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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 facility’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
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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/m² 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.

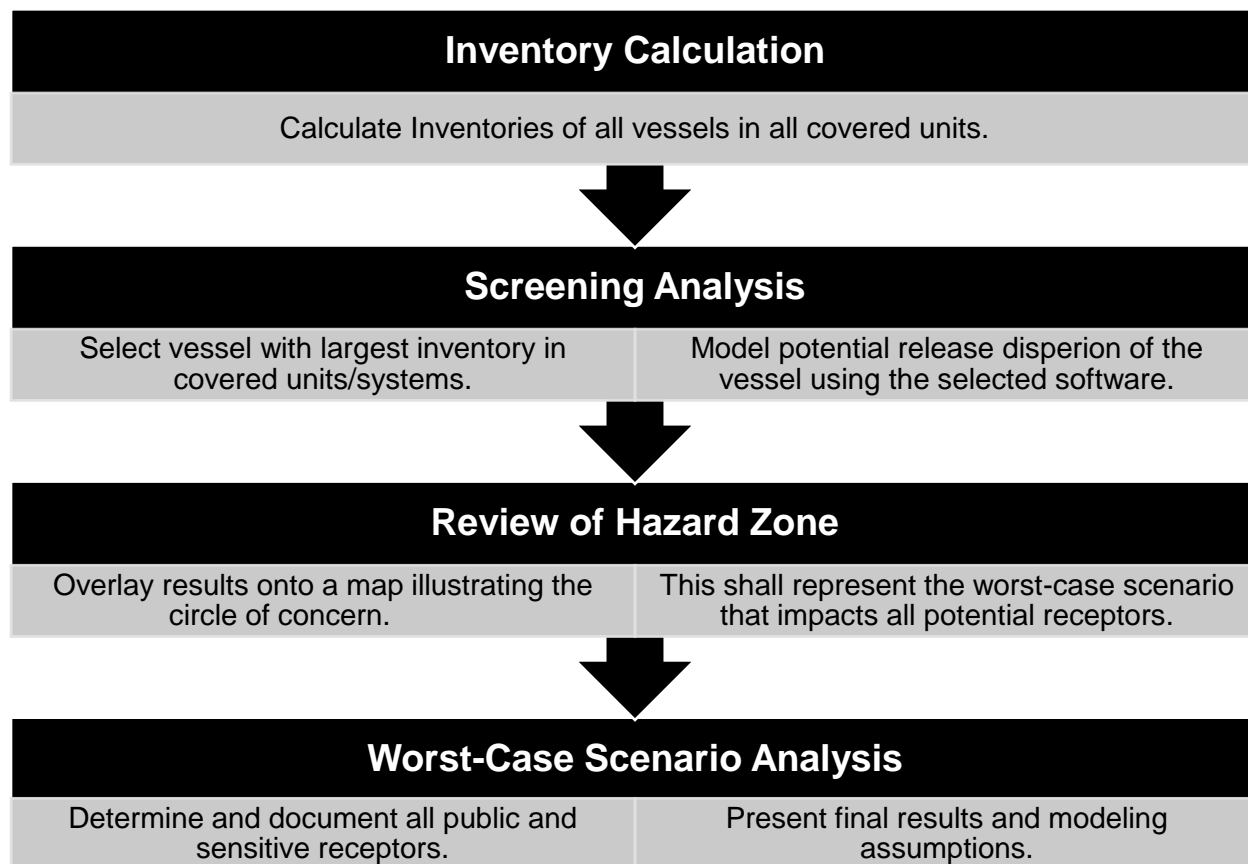


Figure 2: Worst-Case Scenario Selection Process

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/m².

- **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/m² 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/m²) 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 Phillips 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		

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	77°F	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.

