario due to human factors associated with manned transfer operations, as well as reliability issues in industry related to hose degradation and coupling failures. The following table provides a summary of the parameters that were used for alternative release scenario and the corresponding inputs.

**Table 4: Alternative Release Scenario Parameter/Input Summary**

| **Alternative Release Scenario** | |
|---|---|
| Chemical | Isopentane |
| Model Used | ALOHA |
| Scenario | Vapor Cloud Explosion |
| Quantity Released | 46,260 lbs. |
| Endpoint Used | Overpressure of 1 psi |
| Distance to Endpoint | 57 yd / 171 ft / 0.032 mi |
| Estimated Residential Population within Distance to Endpoint (numbers) | 0 |
| Public Receptors within Distance to Endpoint | |
| Schools | No |
| Residences | No |
| Hospitals | No |
| Prison/Correctional Facilities | No |
| Recreational Areas | No |
| Major Commercial, Office, or Industrial Areas | No |
| Other | None |
| Environmental Receptors within Distance to Endpoint | |
| National or State Parks, Forests, or Monuments | No |
| Officially Designated Wildlife Sanctuaries, Preserves or Refuges | No |
| Federal Wilderness Area | No |
| Other | No |
| Passive Mitigation Considered | |
| Secondary Containment Area | Yes |

| Alternative Release Scenario | |
|---|---|
| Other | No |
| Active Mitigation Considered | |
| Sprinkler Systems | No |
| Deluge Systems | No |
| Water Curtain | No |
| Excess Flow Valve | No |
| Other | No |

## 8.0 FIVE YEAR ACCIDENT HISTORY

There have been no applicable CalARP/RMP/PSM releases of isopentane at the facility within the last five years, therefore, this section is not applicable.

# 9.0 REFERENCES

1. Code of Federal Regulations (CFR), Title 40, Chapter I, Subchapter C, Part 68, Subpart B, Sections 68.20 to 68.42, "Hazard Assessment"; 2015, January 1.
2. California Code of Regulations (CCR), Title 19, Division 2, Chapter 4.5, Article 4, Sections 2750.1 to 2750.9, "Hazard Assessment"; 2015, January 1.
3. Areal Locations of Hazardous Atmospheres - ALOHA Version 5.4.7, U.S. Environmental Protection Agency, September 2016. http://www2.epa.gov/cameo/aloha-software
4. Risk Management Program Guidance for Offsite Consequence Analysis, U.S. Environmental Protection Agency, March 2009.
5. MARPLOT® 5.1.1 Mapping Software (internet download), National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency. http://www.epa.gov/osweroe1/content/cameo/marplot.htm. December 2017.
6. Weather History for KIPL (Imperial County Station), Weather Underground, May 11, 2020, https://www.wunderground.com/history/monthly/us/ca/imperial/KIPL
7. Google TM Earth, version 7.3.2.5776, Google, Inc. (2019)
8. Google TM Maps, Google, Inc. (2019)
9. General Risk Management Program Guidance – Chapter 2: Applicability of Program Levels, U.S. Environmental Protection Agency, April 2004.

# APPENDIX A

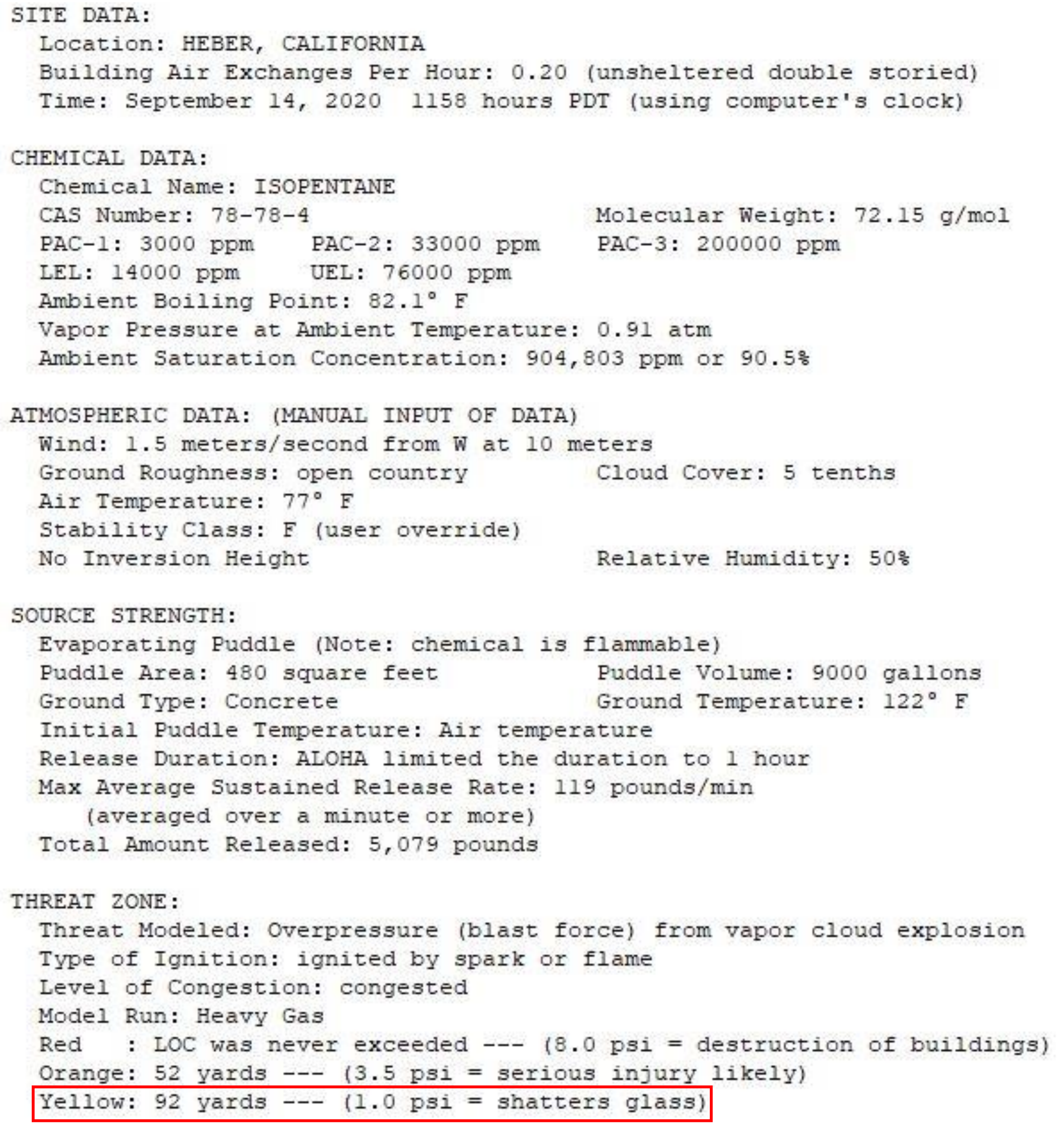
# WORST-CASE SCENARIO CALCULATIONS

## WORST-CASE SCENARIO (WCS)

The selected worst-case release scenario analyzes the hypothetical rupture of any one of the 10,000-gallon isopentane vessels, new or existing. Any one vessel can store up to 9,000 gallons of isopentane, taking into account administrative controls, which are in place to limit the quantity stored in each tank. Per requirement of the EPA rule for flammable substances, it was assumed that the whole quantity is released. The entire quantity is released into the secondary containment area, which is credited as a passive mitigation measure, to form an evaporating puddle, for which the vapors form a vapor cloud. If this vapor cloud ignited, the resultant blast could generate overpressure damage. The secondary containment area dimensions are 40 ft length, 12 ft width, 3.5 ft depth (surface area = 480 $ft^2$), and it assumed the secondary containment area ground type is concrete.

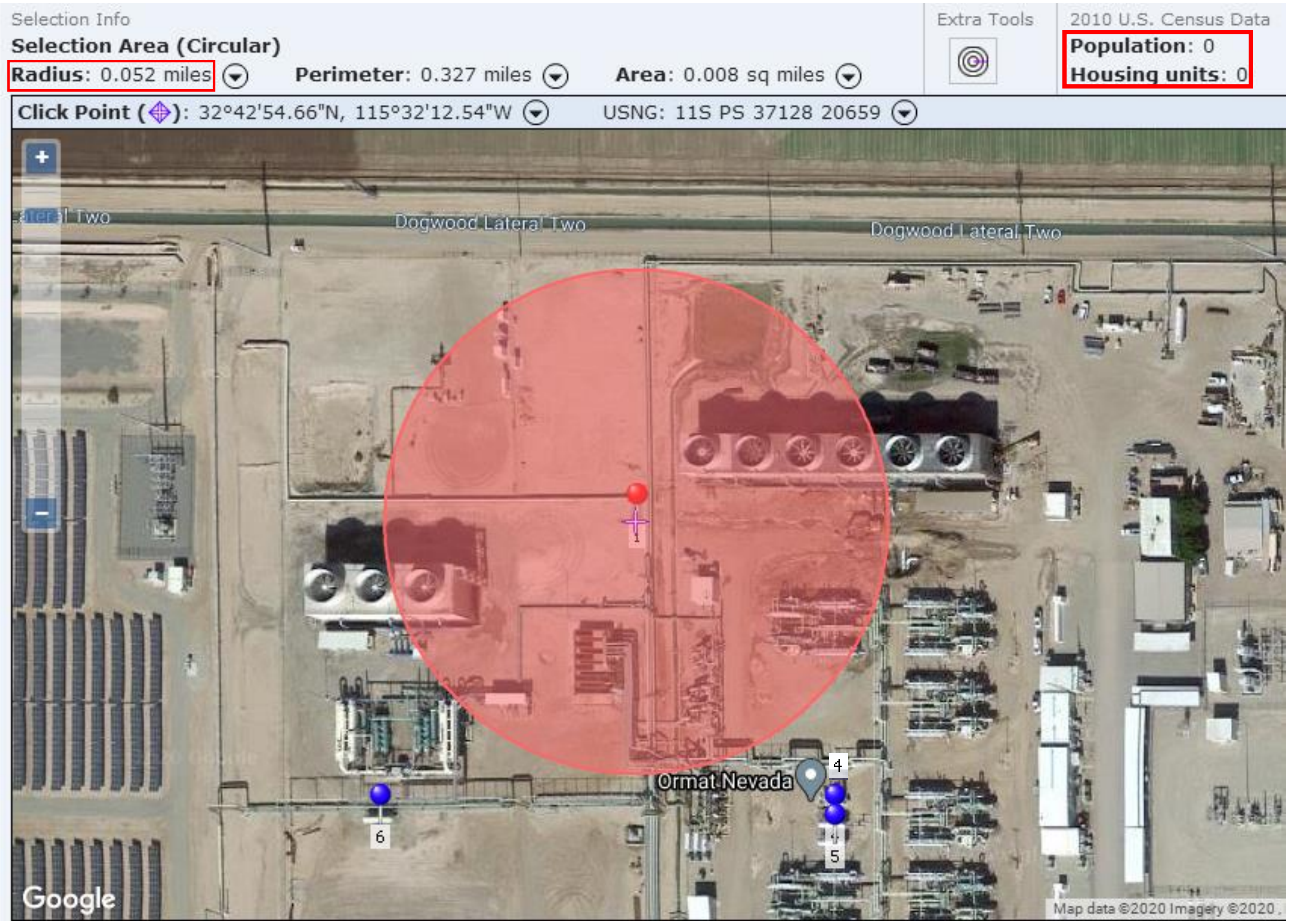
The ALOHA modeling calculation predicts that the area impacted by the endpoint, which is an overpressure of 1 psi, is a circle with approximately a 92-yard radius (276 ft / 0.052 mi). According to MARPLOT 5.1.1, there are 0 residents and 0 housing units within this vulnerability zone for all six vessels. The table and figures on the following pages illustrate the scenario modeling parameter summary, scenario circle for the release, the ALOHA modeling output, as well as the MARPLOT results. These figures demonstrate Ormat's strategic placement of new storage vessels, showing that one explosion and release of all isopentane contents would not affect the other as demonstrated in the following figures. Each of the new vessels are at least 184 yards (twice the radius of concern) from one another and do not reach any of the three existing vessels. Only vessels 4 and 5 withhold the potential to experience interacting explosion impacts and has been addressed with the future implementation of a blast wall. This barrier will serve as a separation mechanism to prevent the explosion area of one vessel from triggering the release and ignition of the other.

## Figure 5: WCS ALOHA Modeling Results



```
SITE DATA:
  Location: HEBER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.20 (unsheltered double storied)
  Time: September 14, 2020  1158 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: ISOPENTANE
  CAS Number: 78-78-4                    Molecular Weight: 72.15 g/mol
  PAC-1: 3000 ppm    PAC-2: 33000 ppm    PAC-3: 200000 ppm
  LEL: 14000 ppm     UEL: 76000 ppm
  Ambient Boiling Point: 82.1° F
  Vapor Pressure at Ambient Temperature: 0.91 atm
  Ambient Saturation Concentration: 904,803 ppm or 90.5%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 1.5 meters/second from W at 10 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 77° F
  Stability Class: F (user override)
  No Inversion Height                    Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Area: 480 square feet           Puddle Volume: 9000 gallons
  Ground Type: Concrete                  Ground Temperature: 122° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 119 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 5,079 pounds

THREAT ZONE:
  Threat Modeled: Overpressure (blast force) from vapor cloud explosion
  Type of Ignition: ignited by spark or flame
  Level of Congestion: congested
  Model Run: Heavy Gas
  Red   : LOC was never exceeded --- (8.0 psi = destruction of buildings)
  Orange: 52 yards --- (3.5 psi = serious injury likely)
  Yellow: 92 yards --- (1.0 psi = shatters glass)
```

**Figure 6: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #1**



Selection Info

**Selection Area (Circular)**

**Radius**: 0.052 miles

**Perimeter**: 0.327 miles

**Area**: 0.008 sq miles

Extra Tools

2010 U.S. Census Data

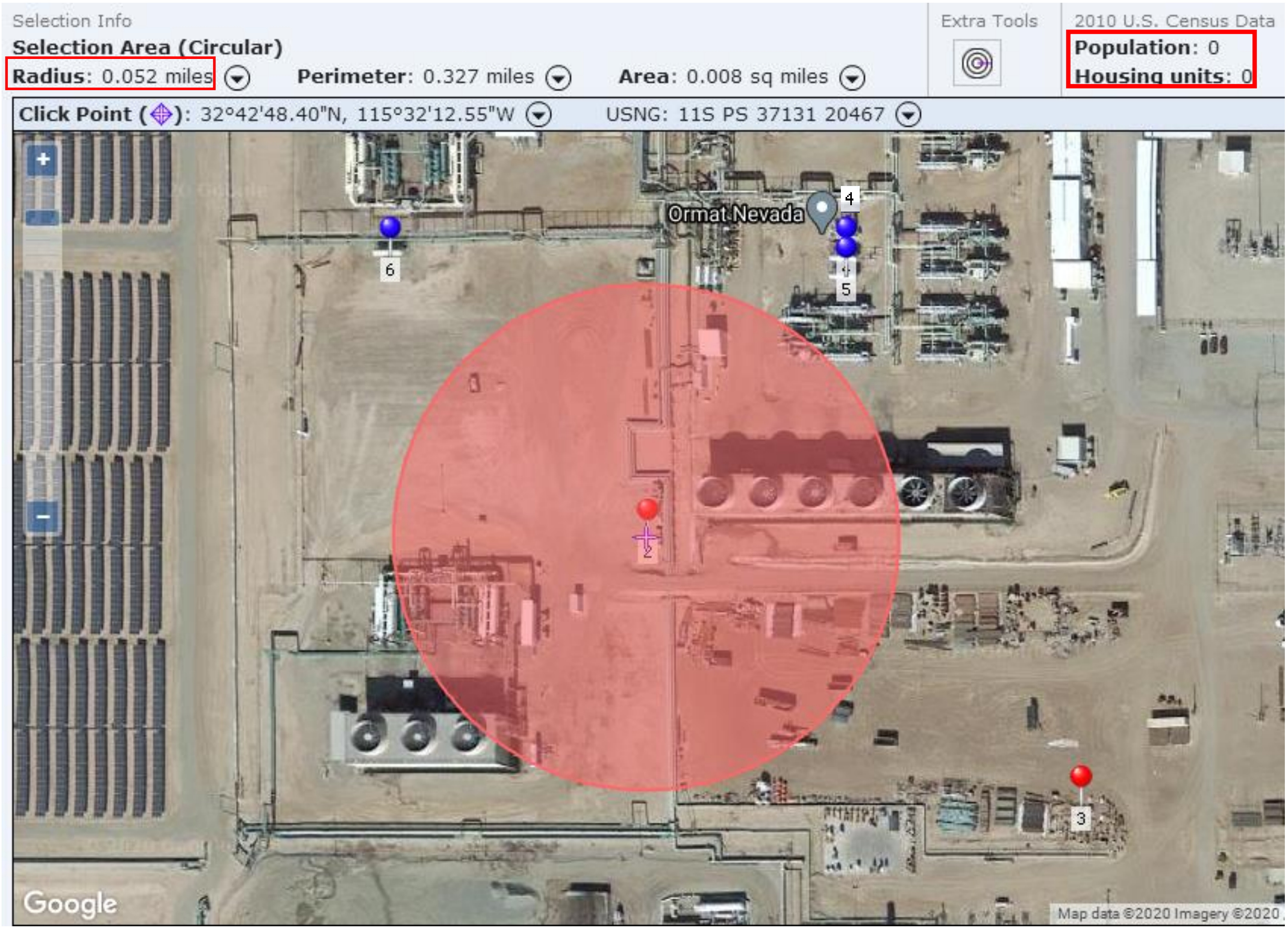
**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'54.66"N, 115°32'12.54"W

USNG: 11S PS 37128 20659

## Figure 7: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2



Selection Info

**Selection Area (Circular)**

**Radius**: 0.052 miles

**Perimeter**: 0.327 miles

**Area**: 0.008 sq miles

2010 U.S. Census Data

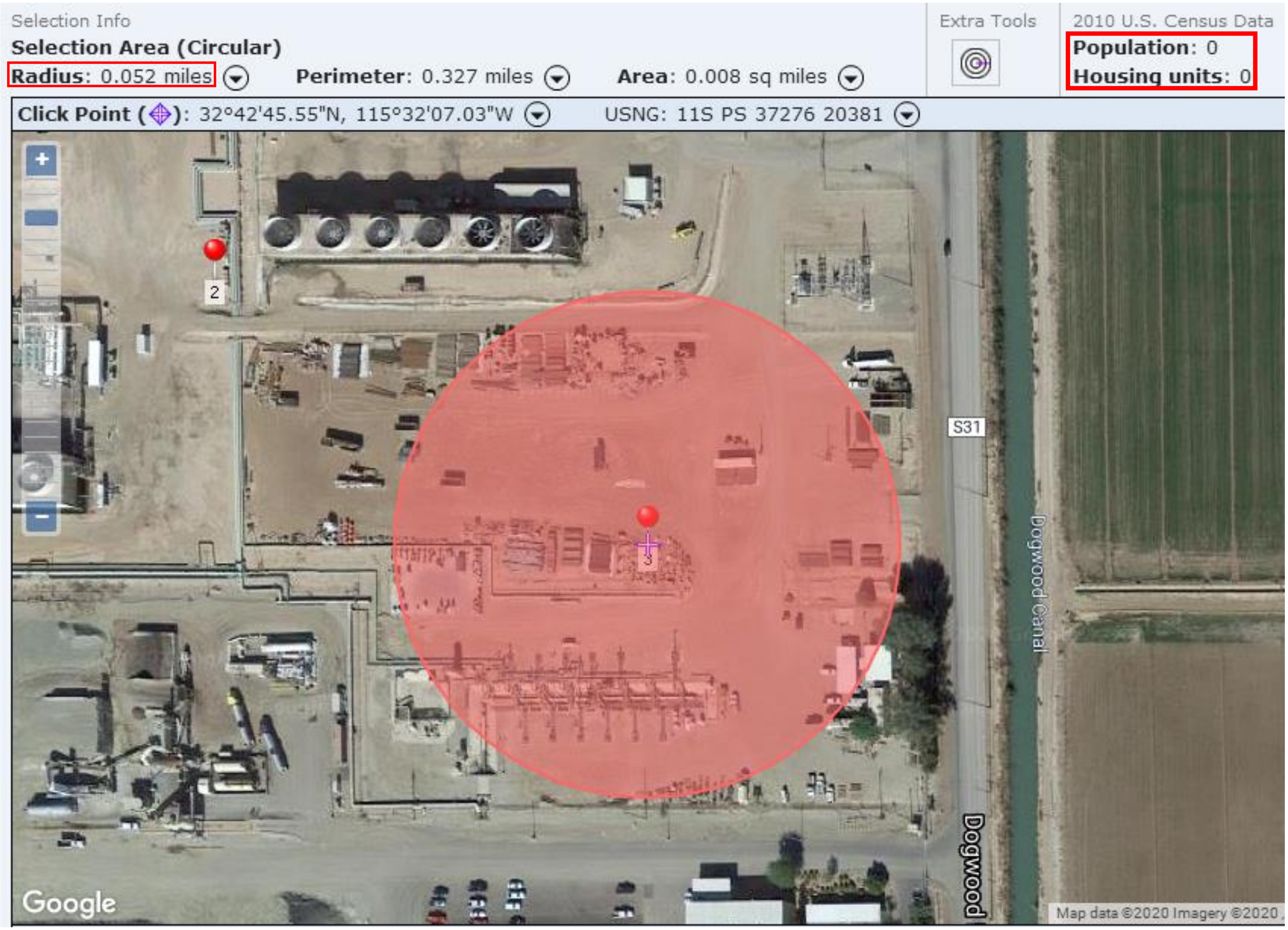
**Population**: 0

**Housing units**: 0

**Click Point (⌖)**: 32°42'48.40"N, 115°32'12.55"W

USNG: 11S PS 37131 20467

## Figure 8: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3



Selection Info

**Selection Area (Circular)**

**Radius**: 0.052 miles

**Perimeter**: 0.327 miles

**Area**: 0.008 sq miles

2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'45.55"N, 115°32'07.03"W

USNG: 11S PS 37276 20381

## Figure 9: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #4

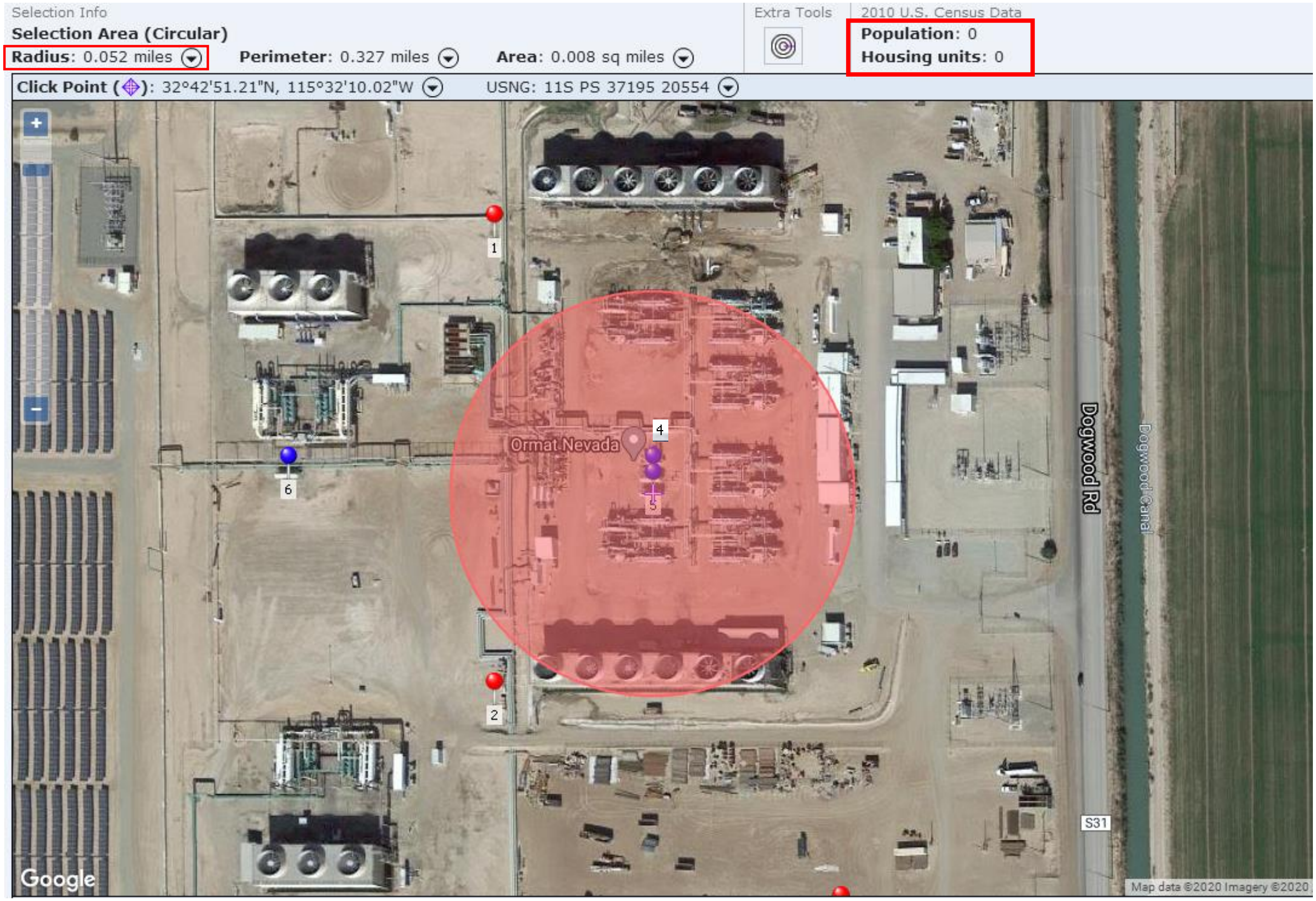
Selection Info
**Selection Area (Circular)**
**Radius:** 0.052 miles
**Perimeter:** 0.327 miles
**Area:** 0.008 sq miles

Extra Tools

2010 U.S. Census Data
**Population:** 0
**Housing units:** 0

**Click Point (⌖):** 32°42'51.42"N, 115°32'10.02"W
USNG: 11S PS 37195 20560

## Figure 10: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #5



Selection Info

**Selection Area (Circular)**

**Radius**: 0.052 miles **Perimeter**: 0.327 miles **Area**: 0.008 sq miles

Extra Tools

2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'51.21"N, 115°32'10.02"W USNG: 11S PS 37195 20554

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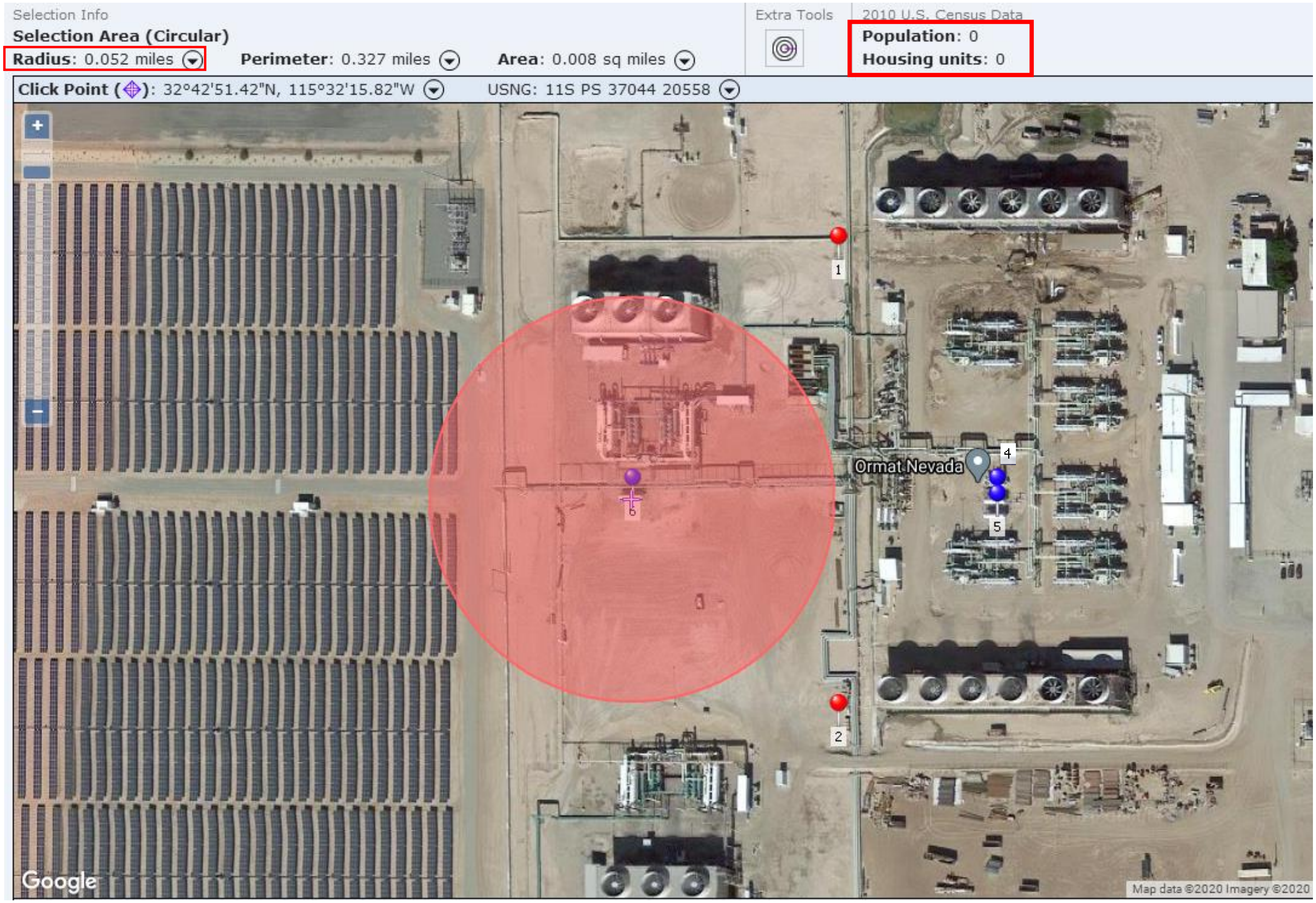
## Figure 11: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #6



Selection Info

**Selection Area (Circular)**

**Radius:** 0.052 miles **Perimeter:** 0.327 miles **Area:** 0.008 sq miles

Extra Tools

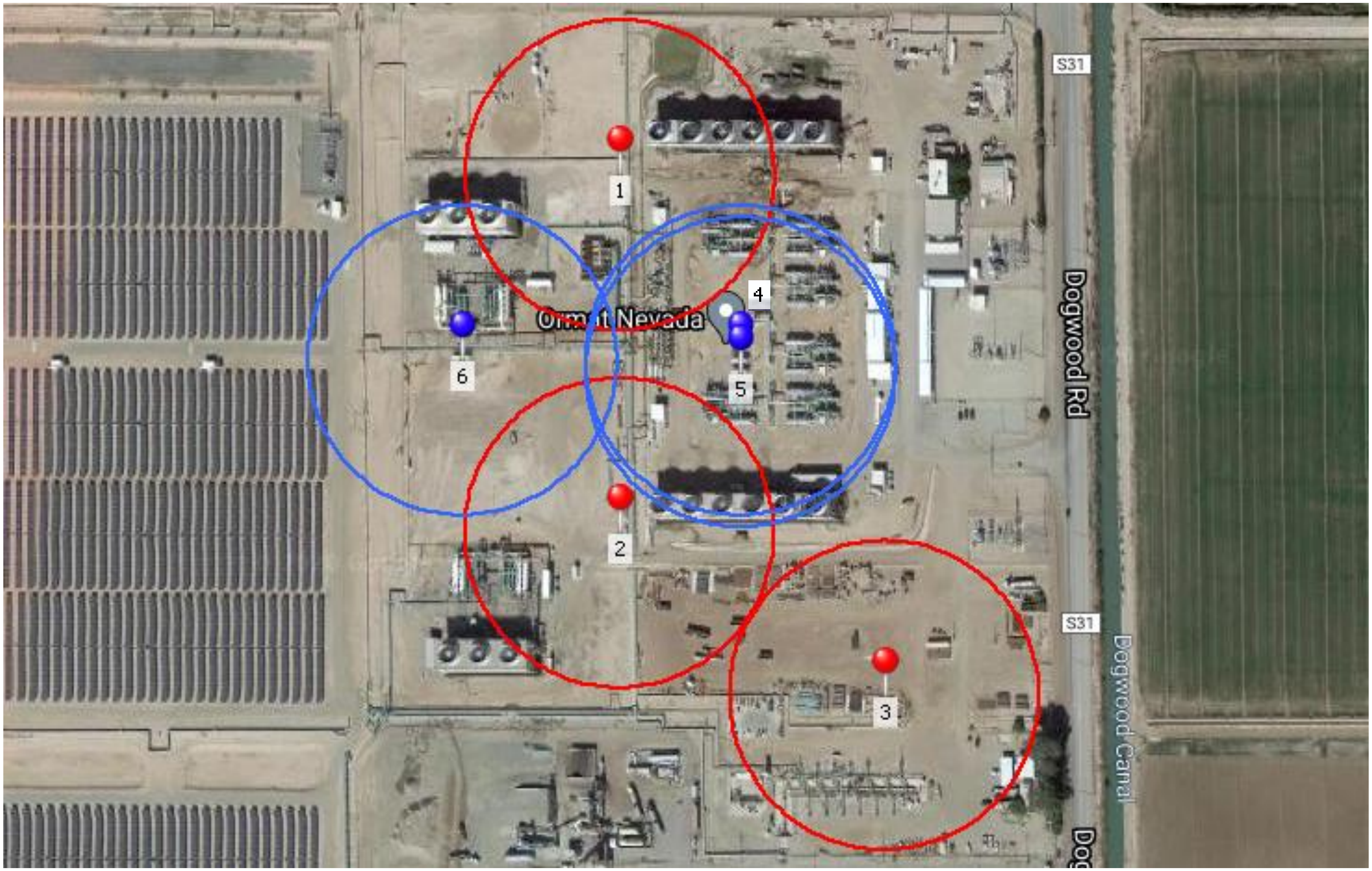
2010 U.S. Census Data

**Population:** 0

**Housing units:** 0

**Click Point:** 32°42'51.42"N, 115°32'15.82"W USNG: 11S PS 37044 20558

Figure 12: WCS Vulnerability Maps Overlaid for Isopentane Storage Vessels #1, #2, #3, #4, #5, & #6



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# APPENDIX B

# ALTERNATIVE SCENARIO CALCULATIONS

## ALTERNATIVE RELEASE SCENARIO (ARS)

The selected alternative release scenario is a release due to a break in the product (isopentane) transfer hose connection during truck loading. This was considered the most likely release scenario due to human factors associated with manned transfer operations, as well as reliability issues in industry related to hose degradation and coupling failures. It is assumed that the transfer hose uncouples during isopentane transfer operations and that it is released through an area of 12.6 square inches based on the transfer hose size. The release duration is limited by the volume in the Isopentane Storage Vessel (9,000 gallons), which is 2.4 minutes. In the evaluations of this alternative release scenario, the concrete secondary containment area composed was credited as a mitigation measure.