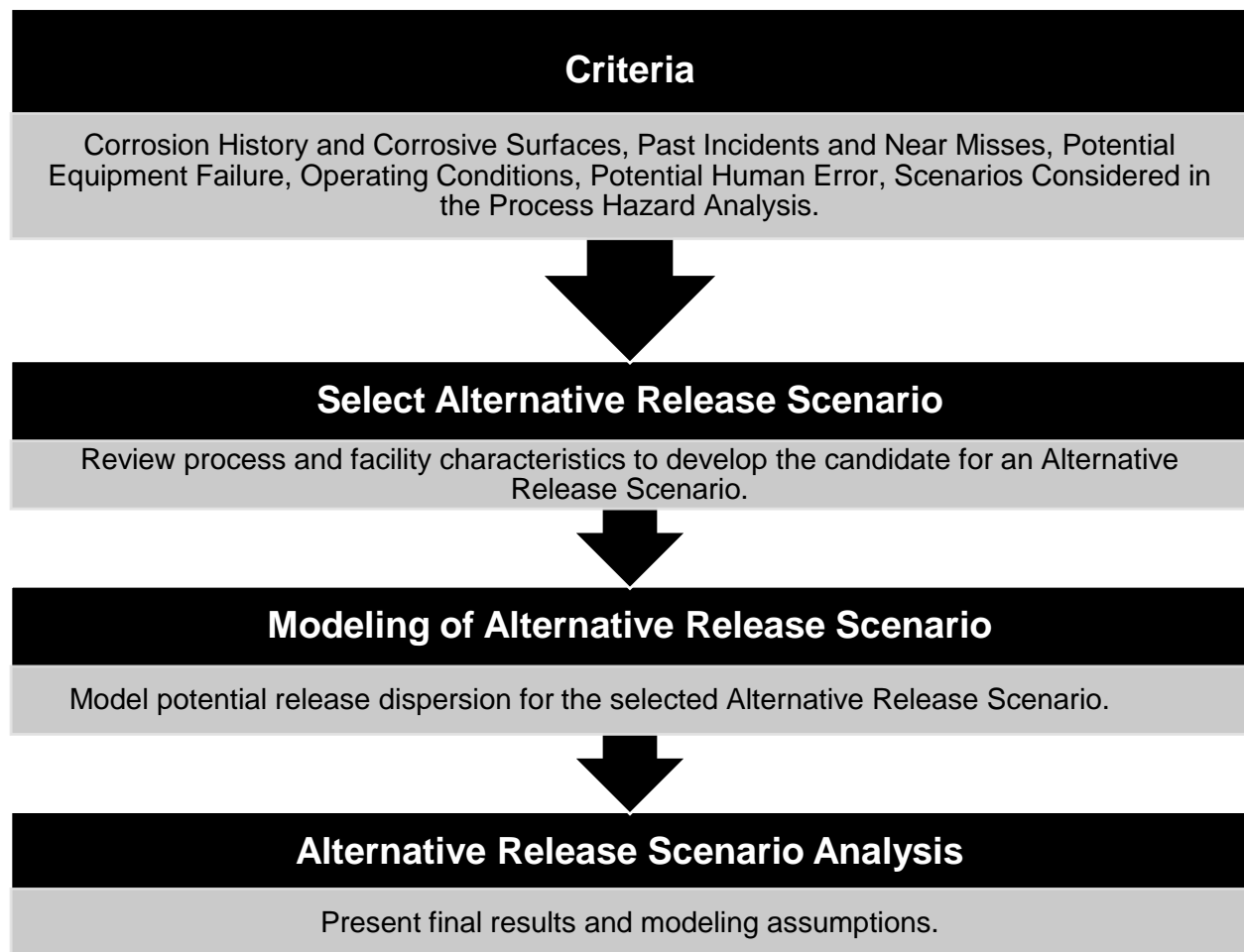


Figure 3: Alternative Release Scenario Selection Process

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 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. 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°F	

Parameter	Input Value	Notes
Relative Humidity	50%	As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, “this guidance assumes 25°C 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.	
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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 (0.3 MI)	ARS (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

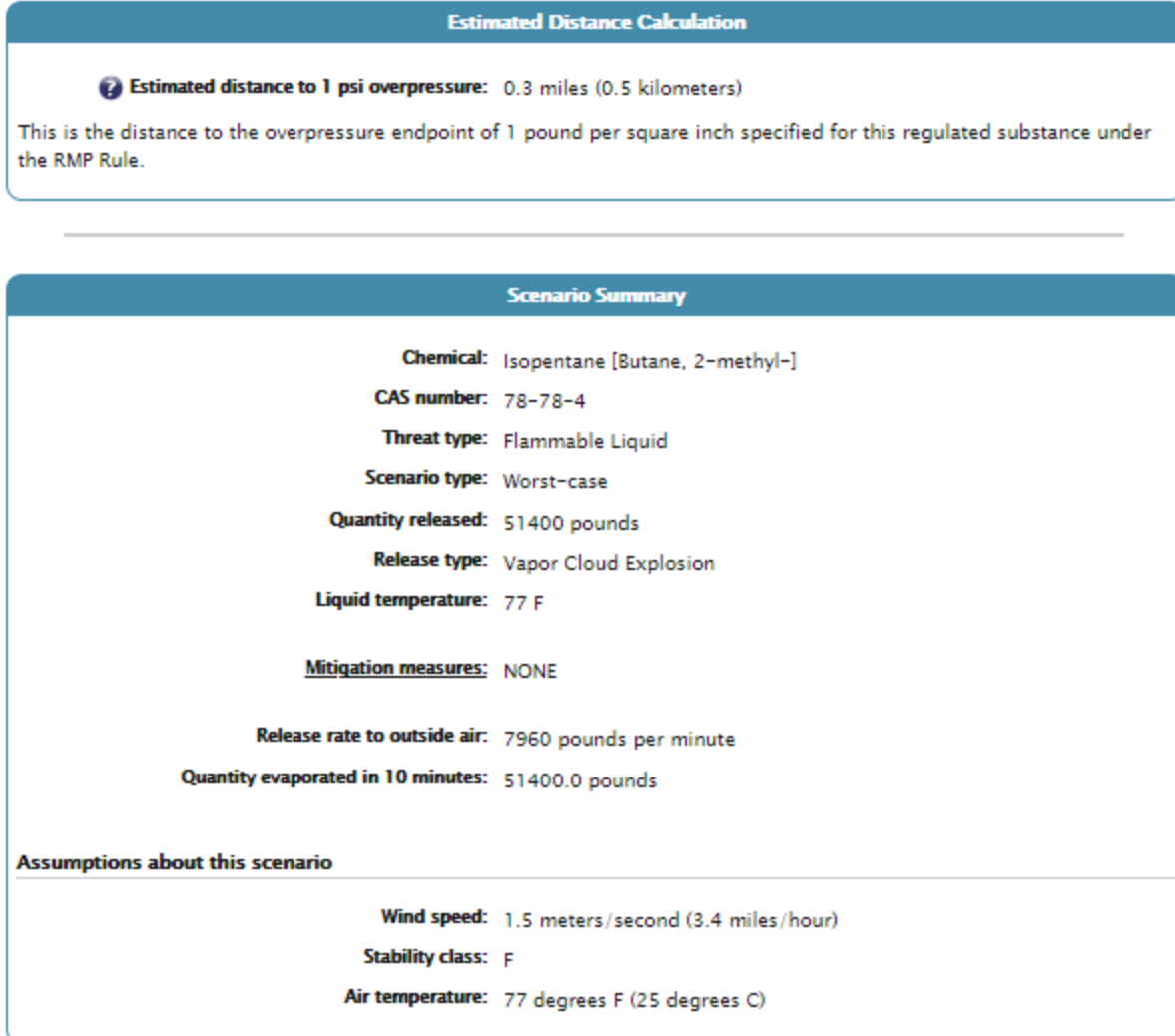
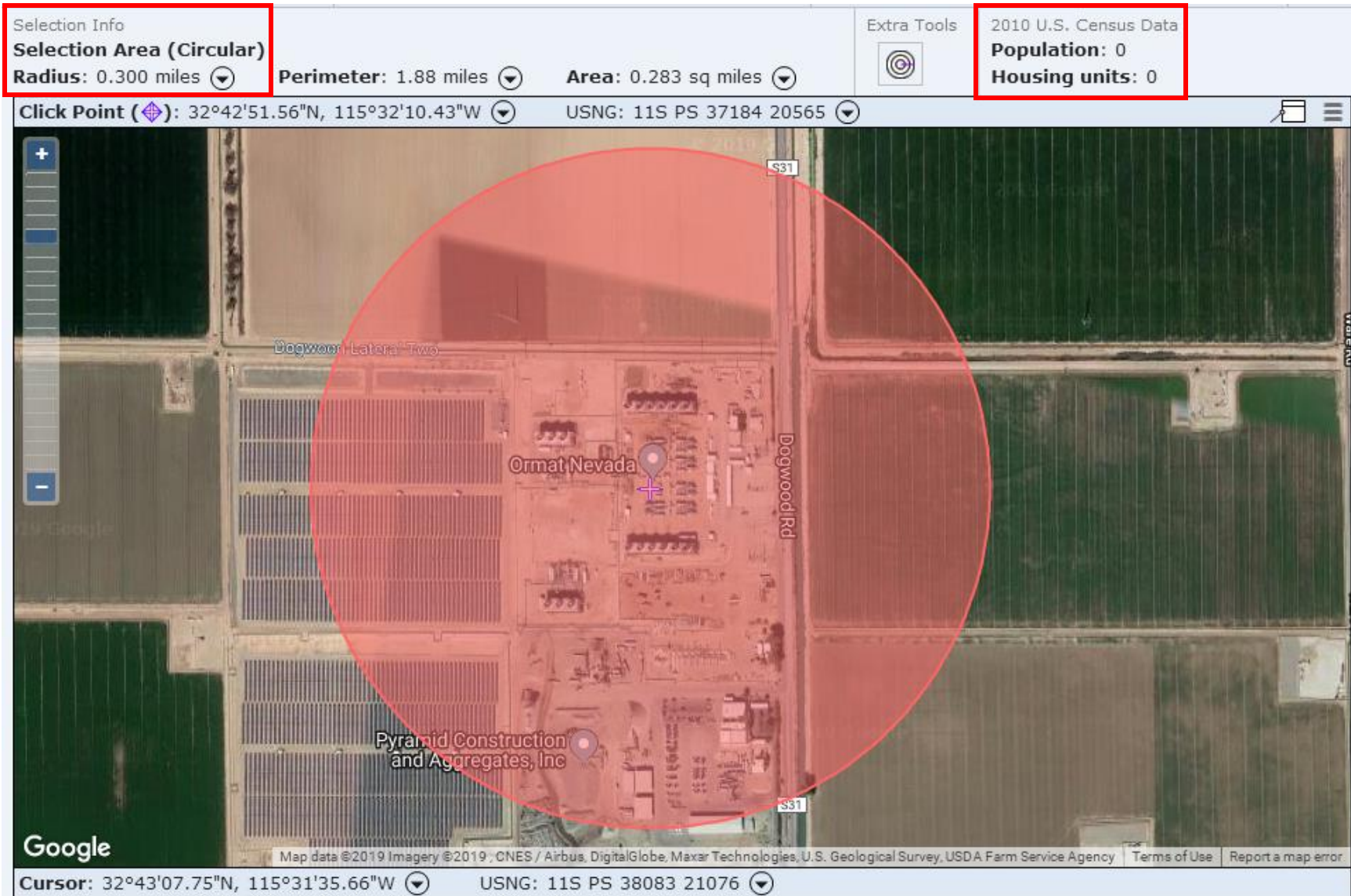