In order to calculate the release quantity for a transfer hose rupture, the release rate through the transfer hose must be calculated. The following equation, obtained from the EPA Risk Management Plan Guidance for Offsite Consequence Analysis, illustrates the calculation of the release rate for flammable liquids under pressure through a transfer hose:

$$QR = A_h \times 6.82\sqrt{\frac{11.7}{DF^2} \times LH + \frac{669}{DF} \times P_g}$$

Where:

- QR = Release rate (lbs./min)
- $A_h$= Hole or puncture area (square inches)
- DF = Density Factor, dimensionless, obtained from the EPA Risk Management Plan Guidance for Offsite Consequence Analysis
- LH = Height of liquid level above hole (inches)
- $P_g$ = Gauge pressure of the vessel (psig)

To calculate the release rate utilizing the above equation, the values for each of the following variables were calculated for isopentane:

## Hole Area

The transfer hose used in isopentane filling operations at both plants is 4 inches in diameter. Thus, the hole area is based upon the transfer hose rupturing and calculated using the following:

$$HA = \pi r^2 = \ 12.6 \text{ in}^2$$

## Density Factor

The Density Factors are obtained from Appendix C of the EPA Risk Management Plan Guidance for Offsite Consequence Analysis. The Density Factor value for isopentane is 0.79.

## Liquid Height

The height of the liquid level above the hole is determined by the nominal liquid level in the vessel. The isopentane transfer point is taken to be at the bottom of the tank. Assuming that the isopentane storage vessel is 33% full of isopentane, this equates to 2,970 gallons being stored in the vessel (397 ft$^3$). This is a conservative assumption as the storage tanks are normally empty and are only used for temporary storage of isopentane. According to the available tank data provided by the facility, the diameter of the Isopentane Storage Vessel is approximately 8 feet and length is 33.5 feet (tangent to tangent length). It should be noted that the Isopentane Storage Vessel is a horizontal vessel. In calculating the height of the liquid column within the tank, the Isopentane Storage Vessel was modeled as a cylinder, and thus the equation for volume of liquid within the tank is that of a horizontal cylinder. The equations below were used to find the height of the liquid column within the Isopentane Storage Vessel:

$$V_L = A_L \times L$$

$$A_L = R^2 \cos^{-1}\left(\frac{R - LH}{R}\right) - (R - LH)\sqrt{2R \cdot LH - LH^2}, \qquad \therefore$$

$$V_L = L \times \left[R^2 \cos^{-1}\left(\frac{R - LH}{R}\right) - (R - LH)\sqrt{2R \cdot LH - LH^2}\right]$$

Where:

$V_L$ = Volume of liquid within the Tank (ft$^3$)

$A_L$ = Area of liquid (ft$^2$)

R = Radius of the Tank (ft.)

L = Length of the Tank (ft.)

LH = Height of the liquid within the Tank (ft.)

Values for each variable listed in the equations above are provided below, with the exception of LH, as this is the variable to be calculated:

$V_L$ = 2,970 gallons = 397 $ft^3$

R = 4 ft.

L = 33.5 ft.

By using the above values within the equation, the height of the liquid column within the Isopentane Storage Vessel can be calculated, which is approximately 2.3 ft (2.2857 ft) or 27.6 inches.

**Pressure**

The normal operating pressure of the isopentane motive fluid storage tank was identified to be 60 psig.

**Modeling**

Using these values, the release rate of isopentane can be determined. Please see the calculations below for determining the isopentane release rate:

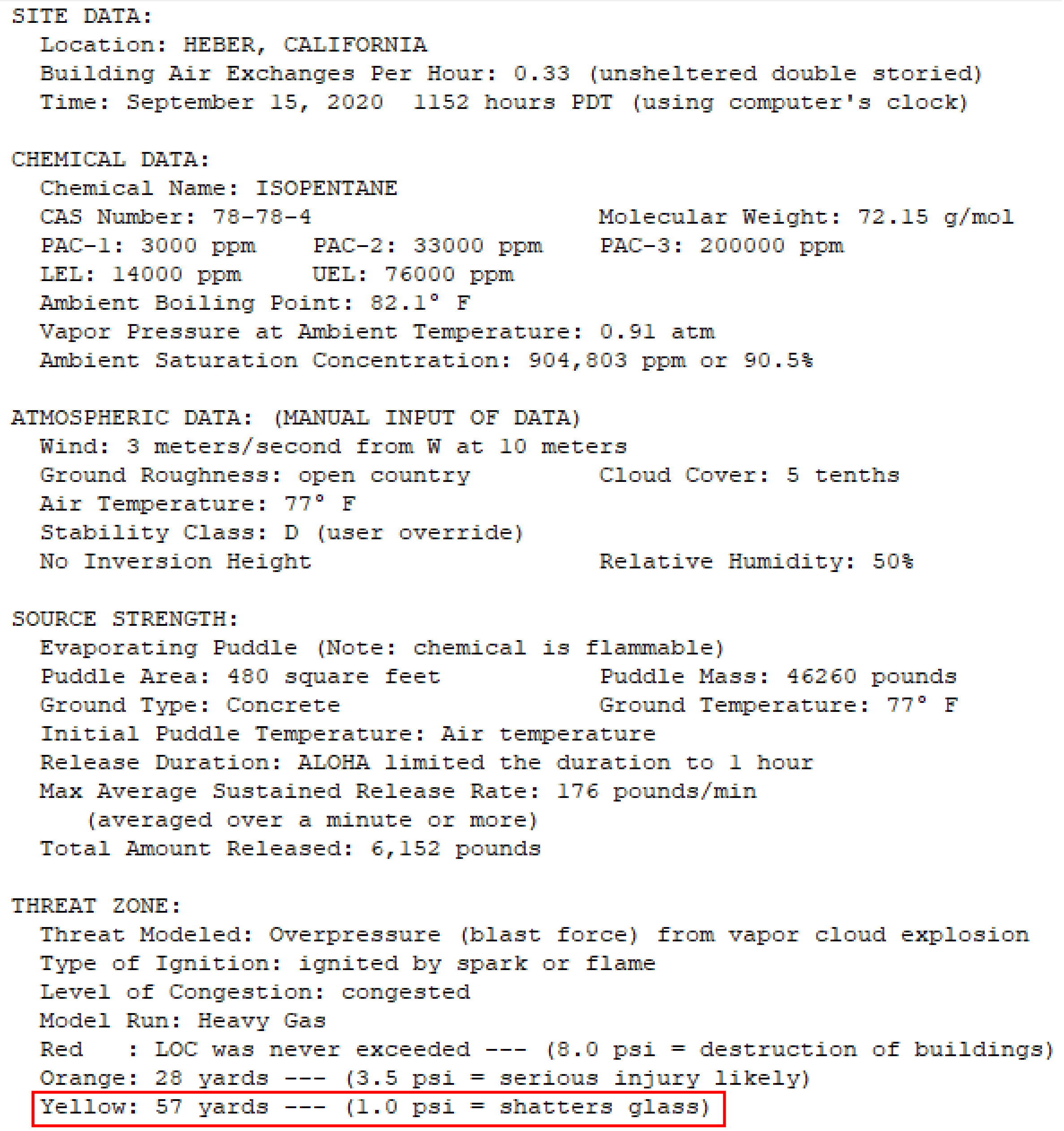
$$QR = 12.6\, in^2 \times 6.82 \sqrt{\frac{11.7}{(0.79^2)} \times 27.6\, in + \frac{669}{0.79} \times 60\, psig}$$

$$QR = 19{,}468.3955\, \frac{lbs.}{min} \approx 19{,}468\, \frac{lbs.}{min}$$

Over the 2.4 minute release period, this results in a total of 46,260 lbs. released to the secondary containment area to form an evaporating puddle, for which the vapors form a vapor cloud. If this vapor cloud ignited, the resultant blast could generate overpressure damage.

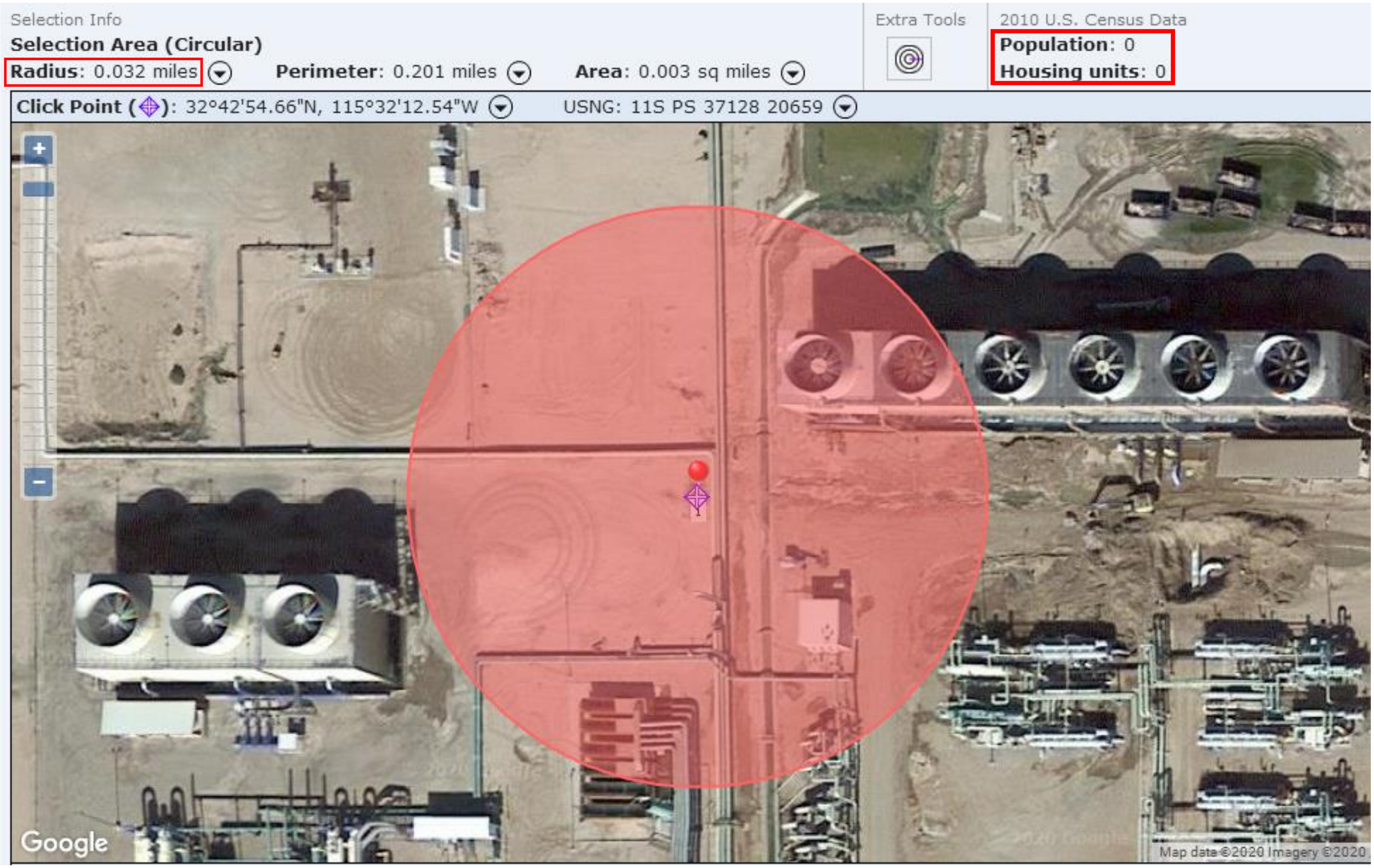
The ALOHA modeling calculation predicts that the area impacted by the endpoint, which is overpressure of 1 psi, is a circle with approximately a 57-yard radius (171 ft / 0.032 mi). According to MARPLOT 5.1.1, there are 0 residents and 0 housing units within this vulnerability zone for all six vessels. The table and figures on the following pages illustrate the scenario modeling parameter summary, scenario circle for the release, the ALOHA modeling output, as well as the MARPLOT results.

## Figure 10: ARS ALOHA Modeling Results



```
SITE DATA:
  Location: HEBER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.33 (unsheltered double storied)
  Time: September 15, 2020  1152 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: ISOPENTANE
  CAS Number: 78-78-4                    Molecular Weight: 72.15 g/mol
  PAC-1: 3000 ppm    PAC-2: 33000 ppm    PAC-3: 200000 ppm
  LEL: 14000 ppm     UEL: 76000 ppm
  Ambient Boiling Point: 82.1° F
  Vapor Pressure at Ambient Temperature: 0.91 atm
  Ambient Saturation Concentration: 904,803 ppm or 90.5%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from W at 10 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 77° F
  Stability Class: D (user override)
  No Inversion Height                    Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Area: 480 square feet           Puddle Mass: 46260 pounds
  Ground Type: Concrete                  Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 176 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 6,152 pounds

THREAT ZONE:
  Threat Modeled: Overpressure (blast force) from vapor cloud explosion
  Type of Ignition: ignited by spark or flame
  Level of Congestion: congested
  Model Run: Heavy Gas
  Red   : LOC was never exceeded --- (8.0 psi = destruction of buildings)
  Orange: 28 yards --- (3.5 psi = serious injury likely)
  Yellow: 57 yards --- (1.0 psi = shatters glass)
```

## Figure 13: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #1



Selection Info

**Selection Area (Circular)**

**Radius**: 0.032 miles **Perimeter**: 0.201 miles **Area**: 0.003 sq miles

Extra Tools

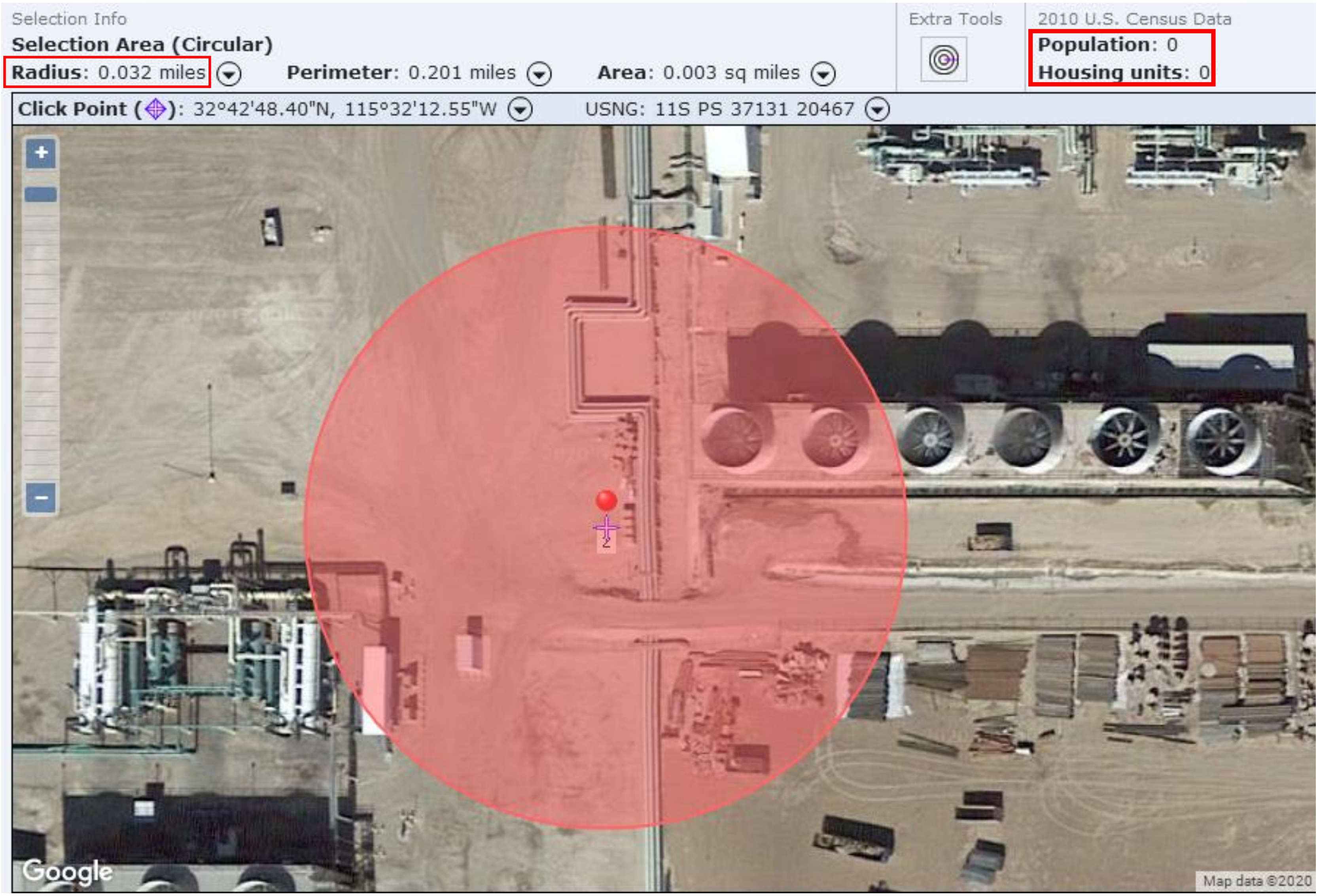
2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point**: 32°42'54.66"N, 115°32'12.54"W USNG: 11S PS 37128 20659

**Figure 14: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2**



Selection Info

**Selection Area (Circular)**

**Radius**: 0.032 miles **Perimeter**: 0.201 miles **Area**: 0.003 sq miles

Extra Tools

2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'48.40"N, 115°32'12.55"W USNG: 11S PS 37131 20467

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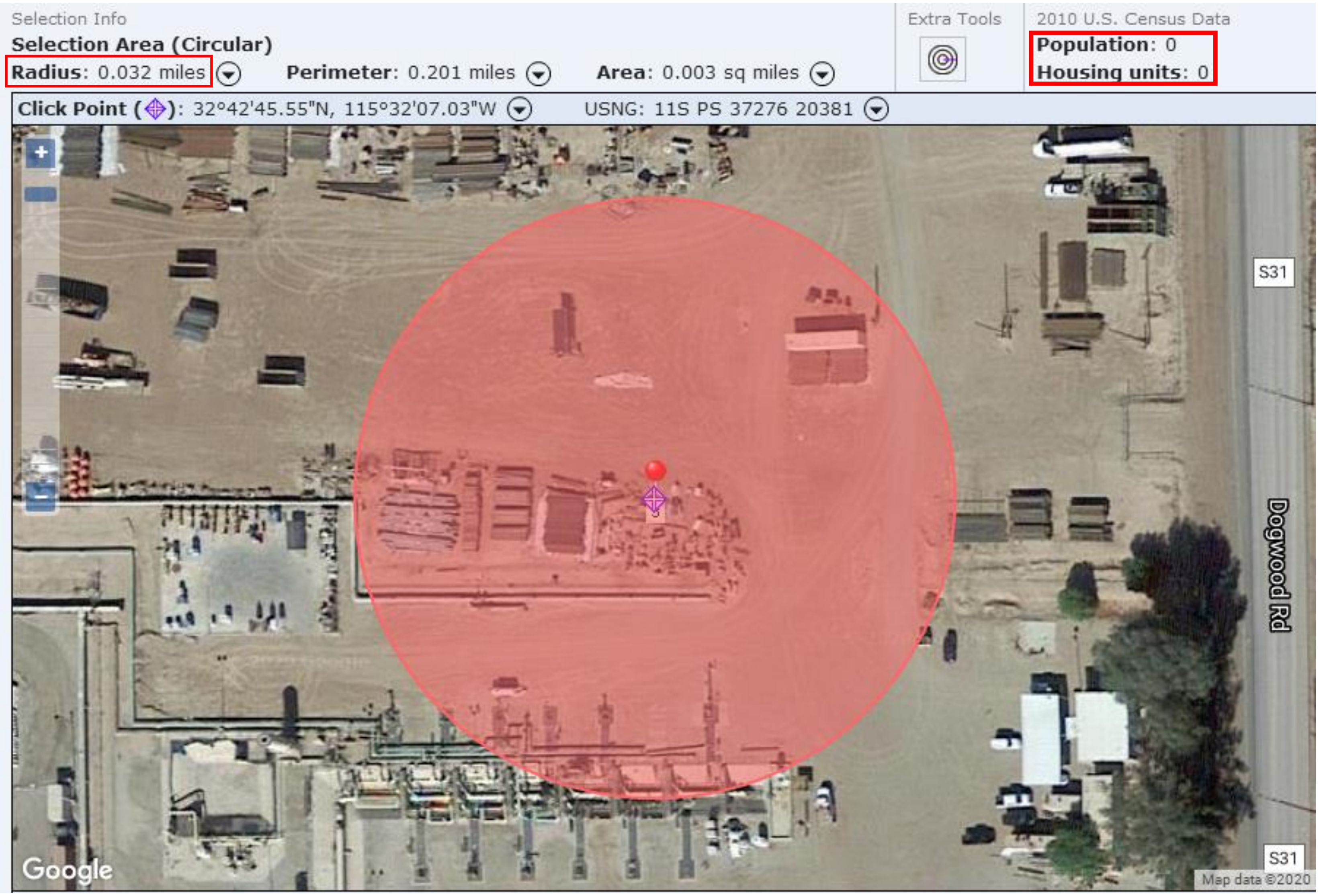
### Figure 15: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3



Selection Info

**Selection Area (Circular)**

**Radius**: 0.032 miles **Perimeter**: 0.201 miles **Area**: 0.003 sq miles

Extra Tools

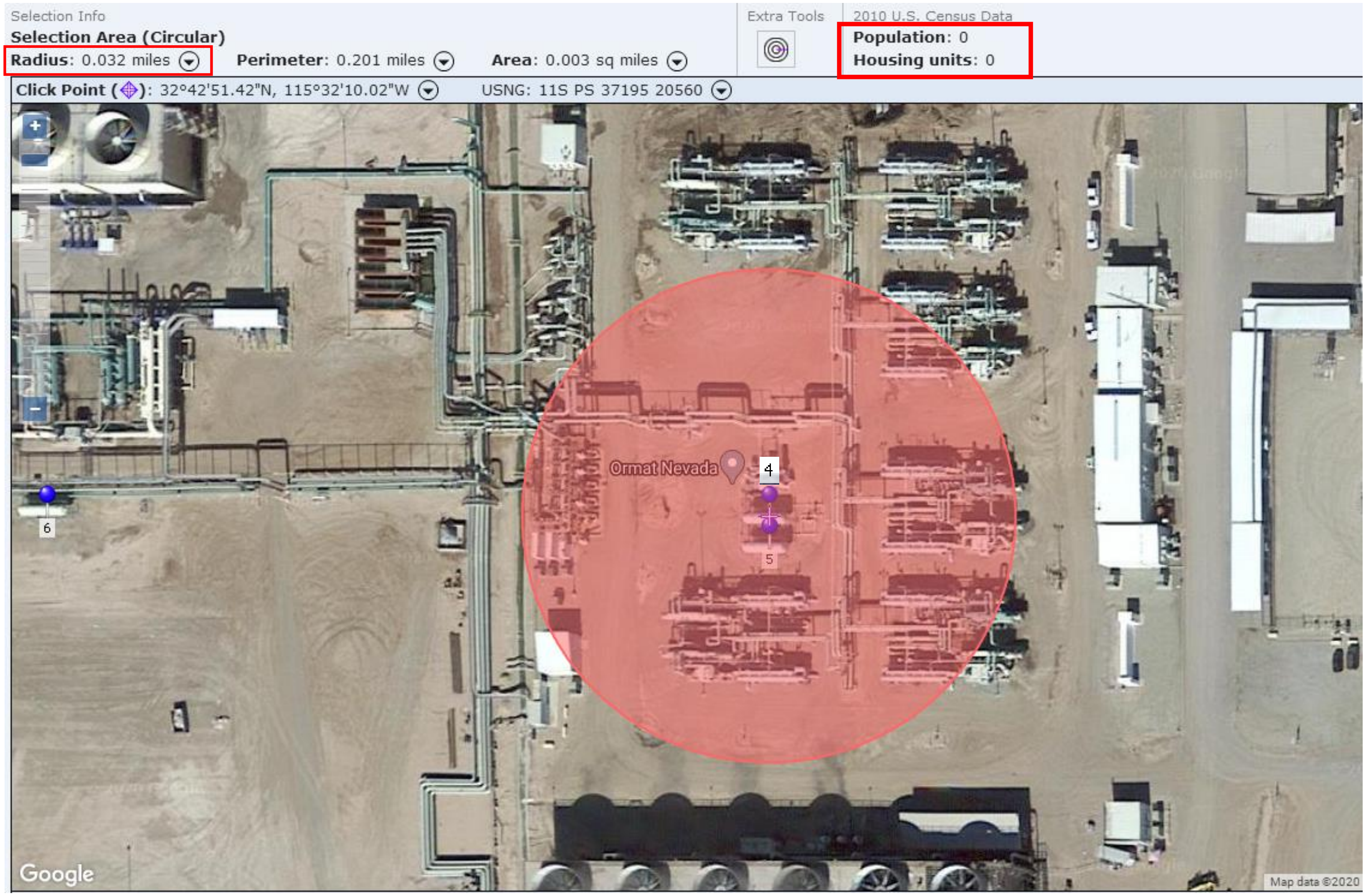
2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'45.55"N, 115°32'07.03"W USNG: 11S PS 37276 20381

## Figure 16: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #4



Selection Info

**Selection Area (Circular)**

**Radius**: 0.032 miles **Perimeter**: 0.201 miles **Area**: 0.003 sq miles

Extra Tools

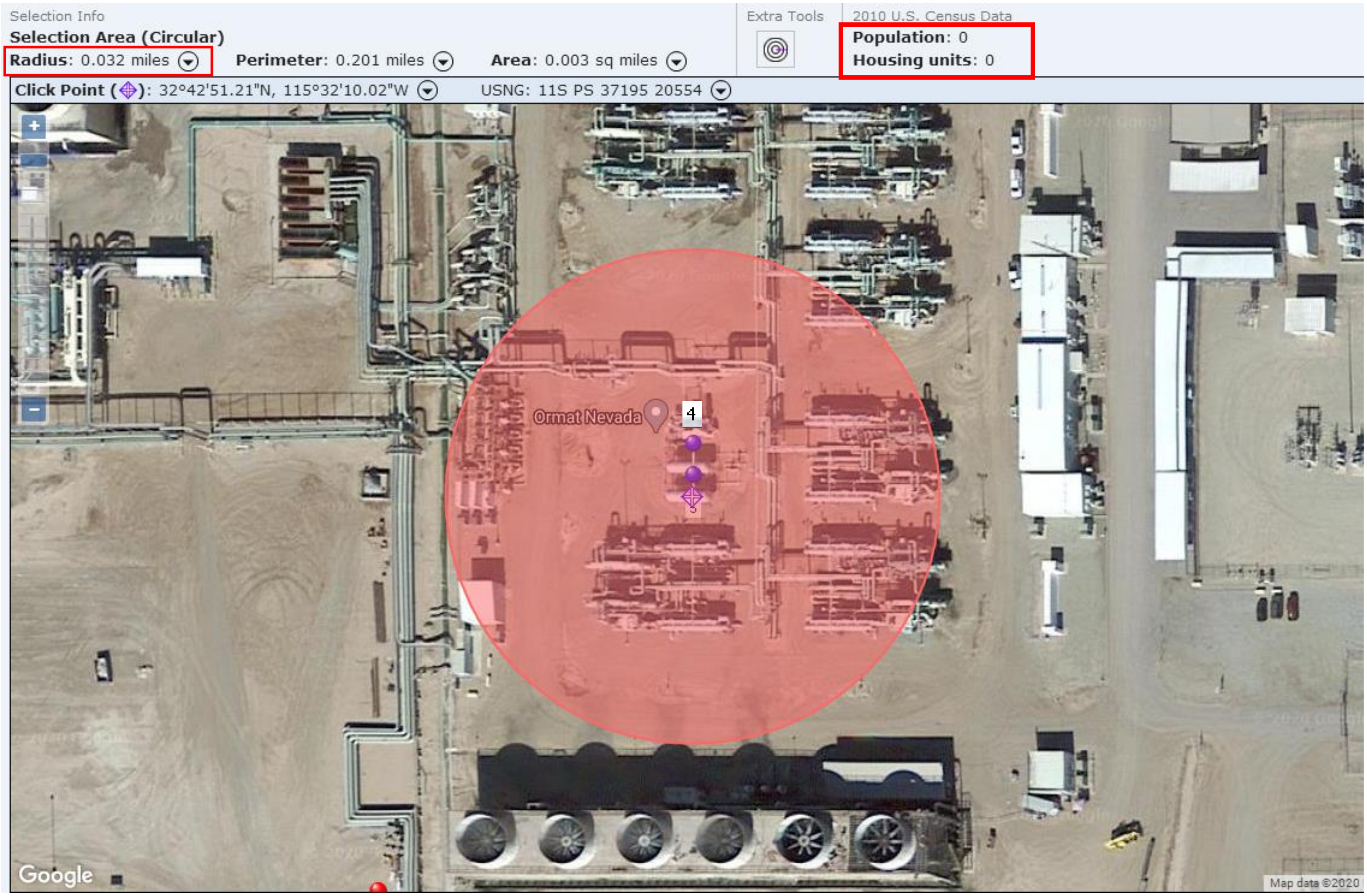
2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'51.42"N, 115°32'10.02"W USNG: 11S PS 37195 20560