Figure 5: WCS MARPLOT 5.1.1 Population Estimates



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:

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

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 Stability
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

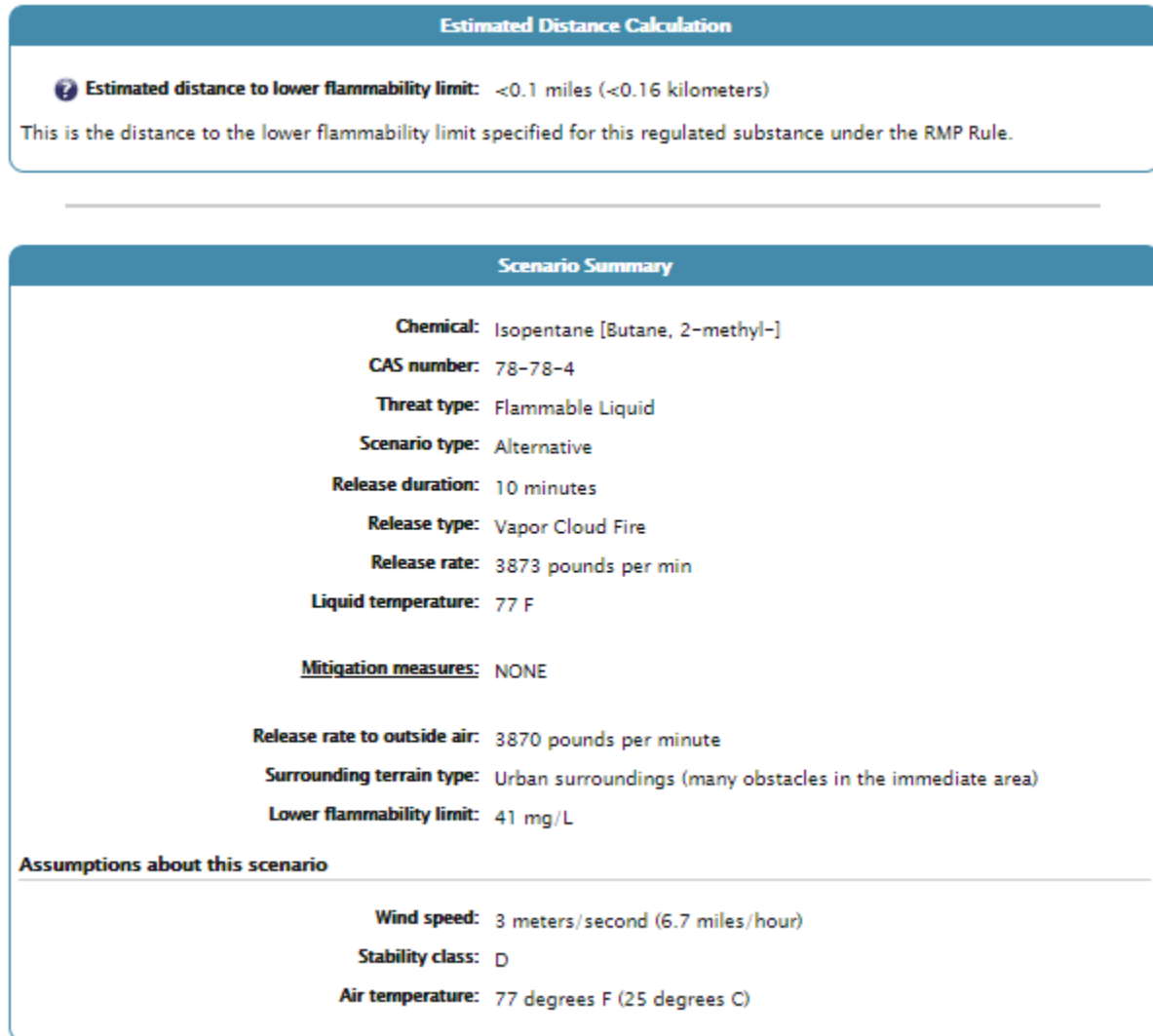
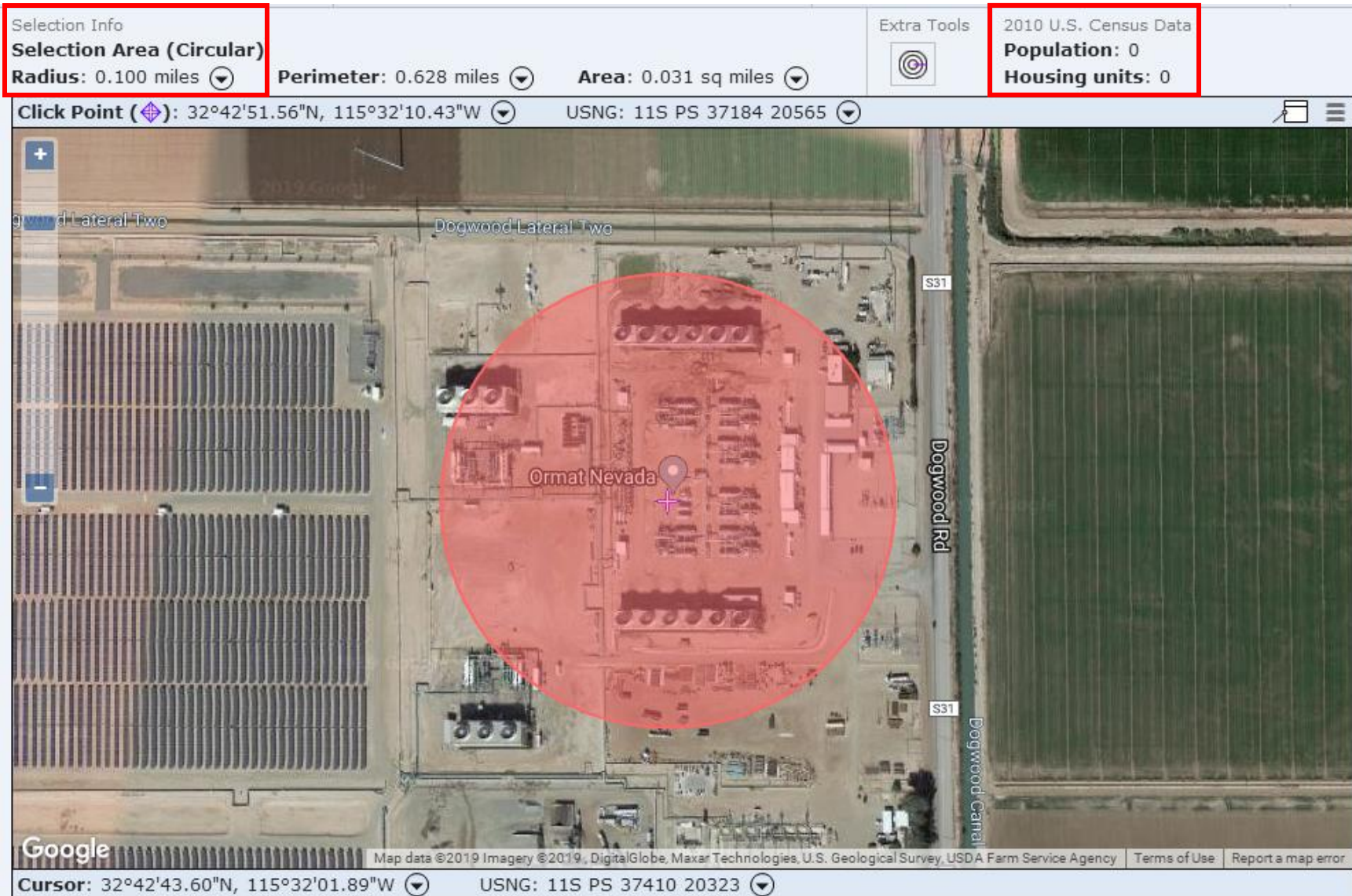


Figure 7: ARS MARPLOT 5.1. Population Estimates





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 Pliocene 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 completely 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 _____

MAIN OFFICE:	801 Main Street	El Centro, CA 92243	(760) 482-4236	FAX: (760) 353-8338	E-MAIL: planning@imperialcounty.net
ECON. DEV. OFFICE:	836 Main Street	El Centro, CA 92243	(760) 482-4900	FAX: (760) 337-8907	

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).

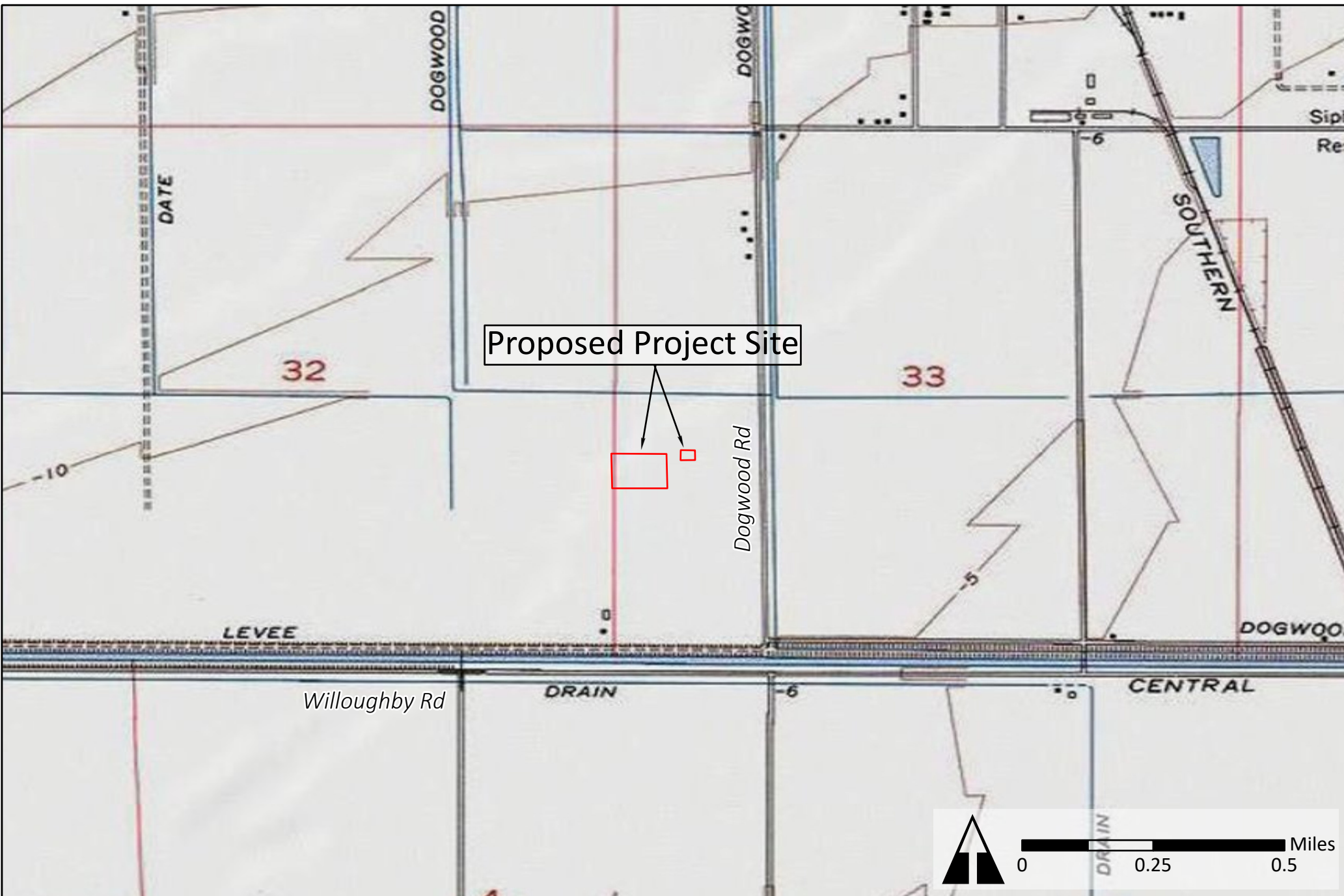
33. Describe how reclamation of this site in this manner may affect future mining at this site and in the surrounding area:

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.