## Figure 17: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #5



Selection Info

**Selection Area (Circular)**

**Radius**: 0.032 miles

**Perimeter**: 0.201 miles

**Area**: 0.003 sq miles

Extra Tools

2010 U.S. Census Data

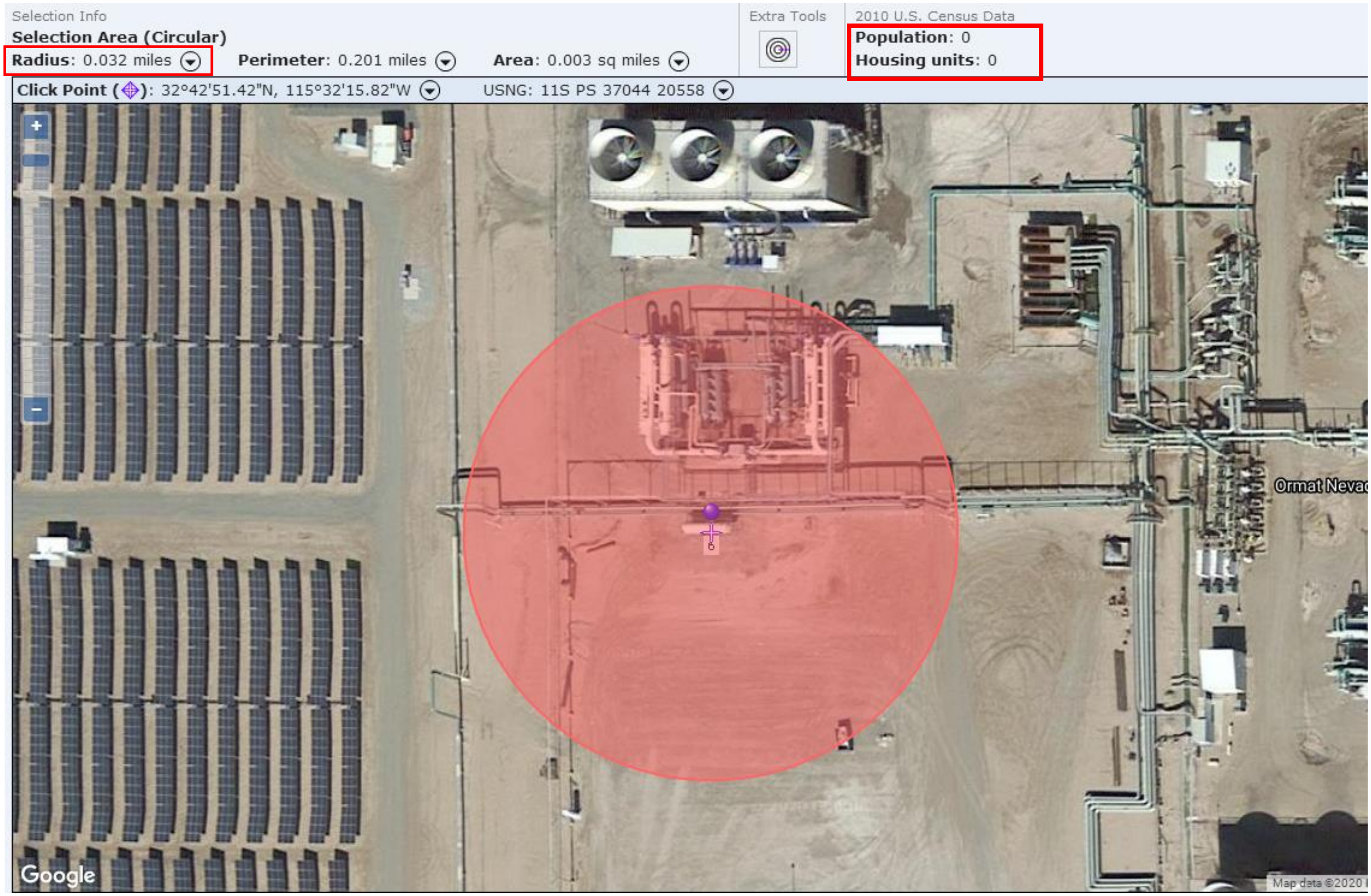
**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'51.21"N, 115°32'10.02"W

USNG: 11S PS 37195 20554

Figure 18: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #6



Selection Info

**Selection Area (Circular)**

**Radius**: 0.032 miles **Perimeter**: 0.201 miles **Area**: 0.003 sq miles

**Click Point** (): 32°42'51.42"N, 115°32'15.82"W USNG: 11S PS 37044 20558

2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

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# Attachment A

# Table of Present and Proposed Geothermal Energy Generation by Unit at the Heber 2 Complex

Catalyst
ENVIRONMENTAL SOLUTIONS

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**Present and Proposed Geothermal Energy Generation by Unit at the Heber 2 Complex**

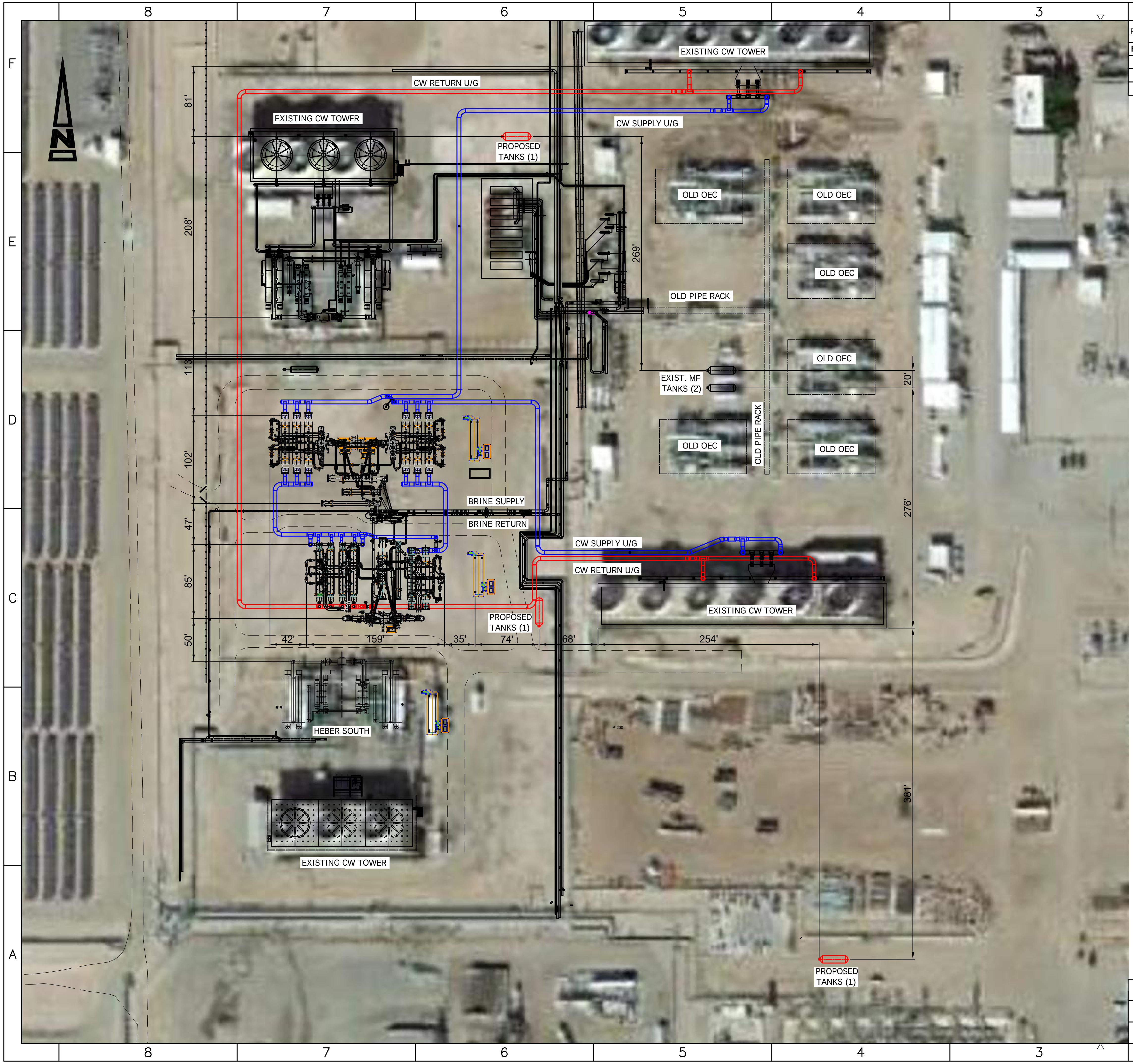
| **Heber 2 Complex Generation Unit** | **Current Net Generation (MW)** | **Current Gross Generation (MW)** | **Proposed Net Generation (MW)** | **Proposed Gross Generation (MW)** |
|---|---|---|---|---|
| Heber 2 | 11 MW | 22 MW | 27 MW | 39 MW |
| Heber South | 9 MW | 12 MW | 9 MW | 12 MW |
| Goulds 2 | 8 MW | 10 MW | 8 MW | 10 MW |
| **TOTAL HEBER 2 COMPLEX** | **28 MW** | **44 MW** | **44 MW** | **61 MW** |

Proposed new generation: 16 MW (net), 17 MW (gross); all to occur through repowering the Heber 2 unit with no changes to Heber South and Goulds 2.

# Attachment B

# Site Plan with Adjusted Isopentane Tank Locations

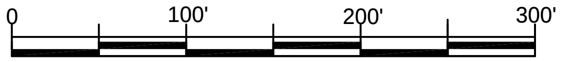
Catalyst
ENVIRONMENTAL SOLUTIONS



| REV | DESCRIPTION | DATE | BY | CHK | ENG | PRJ |
|---|---|---|---|---|---|---|
| P1 | PRELIMINARY | 16.SEP.2020 | S.S. | | A.S. | S.H. |
| | | | | | | |
| | | | | | | |
| | | | | | | |

NOTE:

1. THE ARRANGEMENT AND SIZES PRESENTED ARE PRELIMINARY AND INDICATIVE ONLY AND SUBJECT TO CHANGED ON DESIGN OPTIMIZATION, DETAILED DESIGN AND ACTUAL EQUIPMENT PURCHASED (MANUFACTURED).
2. DIMENSIONS ARE IN MM [ FEET], ELEVATIONS ARE IN MM FEET]



GRAPHIC SCALE (FEET)

APPROVED: A.S.
CHECKED:
DESIGNER: S.S. 16.JAN.2020

ORMAT

THIS DRAWING IS THE PROPERTY OF ORMAT AND MUST NOT BE COPIED OR REISSUED WITHOUT PERMISSION

TITLE:
HEBER II REPOWER
GENERAL ARRANGEMENT
POWER PLANT ON MAP

DRAWING NO. 7.910.00.001.0
SHEET 1 OF 1
REV. P1

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# Attachment C

# Hazard Memorandum and Hazard Assessment

Catalyst
ENVIRONMENTAL SOLUTIONS

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# MEMO

**To:** County of Imperial

**From:** Chambers Group, Inc.

**Date:** 9/23/20

**RE:** Hazards Associated with Proposed Isopentane Storage at the Heber 2 Facility in Heber, CA

---

Chambers Group, Inc. has prepared the following transmittal to accompany the attached Updated Hazard Assessment addressing the storage of the regulated substance, isopentane, on the Heber 2 Repower Project site in Heber, California. Risk Management Professionals, Inc. (RMP), produced an initial Hazard Assessment for the Heber 2 Repower Project on July 10, 2019 and revised on October 18, 2019 to address potential hazards associated with isopentane. Following comments from the public expressing safety concerns, RMP produced an updated Hazard Assessment using a more precise modeling software, incorporating a concrete containment area as passive mitigation, and rearranging the new vessels into a safer layout. Both technical assessments were conducted in compliance with the Hazard Assessment Offsite Consequence Analysis requirements of the Environmental Protection Agency (EPA) “Risk Management Plan” regulations (40 CFR § 68.65) and California Code of Regulations “California Accidental Release Prevention (CalARP) Program” (19 CCR 2750.1 to 2750.9).

RMP has developed an updated worst-case modeling scenario for the isopentane proposed to be stored at the Heber 2 facility. According to the EPA Risk Management Plan regulations, the worst-case release is defined as “the release of the largest quantity of a regulated substance from a vessel failure that results in the greatest distance to a specified endpoint” (40 CFR § 68.3). To determine the worst-case release quantity, the EPA regulations dictate “for substances in vessels, you must assume of the release largest amount in a single vessel” (40 CFR § 68.25). In compliance with these regulations, RMP modeled the worst-case scenario as the catastrophic failure of one 10,000-gallon isopentane storage vessel. With the incorporation of a concrete containment area as passive mitigation, the endpoint radius resulting from the release of one vessel was determined to stay within the property boundary and not to reach any new or existing vessels. The EPA’s Offsite Consequences Analysis process is recognized by professionals in the field as being highly conservative.

In addition to being consistent with EPA regulations, the modeling provided represents a sufficient worst-case scenario to be utilized in emergency planning and impact analysis. During normal operations, the isopentane tanks are not filled to capacity; in fact, they are rarely filled. Isopentane is used only as backup fuel during plant outages, which occur up to approximately one week per year. Therefore, a quantity of isopentane in excess of the quantity modeled occurs less than 2 percent of the entire year. The remaining over 98 percent of the year, at most the tanks are partially filled to approximately 15 percent capacity or alternatively, only one tank is completely full, and the remaining tanks are empty. Further, the modeling incorporates extremely conservative assumptions with regards to atmospheric conditions which further provide an analysis that would cover an extreme catastrophic event.

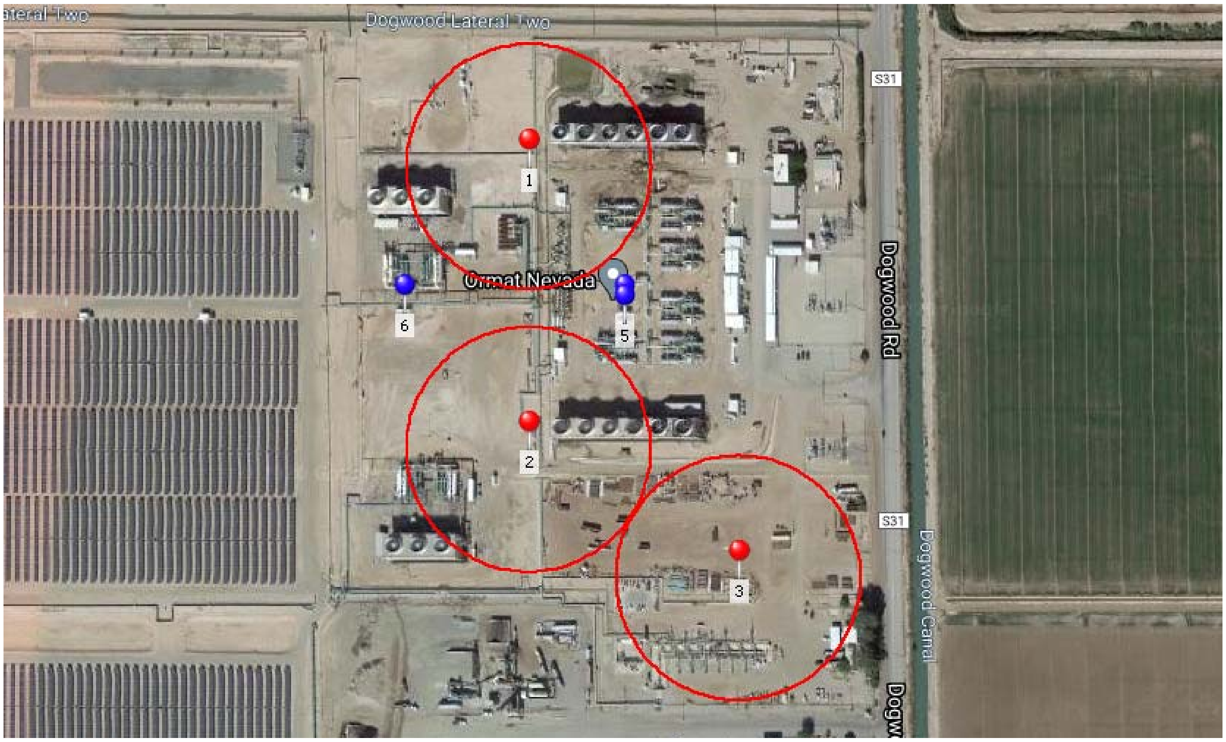
Moreover, Ormat will implement several safety-control measures into the isopentane storage system that would further reduce the potential for both initial tank failure and multi-tank failure:

- Each tank will be equipped with an automated water suppression system.
- Each tank will be equipped with two flame detectors and one gas detector (for a total of 6 flame detectors and 3 gas detectors for the three tanks).
- In the case of an isopentane leak, the gas detector(s) will detect it immediately and send a notification to the operator at the control room (manned 24/7) in order to mobilize fixing the leak.
- In case of a fire, the flame detector(s) will detect it and immediately start the automatic fire suppression system.
- In case of a fire, there will also be a horn and strobe system that will turn on automatically to alert the plant employees.

Due to the conservative Offsite Consequences Analysis process; taking into consideration:

- a concrete containment area as passive mitigation,
- vessels rarely filled to 90% capacity,
- and isopentane safety-control measures,

areas of concern are limited to inside facility boarders, thus producing zero sensitive receptors. Furthermore, Ormat can go as far as to say that according to the figure below, the explosion area of one new vessel (red) will not reach any of the existing vessels (blue), nor overlap with the explosion area resulting from the other new vessels.



# ORMAT, HEBER 2
# GEOTHERMAL POWER GENERATION FACILITIES
# HEBER, CALIFORNIA

## Hazard Assessment

| Revision | Date | Description |
|---|---|---|
| 0.0 | September 24, 2020 | Initial Issue – Concrete Secondary Containment Area and Relocating New Storage Vessels |
| | | |
| | | |

**Risk Management Professionals, Inc.**
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EEC ORIGINAL PKG

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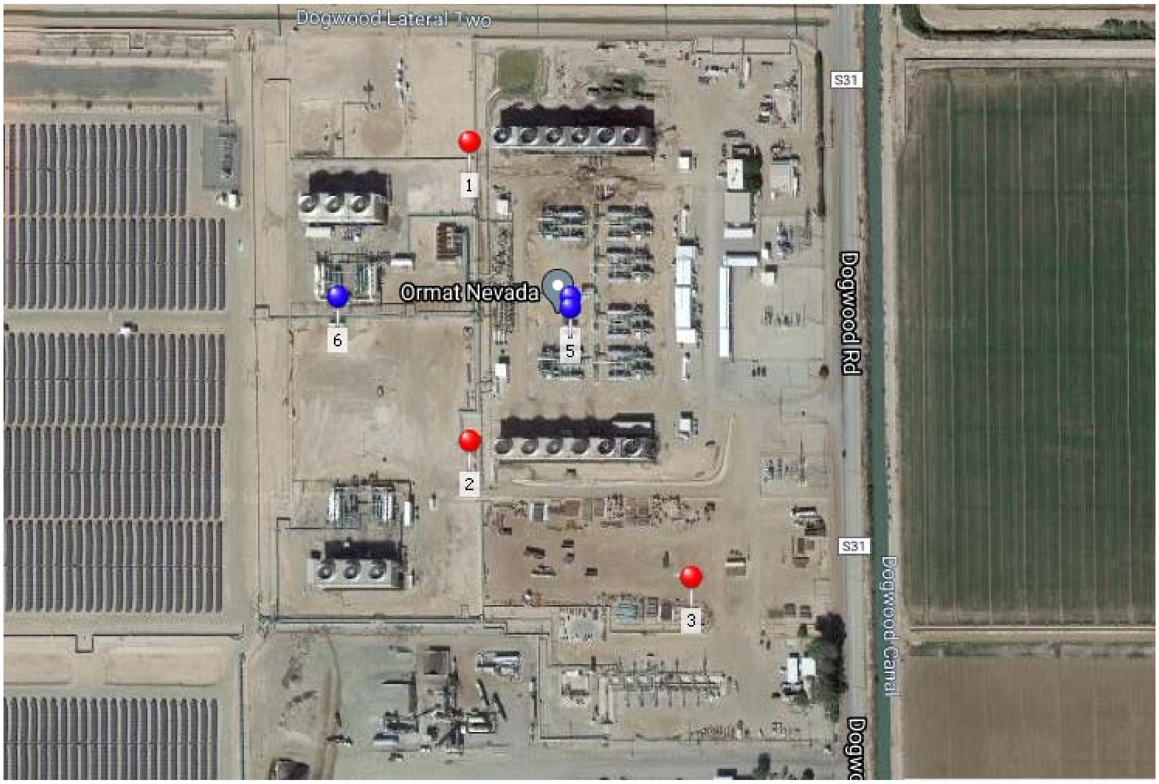
# 1.0 FACILITY OVERVIEW

This technical assessment was conducted to fulfill the Hazard Assessment Offsite Consequence Analysis (OCA) requirements of the following regulations:

- 40 CFR §68.65 – Environmental Protection Agency (EPA) "Risk Management Plan (RMP)"[1]
- 19 CCR 2750.1 to 2750.9 – California Code of Regulation "California Accidental Release Prevention (CalARP) Program"[2]

This assessment is completed for the **Ormat– Heber 2 Geothermal Complex** Facility located in Heber, California. The facility's location at 855 Dogwood Road, Heber, CA 92249 is illustrated in Figure 1 below. The blue markers depict the locations of the three existing 10,000-gallon vessels and red markers for three new 10,000-gallon isopentane vessels that are being added to the facility as part of the Repower project. The coordinates for each vessel's location are presented in Table 1 and Table 2 on the following page.

**Figure 1: Aerial View of the Facility Location**



The following page presents a closer view of the facility's storage vessel locations, as well as tables displaying the approximate locations of the three new and three existing storage vessels.

**Figure 2: Aerial View of the Storage Vessel Locations**

**Table 1: Ormat—Heber 2 New Storage Vessel Coordinates**

| NEW VESSELS | FORMAT | LATITUDE | LONGITUDE |
|---|---|---|---|
| Isopentane Vessel 1 | Degrees/Minutes/Seconds | 32°42'54.66"N | 115°32'12.54"W |
| Isopentane Vessel 2 | Degrees/Minutes/Seconds | 32°42'48.40"N | 115°32'12.55"W |
| Isopentane Vessel 3 | Degrees/Minutes/Seconds | 32°42'45.55"N | 115°32'07.03"W |

**Table 2: Ormat—Heber 2 Existing Storage Vessel Coordinates**

| EXISTING VESSELS | FORMAT | LATITUDE | LONGITUDE |
|---|---|---|---|
| Isopentane Vessel 4 | Degrees/Minutes/Seconds | 32°42'51.42"N | 115°32'10.02"W |
| Isopentane Vessel 5 | Degrees/Minutes/Seconds | 32°42'51.21"N | 115°32'10.02"W |
| Isopentane Vessel 6 | Degrees/Minutes/Seconds | 32°42'51.42"N | 115°32'15.82"W |

## 2.0 COVERED PROCESS

The ***Ormat – Heber 2 Geothermal Complex*** has three geothermal electrical generating plants in Heber, CA. Heber 2 consists of the H2, Gould-2 (G-2), and Heber South binary processes. The projects use the renewable geothermal resources of the Heber Known Geothermal Resource Area (KGRA) to generate electrical power.

The Heber 2 Geothermal Project produces electricity by using a vaporized motive fluid to spin a turbine connected to a generator. In the H2 binary processes, isopentane is the motive fluid.

The covered processes at the facility are listed below.

**Table 3: Ormat—Heber 2 Geothermal Complex Facility Covered Process**

| PLANT | REGULATED SUBSTANCE | MAXIMUM INVENTORY IN SINGLE VESSEL (GAL)[A] | TANK TYPE | VESSEL STORAGE INVENTORY |
|---|---|---|---|---|
| Heber 2 | Isopentane | 9,000 | Storage | 10,000-gallon tank |

[A] This value represents the maximum amount stored in a single vessel, taking into account administrative controls, which are in place to limit the quantity stored.

This hazard assessment will focus on the regulated substance, isopentane, in Heber 2. The facility is classified as Prevention Program 3 and is regulated by the Environmental Protection Agency's Risk Management Program (EPA RMP) for Chemical Accidental Release Prevention in accordance with the Code of Federal Regulations, Title 40, Chapter I, Subchapter C, Part 68, Subpart B Sections 68.20 to 68.42 (40 CFR §68.20 - 68.42)[1] for isopentane, because it is held on site in excess of 10,000 lbs. The geothermal power plant utilizes isopentane as the motive fluid in the generation of electricity.

## 3.0 LEVEL OF CONCERN

To address potential health effects for the worst-case release scenario, the following are the key endpoints of concern for the EPA RMP as defined in Title 40 CFR Section 68.22(2):

*(i)* *Explosion. An overpressure of 1 psi.*
*(ii)* *Radiant heat/exposure time. A radiant heat of 5 kW/m$^2$ for 40 seconds.*
*(iii)* *Lower flammability limit. A lower flammability limit as provided in NFPA documents or other generally recognized sources.*

The distance from the point of release to the endpoint identified above defines a radius circle of concern for which consequences are reported in the Risk Management Plan.

## 4.0 WORST-CASE SCENARIO

The US EPA RMP determines the worst-case release quantity in Title 40 CFR Part 68.25(b) as follows:

> *The worst-case release quantity shall be the greater of the following:*
>
> *(1) For substances in a vessel, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity;*
>
> *(2) For substances in pipes, the greatest amount in a pipe, taking into account administrative controls that limit the maximum quantity.*

Given the substance released is a flammable, the US EPA RMP gives further guidelines in 68.25 (f):

> *Worst-Case scenario-flammable liquids. The owner or operator shall assume that the quantity of the substance, as determined under paragraph (b) of this section and the provisions below, vaporizes resulting in a vapor cloud explosion. A yield factor of 10 percent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT equivalent methods.*
>
> *(1) For regulated flammable substances that are normally liquids at ambient temperature, the owner or operator shall assume that the entire quantity in the vessel or pipe as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool. For liquids at temperatures below their atmospheric boiling point, the volatilization rate shall be calculated at the condition specified in paragraph (d) of this section.*
>
> *(2) The owner or operator shall assume that the quantity which becomes vapor in the first 10 minutes is involved in the vapor cloud explosion.*

Furthermore, vapor cloud explosions are considered a conservative analysis as Chapter 4: OCA of the General Risk Management Program Guidance states:

> *As in the case of the worst-case release analysis for toxic substances, the worst-case distance to the endpoint for flammable substances is based on a number of very*

> *conservative assumptions. Release of the total quantity of a flammable substance in a vessel or pipe into a vapor cloud generally would be highly unlikely. Vapor cloud explosions are also unlikely events; in an actual release, the flammable gas or vapor released to air might disperse without ignition, or it might burn instead of exploding, with more limited consequences. The endpoint of 1 psi is intended to be conservative and protective; it does not define a level at which severe injuries or death would be commonly expected. An overpressure of 1 psi is unlikely to have serious direct effects on people; this overpressure may cause property damage such as partial demolition of houses, which can result in injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.*

EPA requires the assessment of a suitable worst-case scenario based on a thorough review of vessels and storage tanks to determine the single vessel with the largest quantity of the regulated substance. However, in this particular Hazard Assessment, the worst-case scenario instead analyzes a release from the three new 10,000-gallon isopentane storage vessels, despite the fact that any one of these vessels is not the single largest vessel at the facility. This updated Hazard Assessment was performed to account for the modifications made to Heber 2 as part of the facility's Repower project and thus, an exclusive examination of the three new 10,000-gallon storage vessels was performed rather than a review of the single largest vessel.

The Areal Locations of Hazardous Atmospheres (ALOHA)[3] modeling software was used to determine the distance to the endpoint for the worst-case release scenario analysis. The vulnerability zone resulting from this analysis was then reviewed. A vulnerability zone is defined as a circle whose center is the point of release and its radius is the length of the endpoint, which is predicted by the dispersion model (e.g., ALOHA).

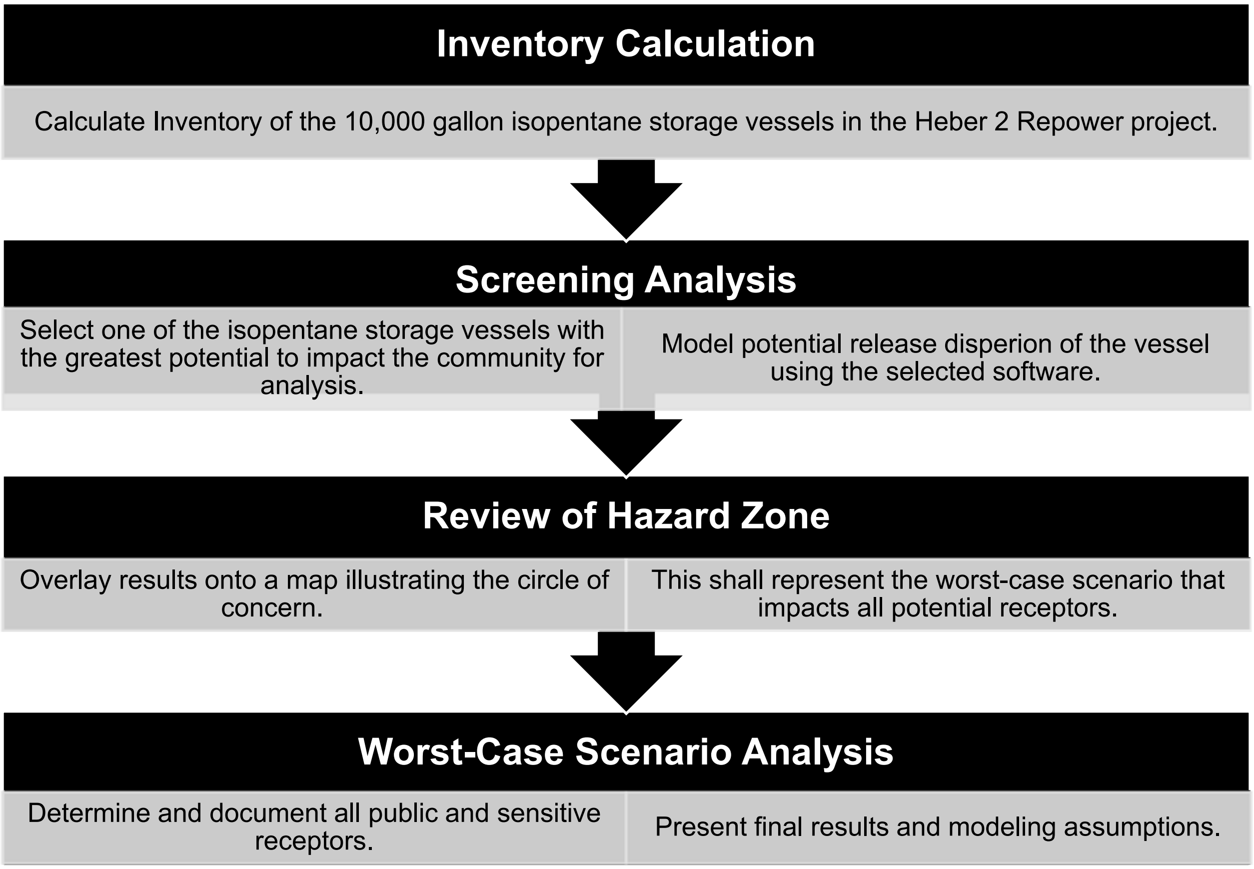
## 4.1 Worst-Case Scenario Selection Process

The process of worst-case release scenario identification is summarized as follows. Figure 3 on the following page depicts the steps in this process.