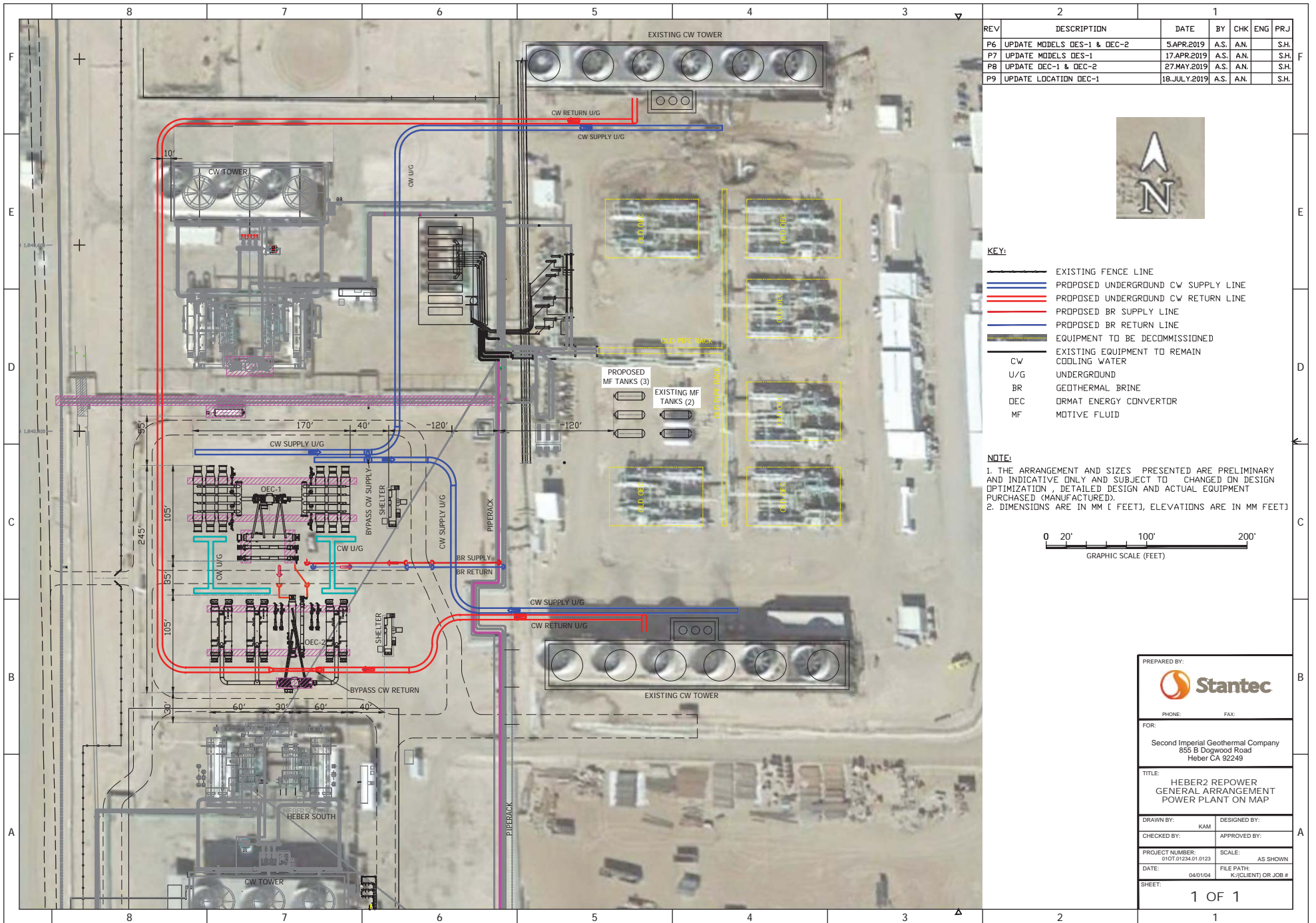
36. Describe proposed Revegetation Plan (attach as "Attachment D" if necessary):
The entire Heber 2 site would be dismantled and removed. All wells would
abandoned per DOGGR requirements. Once free of facilities, the site
would be disced and seeded with a native mix, per Imperial County's
recommendation. See Attachment D.



TOPOGRAPHIC MAP OF PROJECT SITE



Figure 1
ORMAT
Date: July 2019



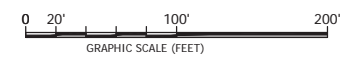
REV	DESCRIPTION	DATE	BY	CHK	ENG	PRJ
P6	UPDATE MODELS DES-1 & DEC-2	5.APR.2019	A.S.	A.N.		S.H.
P7	UPDATE MODELS DES-1	17.APR.2019	A.S.	A.N.		S.H.
P8	UPDATE DEC-1 & DEC-2	27.MAY.2019	A.S.	A.N.		S.H.
P9	UPDATE LOCATION DEC-1	18.JULY.2019	A.S.	A.N.		S.H.



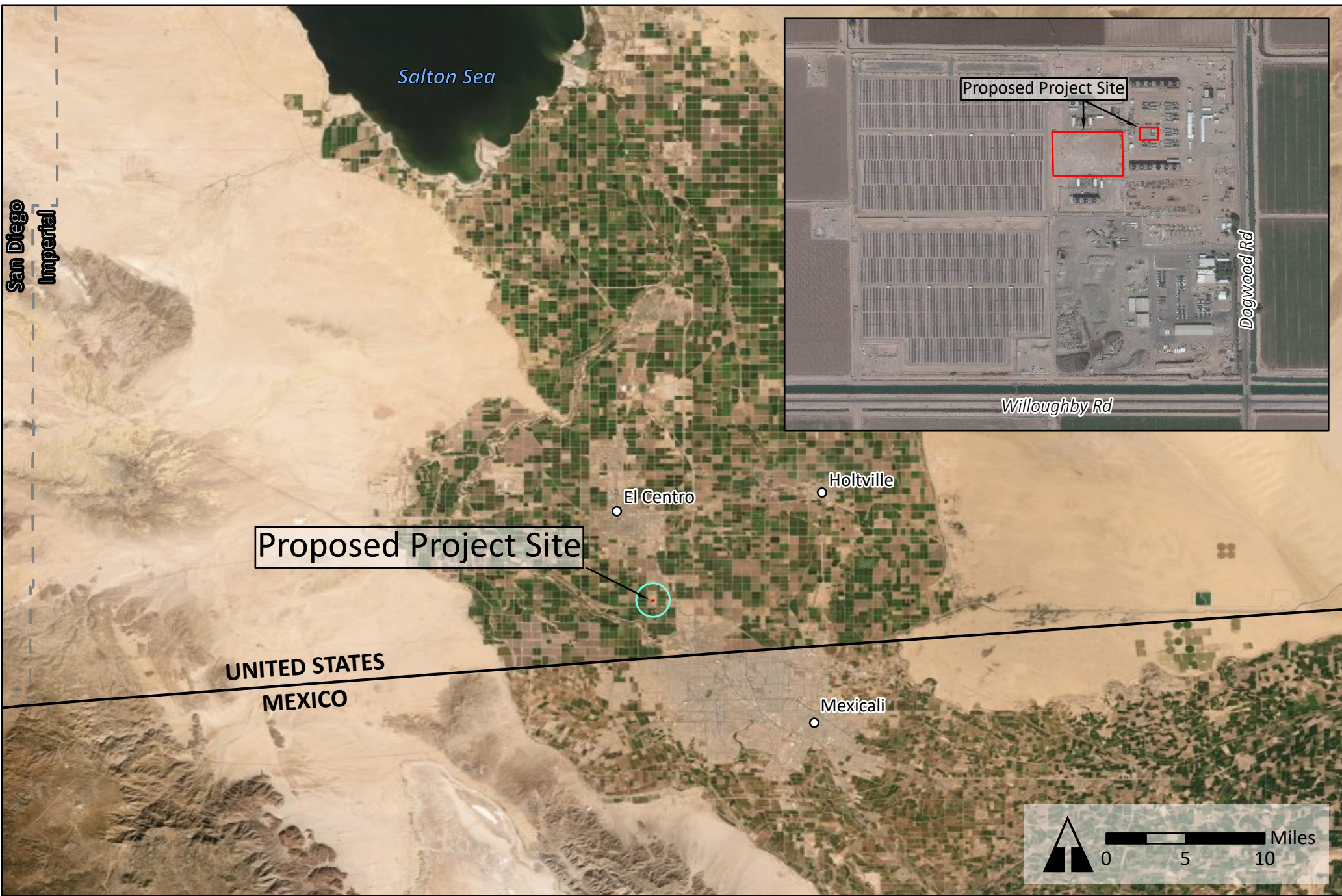
- KEY:**
- EXISTING FENCE LINE
 - PROPOSED UNDERGROUND CW SUPPLY LINE
 - PROPOSED UNDERGROUND CW RETURN LINE
 - PROPOSED BR SUPPLY LINE
 - PROPOSED BR RETURN LINE
 - EQUIPMENT TO BE DECOMMISSIONED
 - EXISTING EQUIPMENT TO REMAIN
 - CW COOLING WATER
 - U/G UNDERGROUND
 - BR GEOTHERMAL BRINE
 - DEC ORMAT ENERGY CONVERTOR
 - MF MOTIVE FLUID

NOTE:

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



PREPARED BY:	
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:	DESIGNED BY:
KAM	
CHECKED BY:	APPROVED BY:
PROJECT NUMBER:	SCALE:
010T.01234.01.0123	AS SHOWN
DATE:	FILE PATH:
04/01/04	K:\CLIENT\OR JOB #
SHEET:	
1 OF 1	



- Legend**
- United States/Mexico Border
 - County Line
 - Project Site
 - 1-Mile Radius

PROPOSED PROJECT SITE - HEBER 2



Figure 1
ORMAT
Date: July 2019

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

MAIN OFFICE: 801 Main Street El Centro, CA 92243 (760) 482-4236 FAX: (760) 353-8338 E-MAIL: planning@imperialcounty.net
ECON. DEV. OFFICE: 836 Main Street El Centro, CA 92243 (760) 482-4900 FAX: (760) 337-8907

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

$$2 \text{ wells} \times 200 \text{ feet}^1 \times \$16.10/\text{foot}^2 = \mathbf{\$6,440}$$

Site Reclamation and Revegetation

- Cost of Reclaiming 40 acres

$$\$10,235^2 \text{ (first acre)} + 219,765 \text{ } (\$5,635/\text{acre}^2 \text{ for 39 acres}) = \mathbf{\$230,000}$$

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 application

MAIN OFFICE:	801 Main Street	El Centro, CA 92243	(760) 482-4236	FAX: (760) 353-8338	E-MAIL: planning@imperialcounty.net
ECON. DEV. OFFICE:	836 Main Street	El Centro, CA 92243	(760) 482-4900	FAX: (760) 337-8907	

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
GEOHERMAL 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



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

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Appendix A: Worst-Case Scenario Calculations

Appendix B: Alternative Case Scenario Calculations

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/m² 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.

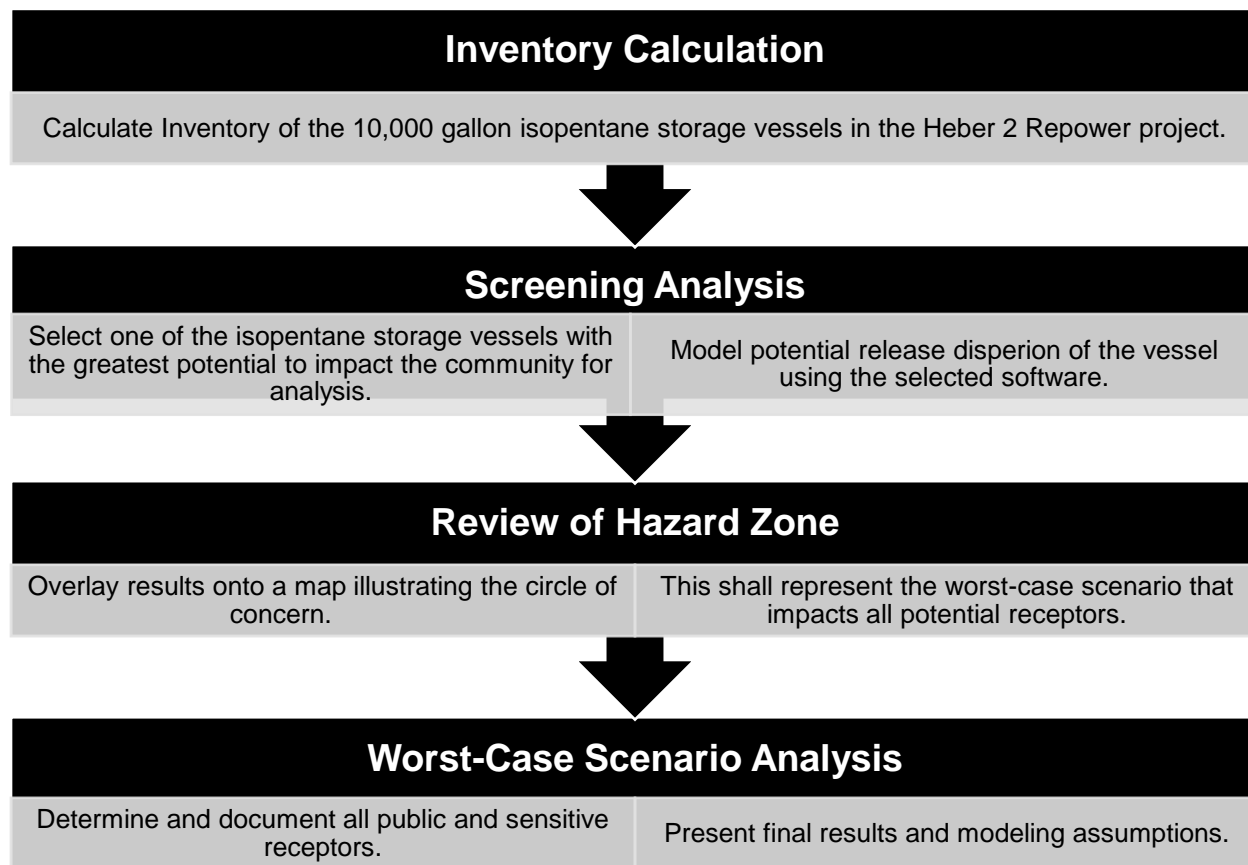
The Areal Locations of Hazardous Atmospheres (ALOHA)^[3] modeling software was used to determine the distance to the endpoint for the worst-case release scenario analysis. The vulnerability zone resulting from this analysis was then reviewed. A vulnerability zone is defined as a circle whose center is 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