- **Inventory Calculation**: The first step was to perform the inventory calculations for the 10,000-gallon storage vessels in the covered units and systems.
- **Screening Analysis**: The 10,000-gallon isopentane storage vessels' location was screened. ALOHA modeling software was used to model the scenario and determine the dispersion endpoints for the worst-case release scenario. This was performed to determine the vulnerability zone associated with the worst-case release scenario.

- **Review of the Vulnerability Zone**: The vulnerability zone resulting from the previous step was reviewed and is representative for the plant's worst-case scenario.
- **Worst-Case Analysis**: To document the worst-case scenario, the potential public receptors within the vulnerability zone were identified. All modeling inputs, calculations and assumptions are documented.

**Figure 3: Worst-Case Scenario Selection Process**



## 4.2 Flammable Release Potential Consequences

Several possible consequences of releases of flammable substances are discussed below. It should be noted that the following possible consequences apply to not only worst-case release analysis.

- **Flash Fire**. This event may result from dispersion of a flammable vapor cloud and ignition of the cloud following dispersion. Such a fire could flash back and could represent a severe heat radiation hazard to anyone in the area of the cloud. The lower flammability limit (LFL) endpoint, specified in the rule, would be appropriate for flash fires (vapor cloud fires).

- **Pool Fire**. Spill of a liquid whose boiling point is above ambient temperature may form a liquid pool, which could ignite and form a pool fire. The applicable endpoint specified in the rule is the heat radiation level of 5 kW/m$^2$.
- **BLEVE.** A BLEVE (Boiling Liquid Expanding Vapor Explosion) is a potential release scenario associated with a large quantity of flammable materials kept at below their boiling points. A BLEVE that may lead to a fireball could produce intense heat. This event may occur if a vessel containing flammable material ruptures as a result of exposure to fire. Heat radiation from the fireball is the primary hazard and vessel fragments and overpressure from the explosion are generally considered unlikely. To estimate the distance to a radiant heat level that can cause second degree burns (a heat “dose” equivalent to the specified radiant heat endpoint of 5 kW/m$^2$ for 40 seconds). Consistent with the EPA’s “Risk Management Program Guidance for Offsite Consequence Analysis” published guidance, BLEVEs are generally considered unlikely events and were therefore not considered a probable event for the Offsite Consequence Analysis.
- **Vapor Cloud Explosion.** For a vapor cloud explosion to occur, rapid release of a large quantity, turbulent conditions (caused by a turbulent release or congested conditions in the area of the release, or both), and other factors are generally necessary. The endpoint for vapor cloud explosions is 1 psi.
- **Jet Fire.** This may result from the puncture or rupture of a tank or pipeline containing a compressed or liquefied gas under pressure. The gas discharging from the hole can form a jet that "blows" into the air in the direction away from the hole; the jet then may ignite. Jet fires could contribute to BLEVEs and fireballs if they impinge on tanks of flammable substances. A large horizontal jet fire may have the potential to pose an offsite hazard.

For the flammable worst-case release scenario, a vapor cloud explosion was the most appropriate consequence, as defined by the EPA RMP rule.

## 4.3 Endpoints

As mentioned previously, for flammable materials, the endpoints specified by the EPA RMP are:

- Overpressure of 1 pound per square inch (psi) for vapor cloud explosions

- Radiant heat of 5 kilowatts per square meter (kW/$m^2$) for jet fires
- Lower flammability limit (LFL) for flash fires

The rule specifies endpoints for fires based on the heat radiation level that may cause second degree burns from a 40-second exposure and the LFL, which is the lowest concentration in air at which a substance will burn. For a vapor cloud explosion, the endpoint is 1 psi, which is the force to cause partial demolition of houses with potential serious injuries to people, or shattering glass windows with potential skin laceration from flying glass.

## 4.4 Modeling Assumptions

The EPA RMP regulation imposes several assumptions that were adhered to when performing the offsite consequence analysis of the worst-case release scenario. These are conservative assumptions for weather and release conditions. The distance to the endpoint estimated under worst-case conditions provides an estimate for the maximum possible area that might be affected by these unlikely conditions. It should be noted that EPA's intention for the vulnerability zone representing a worst-case release scenario is to provide a basis for discussion among the regulated industry, emergency responders, and the public, rather than a basis for any specific actions. The EPA RMP regulations, in conjunction with the RMP Guidance for Offsite Consequence Analysis[4], were used to model the worst-case release scenario and prescribe these atmospheric parameters.

- **Meteorological Parameters:** For the worst-case release analysis, the following assumptions were entered into ALOHA, as specific by the EPA RMP regulations / RMP Guidance for Offsite Consequence Analysis.
    - *Atmospheric stability*: F stability (very stable conditions)
    - *Wind speed:* 1.5 meters/second
    - *Ambient Temperature:* 77 ° F
    - *Relative Humidity*: The typical relative humidity at the stationary source, which is 50%
- **Dispersion & Impact Modeling Parameters:**
    - *Height of Release:* Ground level, per EPA Rule requirement

  - *Surface Roughness:* Open Country, meaning there are no obstacles in the immediate area; obstacles including buildings or trees, as defined by the EPA RMP regulations
  - *Vapor Cloud Explosion Impact:* A Vapor Cloud Explosion has been modeled with an endpoint of 1 psi

- **Mitigation Systems:** Once a release has occurred, mitigation systems are means (structures, equipment, or activities) that help minimize the transport of material to the atmosphere. Mitigation systems can be characterized as passive or active systems.
  - *Passive mitigation systems do not require activation, an energy source, or movement of components to perform their intended function*
  - *Active mitigation systems do require activation, an energy source, and/or movement of components to perform their intended function*

It should be emphasized that the effectiveness of mitigation systems was taken into account when these systems were considered in the offsite consequence analysis. The effectiveness is determined based on how well the systems are designed and their abilities to respond reliably upon demand. The rule permits consideration of only passive mitigation systems for the worst-case release analysis provided that the systems are capable of withstanding the event triggering the release scenario and would still function as intended. For the worst-case release scenario, the secondary containment area built with concrete was considered as a passive mitigation measure in the offsite consequence analysis.

## 4.5 Worst-Case Release Scenario

One worst-case scenario (WCS) was developed for the facility. For the worst-case release scenario, one of the new 10,000-gallon storage vessels containing isopentane at the Ormat – Heber 2 Geothermal Complex Facility was considered. The storage vessel is capable of storing a maximum of 9,000 gallons of isopentane, taking into account administrative controls. According to the Chevron Philips Chemical Company safety data sheet, the density of isopentane is 5.14 lbs./gal, which yields a total mass of 46,260 pounds of isopentane held in the storage vessel. The worst-case scenario considers the catastrophic failure of one of the 10,000-gallon isopentane storage vessels, which would result in a release of the entire contents of the vessel, into the secondary containment area. All dispersion modeling parameters utilized in the worst-case release scenario modeling is listed in Table 4 below. A summary of the scenario is presented in

Table 5. Appendix A of this report provides a detailed description of the worst-case release scenario, ALOHA modeling output, MARPLOT 5.1.1[5] output with population estimates, and maps displaying the vulnerability zone for a release from each tank, denoted by a circle superimposed on the map.

**Table 4: Worst Case Release Scenario Dispersion Modeling Parameters**

| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| **Isopentane Input Parameters** | | |
| Quantity Released | 9,000 gallons | Entire contents of isopentane storage vessel assumed to be released and form an evaporating puddle in secondary containment area, which is involved in a vapor cloud explosion. |
| **Meteorological Parameters** | | |
| Atmospheric Stability | F stability | As per 40 CFR §68.22 (b), "For the worst-case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second and F atmospheric stability class" |
| Wind Speed | 1.5 m/s | |
| Wind Direction | W | Wind Direction from the west based on the Wind Rose plot for Imperial, CA (closest city with wind rose plot available). Since the endpoint distance and circle of interest is presented in this report, the wind direction does not impact the analysis/distance to endpoint and instead is a generic input that ALOHA modeling software requires. |
| Measurement Height above Ground | 10 m | Wind speed is assumed to be measured at this elevation, as this is the standard height at which the National Weather Service usually reports wind speed. |
| Ambient Temperature | 77ºF (25°C) | As per 40 CFR §68.22 (c), "An owner or operator using the RMP Offsite |

| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| Relative Humidity | 50% | Consequence Analysis Guidance may use 25 °C and 50 percent humidity as values for these variables” |
| Ground temperature | 122ºF | As per 40 CFR §68.22 (g), “for worst case, [it] shall be considered to be released at the highest daily maximum temperature, based on data for the previous three years appropriate for the stationary source.” Temperature data was sourced from Weather Underground [6] for Imperial, CA (closest available city with temperature history) and the highest daily maximum temperature from the previous 3 years was identified. |
| **Dispersion and Impact Modeling Parameters** | | |
| Height of Release | Ground level | As per 40 CFR §68.22(d), “you must assume a ground level release” and as per the RMP Offsite Consequence Analysis Guidance Document, “this guidance assumes a ground-level release” |
| Topography/Surface Roughness | Open Country | Open Country, meaning there are no obstacles in the immediate area; obstacles including buildings or trees, as defined by the EPA RMP regulations. |

| PARAMETER | INPUT VALUE | NOTES |
|---|---|---|
| Level of Congestion | Congested | The level of congestion was assumed to be congested, which is a conservative assumption since greater turbulence (greater congestion) allows the flame front to accelerate, thereby generating a more powerful blast wave (i.e., greater overpressure). The immediate area within the facility is also considered to be congested with piping and equipment. |
| **Isopentane Mitigation System** | | |
| Passive Mitigation | Secondary Containment Area | The volume released from a single Isopentane Storage Vessel is assumed to release into a concrete secondary containment area, which is contained around each storage vessel. The secondary containment area dimensions are 40 ft length, 12 ft width, 3.5 ft depth (Surface area = 480 $ft^2$). |

**Table 5: Worst-Case Scenario Results Summary**

| RELEASE SCENARIO | REGULATED SUBSTANCE | ENDPOINT | ENDPOINT DISTANCE |
|---|---|---|---|
| WCS: 10,000-gallon Isopentane Storage Vessel Rupture/Release | Isopentane | Overpressure of 1 psi | 92 yd / 276 ft / 0.052 mi |

## 4.6 Worst-Case Analysis Considerations

The worst-case distances to the flammable endpoints are based on a number of very conservative assumptions. The following summarizes the assumptions:

- The likelihood of a vessel rupture is extremely low. As a result, the release of entire inventory of a vessel is an unrealistic assumption.
- An overpressure of 1 psi is unlikely to have serious direct effects on people. This overpressure may cause property damage such as partial demolition of houses, which can result in injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.

## 5.0 ALTERNATIVE RELEASE SCENARIO

Alternative scenarios are potential releases that may result in consequences whose footprints represented by the endpoints could extend beyond the plant boundary. For a release case to be considered an alternative scenario, two conditions must be met:

1. The likelihood of the alternative release scenarios should be higher than that of the worst-case release scenarios.
2. The distance to endpoint from an alternative release scenario must go beyond the plant fence line.

As put forth in Title 40 CFR Section 68.28(a):

> *The owner or operator shall identify and analyze…at least one alternative release scenario to represent all flammable substances held in a covered process*

Title 40 CFR Section 68.28 (b)(2) defines the scenarios typically considered, but not limited to, the following:

> *(i) Transfer hose releases due to splits or sudden hose uncoupling;*
>
> *(ii) Process piping releases from failures at flanges, joints, welds, valves and valve seals, and drains or bleeds*
>
> *(iii) Process vessel or pump release due to cracks, seal failure, or drain, bleed, or plug failure; and*
>
> *(iv) Vessel overfilling and spill, or over pressurization and venting through relief valves or rupture disks.*
>
> *(v) Shipping container mishandling and breakage or puncturing leading to a spill.*

For alternative release scenarios, active mitigation systems, such as interlocks, shutdown systems, pressure relieving devices, flares, emergency isolation systems, and fire water and deluge systems, as well as passive mitigation systems are considered, if they were applicable. In order to be credited, the mitigation systems considered must be capable of withstanding the event that triggers the release while remaining functional.

## 5.1 Alternative Release Scenario Selection Process

The process of alternative release scenario identification is summarized as follows and depicted in Figure 4.

- **Selection of Candidate Alternative Release Scenario:** The process of alternative release scenario identification was initiated with the review of the worst-case release case. Additional vessels, containing various quantities of regulated substances, which considered having a higher likelihood of release, were then reviewed. In this process, all covered processes were reviewed and the candidate case for the alternative release scenario analysis was subsequently selected. The following criteria was utilized to identify the potential scenario:
    - Corrosion history and corrosive services
    - Past incidents and near misses
    - Potential equipment failure
    - Operating conditions
    - Potential for human error
    - Consequences considered in the unit Process Hazard Analysis
- **Analysis of the Selected Alternative Release Scenario:** Once the candidate scenario was selected, ALOHA was utilized to model the selected scenario. The vulnerability zone resulting from the analysis of the alternative release scenario was then reviewed. The release duration was limited by the length of time to release the entire contents of the single Isopentane Storage Vessel.

- **Alternative Release Scenario**: The alternative release scenario for the flammable substance was selected and modeled to evaluate potential offsite impacts. Documentation of this scenario included modeling calculations, parameters and assumptions.

**Figure 4: Alternative Release Scenario Selection Process**

**Criteria**

Corrosion History and Corrosive Surfaces, Past Incidents and Near Misses, Potential Equipment Failure, Operating Conditions, Potential Human Error, Scenarios Considered in the Process Hazard Analysis.

**Select Alternative Release Scenario**

Review process and facility characteristics to develop the candidate for an Alternative Release Scenario.

**Modeling of Alternative Release Scenario**

Model potential release dispersion for the selected Alternative Release Scenario.

**Alternative Release Scenario Analysis**

Present final results and modeling assumptions.

## 5.2 Modeling Assumptions

The EPA RMP regulation does not impose any mandatory assumptions for the OCA of the alternative release scenario. All dispersion modeling parameters utilized in the alternative release scenario modeling are listed in Table 6. For the alternative release scenario, a release due to a break in the product transfer hose connection during truck loading has been considered. Appendix B of this report provides a detailed description of the worst-case release scenario, ALOHA modeling output, MARPLOT 5.1.1 output with population estimates, and a map with the vulnerability zone denoted by a circle superimposed on the map.

### Table 6: Alternative Release Scenario Dispersion Modeling Parameters

| Parameter | Input Value | Notes |
|---|---|---|
| **Isopentane Input Parameters** | | |
| Quantity Released | 46,260 lbs. | The most likely alternative release scenario involves the uncoupling of a transfer hose during truck loading operations.<br>Calculations shown in Appendix B. |
| Release Rate | 19,468 lbs./min | Calculations shown in Appendix B. |
| Release Duration | 2.4 mins | The release duration is limited by the quantity stored in a single Isopentane Storage Vessel (9,000 gallons). |
| **Meteorological Parameters** | | |
| Atmospheric Stability | D stability | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, “this guidance assumes wind speed of 3 meters per second and D stability” |
| Wind Speed | 3.0 m/s | |
| Wind Direction | W | Wind Direction from the west based on the Wind Rose plot for Imperial, CA (closest city with wind rose plot available). Since the endpoint distance and circle of interest is presented in this report, the wind direction does not impact the analysis/distance to endpoint and instead is a generic input that ALOHA modeling software requires. |

| Parameter | Input Value | Notes |
|---|---|---|
| Measurement Height above Ground | 10 m | Wind speed is assumed to be measured at this elevation, as this is the standard height at which the National Weather Service usually reports wind speed. |
| Ambient Temperature | 77ºF (25°C) | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, "this guidance assumes 25ºC and 50 percent humidity" |
| Relative Humidity | 50% | |
| **Dispersion and Impact Modeling Parameters** | | |
| Height of Release | Ground Level | As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, "this guidance assumes a ground-level release" |
| Topography/Surface Roughness | Open Country | Open Country, meaning there are no obstacles in the immediate area; obstacles including buildings or trees, as defined by the EPA RMP regulations. |
| Level of Congestion | Congested | The level of congestion was assumed to be congested, which is a conservative assumption since greater turbulence (greater congestion) allows the flame front to accelerate, thereby generating a more powerful blast wave (i.e., greater overpressure). The immediate area within the facility is also considered to be congested with piping and equipment. |

| Parameter | Input Value | Notes |
|---|---|---|
| **Isopentane Mitigation System** | | |
| Passive Mitigation | Secondary Containment Area | The amount released from the alternative release scenario is assumed to release into a concrete secondary containment area, which is contained around each storage vessel. The secondary containment area dimensions are 40 ft length, 12 ft width, 3.5 ft depth (Surface area = 480 ft$^2$). |
| Active Mitigation | None | |

## 5.3 Alternative Release Scenario

A summary of the alternative release scenario is presented in Table 7. Appendix B of this report provides a detailed description of the alternative release scenario, ALOHA modeling outputs, MARPLOT 5.1.1 outputs with population estimates, and a map with circles representing the vulnerability zones.

**Table 7: Alternative Release Scenario Result Summary**

| RELEASE SCENARIO | REGULATED SUBSTANCE | ENDPOINT | ENDPOINT DISTANCE |
|---|---|---|---|
| ARS: Transfer Hose uncoupling from 10,000-gallon Isopentane Storage Vessel during Truck Loading Operations | Isopentane | Overpressure of 1 psi | 57 yd / 171 ft / 0.032 mi |

## 5.4 Alternative Release Analysis Considerations

Typically, the same conservative assumptions apply for the alternative release analysis as for the worst-case release analysis. Although the alternative release scenario is intended to be more likely than the worst-case release scenario, the analysis of the alternative release scenario should not be expected to provide a realistic estimate of an area in which off-site impact may occur. The same conservative endpoints have been used for both the worst-case and the alternative release analysis. These endpoints are intended to represent exposure levels below which most members of the public will not experience serious long-term health effects.

# 6.0 OFFSITE IMPACTS

A summary of the off-site impacts from an accidental release, including population and sensitive receptors, is discussed in the following sub-sections.

## 6.1 Impacted Population

In order to determine the impacted population around the facility, the potential for exposure within the endpoint was determined. The furthest endpoint distances reached by the worst-case scenario and alternative release scenario along with the estimated impacted population are summarized in Table 8:

**Table 8: Impacted Population for OCA Scenarios**

| SCENARIO | ENDPOINT DISTANCE | ESTIMATED IMPACTED POPULATION |
|---|---|---|
| WCS: 10,000-gallon Isopentane Storage Vessel Rupture/Release | 92 yd / 276 ft / 0.052 mi | 0 |
| ARS: Transfer Hose uncoupling from 10,000-gallon Isopentane Storage Vessel during Truck Loading Operations | 57 yd / 171 ft / 0.032 mi | 0 |

The population was estimated using 2010 census tract data with the MARPLOT 5.1.1 software. When calculating population densities for large areas that encompass many tracts, the accuracy is rated as good; however, for small areas that encompass only two or three partial tracts, the population data may be skewed due to the unequal distribution within the tract. The use of MARPLOT 5.1.1 is pursuant to guidance endorsed by the US EPA. MARPLOT 5.1.1 requires the latitude and longitude of the facility in order to calculate the population. The latitude and longitude were estimated using Google Earth GPS[7] software and an aerial photo. In consideration of the unique case of bystanders along facility boarders during a vapor cloud explosion, vessels are placed far enough within company fencing that surrounding walkways and streets are free of severe impacts.

## 6.2 Offsite Sensitive Receptor Data Sources

Table 9 includes a list of websites and software used to locate offsite sensitive receptors. A few sites will perform a distance search in order to determine the eligibility of a possible receptor. For all other sites, a map interpolation determines whether the receptor falls within the circle of concern.

**Table 9: Websites and Software Used**

| SOURCE | RECEPTORS THIS SOURCE IS USED TO IDENTIFY | METHOD OF DETERMINING ELIGIBILITY |
|---|---|---|
| Google Maps[8] | Used to identify all receptors | Distance search in conjunction with a map interpolation |
| Google Earth | This mapping software is used to locate all receptors. It also incorporates an internet search with the map to locate businesses. | Software will map the location of the receptor. |

## 6.3 Offsite Sensitive Receptors

RMP requirements state that sensitive populations such as schools, hospitals, day-care centers, long-term health care facilities, prisons, residential areas, public use parks/recreational areas, and major commercial facilities, located within the "at risk" area must be identified. These sensitive populations include individuals who could not remove themselves from the exposure area without assistance. The sensitive populations also include industrial installations which may have a hazardous process that cannot be immediately left unattended. According to the EPA's General Risk Management Plan Guidance [9], "The basic test for identifying a public receptor is thus whether an area is a place where it is reasonable to expect that members of the public will routinely gather at least some of the time… Roads and parking lots are not included as such in the definition of 'public receptor.' Neither are places where people typically gather; instead, they are used to travel from one place to another or to park a vehicle while attending an activity elsewhere." Table 10 shows a summary of offsite population receptors and offsite environmental receptors for isopentane, within the circle of concern as determined by the worst-case and alternative release scenarios.

**Table 10: Summary of Sensitive and Environmental Receptors**

| RECEPTOR | WCS (0.052 MI) | ARS (0.032 MI) |
|---|---|---|
| **Population Receptors** | | |
| Schools | No | No |
| Residences | No | No |
| Hospitals | No | No |
| Prisons/Correction Facilities | No | No |
| Recreation Areas | No | No |
| Major Commercial, Office, or Industrial Areas | No | No |
| Child Daycare | No | No |
| Long-term Health Care (e.g., convalescent homes) | No | No |
| Other (Government Buildings) | No | No |
| **Environmental Receptors** | | |
| National or State Parks, Forests, or Monuments | No | No |
| Officially Designated Wildlife Sanctuaries, Preserves, or Refuges | No | No |
| Federal Wilderness Areas | No | No |
| Other (Landmark & Indian Reservations) | No | No |

# 7.0 WORST-CASE RELEASE AND ALTERNATIVE RELEASE SCENARIO SUMMARY

The following sections outlines a summary of the parameters used for the one worst case release scenario and the one alternative release scenario analyzed for the Heber 2 Repower project.

## 7.1 Worst-Case Scenario

The worst-case scenario evaluated the release of the entire contents of one of the new 10,000-gallon isopentane storage vessels, containing 9,000 gallons of isopentane. The following table provides a summary of the parameters used for the worst-case scenario and the corresponding inputs.

**Table 3: Worst-Case Scenario Parameter/Input Summary**

| Worst-Case Scenario | |
|---|---|
| Chemical | Isopentane |
| Model Used | ALOHA |
| Scenario | Vapor Cloud Explosion |
| Quantity Released (gal) | 9,000 gallons |
| Endpoint Used | Overpressure of 1 psi |
| Distance to Endpoint | 92 yd / 276 ft / 0.052 mi |
| Estimated Residential Population within Distance to Endpoint (numbers) | 0 |
| Public Receptors within Distance to Endpoint | |
| Schools | No |
| Residences | No |
| Hospitals | No |
| Prison/Correctional Facilities | No |
| Recreational Areas | No |
| Major Commercial, Office, or Industrial Areas | No |
| Other | None |

| Worst-Case Scenario | |
|---|---|
| Environmental Receptors within Distance to Endpoint | |
| National or State Parks, Forests, or Monuments | No |
| Officially Designated Wildlife Sanctuaries, Preserves or Refuges | No |
| Federal Wilderness Area | No |
| Other | No |
| Passive Mitigation Considered | |
| Secondary Containment Area | Yes |
| Other | No |

## 7.2 Alternative Release Scenario

It was determined that a release due to a break in the isopentane transfer hose connection during truck loading, was the most likely release scenario due to human factors associated with manned transfer operations, as well as reliability issues in industry related to hose degradation and coupling failures. The following table provides a summary of the parameters that were used for alternative release scenario and the corresponding inputs.

**Table 4: Alternative Release Scenario Parameter/Input Summary**

| Alternative Release Scenario | |
|---|---|
| Chemical | Isopentane |
| Model Used | ALOHA |
| Scenario | Vapor Cloud Explosion |
| Quantity Released | 46,260 lbs. |
| Endpoint Used | Overpressure of 1 psi |
| Distance to Endpoint | 57 yd / 171 ft / 0.032 mi |
| Estimated Residential Population within Distance to Endpoint (numbers) | 0 |

| **Alternative Release Scenario** | |
|---|---|
| Public Receptors within Distance to Endpoint | |
| Schools | No |
| Residences | No |
| Hospitals | No |
| Prison/Correctional Facilities | No |
| Recreational Areas | No |
| Major Commercial, Office, or Industrial Areas | No |
| Other | None |
| Environmental Receptors within Distance to Endpoint | |
| National or State Parks, Forests, or Monuments | No |
| Officially Designated Wildlife Sanctuaries, Preserves or Refuges | No |
| Federal Wilderness Area | No |
| Other | No |
| Passive Mitigation Considered | |
| Secondary Containment Area | Yes |
| Other | No |
| Active Mitigation Considered | |
| Sprinkler Systems | No |
| Deluge Systems | No |
| Water Curtain | No |
| Excess Flow Valve | No |
| Other | No |

## 8.0 FIVE YEAR ACCIDENT HISTORY

There have been no applicable CalARP/RMP/PSM releases of isopentane at the facility within the last five years, therefore, this section is not applicable.

## 9.0 REFERENCES

1. Code of Federal Regulations (CFR), Title 40, Chapter I, Subchapter C, Part 68, Subpart B, Sections 68.20 to 68.42, "Hazard Assessment"; 2015, January 1.
2. California Code of Regulations (CCR), Title 19, Division 2, Chapter 4.5, Article 4, Sections 2750.1 to 2750.9, "Hazard Assessment"; 2015, January 1.
3. Areal Locations of Hazardous Atmospheres - ALOHA Version 5.4.7, U.S. Environmental Protection Agency, September 2016. http://www2.epa.gov/cameo/aloha-software
4. Risk Management Program Guidance for Offsite Consequence Analysis, U.S. Environmental Protection Agency, March 2009.
5. MARPLOT® 5.1.1 Mapping Software (internet download), National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency. http://www.epa.gov/osweroe1/content/cameo/marplot.htm. December 2017.
6. Weather History for KIPL (Imperial County Station), Weather Underground, May 11, 2020, https://www.wunderground.com/history/monthly/us/ca/imperial/KIPL
7. Google ™ Earth, version 7.3.2.5776, Google, Inc. (2019)
8. Google ™ Maps, Google, Inc. (2019)
9. General Risk Management Program Guidance – Chapter 2: Applicability of Program Levels, U.S. Environmental Protection Agency, April 2004.

# APPENDIX A

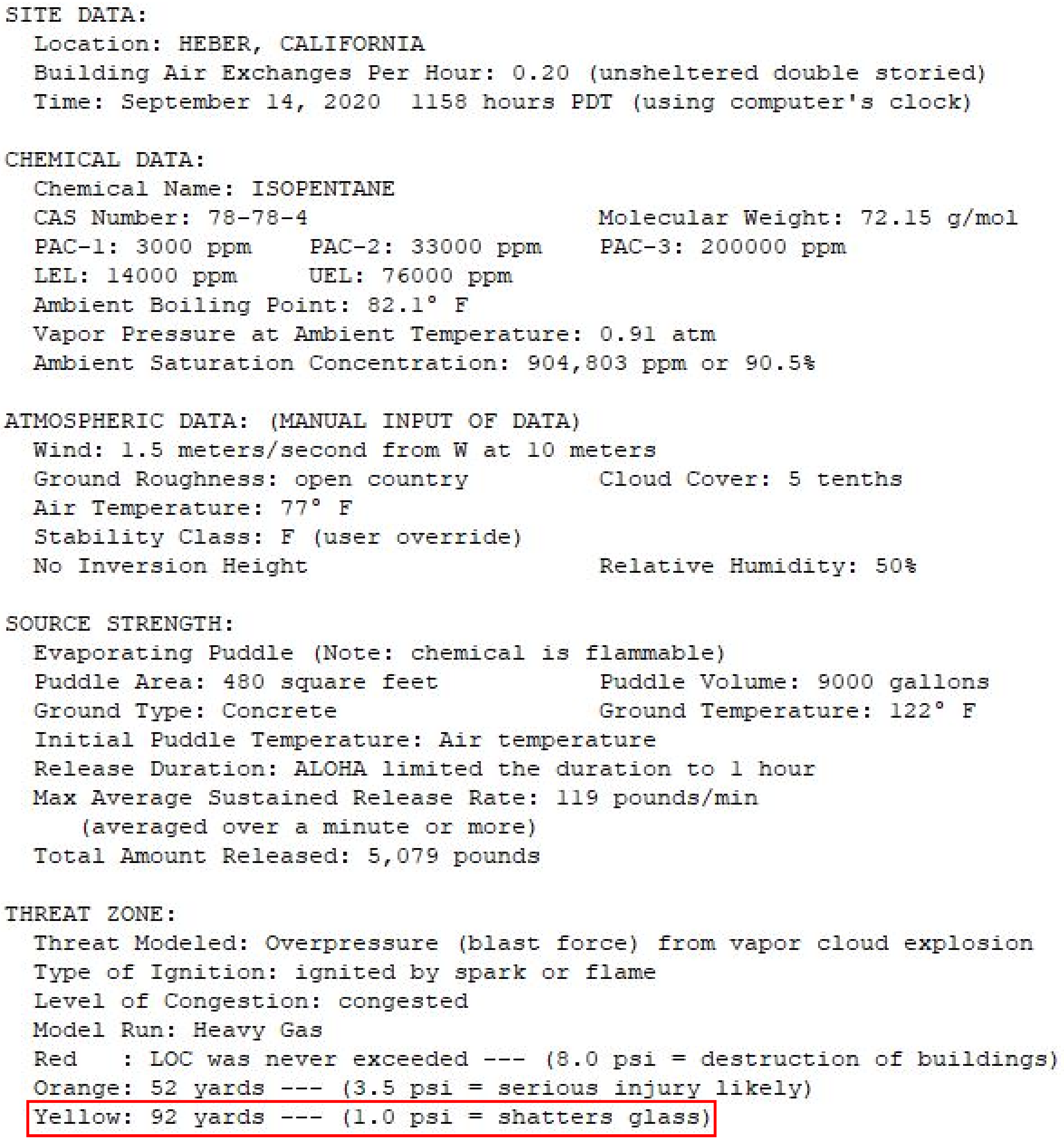
# WORST-CASE SCENARIO CALCULATIONS

## WORST-CASE SCENARIO (WCS)

The selected worst-case release scenario analyzes the hypothetical rupture of any one of the 10,000-gallon isopentane vessel, introduced as part of the Heber 2 facility's Repower project. Any one vessel can store up to 9,000 gallons of isopentane, taking into account administrative controls, which are in place to limit the quantity stored in each tank. Per requirement of the EPA rule for flammable substances, it was assumed that the whole quantity is released. The entire quantity is released into the secondary containment area, which is credited as a passive mitigation measure, to form an evaporating puddle, for which the vapors form a vapor cloud. If this vapor cloud ignited, the resultant blast could generate overpressure damage. The secondary containment area dimensions are 40 ft length, 12 ft width, 3.5 ft depth (surface area = 480 ft$^2$), and it assumed the secondary containment area ground type is concrete.

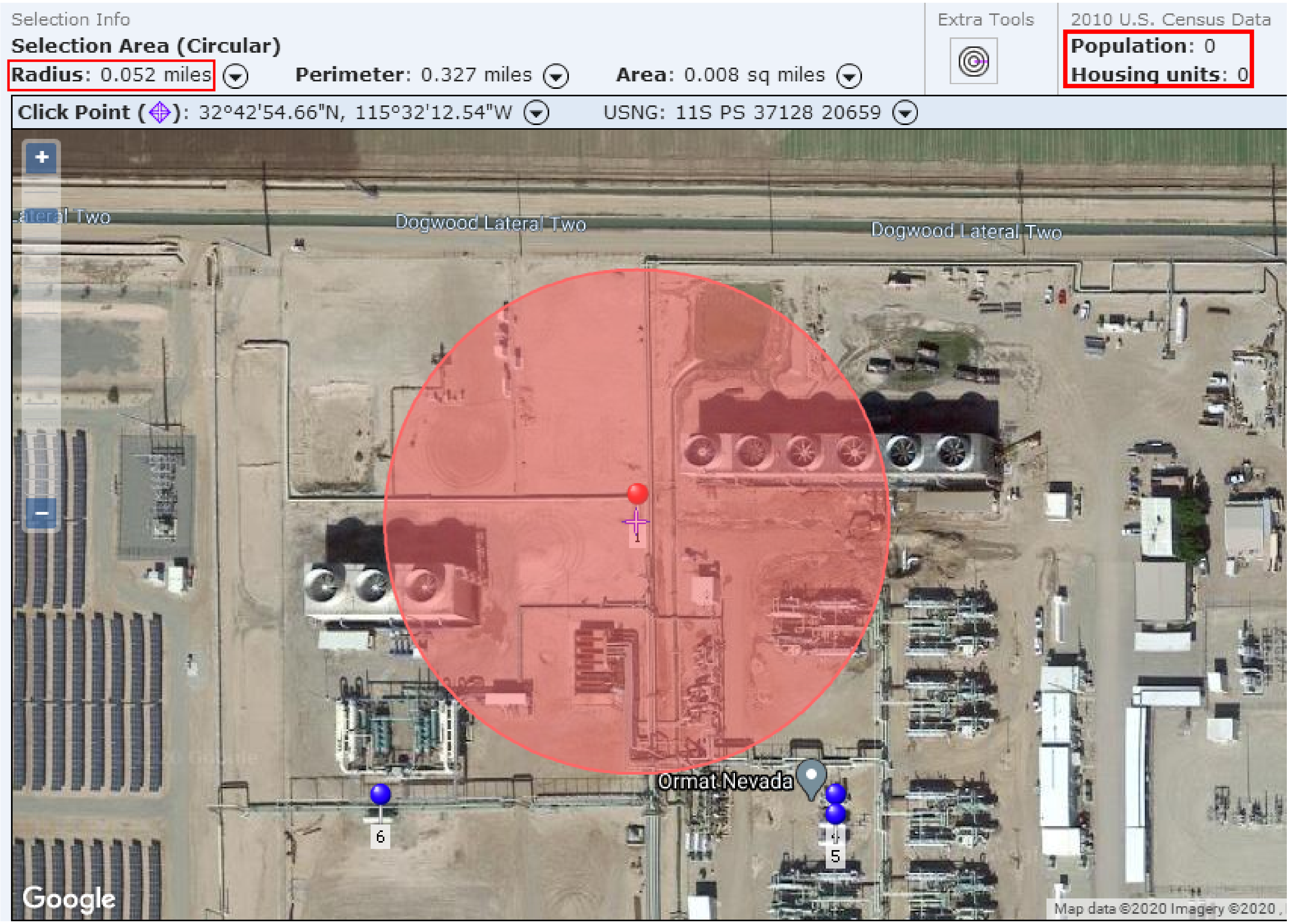
The ALOHA modeling calculation predicts that the area impacted by the endpoint, which is an overpressure of 1 psi, is a circle with approximately a 92-yard radius (276 ft / 0.052 mi). According to MARPLOT 5.1.1, there are 0 residents and 0 housing units within this vulnerability zone for all three vessels. The table and figures on the following pages illustrate the scenario modeling parameter summary, scenario circle for the release, the ALOHA modeling output, as well as the MARPLOT results. These figures demonstrate Ormat's strategic placement of new storage vessels, showing that one explosion and release of all isopentane contents would not affect the other. Each of the new vessels are at least 184 yards (twice the radius of concern) from one another and do not reach any of the three existing vessels.

## Figure 5: WCS ALOHA Modeling Results



```
SITE DATA:
  Location: HEBER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.20 (unsheltered double storied)
  Time: September 14, 2020  1158 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: ISOPENTANE
  CAS Number: 78-78-4                     Molecular Weight: 72.15 g/mol
  PAC-1: 3000 ppm    PAC-2: 33000 ppm    PAC-3: 200000 ppm
  LEL: 14000 ppm     UEL: 76000 ppm
  Ambient Boiling Point: 82.1° F
  Vapor Pressure at Ambient Temperature: 0.91 atm
  Ambient Saturation Concentration: 904,803 ppm or 90.5%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 1.5 meters/second from W at 10 meters
  Ground Roughness: open country          Cloud Cover: 5 tenths
  Air Temperature: 77° F
  Stability Class: F (user override)
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Area: 480 square feet            Puddle Volume: 9000 gallons
  Ground Type: Concrete                   Ground Temperature: 122° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 119 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 5,079 pounds

THREAT ZONE:
  Threat Modeled: Overpressure (blast force) from vapor cloud explosion
  Type of Ignition: ignited by spark or flame
  Level of Congestion: congested
  Model Run: Heavy Gas
  Red   : LOC was never exceeded --- (8.0 psi = destruction of buildings)
  Orange: 52 yards --- (3.5 psi = serious injury likely)
  Yellow: 92 yards --- (1.0 psi = shatters glass)
```

## Figure 6: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #1



Selection Info

**Selection Area (Circular)**

**Radius:** 0.052 miles **Perimeter:** 0.327 miles **Area:** 0.008 sq miles

Extra Tools

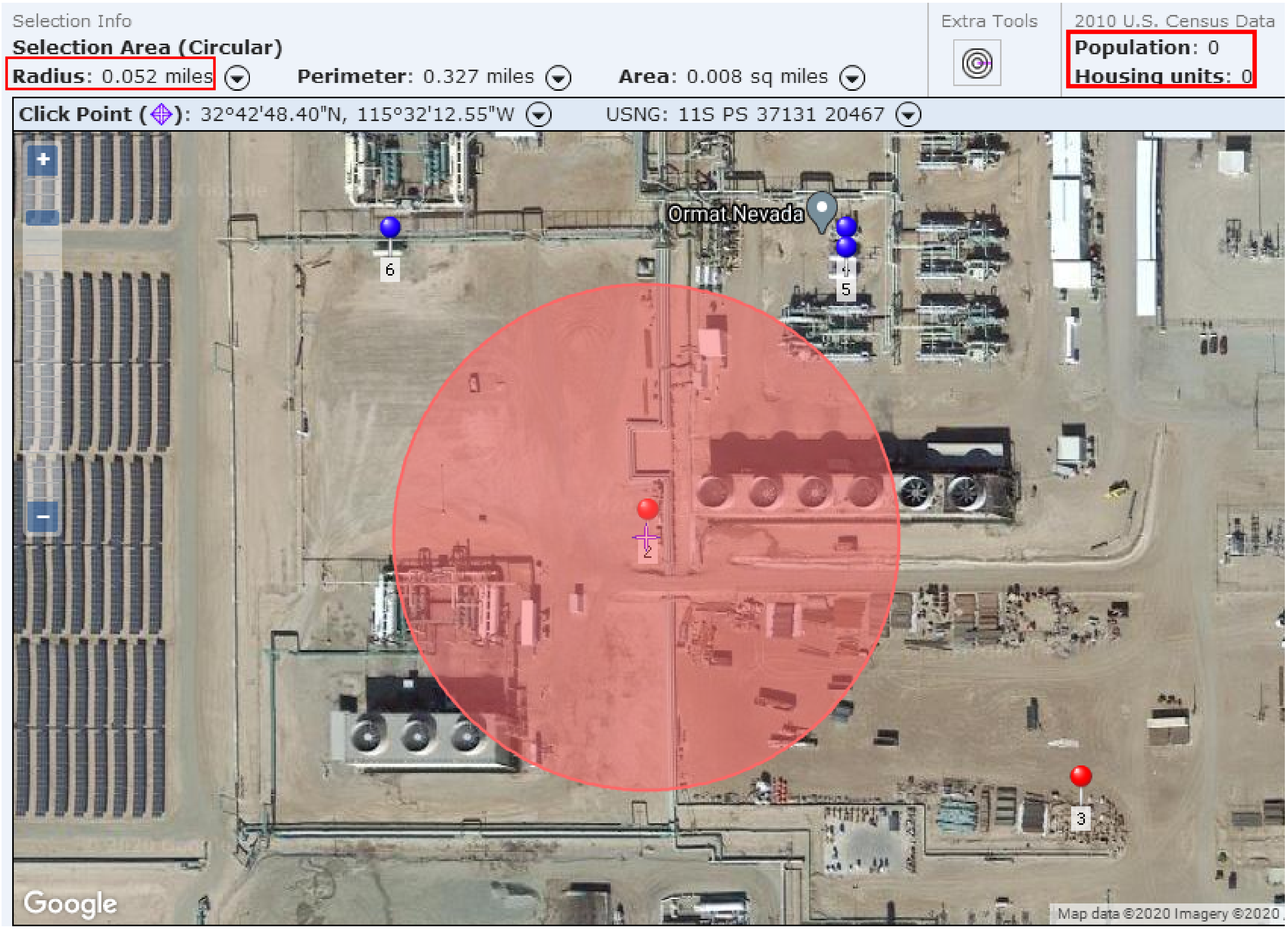
2010 U.S. Census Data

**Population:** 0

**Housing units:** 0

**Click Point** (⌖): 32°42'54.66"N, 115°32'12.54"W USNG: 11S PS 37128 20659

**Figure 7: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2**



Selection Info

**Selection Area (Circular)**

**Radius:** 0.052 miles

**Perimeter:** 0.327 miles

**Area:** 0.008 sq miles

2010 U.S. Census Data

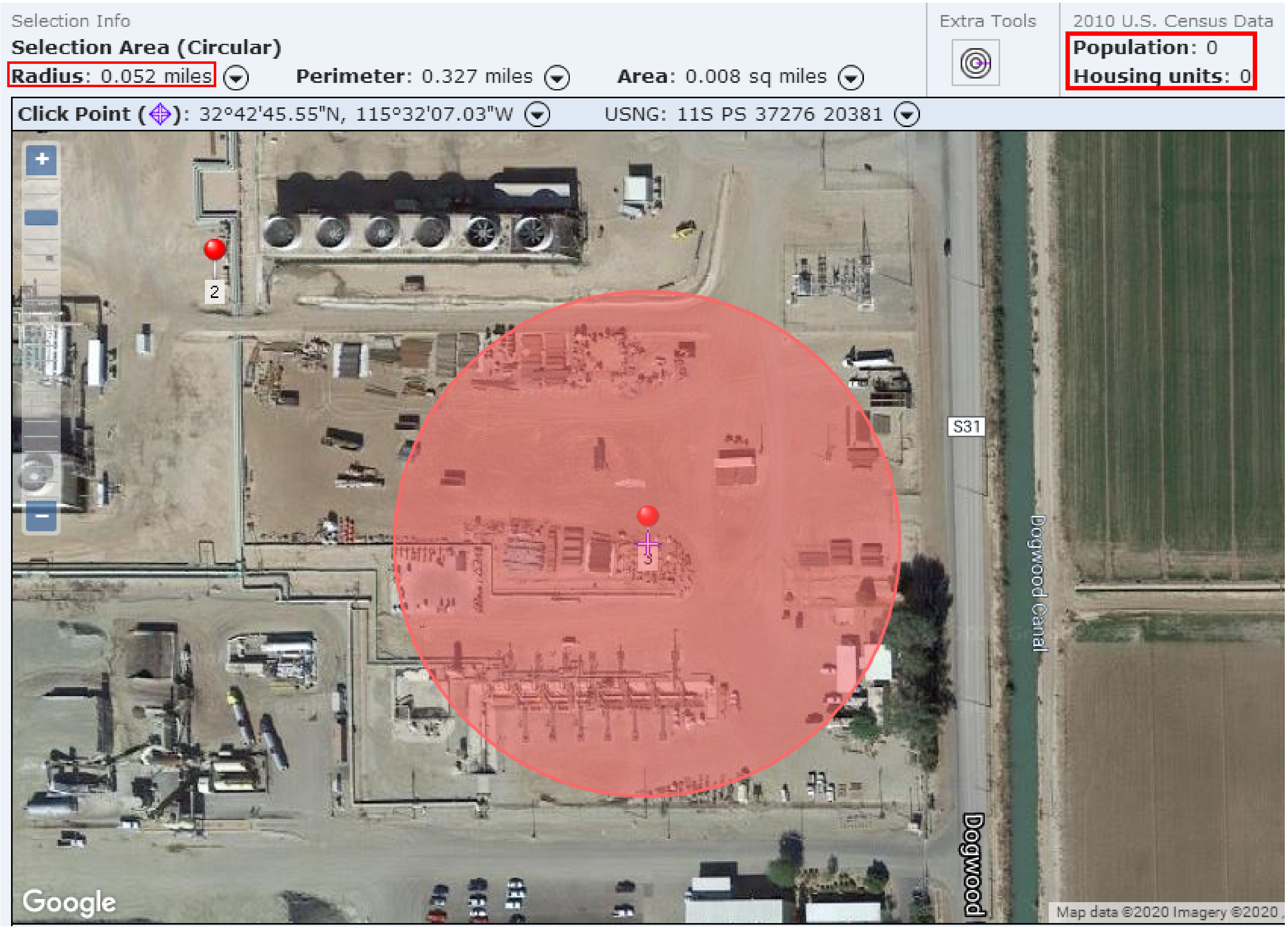
**Population:** 0

**Housing units:** 0

**Click Point:** 32°42'48.40"N, 115°32'12.55"W

USNG: 11S PS 37131 20467

## Figure 8: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3



Selection Info

**Selection Area (Circular)**

**Radius**: 0.052 miles **Perimeter**: 0.327 miles **Area**: 0.008 sq miles

Extra Tools

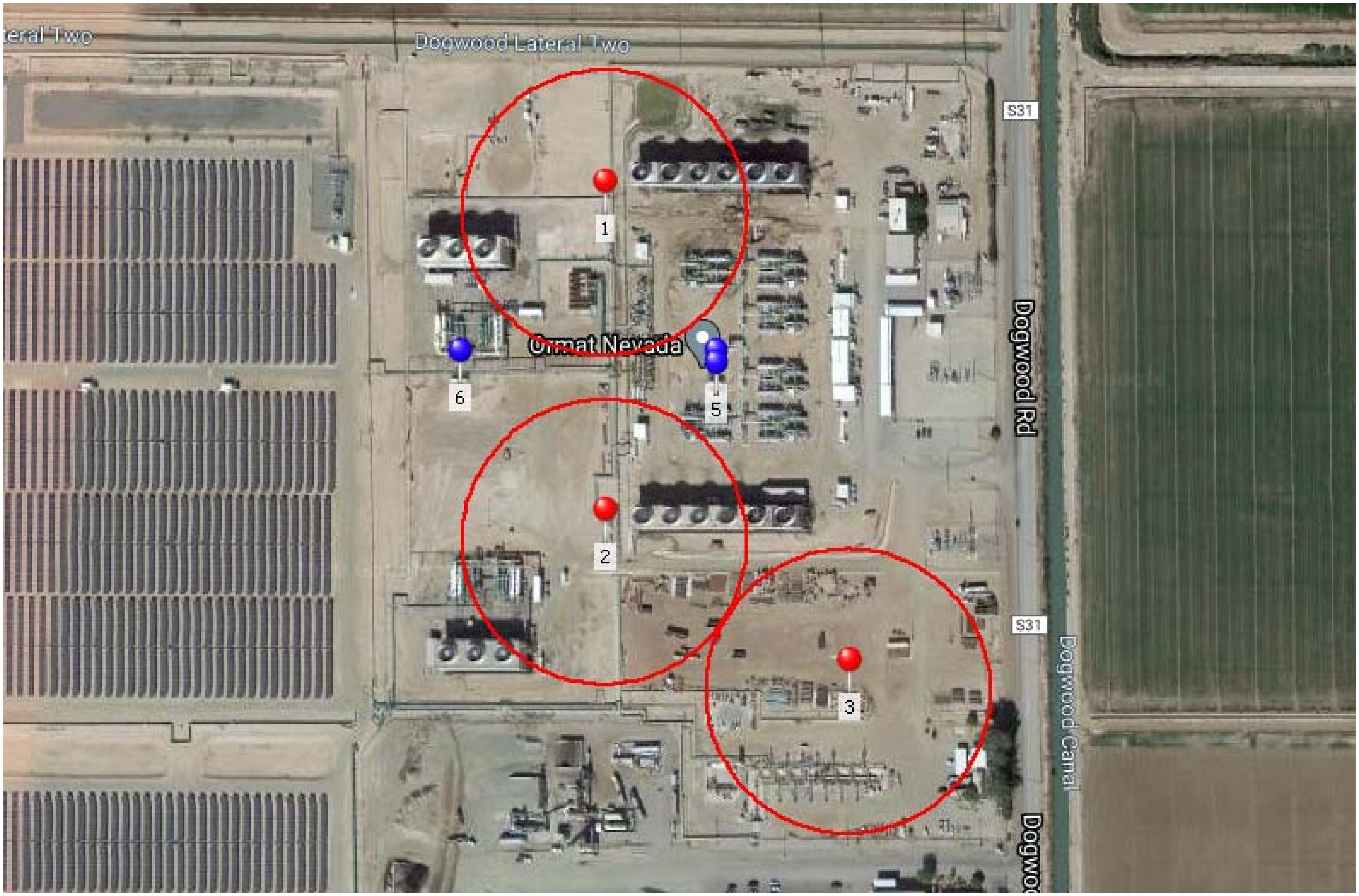
2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'45.55"N, 115°32'07.03"W USNG: 11S PS 37276 20381

## Figure 9: WCS Vulnerability Maps Overlaid for Isopentane Storage Vessels #1, #2, #3



EEC ORIGINAL PKG

# APPENDIX B

# ALTERNATIVE SCENARIO CALCULATIONS

## ALTERNATIVE RELEASE SCENARIO (ARS)

The selected alternative release scenario is a release due to a break in the product (isopentane) transfer hose connection during truck loading. This was considered the most likely release scenario due to human factors associated with manned transfer operations, as well as reliability issues in industry related to hose degradation and coupling failures. It is assumed that the transfer hose uncouples during isopentane transfer operations and that it is released through an area of 12.6 square inches based on the transfer hose size.. The release duration is limited by the volume in the Isopentane Storage Vessel (9,000 gallons), which is 2.4 minutes. In the evaluations of this alternative release scenario, the concrete secondary containment area composed was credited as a mitigation measure.

In order to calculate the release quantity for a transfer hose rupture, the release rate through the transfer hose must be calculated. The following equation, obtained from the EPA Risk Management Plan Guidance for Offsite Consequence Analysis, illustrates the calculation of the release rate for flammable liquids under pressure through a transfer hose:

$$QR = A_h \times 6.82\sqrt{\frac{11.7}{DF^2} \times LH + \frac{669}{DF} \times P_g}$$

Where:

- QR = Release rate (lbs./min)
- $A_h$= Hole or puncture area (square inches)
- DF = Density Factor, dimensionless, obtained from the EPA Risk Management Plan Guidance for Offsite Consequence Analysis
- LH = Height of liquid level above hole (inches)
- $P_g$ = Gauge pressure of the vessel (psig)

To calculate the release rate utilizing the above equation, the values for each of the following variables were calculated for isopentane:

## Hole Area

The transfer hose used in isopentane filling operations at both plants is 4 inches in diameter. Thus, the hole area is based upon the transfer hose rupturing and calculated using the following:

$$HA = \pi r^2 = 12.6 \text{ in}^2$$

## Density Factor

The Density Factors are obtained from Appendix C of the EPA Risk Management Plan Guidance for Offsite Consequence Analysis. The Density Factor value for isopentane is 0.79.

## Liquid Height

The height of the liquid level above the hole is determined by the nominal liquid level in the vessel. The isopentane transfer point is taken to be at the bottom of the tank. Assuming that the isopentane storage vessel is 33% full of isopentane, this equates to 2,970 gallons being stored in the vessel (397 ft$^3$). This is a conservative assumption as the storage tanks are normally empty and are only used for temporary storage of isopentane. According to the available tank data provided by the facility, the diameter of the Isopentane Storage Vessel is approximately 8 feet and length is 33.5 feet (tangent to tangent length). It should be noted that the Isopentane Storage Vessel is a horizontal vessel. In calculating the height of the liquid column within the tank, the Isopentane Storage Vessel was modeled as a cylinder, and thus the equation for volume of liquid within the tank is that of a horizontal cylinder. The equations below were used to find the height of the liquid column within the Isopentane Storage Vessel:

$$V_L = A_L \times L$$

$$A_L = R^2 \cos^{-1}\left(\frac{R - LH}{R}\right) - (R - LH)\sqrt{2R \cdot LH - LH^2}, \qquad \therefore$$

$$V_L = L \times \left[R^2 \cos^{-1}\left(\frac{R - LH}{R}\right) - (R - LH)\sqrt{2R \cdot LH - LH^2}\right]$$

Where:

$V_L$ = Volume of liquid within the Tank (ft$^3$)

$A_L$ = Area of liquid (ft$^2$)

R = Radius of the Tank (ft.)

L = Length of the Tank (ft.)

LH = Height of the liquid within the Tank (ft.)

Values for each variable listed in the equations above are provided below, with the exception of LH, as this is the variable to be calculated:

$V_L$ = 2,970 gallons = 397 $ft^3$

R = 4 ft.

L = 33.5 ft.

By using the above values within the equation, the height of the liquid column within the Isopentane Storage Vessel can be calculated, which is approximately 2.3 ft (2.2857 ft) or 27.6 inches.

## Pressure

The normal operating pressure of the isopentane motive fluid storage tank was identified to be 60 psig.

## Modeling

Using these values, the release rate of isopentane can be determined. Please see the calculations below for determining the isopentane release rate:

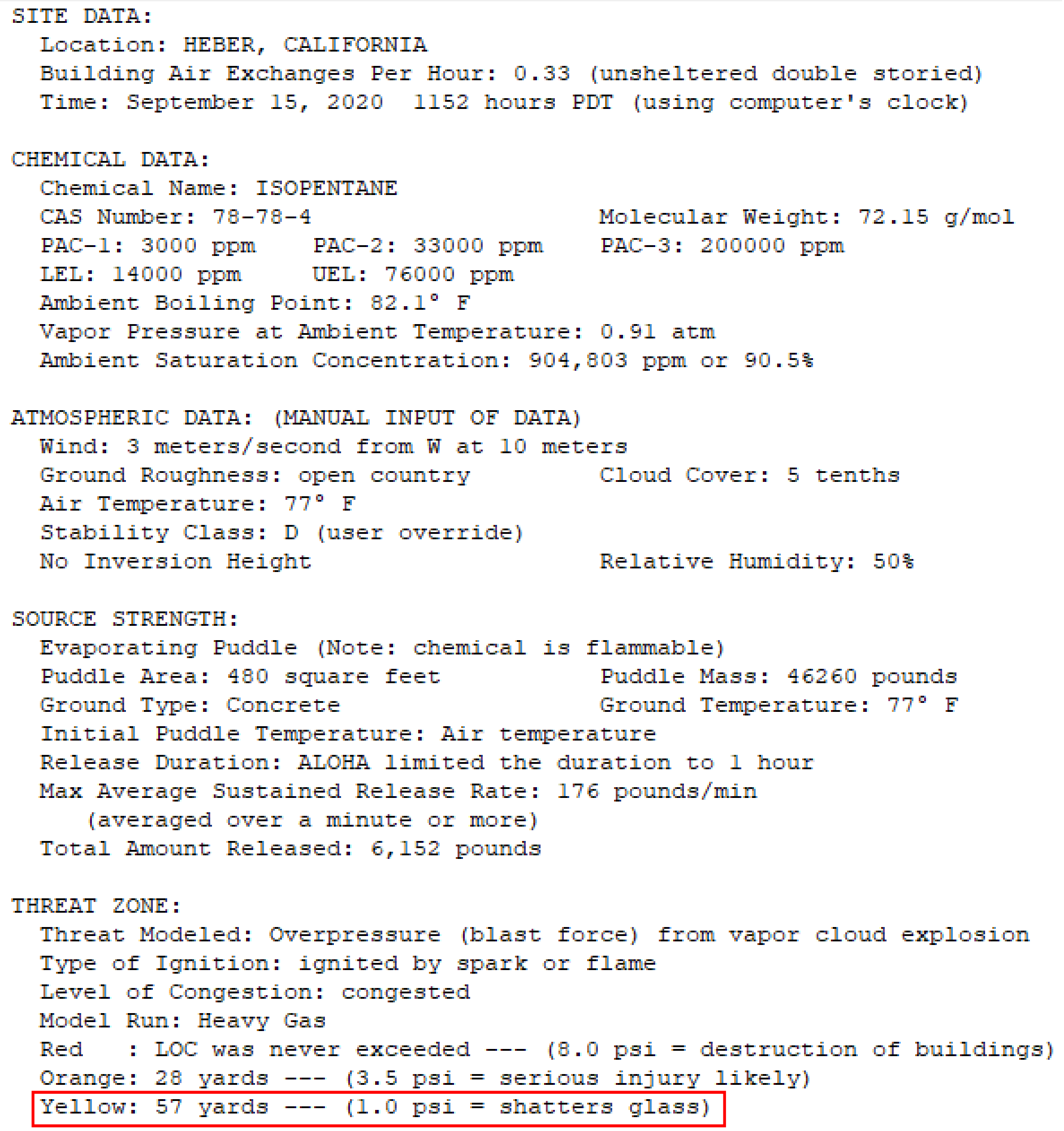
$$QR = 12.6\, in^2 \times 6.82 \sqrt{\frac{11.7}{(0.79^2)} \times 27.6\, in + \frac{669}{0.79} \times 60\, psig}$$

$$QR = 19{,}468.3955\, \frac{lbs.}{min} \approx 19{,}468\, \frac{lbs.}{min}$$

Over the 2.4 minute release period, this results in a total of 46,260 lbs. released to the secondary containment area to form an evaporating puddle, for which the vapors form a vapor cloud. If this vapor cloud ignited, the resultant blast could generate overpressure damage.

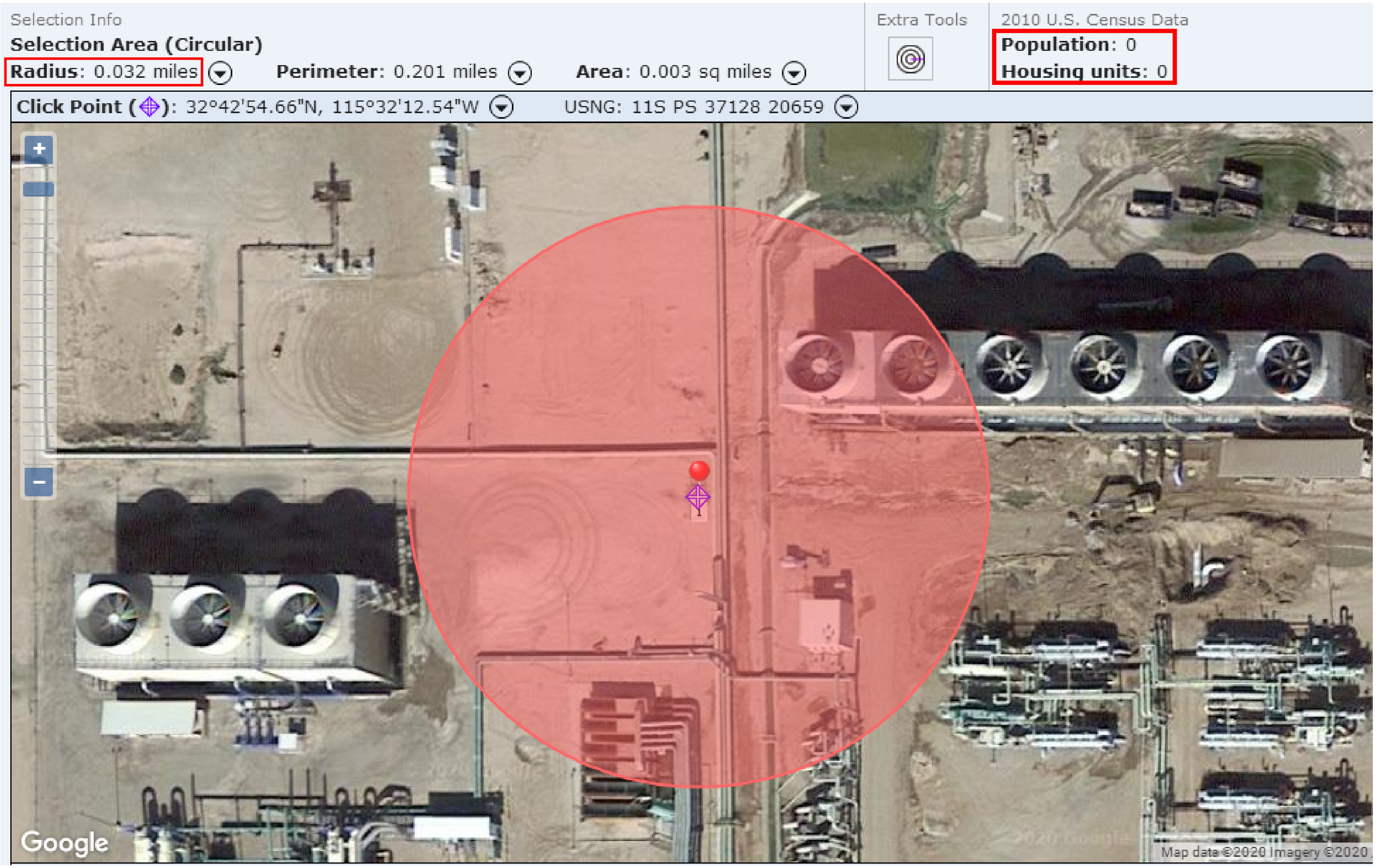
The ALOHA modeling calculation predicts that the area impacted by the endpoint, which is overpressure of 1 psi, is a circle with approximately a 57-yard radius (171 ft / 0.032 mi). According to MARPLOT 5.1.1, there are 0 residents and 0 housing units within this vulnerability zone for all three vessels. The table and figures on the following pages illustrate the scenario modeling parameter summary, scenario circle for the release, the ALOHA modeling output, as well as the MARPLOT results.

## Figure 10: ARS ALOHA Modeling Results



```
SITE DATA:
  Location: HEBER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.33 (unsheltered double storied)
  Time: September 15, 2020  1152 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: ISOPENTANE
  CAS Number: 78-78-4                     Molecular Weight: 72.15 g/mol
  PAC-1: 3000 ppm    PAC-2: 33000 ppm     PAC-3: 200000 ppm
  LEL: 14000 ppm     UEL: 76000 ppm
  Ambient Boiling Point: 82.1° F
  Vapor Pressure at Ambient Temperature: 0.91 atm
  Ambient Saturation Concentration: 904,803 ppm or 90.5%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from W at 10 meters
  Ground Roughness: open country          Cloud Cover: 5 tenths
  Air Temperature: 77° F
  Stability Class: D (user override)
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Area: 480 square feet            Puddle Mass: 46260 pounds
  Ground Type: Concrete                   Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 176 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 6,152 pounds

THREAT ZONE:
  Threat Modeled: Overpressure (blast force) from vapor cloud explosion
  Type of Ignition: ignited by spark or flame
  Level of Congestion: congested
  Model Run: Heavy Gas
  Red   : LOC was never exceeded --- (8.0 psi = destruction of buildings)
  Orange: 28 yards --- (3.5 psi = serious injury likely)
  Yellow: 57 yards --- (1.0 psi = shatters glass)
```

## Figure 11: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #1



**Selection Area (Circular)**

**Radius**: 0.032 miles

**Perimeter**: 0.201 miles

**Area**: 0.003 sq miles

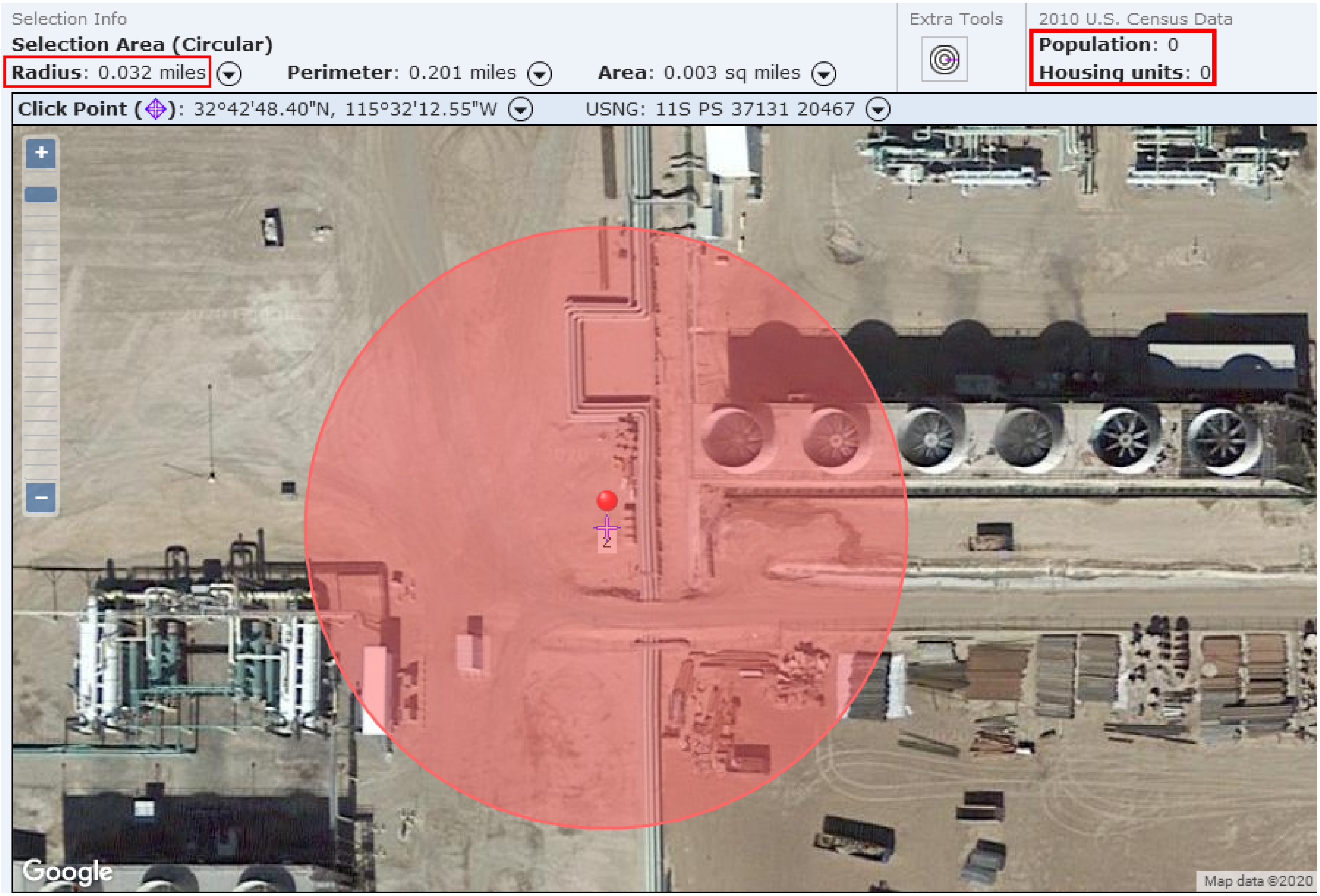
**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'54.66"N, 115°32'12.54"W

USNG: 11S PS 37128 20659

Figure 12: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2



Selection Info

**Selection Area (Circular)**

**Radius**: 0.032 miles **Perimeter**: 0.201 miles **Area**: 0.003 sq miles

Extra Tools

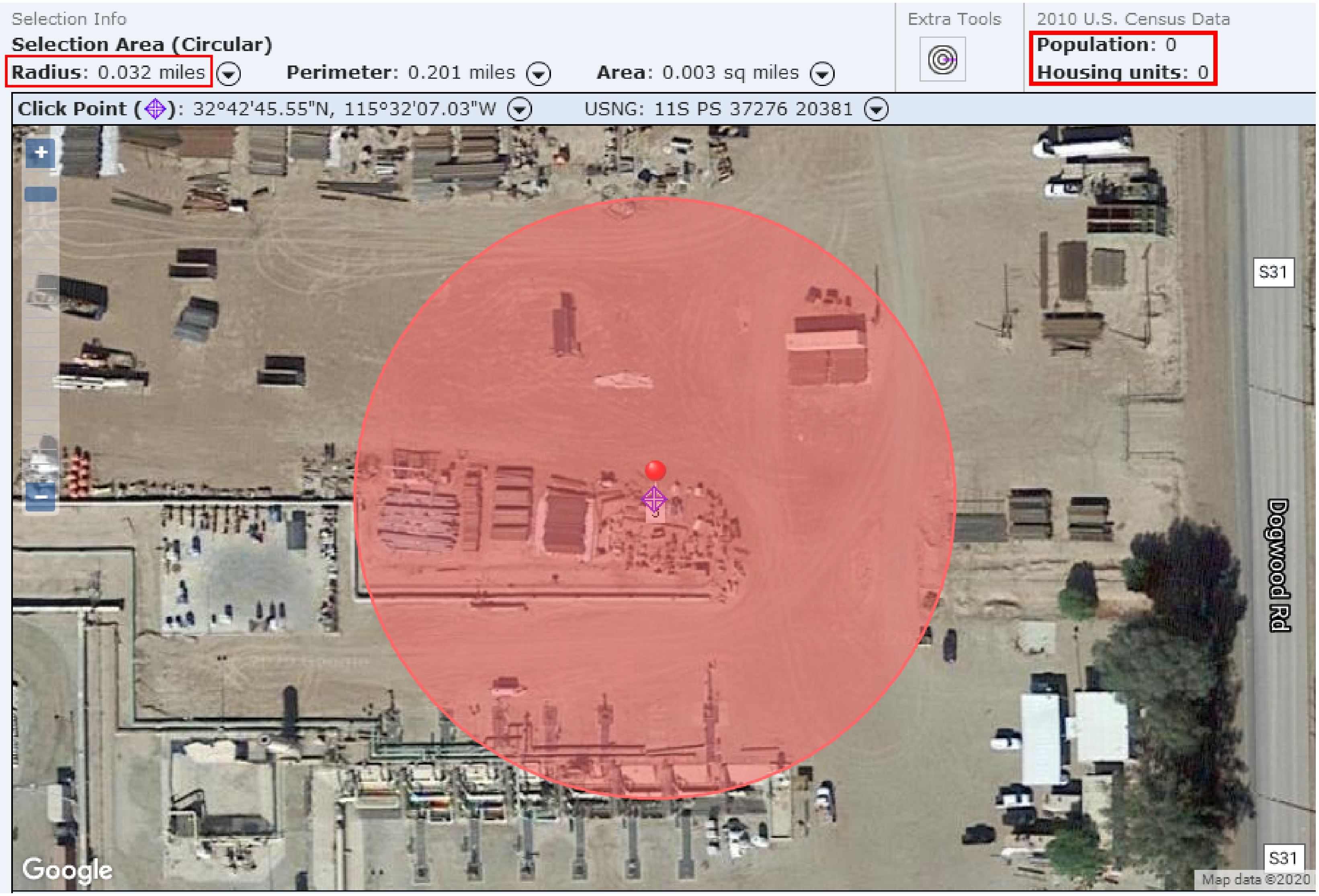
2010 U.S. Census Data

**Population**: 0

**Housing units**: 0

**Click Point** (⌖): 32°42'48.40"N, 115°32'12.55"W USNG: 11S PS 37131 20467

**Figure 9: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3**



Selection Info

**Selection Area (Circular)**

**Radius:** 0.032 miles

**Perimeter:** 0.201 miles

**Area:** 0.003 sq miles

Extra Tools

2010 U.S. Census Data

**Population:** 0

**Housing units:** 0

**Click Point (⌖):** 32°42'45.55"N, 115°32'07.03"W

USNG: 11S PS 37276 20381

# Attachment D

# California Department of Conservation Concurrence

Catalyst
ENVIRONMENTAL SOLUTIONS

EEC ORIGINAL PKG

**From:** Welty, Curtis@DOC [mailto:Curtis.Welty@conservation.ca.gov]
**Sent:** Wednesday, July 22, 2020 10:27 AM
**To:** Melissa Wendt <mwendt@ORMAT.COM>
**Subject:** Heber 2 Repower Project

Dear Melissa,

On June 23rd, you sent an email (below) to Charlene Wardlow concerning a review of CEQA documents and the possibility of a letter of review for those documents. Your request eventually made its way to me.

As Charlene noted in her reply to you, we usually get notices about these CEQA documents through the State Clearinghouse and our CEQA staff in Sacramento does a preliminary review and sends a request for comment to the district office (me, in this case) if there is the possibility of issues that CalGEM might want to make comment on.

I reviewed the document that Ben Pogue linked in another email. From that review, I see that the proposed work will take place within the main area of the existing facility and that there are no wells in that area. Since CalGEM's basic responsibility is all about wells, there appears to be no probable impact related to wells for the Heber 2 Repower Project.

Thank you and if you have any questions about this matter please contact me

Take care,

**Curtis M. Welty, PG**
Associate Oil and Gas Engineer
California Geologic Energy Management Division
Southern District

**California Department of Conservation**
3780 Kilroy Airport Way, Suite 400
Long Beach, CA 90806
T: (562) 637-4410
C: (714) 294-4396
E: curtis.welty@conservation.ca.gov

EEC ORIGINAL PKG

# Attachment E

# Air Quality Memorandum

Catalyst
ENVIRONMENTAL SOLUTIONS

EEC ORIGINAL PKG

TECHNICAL MEMORANDUM

# HEBER 2 REPOWER PROJECT AIR EMISSIONS ADDITIONAL INFORMATION

**PREPARED FOR:** Melissa Wendt, Ormat
**PREPARED BY:** Joel Firebaugh, Air Sciences Inc.
**PROJECT NO.:** 346-2-1
**COPIES:** Ben Pogue, Catalyst Environmental Solutions
**DATE:** September 24, 2020

This memorandum includes additional information regarding the Heber 2 Re-Power Project (Project) air emissions not included in the Application for Authority to Construct submitted to Imperial County Air Pollution Control District in November 2019 or in the Air Sciences memo "Air Quality Analysis Summary for the ORMAT Heber 2 Re-Power Project" dated August 12, 2019. The following sections discuss emissions from construction activities, greenhouse gas emissions, and historical actual emissions.

## 1.0 Construction Emissions

Construction activities for the Project are expected to last up to eight months. Heavy construction equipment, including semi-truck trailers, flatbed trucks, excavators/bulldozers, roller, and a crane will be used at the Project site. Smaller powered equipment, such as drills, compressors, and welding equipment will also be used. Construction activities will be limited to 7:00am through 7:00pm.

The total Project disturbance is approximately 2.5 acres, entirely within the existing Heber 2 site. The Project site was developed and graded during the original construction of the Heber 2 facilities in 1992, and its current condition is exposed soil and gravel. To ensure the proposed facilities are situated on safe and stable surfaces, minor excavation and compaction activities will be performed. Fugitive dust emissions due to construction activities will be negligible. Water will be applied during excavation and compaction with sufficient frequency to minimize emissions. Construction vehicles will be limited to five miles per hour on unpaved surfaces and water will be applied to minimize vehicle fugitive dust emissions.

Air emissions from construction will be caused by fuel combustion by the construction equipment. A summary of construction emissions is presented in Table 1. Detailed construction emission calculations are included in the updated emission inventory provided with this memorandum.

**Table 1. Construction Emissions Summary (hourly and total tons for the Project)**

| | PM | | NOX | | CO | | SO2 | | VOC | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **lb/hr** | **tons** | **lb/hr** | **tons** | **lb/hr** | **tons** | **lb/hr** | **tons** | **lb/hr** | **tons** |
| Fuel Combustion | 0.35 | 0.51 | 5.47 | 7.99 | 4.93 | 7.20 | 0.008 | 0.011 | 1.03 | 1.50 |

## 2.0 Greenhouse Gas Emissions

The Project is expected to emit only small amounts of greenhouse gases (GHG) from construction activities and operations. GHG emissions during construction will come from fuel combustion by the construction equipment. GHG emissions from operations are generated by emergency diesel engines. Note that the proposed changes at Heber 2 do not affect GHG emissions from operations. The existing and proposed geothermal power generating units do not burn fuel and do not emit GHG. Table 2 provides a summary of GHG emissions from the Project, in units of tons per year of carbon dioxide equivalent ($CO_2$e). Detailed GHG emission calculations are included in the updated emission inventory provided with this memorandum.

**Table 2. Greenhouse Gas Emissions Summary**

| **Project Phase** | **$CO_2$e tons per year[1]** |
|---|---|
| Construction | 982 |
| Operations | 42 |

[1] The listed GHG emissions for construction are the total estimated emissions, in tons, for the duration of the 8-month construction phase of the project.

## 3.0 Historical Actual Emissions of Isopentane

The isopentane emissions increase for the Project was calculated based on the worst-case estimated future potential to emit and the previous two years of actual emissions data for the facility. The worst-case quarter from the historical actual emissions data was used as the baseline emissions case for comparison with the worst-case future potential to emit to calculate the emissions increase.

The emissions increase has been recalculated in Table 3 below, this time using the two-year average isopentane emissions from the historical actual data as the baseline emissions case.

**Table 3. Isopentane Emissions Increase**

| | Facility Total Isopentane Emissions | |
|---|---|---|
| | **lb / day** | **tons / year** |
| Historical Actual Emissions (Average 2017-2018) | 62.6 | 14.9 |
| Future Potential Emissions | 59.7 | 10.9 |
| Emissions Increase | -3.0 | -4.0 |

The emissions increase shown in Table 3 is negative, which indicates an expected decrease in potential isopentane emissions from the Project.

| | | |
|---|---|---|
| **Air Sciences Inc.** | PROJECT TITLE:<br>Ormat Heber 2 | BY:<br>J. Firebaugh |
| | PROJECT NO:<br>346-2 | PAGE: 1 OF: 4 SHEET: Emis_Calcs |
| AIR EMISSION CALCULATIONS | SUBJECT:<br>2019 Re-Power Emissions | DATE:<br>September 24, 2020 |

**Ormat Heber 2: 2019 Re-Power Project - Facility-Wide Air Emissions Summary**

**Facility-wide Daily Emissions Estimate (lbs/day)**

| Emission Source | PM | PM$_{10}$ | PM$_{2.5}$ | NO$_X$ | CO | SO$_2$ | VOC[1] | Isopentane[1] |
|---|---|---|---|---|---|---|---|---|
| OECs + Motive Fluid Tanks | | | | | | | 59.7 | 59.7 |
| Cooling Towers | 76.9 | 9.2 | 9.2 | | | | | |
| Diesel Engines[2] | 1.3 | 1.3 | 1.3 | 29.0 | 5.6 | 0.016 | 3.7 | |
| Facility Total Emissions | 78 | 10.5 | 10.5 | 29.0 | 5.6 | 0.016 | 63.3 | 59.7 |

[1] Isopentane emissions are reported separately, but they are also included in the VOC emission estimate.

[2] Daily diesel engine emissions are based on one hour per day for maintenance and testing.

**Facility-wide Annual Emissions Estimate (tons/year)**

| Emission Source | PM | PM$_{10}$ | PM$_{2.5}$ | NO$_X$ | CO | SO$_2$ | VOC* | Isopentane* |
|---|---|---|---|---|---|---|---|---|
| OECs + Motive Fluid Tanks | | | | | | | 10.9 | 10.9 |
| Cooling Towers | 14.0 | 1.7 | 1.7 | | | | | |
| Diesel Engines | 0.027 | 0.027 | 0.027 | 0.63 | 0.11 | 3.6E-4 | 0.068 | |
| Facility Total Emissions | 14.1 | 1.7 | 1.7 | 0.63 | 0.11 | 3.6E-4 | 11.0 | 10.9 |

*Isopentane emissions are reported separately, but they are also included in the VOC emission estimate.

**Emissions Increase - Isopentane**

| | Facility Total Isopentane Emissions | |
|---|---|---|
| | *lbs/day* | *tons/year* |
| Previous Actual Emissions (average 2017-2018) | 62.6 | 14.9 |
| Projected Actual Emissions | 59.7 | 10.9 |
| Increase | -3.0 | -4.0 |

**Isopentane Permitted Emission Limits - (Purging, Fugitive and Maintenance)**

| | Current Permit | Proposed Limits |
|---|---|---|
| | *lbs/day* | *lbs/day* |
| 1st Quarter | 185 | 171 |
| 2nd Quarter | 137 | 137 |
| 3rd Quarter | 137 | 137 |
| 4th Quarter | 218 | 202 |

| | | |
|---|---|---|
| **Air Sciences Inc.** | PROJECT TITLE: Ormat Heber 2 | BY: J. Firebaugh |
| | PROJECT NO: 346-2 | PAGE: 2 OF: 4 SHEET: Emis_Calcs |
| **AIR EMISSION CALCULATIONS** | SUBJECT: 2019 Re-Power Emissions | DATE: September 24, 2020 |

## Isopentane Emission Calculations

### Emission Units

| OEC / ITLU | Rating (MW, each) | # of Units | Gross Power *MW (total)* | MF Volume* *gallons (total)* | GF Flow Rate* *gal/hr* | Permitting Status |
|---|---|---|---|---|---|---|
| Heber 2 | 6 | 6 | 36.0 | 72,000 | | Will be shut down and replaced by new OEC-1 and OEC-2 |
| Goulds 2 | 10 | 1 | 10.0 | 22,500 | | Existing - no change |
| Heber South | 12 | 1 | 12.0 | 25,500 | | Existing - no change |
| OEC-1 | 14.01 | 1 | 14.0 | 35,000 | 12,200 | New unit |
| OEC-2 | 25.43 | 1 | 25.4 | 28,000 | 12,200 | New unit |
| MF Tanks | Size (gal, each) | | | *gallons (total)* | | |
| Existing | 10,000 | 3 | | 30,000 | | Existing - no change |
| New | 10,000 | 3 | | 30,000 | | New tanks |

** MF is motive fluid (isopentane) and GF is geothermal fluid (brine)*

### Actual Isopentane Emissions (Previous 2 Years)

| | | Maintenance | | Purging | | Fugitive | | Facility Total | |
|---|---|---|---|---|---|---|---|---|---|
| | # of days | *gallons* | *lbs/day* | *gallons* | *lbs/day* | *gallons* | *lbs/day* | *lbs/day* | *tons/year* |
| 2017 - 1st Qtr | 90 | 300 | 17.2 | 0.02 | 0.001 | 1,636 | 94.1 | 111.3 | |
| 2017 - 2nd Qtr | 91 | 240 | 13.6 | 0.04 | 0.002 | 123 | 7.0 | 20.7 | |
| 2017 - 3rd Qtr | 92 | 400 | 22.5 | 0.05 | 0.003 | 1,616 | 90.9 | 113.4 | |
| 2017 - 4th Qtr | 92 | 100 | 5.6 | 0.02 | 0.001 | 1,337 | 75.2 | 80.8 | 14.9 |
| 2018 - 1st Qtr | 90 | 0 | 0.0 | 0.00 | 0.000 | 0 | 0.0 | 0.0 | |
| 2018 - 2nd Qtr | 91 | 0 | 0.0 | 0.00 | 0.000 | 0 | 0.0 | 0.0 | |
| 2018 - 3rd Qtr | 92 | 400 | 22.5 | 0.06 | 0.003 | 1,688 | 95.0 | 117.5 | |
| 2018 - 4th Qtr | 92 | 250 | 14.1 | 0.02 | 0.001 | 770 | 43.3 | 57.4 | 8.0 |

Isopentane Density

620 mg/ml

0.00835 (lb/gal)/(mg/ml)

5.17 lb/gal

### Site-Specific Isopentane Emission Factor Calculation

| Previous 2 Years Emissions | Basis | Isopentane Emissions *lbs/day* | *tons/year* | Existing Isopentane Volume *gallons* | Units Included | Calculated Site-Specific Emission Factor |
|---|---|---|---|---|---|---|
| Maintenance | worst-case quarter | 11.9 | 2.7 | 120,000 | OECs | 0.10 *(lb/day)/1,000 gal MF* |
| Purging | worst-case quarter | 0.0034 | 0.0003 | 120,000 | OECs | 2.8E-5 *(lb/day)/1,000 gal MF* |
| Fugitive | worst-case quarter | 95.0 | 12.2 | 150,000 | OECs + MF tanks | 0.63 *(lb/day)/1,000 gal MF* |
| Total | | 106.9 | 14.9 | | | |

### Heber 2 Re-Power Isopentane Emission Estimate - After proposed changes

| OEC Units & MF Tanks | MF Volume (new) *gallons* | Emission Factor *(lb/day)/1,000 gal* | Expected Reduction Due to Fewer Emission Units | Isopentane Emissions *lbs/day* | *tons/year* | Change in Emissions *lbs/day* | *tons/year* |
|---|---|---|---|---|---|---|---|
| Maintenance | 111,000 | 0.10 | 50% | 5.5 | 1.0 | -6.4 | -1.7 |
| Purging | 111,000 | 2.8E-5 | 0% | 0.0 | 0.0 | 0.0 | 0.0 |
| Fugitive | 171,000 | 0.63 | 50% | 54.1 | 9.9 | -40.8 | -2.3 |
| Total | | | | 59.7 | 10.9 | -47.3 | -4.0 |

EEC ORIGINAL PKG

| | | |
|---|---|---|
| **Air Sciences Inc.** | PROJECT TITLE:<br>Ormat Heber 2 | BY:<br>J. Firebaugh |
| | PROJECT NO:<br>346-2 | PAGE: 3 OF: 4 SHEET: Emis_Calcs |
| AIR EMISSION CALCULATIONS | SUBJECT:<br>2019 Re-Power Emissions | DATE:<br>September 24, 2020 |

**Cooling Towers Emission Calculations (Existing - no change)**

| **Site Data** | | | Reference |
|---|---|---|---|
| Total solids in recirculating water | 3,950 | ppm | Heber 1 OEC-14 ATC Application |
| Water Density at 84.9 F | 8.31 | lb/gal | |
| Droplets larger than 10 μm | 88% | | Heber 1 OEC-14 ATC Application |
| Droplets larger than 2.5 μm | 88% | | Heber 1 OEC-14 ATC Application |

**Cooling Tower Emissions**

| | Water Flow | | PM | | $PM_{10}$ | | $PM_{2.5}$ | |
|---|---|---|---|---|---|---|---|---|
| Description | *gal/min* | Drift Rate | *lb/day* | *ton/yr* | *lb/day* | *ton/yr* | *lb/day* | *ton/yr* |
| 3-Cell Cooling Tower | 41,250 | 0.0010% | 19.50 | 3.56 | 2.340 | 0.43 | 2.340 | 0.43 |
| 3-Cell Cooling Tower | 41,250 | 0.0005% | 9.75 | 1.78 | 1.170 | 0.21 | 1.170 | 0.21 |
| 6-Cell Cooling Tower | 63,000 | 0.0008% | 23.82 | 4.35 | 2.859 | 0.52 | 2.859 | 0.52 |
| 6-Cell Cooling Tower | 63,000 | 0.0008% | 23.82 | 4.35 | 2.859 | 0.52 | 2.859 | 0.52 |
| Total | | | 76.9 | 14.0 | 9.23 | 1.7 | 9.23 | 1.7 |

| | | |
|---|---|---|
| **Air Sciences Inc.**<br>**AIR EMISSION CALCULATIONS** | PROJECT TITLE: Ormat Heber 2 | BY: J. Firebaugh |
| | PROJECT NO: 346-2 | PAGE: 4 OF: 4 SHEET: Emis_Calcs |
| | SUBJECT: 2019 Re-Power Emissions | DATE: September 24, 2020 |

## Diesel Engines Emission Calculations (Existing - no change)

### Diesel Engines

| Type | Engine Make & Model | Engine Power | Operating Hours | Emission Factors |
|---|---|---|---|---|
| Emergency Generator | Cummins KTA19G2 | 685 hp | 50 hrs/yr | AP-42 Table 3.4-1, Existing Permit Limits |
| Fire Pump | Detroit Diesel DDFP-L6AT-7017V | 305 hp | 35 hrs/yr | AP-42 Table 3.3-1 |
| Emergency Pump | John Deere 6090HF485 | 350 hp | 50 hrs/yr | EPA Certification Data |
| Fire Pump | Clarke JW6H-UF40 (John Deere 6081HF001) | 300 hp | 35 hrs/yr | CA Tier 2, Fire Pumps |

### Emission Factors

| Reference | PM | $PM_{10}$ | $PM_{2.5}$ | $NO_X$ | CO | $SO_2$ | VOC | Units |
|---|---|---|---|---|---|---|---|---|
| PTO #2217A-4 Emission Limits - Cummins KTA19G2 | | | | 14.3 | 1.5 | | | *lb/hr* |
| AP-42 Table 3.4-1 (Diesel engines >600hp) | 7.0E-4 | 7.0E-4 | 7.0E-4 | 0.024 | 0.0055 | 1.1E-5 | 7.1E-4 | *lb/hp-hr* |
| AP-42 Table 3.3-1 (Diesel engines <600hp) | 0.0022 | 0.0022 | 0.0022 | 0.031 | 0.0067 | 1.1E-5 | 0.0025 | *lb/hp-hr* |
| EPA Cert. Data for JD Family 6JDXL09.0102 | 0.10 | 0.10 | 0.100 | 3.5 | 0.50 | 0.0049 | 0.10 | *g/kW-hr* |
| CA Tier 2, Fire Pumps (300 ≤ hp < 600) | 0.15 | 0.15 | 0.15 | 4.8 | 2.6 | 0.0049 | 4.8 | *g/hp-hr* |

### $SO_2$ Emission Factor Calculation (mass balance):

$$\frac{7{,}000\text{ Btu}}{1\text{ hp-hr}} \left| \frac{1\text{ lb diesel}}{19{,}300\text{ Btu}} \right| \frac{15\text{ lb S}}{1{,}000{,}000\text{ lb diesel}} \left| \frac{1.998\text{ lb SO2}}{1\text{ lb S}} \right. = 1.09E-05\text{ lb }SO_2\text{/hp-hr}$$

Diesel Properties
15 ppm S (ULSD)
7.1 lb/gal (AP-42)
19,300 Btu/lb (AP-42)

Typical CI Engine BSFC (AP-42)
7,000 Btu/hp-hr

Units Conversions
1.341 hp/kW
453.592 g/lb
1.998 g $SO_2$/g S

### Diesel Engine Emissions - Daily (lbs/day)

| Type | Engine Make & Model | PM | $PM_{10}$ | $PM_{2.5}$ | $NO_X$ | CO | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|---|
| Emergency Generator | Cummins KTA19G2 | 0.5 | 0.5 | 0.5 | 14.3 | 1.5 | 0.0074 | 0.48 |
| Fire Pump | Detroit Diesel DDFP-L6AT-7017V | 0.7 | 0.7 | 0.7 | 9.5 | 2.0 | 0.0033 | 0.77 |
| Emergency Generator | John Deere 6090H | 0.1 | 0.1 | 0.1 | 2.0 | 0.29 | 0.0028 | 0.058 |
| Emergency Pump | Clarke JW6H-UF40 | 0.1 | 0.1 | 0.1 | 3.2 | 1.7 | 0.0024 | 2.4 |
| Total | | 1.3 | 1.3 | 1.3 | 29.0 | 5.6 | 0.016 | 3.7 |

*Daily diesel engine emissions are based on one hour per day for maintenance and testing.

### Diesel Engine Emissions - Annual (tons/year)

| Type | Engine Make & Model | PM | $PM_{10}$ | $PM_{2.5}$ | $NO_X$ | CO | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|---|
| Emergency Generator | Cummins KTA19G2 | 0.012 | 0.012 | 0.012 | 0.36 | 0.039 | 1.9E-4 | 0.012 |
| Fire Pump | Detroit Diesel DDFP-L6AT-7017V | 0.012 | 0.012 | 0.012 | 0.17 | 0.036 | 5.8E-5 | 0.013 |
| Emergency Generator | John Deere 6090H | 0.0014 | 0.0014 | 0.0014 | 0.050 | 0.0072 | 7.1E-5 | 0.0014 |
| Emergency Pump | Clarke JW6H-UF40 | 0.0017 | 0.0017 | 0.0017 | 0.056 | 0.030 | 4.3E-5 | 0.041 |
| Total | | 0.027 | 0.027 | 0.027 | 0.63 | 0.11 | 3.6E-4 | 0.068 |

EEC ORIGINAL PKG

# Attachment F

# CEQA Deskbook Reference Evaluation for Related Activities in a CEQA Document

Catalyst
ENVIRONMENTAL SOLUTIONS

EEC ORIGINAL PKG

Updates
available at
www.solano.com

# CEQA deskbook

## A STEP-BY-STEP GUIDE ON HOW TO COMPLY WITH THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

Third Edition

RONALD E. BASS | KENNETH M. BOGDAN | TERRY RIVASPLATA

## Figure 2-2. Evaluation of Related Activities in a CEQA Document
## Illustrative Case Examples

### When must related activities be evaluated in the same CEQA document?

**When "Action B" is a reasonably foreseeable consequence of "Action A"**

*Bozung v. Local Agency Formation Commission* (1975) 13 Cal. 3d 263 (successive government approvals for the same underlying project must be considered together); *Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal.3d 376 (future phases of a single building must be evaluated in the EIR on the first phase because they are foreseeable)

**When "Action B" is a future expansion of "Action A" and will be significant because it will likely change the scope, nature, and impacts of "Action A"**

*Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal.3d 376 (future phases of a single building must be evaluated in the EIR on the first phase because they will contribute to the project's impacts)

**When "Action A" cannot proceed without essential public services that would be provided by "Action B"**

*Santiago County Water District v. County of Orange* (1981) 118 Cal. App. 3d 818 (EIR on a mining project must include impacts of water delivery system to serve the project); *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1995) 27 Cal. App. 4th 713 (EIR on a housing project must include impacts of additional sewer capacity to serve the project)

**When "Action A" and "Action B" are integral parts of the same project**

*No Oil, Inc. v. City of Los Angeles* (1987) 196 Cal. App. 3d 223 (Pipelines to deliver oil must be evaluated in an EIR for an oil drilling project)

### When may related activities be deferred to a future CEQA document? *

**When "Action A" is being evaluated at a time when meaningful information about "Action B" is not capable of being obtained (e.g., is " remote and speculative")**

*No Oil, Inc. v. City of Los Angeles* (1987) 196 Cal. App. 3d 223 (information about pipeline locations was not yet available and did not have to be evaluated in an EIR on an oil drilling project)

**When information about "Action B" is not necessary to make an intelligent decision whether to proceed with "Action A"**

*No Oil, Inc. v. City of Los Angeles* (1987) 196 Cal. App. 3d 223 (detailed information about pipelines to deliver oil was not necessary for a decision to be made whether to approve an oil drilling project)

**When "Action A" is being evaluated in a first-tier EIR and "Action B" will be evaluated in a second-tier EIR.**

*Rio Vista Farm Bureau Center v. County of Solano* (1992) 5 Cal. App. 4th 351 (program EIR on hazardous waste management plan need not evaluate project-specific impacts of activities that will be subject to future, second-tier EIRs)

**When "Action A" merely establishes criteria for "Action B" but does not commit to its implementation**

*Rio Vista Farm Bureau Center v. County of Solano* (1992) 5 Cal. App. 4th 351 (EIR on hazardous waste management plan need not evaluate future facilities that might be developed under the plan)

**When "Action B" is independent of, and not a contemplated future part of, "Action A"**

*Christward Ministry v. County of San Diego* (1993) 13 Cal. App. 4th 31 (EIR for a proposed landfill expansion need not evaluate impacts of other solid waste projects in the county)

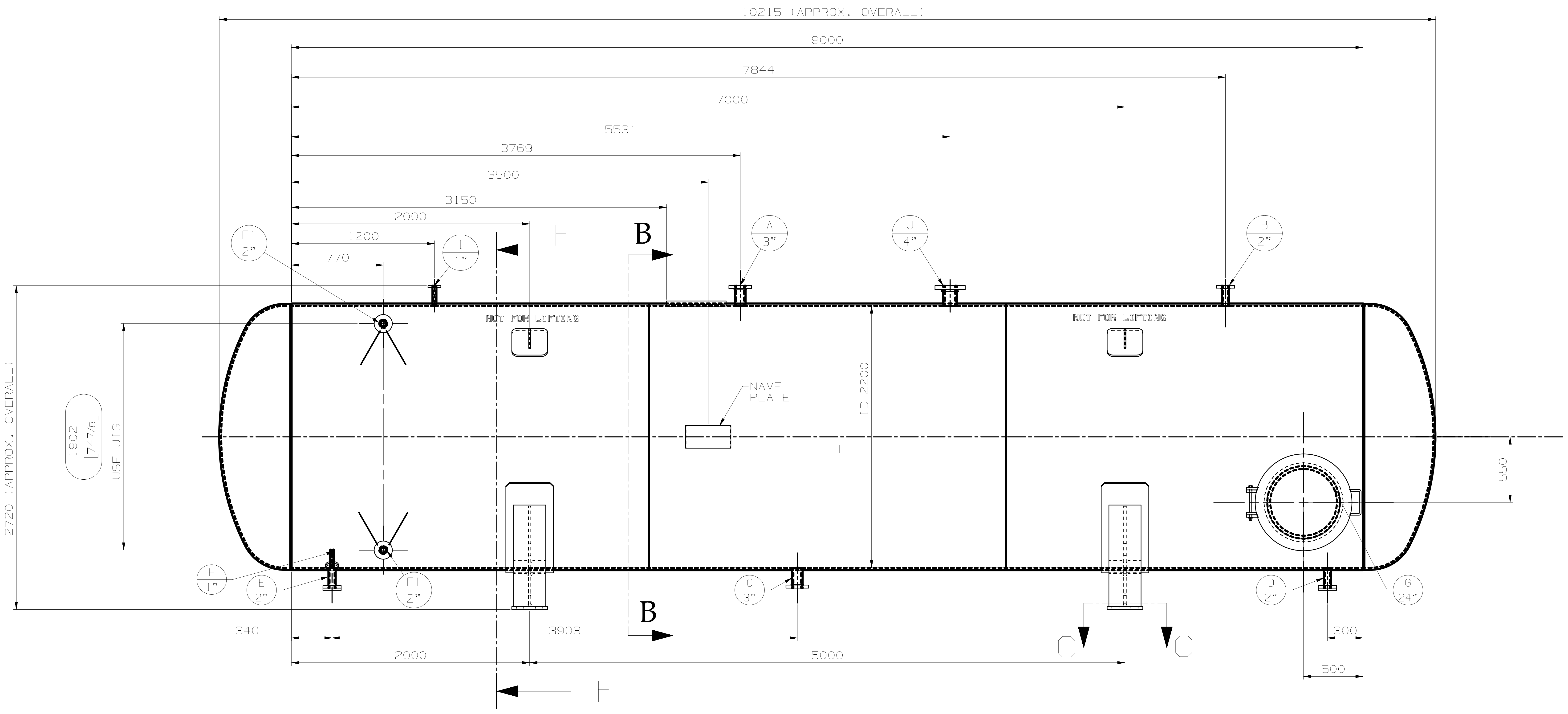
**When "Action A" is part of a large highway project with logical termination points and independent utility and does not foreclose consideration of alternatives**

*Del Mar Terrace Conservancy, Inc. v. City Council of the City of San Diego* (10 Cal. App 4th. 712) (EIR on 1.8 mile highway project was appropriate because it had independent use for local and state service even if no other phases were constructed)

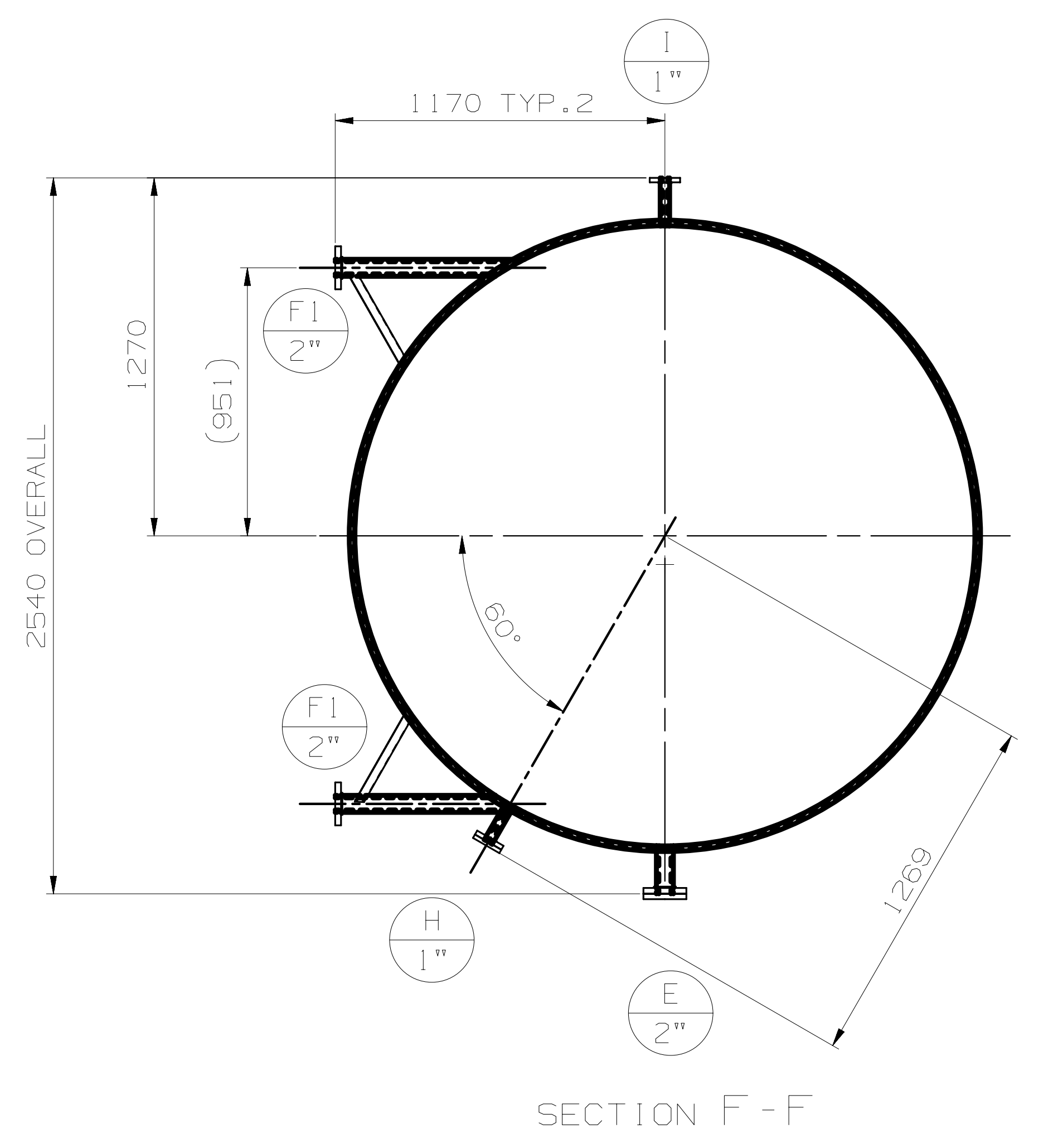
---

* **When a Lead Agency elects to exclude or limit the evaluation of related activities, it should include the following in the CEQA document:**

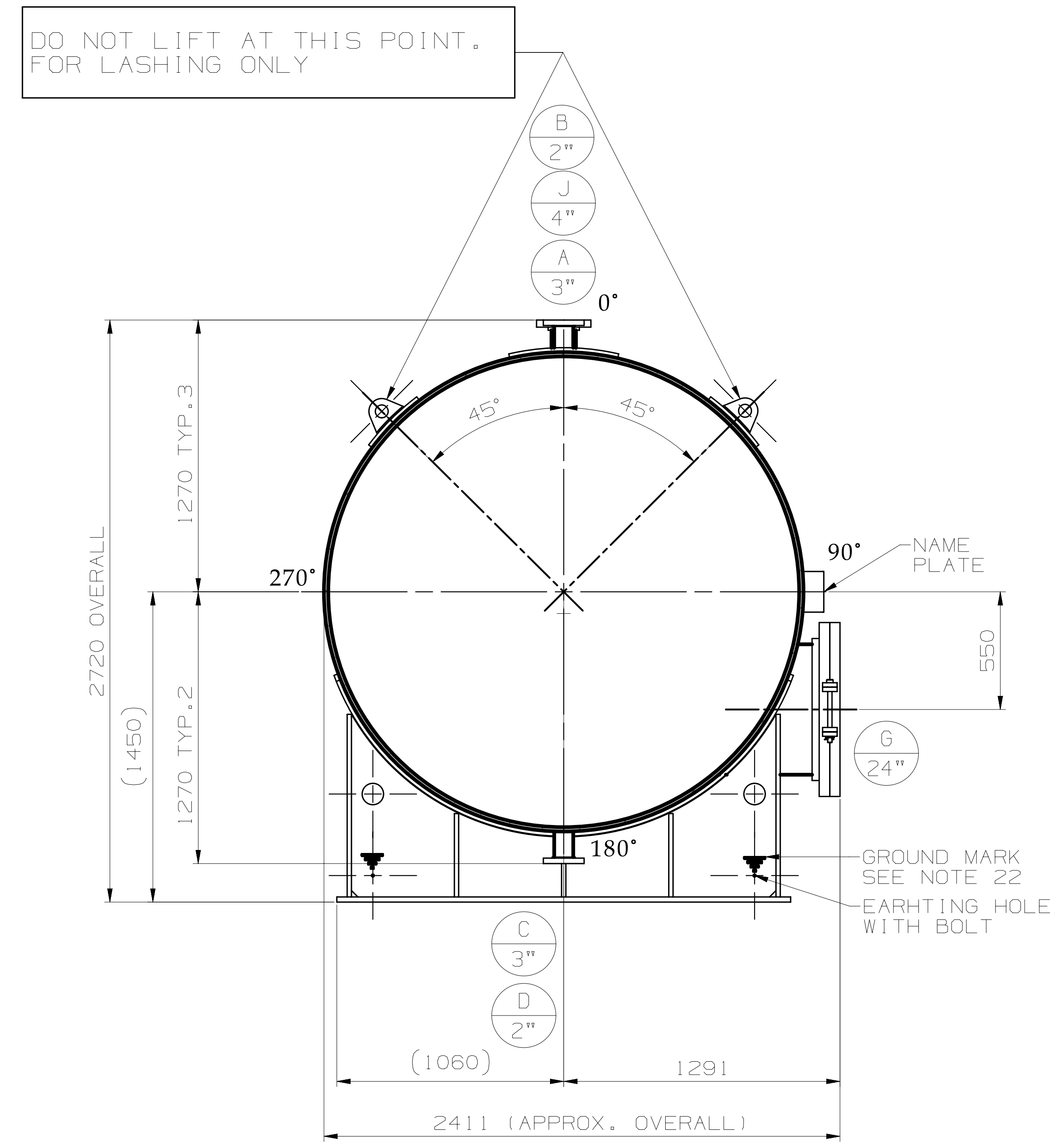
1) A description of the potential future activities and how they relate to the proposed project
2) A brief explanation of the types of impacts that those related actions might produce
3) A discussion of why it is not necessary or possible to evaluate the related actions at the current time
4) An explanation of when, and in what type of CEQA document, the related actions will be evaluated (e.g., second-tier EIR)



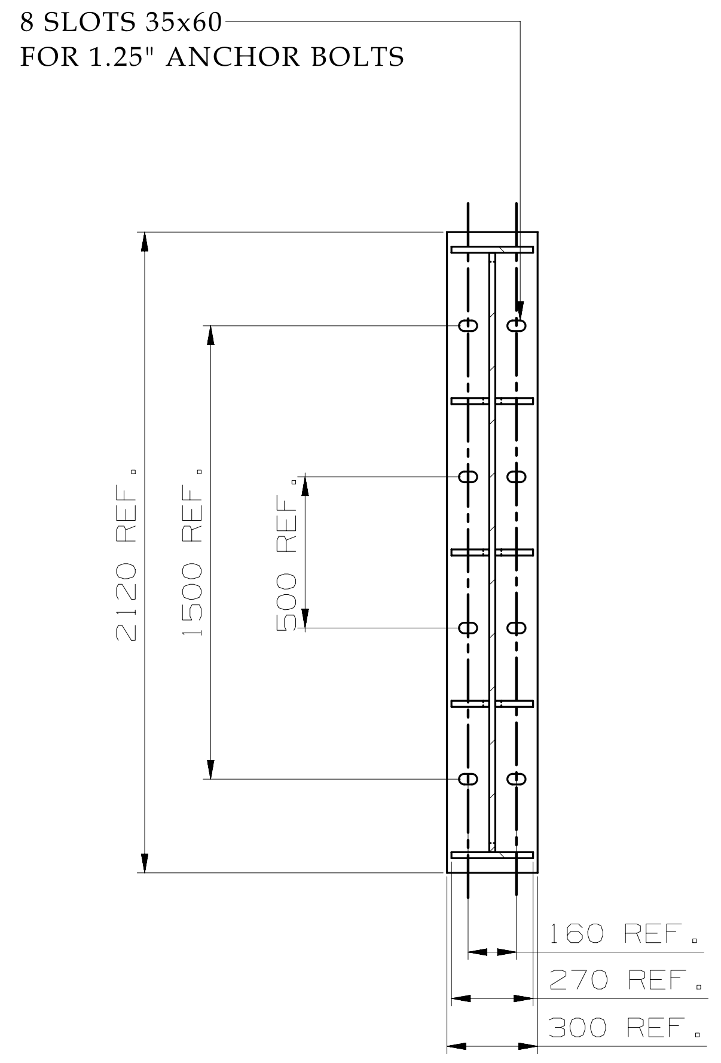
DO NOT LIFT AT THIS POINT.
FOR LASHING ONLY



SECTION F-F

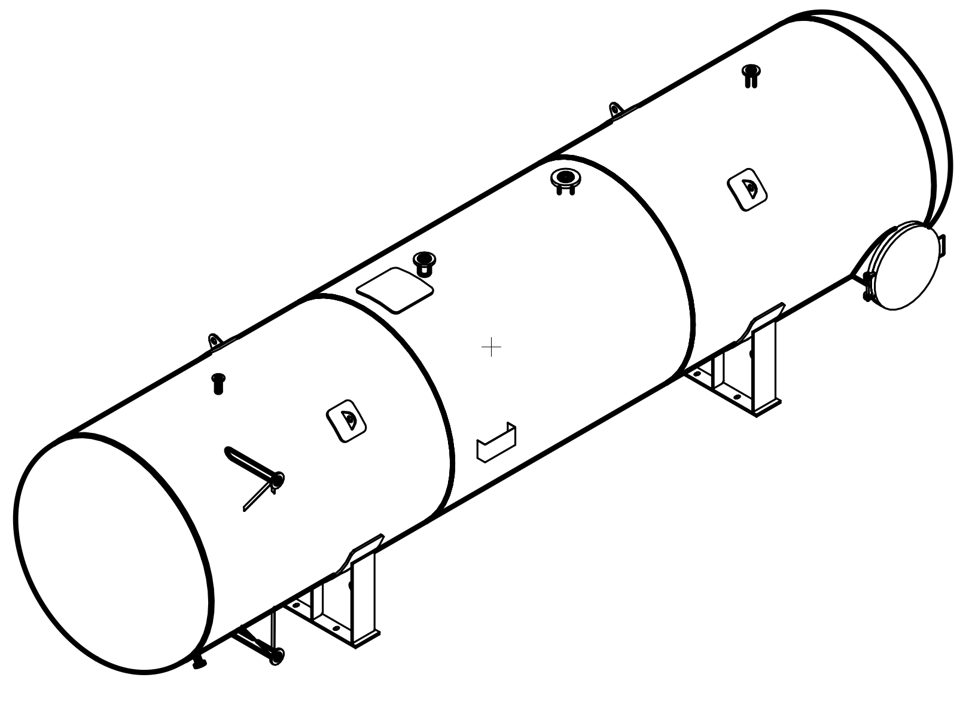


SECTION B-B



8 SLOTS 35x60
FOR 1.25" ANCHOR BOLTS

SECTION C-C
TYP.2



| J | 4" | 1 | SCH 160 (13.49mm) | S.O.R.F | 300# | LEVEL TRANSMITTER | |
|---|---|---|---|---|---|---|---|
| I | 1" | 1 | SCH 160 (8.74mm) | S.O.R.F | 150# | PRESSURE INDICATION | |
| H | 1" | 1 | SCH 160 (8.74mm) | S.O.R.F | 150# | TEMPERATURE INDICATOR | |
| G | 24" | 1 | SCH 80 (30.96mm) | S.O.R.F | 150# | MANHOLE | W/DAVIT |
| F2 | 2" | 1 | SCH 160 (8.74mm) | S.O.R.F | 150# | LEVEL GAUGE | |
| F1 | 2" | 1 | SCH 160 (8.74mm) | S.O.R.F | 150# | LEVEL GAUGE | |
| E | 2" | 1 | SCH 160 (8.74mm) | S.O.R.F | 150# | DRAIN | W/BLIND |
| D | 2" | 1 | SCH 160 (8.74mm) | S.O.R.F | 150# | DRAIN | W/BLIND |
| C | 3" | 1 | SCH 160 (11.13mm) | S.O.R.F | 150# | INLET/OUTLET | |
| B | 2" | 1 | SCH 160 (8.74mm) | S.O.R.F | 150# | PRESSURE EQUALIZATION | |
| A | 3" | 1 | SCH 160 (11.13mm) | S.O.R.F | 150# | RELIEF | |
| | SIZE | QTY. | NOZZLE NECK | TYPE | RATING | SERVICE | REMARKS |

NOZZLES SCHEDULE SERVICE

| REV. | DESCRIPTION | DATE | BY | CHK | APP |
|---|---|---|---|---|---|
| 1 | WEIGHTS AND VOLUME UPDATED | 06-02-2020 | Or Yashar | Maxim Yoffe | |

## GENERAL NOTES

1. INPUT DESIGN DATA

| | | SHELL |
|---|---|---|
| DESIGN PRESSURE | [psig] | 120/FV |
| DESIGN TEMPERATURE | [°F] | 234/122 |
| MAWP | [psig] | 120/FV |
| AT TEMPERATURE | [°F] | 234/122 |
| MDMT | [°F] | 32 |
| AT PRESSURE | [psig] | 120/FV |

| | | SHELL |
|---|---|---|
| DESIGN PRESSURE | [barg] | 8.3/FV |
| DESIGN TEMPERATURE | [°C] | 112/10 |
| MAWP | [barg] | 8.3/FV |
| AT TEMPERATURE | [°C] | 112/10 |
| MDMT | [°C] | 0 |
| AT PRESSURE | [barg] | 8.3/FV |

CORROSION ALLOWANCE

| | SHELL |
|---|---|
| CORROSION ALLOWANCE | 0.063"(1.6mm) |

2. ADDITIONAL INPUT

| | YES | NO |
|---|---|---|
| ASME CERTIFICATION MARK WITH "U" DESIGNATOR | × | |
| REGISTRATION AT NATIONAL BOARD | × | |

NOT REQUIRED, EXEMPTED BY

| IMPACT TEST | UG-20(f) | UCS-66 | UHA-51 |
|---|---|---|---|
| | N/A | × | N/A |
| PWHT | UCS-56 | | UHA-32 |
| | × | | N/A |

REQUIRED, FOR ITEMS

| | |
|---|---|
| IMPACT TEST | FOR SA-516/70 |
| PWHT | N/A |

3. ABRASIVE BLASTING BEFOR WELDING.
ALL CARBON STEEL PLATE SHALL BE BLASTED TO SSPC-SP-10/CLASS 2½

4. TACK WELDING ......................PROC.24.3.6.009

5. WELDING ..........................PROC.24.3.6.009

6. P.T.EXAMINATION ..................PROC.21.1.8.010

7. RADIOGRAPHY: NONE

JOINT EFFICIENCY TABLE

| | SHELL | CAPS |
|---|---|---|
| LONGITUDINAL SEAMS | 0.7 | 0.85 |
| CIRCUMFERENTIAL SEAMS | 0.65 | 0.65 |

8. MACHINING INSPECTION .............PROC.21.1.8.019

10. DIMENSIONAL CHECK AND TOLERANCES...PROC.21.1.8.013

11. BUBLE TEST ......................PROC.21.1.8.009

12. BOLTS TIGHTENING ................PROC.21.1.8.042

13. HYDROSTATIC TEST ................PROC.21.1.8.008,
HOLDING TIME 1 HOUR

| | | | SHELL | |
|---|---|---|---|---|
| HYDROSTATIC PRESSURE (psig/barg) | | | 160/11 | |
| HYDROSTATIC TEST POSITION | HORIZONTAL | × | VERTICAL | - |

14. ALL FLANGES TO ASME / ANSI B.16.5/ASME B/16.47 SERIES A
ALL BOLTS & NUTS TO BE HOT DIP Zn COATED (galvanized)

15. DRAINING,DRYING & NYTROGEN PURGING .....PROC.24.3.8.036

16. FINAL CLEANING..........................PROC.24.1.8.018

17. PAINTING ...............................PROC.24.3.7.080

18. FINAL INSPECTION AND TESTING ...........PROC.21.1.8.081

19. SHIPMENT AND STORAGE ...................PROC.21.1.8.017

20. TELLTALE HOLES 1/4" ON ALL REINFORCEMENT & PAD PLATES

21. DIMENSIONS ARE IN mm

22. APPLY GROUND MARK NEAR GROUND POINT

23. NOTE "NOT FOR LIFTING" 50 MM ABOVE EACH LUG
RED COLOR, RAL 3020,
MINIMUM HEIGHT OF THE LETTERS IS 60 MM

1 24. WEIGHTS AND VOLUME:
VOLUME: 37500 L / 9906 GAL
EMPTY WEIGHT: 12900 KG / 28440 LBS
HYDROTEST WEIGHT: 50400 KG / 111113 LBS
OPERATION WEIGHT: 36375 KG / 80193 LBS

| MTL.: | SURFACE ROUGHNESS: | BREAK SHARP EDGES: | GENERAL TOLERANCES: |
|---|---|---|---|
| CODE MATERIAL: | FINISH: | | WEIGHT: kg |

HXPV DEP. MANAGER
Ehud Ben Shlomo

HXPV DESIGN ENGINEER
Maxim Yoffe

HXPV DESIGNER
Or Yashar
22-Dec-2019

ORMAT®

TITLE:
MOTIVE FLUID TANK (9906 GAL)

DRAWING NO: 1/3
0.909.51.720.0

DRWG REV: 1

SHEET REV: A

CHAMBERS GROUP

# MEMO

**To:** County of Imperial

**From:** Chambers Group, Inc.

**Date:** 10/20/20

**RE:** Hazards Associated with Proposed Isopentane Storage at the Heber 2 Facility in Heber, CA

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Chambers Group, Inc. has prepared the following transmittal to accompany the attached Updated Hazard Assessment addressing the storage of the regulated substance, isopentane, on the Heber 2 Repower Project site in Heber, California. Risk Management Professionals, Inc. (RMP), produced an initial Hazard Assessment for the Heber 2 Repower Project on July 10, 2019 and revised on October 18, 2019 to address potential hazards associated with isopentane. Following comments from the public expressing safety concerns, RMP produced an updated Hazard Assessment using a more precise modeling software, incorporating a concrete containment area as passive mitigation, and rearranging the new vessels into a safer layout. Both technical assessments were conducted in compliance with the Hazard Assessment Offsite Consequence Analysis requirements of the Environmental Protection Agency (EPA) “Risk Management Plan” regulations (40 CFR § 68.65) and California Code of Regulations “California Accidental Release Prevention (CalARP) Program” (19 CCR 2750.1 to 2750.9).

RMP has developed an updated worst-case modeling scenario for the isopentane currently and soon to be stored at the Heber 2 facility. According to the EPA Risk Management Plan regulations, the worst-case release is defined as “the release of the largest quantity of a regulated substance from a vessel failure that results in the greatest distance to a specified endpoint” (40 CFR § 68.3). To determine the worst-case release quantity, the EPA regulations dictate “for substances in vessels, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity” must be analyzed (40 CFR § 68.25). In compliance with these regulations, RMP modeled the worst-case scenario as the catastrophic failure of one 10,000-gallon isopentane storage vessel. With the incorporation of a concrete containment area as passive mitigation, the endpoint radius resulting from the release of one vessel was determined to stay within the property boundary and not to reach any new (#1, #2, and #3) or existing (#4, #5, and #6) vessels. The only overlap of concern is in regard to vessel locations #4 and #5 where they reside in one another’s areas of impact. However, plans to construct a blast wall between the two existing tanks will eliminate this concern. Regardless, the EPA’s Offsite Consequences Analysis process is recognized by process safety professionals as being highly conservative, rendering these scenarios very unlikely.

In addition to being consistent with EPA regulations, the modeling provided represents a sufficient worst-case scenario to be utilized in emergency planning and impact analysis. During normal operations, the isopentane tanks are not filled to capacity; in fact, they are rarely filled. Isopentane is used only as backup fuel during plant outages, which occur up to approximately one week per year. Therefore, a quantity of isopentane in excess of the quantity modeled occurs less than 2 percent of the entire year. The remaining over 98 percent of the year, at most the tanks are partially filled to approximately 15 percent capacity or alternatively, only one tank is completely full, and the remaining tanks are empty. Further, the modeling incorporates extremely conservative assumptions with regards to atmospheric conditions which further provide an analysis addresses a highly unlikely catastrophic failure of the tanks.

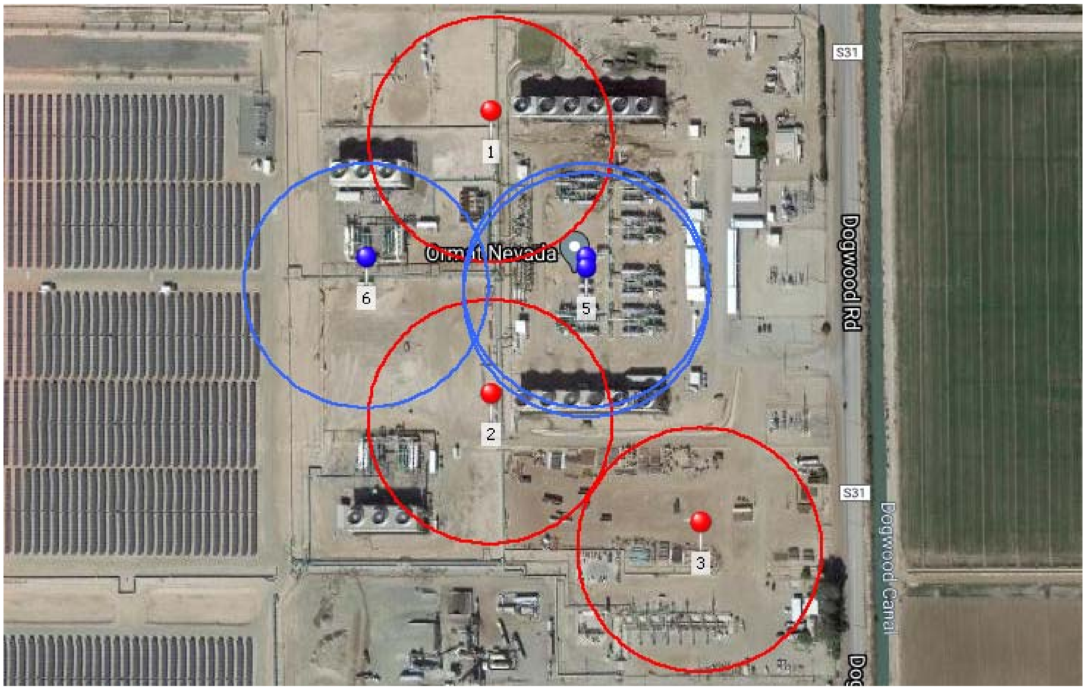
Moreover, ORMAT will implement several safety-control measures into the isopentane storage system that would further reduce the potential for both initial tank failure and multi-tank failure:

- Each tank will be equipped with an automated water suppression system.
- Each tank will be equipped with two flame detectors and one gas detector (for a total of 6 flame detectors and 3 gas detectors for the three tanks).
- In the case of an isopentane leak, the gas detector(s) will detect it immediately and send a notification to the operator at the control room (manned 24/7) in order to mobilize fixing the leak.
- In case of a fire, the flame detector(s) will detect it and immediately start the automatic fire suppression system.
- In case of a fire, there will also be a horn and strobe system that will turn on automatically to alert the plant employees.

Due to the conservative Offsite Consequences Analysis process; taking into consideration:

- concrete containment areas as passive mitigation,
- vessels rarely filled to 90% capacity,
- isopentane safety-control measures,
- and a blast wall

areas of concern are generally limited to inside facility boarders, thus producing zero sensitive receptors. Furthermore, ORMAT can go as far as to say that according to the figure below, the explosion area of one new vessel (red) will not reach any of the existing vessels (blue), nor overlap with the explosion area resulting from the other new vessels. The only overlap of explosion area would be for the existing tanks 4 and 5, which were permitted by the County. However, as discussed above, ORMAT proposes to install a blast wall between tanks 4 and 5 to minimize any chance of a cascading tank failure.



# Responses to Heber 2 IS/ND Comments and Recommended Clarifications and Supplements

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| Date: | 9/28/20 |
| To: | Imperial County Planning Department |
| From: | Ben Pogue (Catalyst) on Behalf of ORMAT/SIGC |
| RE: | CURE Comment Letter on Heber 2 IS/ND |

## Introduction and Purpose

The purpose of this memorandum is to provide clarifying information to the Imperial County Planning Department (ICPD) and its affiliate departments in response to comments submitted by Adams Broadwell Joseph & Cardoza (ABJC) on behalf of California Unions for Reliable Energy (CURE) on the Initial Study and Negative Declaration (IS/ND) for the Heber 2 Repower Project (Project). The two primary sections of this memorandum include a summary outline of the CURE letter and a comment summary matrix with responses.

As discussed below, in response to comments received from the Imperial County Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed below. CEQA contemplates the move from ND to Mitigated Negative Declaration (MND) based on comments on the IS/ND , and we support the County in revising the CEQA decision to a MND and recirculating the IS/MND for a 30 day public review period.

## CURE Comment Letter Issues Outline

This outline provides the basis of issues raised in the CURE comment letter. Those headings in bold represent primary issues, with the sub-issues outlined below. The issues identified in this outline are summarized and responded to in the comment matrix in the following section.

I. **Statement of Interest**
II. **An EIR Must be Prepared**
III. **The IS/ND Fails to Adequately Describe the Project**
    a. The IS/ND's Description of the Project's Construction Activities is Inadequate and Flawed
    b. The IS/ND Fails to Describe Emissions from Reclamation Activities
    c. The IS/ND's Numerous Errors Prohibits the Public from Fully Evaluating the Project's Impacts
IV. **The IS/ND Fails to Accurately Describe the Project's Baseline Conditions**
    a. The IS/ND Fails to Accurately Describe the Project's Baseline Generating Capacity and Associated Impacts, As Well As Its Baseline Emissions
    b. The IS/ND Fails to Accurately Describe Biological Conditions at the Project Site
V. **The County Has Violated CEQA by Piecemealing Environmental Review and Permitting for the Expansion of the Heber Geothermal Facilities as Separate Projects**
VI. **Substantial Evidence Supports a Fair Argument that the Project May Have Significant Impacts Which Must be Analysed in an EIR**

EEC ORIGINAL PKG

  a. There is a Fair Argument that Construction Emissions from the Project Could Have a Significant Impact on Public Health and the Environment
  b. There is a Fair Argument that the Project Could Result in Significant Impacts to Public Health from Valley Fever
  c. The IS/ND's Methods for Evaluating a Hazard Analysis and the Possibility of Accidents or Explosions at the Site Are Inadequate and Unsupported.
  d. There is a Fair Argument that Extending the Life of the Project Could Result in Geologic Impacts
  e. There is a Fair Argument that Special Status Species Could Occur in the Vicinity of the Project Site and Could be Adversely Affected by the Project
  f. The IS/ND Fails to Disclose the Project's Construction or Operational GHG Emissions, and Relies on an Inapplicable Significance Threshold
  g. There is a Fair Argument that the Project Will Have Significant Impacts on Water Supply

**VII. The IS/ND Concedes that Mitigation is Required**

  a. The IS/ND Fails to Consider Feasible Mitigation to Reduce Potentially Significant Impacts to Less than Significant Levels for Construction and Operations

**VIII. The IS/ND Fails to Properly Evaluate Potentially Significant Cumulative Impacts.**

**IX. The Project May Require a CEC License.**

## Comment Summaries and Responses

| CURE Letter Section | Substantive Comment Summary | Response |
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| I. Statement of Interest | ABJC discloses its representation of its client, the California Unions for Reliable Energy (CURE). The IS/ND fails to meet the basic requirements of CEQA. The County must prepare an EIR. | No substantive technical comment provided. Comment lauds renewable energy development and subsequently criticizes the Heber 2 Repower Project.<br>The IS/ND was based on site specific and technically substantiated information on the baseline conditions of the Project site and potential impacts.<br>In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. The following Mitigation Measure HAZ-1 is considered:<br>HAZ-1: To minimize the potential for a cascading failure event of the new isopentane tanks and to limit any potential impacts within the existing Heber 2 Complex fence line, the three isopentane tanks shall be located as set forth in Attachment B. Further, diking and impoundment of the proposed isopentane tanks shall be installed consistent with the Hazard Memorandum (Attachment C) to minimize the magnitude and extent of a tank failure, and the detailed design of the project shall ensure that the Project's features satisfy the design criteria assumed in the Hazard Assessment (Attachment C). As observed in Figure 9 of the Hazard Assessment (Attachment C), the area of potential effect for each new isopentane tank would not overlap, thus preventing a consequential catastrophic event.<br>CEQA contemplates the move from ND to MND based on comments on the IS/ND, and we support the County in revising the CEQA decision to a MND and recirculating the IS/MND for a 30-day public review period.<br>See following comments explaining why a MND is appropriate, instead of the EIR CURE requests. |
| II. An EIR Must Be Prepared | CURE attempts to employ the "fair argument rule" under CEQA that an EIR must be prepared to address significant impacts, but does not site any specific IS/ND sections or analyses. | The proposed Project site is entirely within the existing and permitted plant boundary, and is entirely void of any vegetation, habitat, waterbodies, and existing facilities. The purpose of the Project is to repower the Heber 2 geothermal facilities by replacing old ORMAT Energy Converters (OECs) with state-of-the-art OECs that run more efficiently and emit less emissions, and install three new isopentane tanks to support operations. No facilities are |

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| | | proposed outside of the existing facility’s fence line. Due to the Project’s limited nature, no significant environmental impacts were anticipated. The IS confirmed that the Heber 2 Project would not result in any significant impacts and no mitigation was required, thus the issuance of an ND. In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed below. CEQA contemplates the move from ND to MND based on comments on the IS/ND.<br>This comment identifies air quality, cumulative air quality, public health, water supply, biological resources, and impacts form hazardous materials are not technically substantiated. See responses included in Issue VI below that elaborates on these specific resources and discussions on the information and methods used to reach significance conclusions in the MND. |
| III. The IS/ND Fails to Accurately Describe the Project | CURE sites that CEQA prohibits the “piecemealing” of a larger project into many smaller projects, resulting in numerous environmental reviews for a single project. | A subsidiary of ORMAT is proposing to upgrade and develop additional geothermal energy generation at the Heber 1 plant, approximately 1 mile to the east of the Heber 2 site. The Heber 1 and Heber 2 facilities are physically and electrically separate, as they do not share any facilities, including geothermal production wells, pipeline, OECs, isopentane tanks, or transmission facilities. These geothermal energy facilities were developed at separate times (not as a single project), have never shared any facilities or lands/leases, and are permitted under separate CUPs issued by Imperial County.<br>Further, these projects are treated as separate projects by relevant utilities and regulatory agencies, including each facility has separate Power Purchase Agreements, Interconnection Agreements, Imperial County Air Pollution Control District (ICAPCD). ICAPCD implements state and federal laws that determine how projects are either treated as separate or grouped under an air quality “bubble.” ICAPCD’ s determination that Heber 1 and Heber 2 are separate facilities is substantial evidence that they facilities are in fact two separate projects.<br>There are three principle tests under CEQA with respect to determine whether two projects are separate CEQA projects. |

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| | | In the seminal CEQA test for piecemealing, *Laurel Heights Improvement Association v. Regents of the University of California (“Laurel Heights”)*[1], the California Supreme Court set forth a two prong test for determining whether future phases of a project or other foreseeable consequences of an approved land use must be included as a part of a project for the purposes of environmental review. This important and often cited case provides the clearest guidance as to the standard that will be applied by courts in evaluating whether an agency improperly segmented environmental review of a project.<br>The first prong set forth in *Laurel Heights* is that an agency must analyse the environmental effects of a project’s future expansion or other action if it is a “reasonably foreseeable consequence of the initial project.” In this case, neither Heber 1 nor Heber 2 is a reasonably foreseeable consequence of the other. The projects are separated physically by nearly a mile and share no common critical infrastructure. One project can run with or without the other.<br>The second *Laurel Heights* prong is that an agency must analyse the environmental effects of a project’s future expansion or other action if it “will likely change the scope or nature of the initial project or its environmental effects.” Again, the projects’ physical and operational separation provide that neither project will affect the nature or scope of the other project or its environmental effects. See below for more factual discussions demonstrating that consistent with the *Laurel Heights* case, Heber 1 and Heber 2 are separate and independent CEQA projects.<br>The second important CEQA test is the “independent utility” test. In *Del Mar Conservancy, Inc. v. City Council of the City of San Diego*, 10 Cal. App. 4th 712 (1992), the courts examine whether a project has “independent utility” that warrants separate environmental review and approval, even if it is arguably |

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[1] *Laurel Heights Improvement Assn. v. Regents of University of California*, 47 Cal. 3d 376, 396 (Cal. 1988).

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| | | part of a larger project. This test is derived from federal case law regarding the National Environmental Policy Act (“NEPA”), and has traditionally been applied in the context of the segmentation of environmental review of road projects, but has been applied in other contexts as well.[2] Under this test, it is appropriate for an individual portion of a larger road construction project to be reviewed and approved separately from the larger project if the segment has independent utility, and will serve a purpose even if the larger project is not constructed.[3] In this case, Heber 1 and Heber 2 each have independent utility; that is, each project operates to provide a separate and distinct set of benefits to the project owners. Each is contracted separately. Each sells its own electrical output. The projects do not sell to the same offtakers and each has separate and wholly unrelated contractual obligations, as just some examples of the independent utility of each. Under this CEQA test, Heber 1 and Heber 2 have “independent utility”.<br><br>The third CEQA test is called the “Crucial Functional Element” test, a corollary to the independent utility test. Unlike the independent utility test, which outlines when a project that is arguably part of a larger one can be reviewed and approved separately, the crucial function element test determines when a smaller project must be reviewed as a part of the larger project. Under this test, if a project is a “‘required’ or ‘crucial element’ without which” another |

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[2] See *Planning and Conservation League v. Castaic Lake Water Agency*, 180 Cal. App. 4th 210, 237 (2009)(applying independent utility test in upholding adequacy of EIR in case regarding transfer of water entitlements).

[3] *Del Mar Conservancy, Inc. v. City Council of the City of San Diego*, 10 Cal. App. 4th 712, 734 (citing to *Daly v. Volpe,* 514 F.2d 1106, 1109-1110 (1975)). In the original NEPA cases, *Daly v. Volpe*, three other criteria were also considered: whether the segment (1) is of substantial length and between logical terminal points; (2) is long enough to ensure adequate opportunity for consideration of alternatives; (3) will fulfill important state and local needs. However, as the independent utility criteria has been broken out as a separate test under both NEPA and CEQA case law, only the independent utility criteria is discussed above.

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| | | project “could not go forward,” environmental review of the two cannot be piecemealed, and both projects as a whole must be addressed in an environmental review document. In the case of Heber 1 and Heber 2, neither project is “required or a critical element” of the other. Each operates independently, without sharing critical infrastructure. Neither is necessary for the other to be able to function as neither provides the other with any critical functional element. Each function separately.<br><br>These three cases are fact-specific analyses. Applying the facts in this case demonstrates that Heber 1 and Heber 2 are separate CEQA projects.<br><br>The following are some additional facts demonstrating two separate projects. For example, the proposal to repower Heber 2 does not depend on the outcome of the Heber 1 proposal (and vice versa). The points below are guidance provided in the CEQA Deskbook (Figure 2-2: Evaluation of Related Activities in a CEQA Document; 2012) for when two actions should be addressed in a single CEQA review. A copy of this guidance is also enclosed as Attachment F.<br><br>While Action A and Action B, in this case, could be either Heber 1 and Heber 2, regardless of order, since this response is based on the CURE letter received on Heber 2, Action A below is read as Heber 2 and Action B is Heber 1, as follows:<br>1. When “Action B” is reasonably foreseeable consequence of “Action A”.<br>2. When “Action B” is a future expansion of “Action A” and will be significant because it will likely change the scope, nature, and impacts of “Action A”.<br>3. When “Action A” cannot proceed without essential public services that would be provided by “Action B”.<br>4. When “Action A” and “Action B” are integral parts of the same project.<br><br><u>Response to CEQA Deskbook Hypothetical 1</u>: While Heber 1 and Heber 2 are being proposed in close temporal proximity, the result of either project is not dependent on the outcome of the other project. In other words, for example, if Heber 1 is declined a permit, and Heber 2 is permitted, Heber 2 will still be developed regardless of the fact that Heber 1 was declined (and vice versa). |

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| | | Response to CEQA Deskbook Hypothetical 2: Since Heber 1 and Heber 2 do not share any critical facilities or infrastructure and are separated by almost a mile, and neither proposal includes facilities that would be shared, these actions are not reflective of a connected or future expansion at either plant. Any future expansions at Heber 1 and Heber 2 would remain independent from one another, simply due to the fact that the plants were developed as independent facilities and are not designed to operate in conjunction with each other.<br>Response to CEQA Deskbook Hypothetical 3: Heber 1 and Heber 2 operate independently from one another. For example, ORMAT could shut down operations entirely at either plant and the other would not be affected whatsoever. These facilities do not share any public services, whereas the Heber 2 Repower Project could not proceed without the approval of Heber 1 (and vice versa).<br>Response to CEQA Deskbook Hypothetical 4: As discussed above, the outcome of either proposal is not dependent on the other. In other words, for example, if Heber 1 is declined a permit, and Heber 2 is permitted, Heber 2 will still be developed regardless that Heber 1 was declined (and vice versa). Further, Heber 1 and Heber 2 are located approximately one mile apart from each other and share no facilities. There are no facilities in either proposal that would connect Heber 1 and Heber 2, thereby remaining completely independent geothermal plants at both sites. |
| III.a. The IS/ND's Description of the Project's Construction Activities is Inadequate and Flawed | CURE claims that a description of the proposed construction activities is provided, and that construction emissions are not calculated. | The CUP application clearly states that construction is anticipated to last up to eight months and provides a list of the equipment to be use. Further, construction emissions were calculated and accounted for in the IS/ND, relying on the modelling done as part of the APCD. For purposes of responding to this comment, Attachment E (Air Emissions Memorandum) includes the results of the modelling of construction and operation emissions for both criterial pollutants and GHG. As observed, construction emissions for criteria pollutants and GHG emissions are significantly less than the regulatory thresholds. |

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| III.b. The IS/ND Fails to Describe Emissions from Reclamation Activities | Reclamation emissions are not calculated. | A Reclamation Plan was submitted as part of the Heber 2 CUP Amendment Application to demonstrate the process for site abandonment and returning the condition of the site to a natural state and comply with the County requirements. Per common practice, final site reclamation (in 30 years at the termination of the CUP) would be permitted in the run up to site closure. Emissions calculations for reclamation activities in 2050 would be submitted to ICAPCD for a Permit to Construct. The reason for not speculating at this time is because the ambient air conditions, including attainment and non-attainment zones, may be considerably different in 30 years. Moreover, future potential effects are necessarily speculative. In trying to determine if an impact may be significant, CEQA provides "Argument, speculation, unsubstantiated opinion or narrative, or evidence that is clearly inaccurate or erroneous, or evidence that is not credible, shall not constitute substantial evidence." (14 C.C.R. 15064(f)(5).) Further, CEQA also provides that, "If, after thorough investigation, a Lead Agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact." (14 C.C.R. 15145). |
| III.c. The IS/ND's Numerous Errors Prohibits the Public from Fully Evaluating the Project's Impacts | The IS/ND is rife with inconsistent, misleading, and confusing statements making it impossible for a reader to assess the conclusions. CURE sites:<br>• CURE sites a missing appendix the cultural and historic resources records review.<br>• Figure 6 does not provide substantive support.<br>• That Heber 1 and Heber 2 are the same facility.<br>• The IS misuses the term "complex" and fails to disclose baseline and future generation, and incorrectly identifies the units that would be modified. | • Pursuant to the National Historic Preservation Act, Appendix C contains confidential information pertaining to the location of identified sites/resources in the project vicinity, as recorded in prior surveys. This information is not for public release, and thus, held in confidence by Imperial County.<br>• As noted, Figure 6 (as well as the multiple pictures in Appendix A of the IS/ND and the MND) shows a photograph of the Project site, which is a "dirt lot", as stated by CURE. The purpose of this photography is to provide the reader with a visual aid of the proposed development site and verify that the site is, in fact, void of any water resources and sensitive communities.<br>• See the response to Issue III above for a discussion as to why Heber 1 and Heber 2 are entirely independent facilities.<br>• The term "Heber 2 Complex", as used in the CUP Amendment Application, refers to Heber 2, Goulds 2, and Heber South geothermal facilities (not Heber 1). The term "Complex" was applied because these facilities are interdependent on each other for operations and the CUP Amendment Application is requesting the extension of the permit life all three facilities (collectively, the Heber 2 Complex) until 2050. The |

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| | | figures in the CUP Amendment Application provide clarity on the relationship between the three geothermal units that comprise the Heber 2 Complex, and demonstrates the location of each unit's OECs. As provided in Attachment A, no modifications are proposed for Goulds 2 or Heber South, only the Heber 2 plant, and conditions would remain the same as present baseline conditions at Goulds 2 and Heber South. Attachment A also provides a breakdown of the current and proposed energy generation at the Heber 2 Complex, breaking down overall generation by each power station.<br>As noted in Attachment A, the Heber 2 Repower Project would generate 27 MW. The CUP Amendment Application states that the Heber 2 Complex would generate 33 MW. To avoid confusion, we recommend adding a note to the CUP Amendment Application with the table in Attachment A to clarify the generation capacity for each Heber 2 Complex geothermal unit (Heber 2, Goulds 2, and Heber South). |
| IV. The IS/ND Fails to Accurately Describe the Project's Baseline Conditions | An EIR must include description of the physical environmental conditions in the Project vicinity. | The affected environment descriptions provided in the CEQA Checklist submitted in support of the CUP Amendment Application and the IS/ND are technically substantiated by numerous detailed resource reports. The site specific information collected for this Project reflects a detailed characterization of the baseline conditions to measure potential effects against, primarily quantitatively where feasible, and qualitatively where necessary. |
| IV.a. The IS/ND Fails to Accurately Describe the Project's Baseline Generating Capacity and Associated Impacts, as well as Its Baseline Emissions | CURE attempts to provide "correct" air emissions calculations, and that the project underestimates emissions by 2/3rds. | The ICAPCD makes a determination on whether to treat individual facilities as a single source for the purposes of determining compliance with state and federal air quality laws and regulation. Attachment A provides a breakdown of the baseline and proposed generation capacity. An Authority to Construct and Permit to Operate (ACPO) was submitted to the Imperial County Air Pollution Control District, and as noted in the application, the existing Air District Permit (No. 2217A-5) includes any emissions for the entire Heber 2 Complex, which includes the geothermal units of Heber 2, Heber South, and Goulds 2. Therefore, baseline emissions from all subject facilities has been accounted for and properly assessed in the ACPO application. For purposes of responding to this comment, the enclosed Air Emissions Memorandum provides the historic (baseline) and the proposed future emissions. As observed, the modelled emissions show a decrease in future isopentane emissions of -3.0 lb/day or -4.0 |

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| | | tons/year. Therefore, through the use of more efficient equipment (e.g., the new OECs) would lead to a decrease in emissions. |
| IV.b. The IS/ND Fails to Accurately Describe Biological Conditions at the Project Site | The County failed to make a reasonable effort to describe baseline biological conditions, and account for sensitive species on the site. | As noted by CURE, a comprehensive records search for biological resources, vegetation, and sensitive species was performed to identify species that could occupy the project site and surrounding area. All databases used in this research (e.g., IPac, CNDDB, etc.) are managed by public agencies and serve as the standard for determining the biological community present in/near a project site. After a review of the records, a wildlife biologist performed a reconnaissance-level survey of the Project Site, concurring that the site is completely void of any habitat and sensitive species. These efforts were recorded and provided as an Appendix B to the CUP. For a site that is a “dirt lot” by CURE’s own admission, and confirmed with site photographs and supporting technical documentation, a reasonable effort was made to describe the baseline biological conditions and potentially occurring sensitive species. Further, as provided in the CUP Amendment Application, the Environmental Protection Measures section, “pre-construction surveys would occur to ensure the absence of any sensitive species”.<br>As provided in the CURE letter, a Google Earth snapshot of a common crow flying by the Project site does not constitute evidence that sensitive species are likely present (14 C.C.R. 15064(f).) As documented through verifiable database research and a site-specific survey (as provided in Appendix B of the CUP), the site does not contain suitable habitat and no sensitive species occur on the site. Further, due to the industrialized nature of the site, avian species are likely to avoid the site. Again, the Project site would be surveyed prior to construction to verify the absence of any special status species. |
| V. The County Has Violated CEQA by Piecemealing Environmental Review and Permitting for the Expansion of the Heber Geothermal Facilities as Separate Projects | CURE alleges that the IS/ND does not accurately reflect that Heber South and Goulds 2 are part of the Heber 2 Complex. | The CUP Amendment Application clearly states that the Heber 2 Complex include the generation units of Heber 2, Goulds 2, and Heber South, and the proposal seeks to extend the life of the overall complex by 30 years. The term “Complex” was applied because these facilities are interdependent on each other for operations and the CUP Amendment Application is requesting the extension of the permit life all three facilities until 2050. The enclosed Figure 1 provides clarity on the relationship between the three geothermal units that comprise the Heber 2 Complex, and demonstrates the location of each unit’s OECs. As provided in Attachment A, no modifications are proposed for Goulds 2 or Heber South, only the Heber 2 unit, and conditions would remain the same as present baseline conditions at the Goulds 2 and Heber South portions of the |

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| | | Heber 2 Complex. Attachment A also provides a breakdown of the current and proposed energy generation at the Heber 2 Complex, breaking down overall generation by each unit. |
| VI. Substantial Evidence Supports a Fair Argument that the Project May Have Significant Impacts Which Must be Analysed in an EIR | An EIR must be prepared under the "Fair Argument" standard. | See response to Issue II above. |
| VI.a. There is a Fair Argument that Construction Emissions from the Project Could Have a Significant Impact on Public Health and the Environment | Because the IS/ND fails to provide details on construction schedule and equipment, emissions calculations are insufficient. IS/ND does not describe the existing baseline thresholds. | The IS/ND directly responded to the questions and issues identified in the CEQA Checklist Section III (Air Quality). A detailed and sophisticated air emissions model was prepared for the Project to apply to the ICAPCD for a Permit to Construct and Operate (PCO). For clarification, the PCO application is enclosed to this memo.<br>A detailed CEQA Checklist was enclosed as part of the CUP Amendment Application. The Checklist included a detailed description of the Affected Environment for air quality, including a table that identified attainment and non-attainment emissions in the Imperial Valley. This information allowed the County to accurately characterize the existing ambient air conditions and make an informed impact conclusion. Further, an Air Emissions Memorandum was attached to the CUP Amendment Application as Appendix F. That analysis remains valid, confirming no potentially significant effects. In addition, in response to comments received, the Air Emissions Memorandum (Attachment E) provides information to address the comments received on potential construction emissions, further confirming no potentially significant effects. |
| VI.b. There is a Fair Argument that the Project Could Result in Significant Impacts to Public Health from Valley Fever | The IS/ND does not adequately account for construction workers contracting Valley Fever. | The IS/ND includes Best Management Practices for dust control and worker safety, including:<br>• The Project would comply with the Imperial County Air Pollution Control District (ICAPCD) Regulation VIII (Fugitive Dust Control), the Imperial County 2018 PM10 Plan, and the Imperial County 2018 PM2.5 Plan.<br>• Project equipment and worker vehicles would be turned off when not in use and not left idling to minimize unnecessary emissions.<br>• Water would be applied to the development site and during site preparation and construction to control fugitive dust. |

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| | | • Earth moving work would be completed in phases (as necessary) to minimize the amount of disturbed area at one time.<br>• Construction vehicles and heavy equipment that use non-surfaced facility roads/areas will be restricted to 10 mph to control fugitive dust.<br>• During windy conditions, barriers would be constructed and/or additional watering is conducted to minimize wind-blown fugitive dust.<br>• Vehicle access would be restricted to the disturbance area via signage/fencing.<br>Collectively, these measures would mitigate for the potential contraction of Valley Fever. While not required to mitigate any potentially significant effects, these Applicant proposed Mitigation Measures and practices will be included in the Mitigation and Monitoring Plan for the project. |
| VI.c. The IS/ND's Methods for Evaluating a Hazard Analysis and the Possibility of Accidents or Explosions at the Site Are Inadequate and Unsupported | Hazard Analysis should be based on a worst-case scenario. | The Hazard Assessment (HA) prepared for the CUP Amendment Application (Appendix G of CUP Application) and IS/ND was developed to comply with the regulatory standard for assessing a catastrophic event. In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. CEQA contemplates the move from ND to MND based on comments on the IS/ND. Accordingly, new Mitigation Measure HAZ-1 requires the following:<br>HAZ-1: To minimize the potential for a cascading failure event of the new isopentane tanks and to limit any potential impacts within the existing Heber 2 Complex fence line, the three isopentane tanks shall be located as set forth in Attachment B. Further, diking and impoundment of the proposed isopentane tanks shall be installed consistent with the Hazard Memorandum (Attachment C) to minimize the magnitude and extent of a tank failure, and the detailed design of the project shall ensure that the Project's features satisfy the design criteria assumed in the Hazard Assessment (Attachment C). As observed in Figure 9 of the Hazard Assessment (Attachment C), the area of potential effect for each new isopentane tank would not overlap, thus preventing a consequential catastrophic event. |
| VI.d. There is a Fair Argument that Extending the Life of the Project Could Result in Geologic Impacts | The IS/ND fails to analyze geologic impacts of extending the life of the facilities. | An extensive geotechnical investigation was performed in support of the CUP Amendment Application (Appendix G) and the IS/ND. This geologic characterization served as the basis for measuring impacts against. As observed in the project description, no new wells or alteration of the pressure regime and |

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| | | geothermal utilization program at Heber 2 are proposed, only the replacement of the OECs and the addition of the isopentane tanks. Therefore, there would be no impacts to the baseline geologic conditions or increased potential for subsidence in the nearby area. Additionally, the California Department of Conservation (CDOC) reviewed the IS/ND and concluded that no potential significant impacts from the existing geothermal wells and utilization. The CDOC concurrence on no significant impacts is enclosed to supplement this conclusion. |
| VI.e. There is a Fair Argument that Special Status Species Could Occur in the Vicinity of the Project Site and Could be Adversely Affected by the Project | Avian fatality monitoring at nearby solar facilities show high levels of avian mortality. | See response above for Issue IV.b above. Additionally, as observed in the CUP project description, no new transmission lines (or solar facilities, as volunteered in the CURE comment) or changes to existing Heber 2 substation are proposed; therefore, baseline conditions would remain the same and the Project would not cause any significant impacts to avian species. |
| VI.f. The IS/ND Fails to Disclose the Project's Construction or Operational GHG Emissions, and Relies on an Inapplicable Significance Threshold | The IS/ND fails to meaningfully describe or analyse the Project's construction and operational GHG emissions. | The potential GHG emissions associated with project construction and operations are discussed in the IS/ND CEQA Checklist Section III (Air Quality) and the enclosed Air Quality Memorandum (Attachment E). As observed, construction emissions for criteria pollutants and GHG emissions are significantly less than the regulatory thresholds. The construction phase is expected to emit 982 CO2e tons per year. This figure represents the total construction emissions and are temporary as development is expected to take 8 months. |
| VI.g. There is a Fair Argument that the Project Will Have Significant Impacts on Water Supply | CURE claims that the Project will use more water and the Project should seek an alternative water supply per the Basin Plan. | As noted by CURE, the Project would not require any additional water to operate, and all water would be supplied via existing IID permits. Heber 2 will remain as a retail water customer with IID with no changes in water consumption to support the existing or proposed facilities. Therefore, no significant impacts to the existing baseline conditions would occur. |
| VII. The IS/ND Concedes that Mitigation is Required | The IS/ND defers the formulation of mitigation measures. An EIR must be prepared. | CURE's comments confuse Best Management Practices and Applicant Proposed Measures that were included in the project description of the CUP as voluntary measures, with mitigation measures. An Applicant Proposed Measure is volunteered by the Applicant and should be considered as part of the Project. A mitigation measure, conversely, is a condition of approval issued by the County to reduce the magnitude and/or duration of a significant impact. Therefore, the conditions of what qualifies as a mitigation measures cited in the CURE comment, does not apply. In response to comments received from the Fire |

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| | | Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed above. |
| VII.a. The IS/ND Fails to Consider Feasible Mitigation to Reduce Potentially Significant Impacts to Less than Significant Levels | The County should consider and implement a mitigation plan as part of an EIR. | The IS/ND correctly concluded that no significant impacts would occur and that mitigation is not required because all potential impacts would be less than significant. In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed above in Issue I. |
| VII.a.1. Construction Mitigation | The IS/ND does not include mitigation for fugitive dust and it is assumed that ozone emissions are significant. | Contrary to CURE's comment, the IS/ND contains numerous voluntary measures to control fugitive dust, as provided in response to Issue VI.b above, and included in the CUP Amendment Application. |
| VII.a.2. Operational Mitigation | The Project should implement an extensive leak detection and repair program to mitigate for ROG emissions. | The project owner implements leak and repair programs, consistent with applicable laws, ordinances, regulations, and standards. The PCO issued by the ICAPCD will also address potential for leaks and related issues. There are no significant effects associated with project operations and thus no need for additional mitigation measures. |
| VIII. The IS/ND Fails to Properly Evaluate Potentially Significant Cumulative Impacts | An EIR must discuss significant cumulative impacts. | Under Section 3 of the IS/ND (Mandatory Findings of Significance), the IS/ND considers cumulative effects as less than significant. Cumulative effects for this Project would be limited to off-site Project impacts that coincide with effects from another past, present, or reasonably foreseeable future action. This area of overlap is referred to as the Area of Potential Effect. There are no other projects occurring or proposed in the Heber 2 Area of Potential Effect, and therefore, no significant cumulative effects would occur as result of the Project. |
| IX. The Project May Require a CEC License | CURE alleges that the Project will result in 92 MW and require a CEC license. | The comments on generating capacity and CEC jurisdiction are incorrect on the facts and the applicable law. With respect to the facts, the Heber 2 project will result in a ***net*** increase of only 16 MWs. See Attachment A.<br>With respect to the law, Heber 2 will not result in a net increase of 50 MWs or greater and thus is not CEC jurisdictional. The CEC has exclusive jurisdiction over the certification of proposed thermal powerplants 50 MWs or greater. Specifically, the Public Resources Code vests the CEC with "the exclusive power to certify all sites and related facilities in the state." A site is defined as "any location on which a facility is constructed or is proposed to be constructed." |

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| | | (Pub. Resources Code § 25119.)  A facility is defined as "any thermal powerplant or electric transmission line."  (Pub. Resources Code § 25110.)  A "thermal powerplant" is defined to mean "any stationary or floating electrical generating facility using any source of thermal energy, with a generating capacity of 50 megawatts or more, and any facilities appurtenant thereto."  (Pub. Resources Code § 25120.)<br>Accordingly, the CEC has jurisdiction over new thermal projects 50 MWs or greater and "a change or addition to an existing facility" resulting in a net increase of 50 MWs or greater.  ((Pub. Resources Code § 25500.)  For existing facilities like Heber 2, the CEC's jurisdiction depends on the net increase in generating capacity. The requirement for a net increase of fifty MWs or more is set forth in the California Supreme Court's only ruling on CEC jurisdiction:<br>"We hold that 'facility' in sections 25500 and 25123, as the term applies here, collectively refers to the entirety of the existing powerplants at the Harbor Generating Station.   The plain, common sense meaning of sections 25500 and 25123 is that any alteration, replacement, or improvement of equipment *that results in a 50-megawatt net increase in an existing station's total generating capacity* is subject to the Energy Commission's certification jurisdiction. (*Department of Water and Power, City of Los Angeles V. Energy Resources Conservation And Development Commission*, 2 Cal.App.4th 206, 221; emphasis added.)"<br>As set forth in Table 1, the Heber 2 project does not "result[] in a 50-megawatt net increase in an existing station's total generating capacity."  Accordingly, the CEC has no jurisdiction over Heber 2.<br>Further, without any citation to any authority, CURE claims there are "four factors" that determine CEC jurisdiction.  No authority is cited because no such authority exists.  The four factors cited by CURE do not exist in statute, regulation, or CEC practice.<br>CEC jurisdiction does not attach to Heber because the project will not result in a net increase of generating capacity of 50 MWs or greater. |
| X.  Conclusion | An EIR must be prepared for the Project. | The issues identified in this paragraph are discussed in detail above as to why there are no significant impacts and an IS/ND is therefore the appropriate level of CEQA compliance. |

## Attachments

- Attachment A – Table of Present and Proposed Geothermal Energy Generation by Unit at the Heber 2 Complex
- Attachment B – Site Plan with Adjusted Isopentane Tank Locations
- Attachment C - Hazard Memorandum and Hazard Assessment
- Attachment D - California Department of Conservation Concurrence (Email from Curtis Welty on July 22, 2020)
- Attachment E - Air Quality Memorandum
- Attachment F - CEQA Deskbook Reference for the Evaluation of Related Activities in a CEQA Document