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/m².

- **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/m² 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/m²) 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 Phillips 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	77°F (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	122°F	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.*

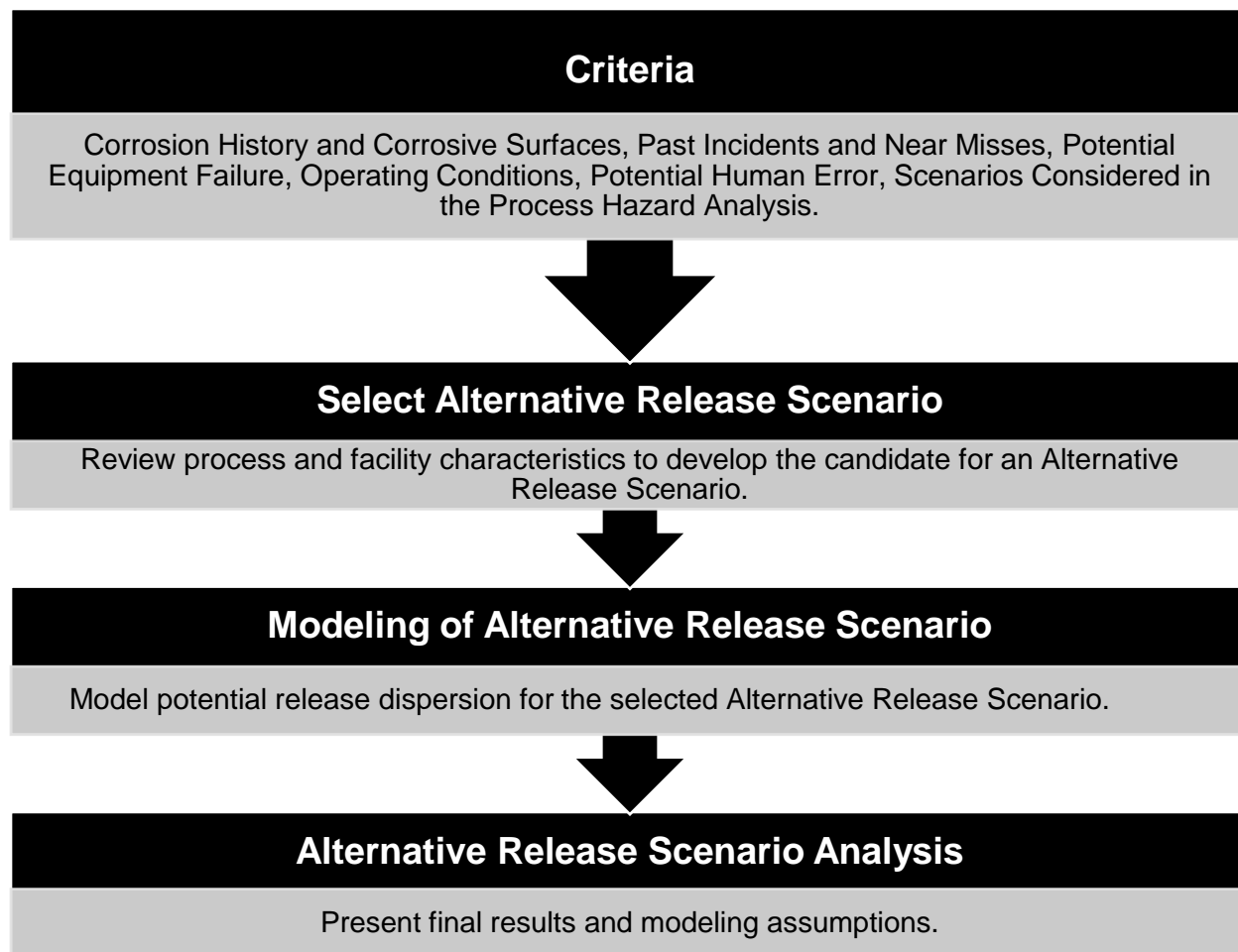
For alternative release scenarios, active mitigation systems, such as interlocks, shutdown systems, pressure relieving devices, flares, emergency isolation systems, and fire water and deluge systems, as well as passive mitigation systems are considered, if they were applicable. In order to be credited, 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. 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	77°F (25°C)	As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, “this guidance assumes 25°C 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 borders 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	ARS
	(0.052 MI)	(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™ 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 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 ft²), 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 6: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #1

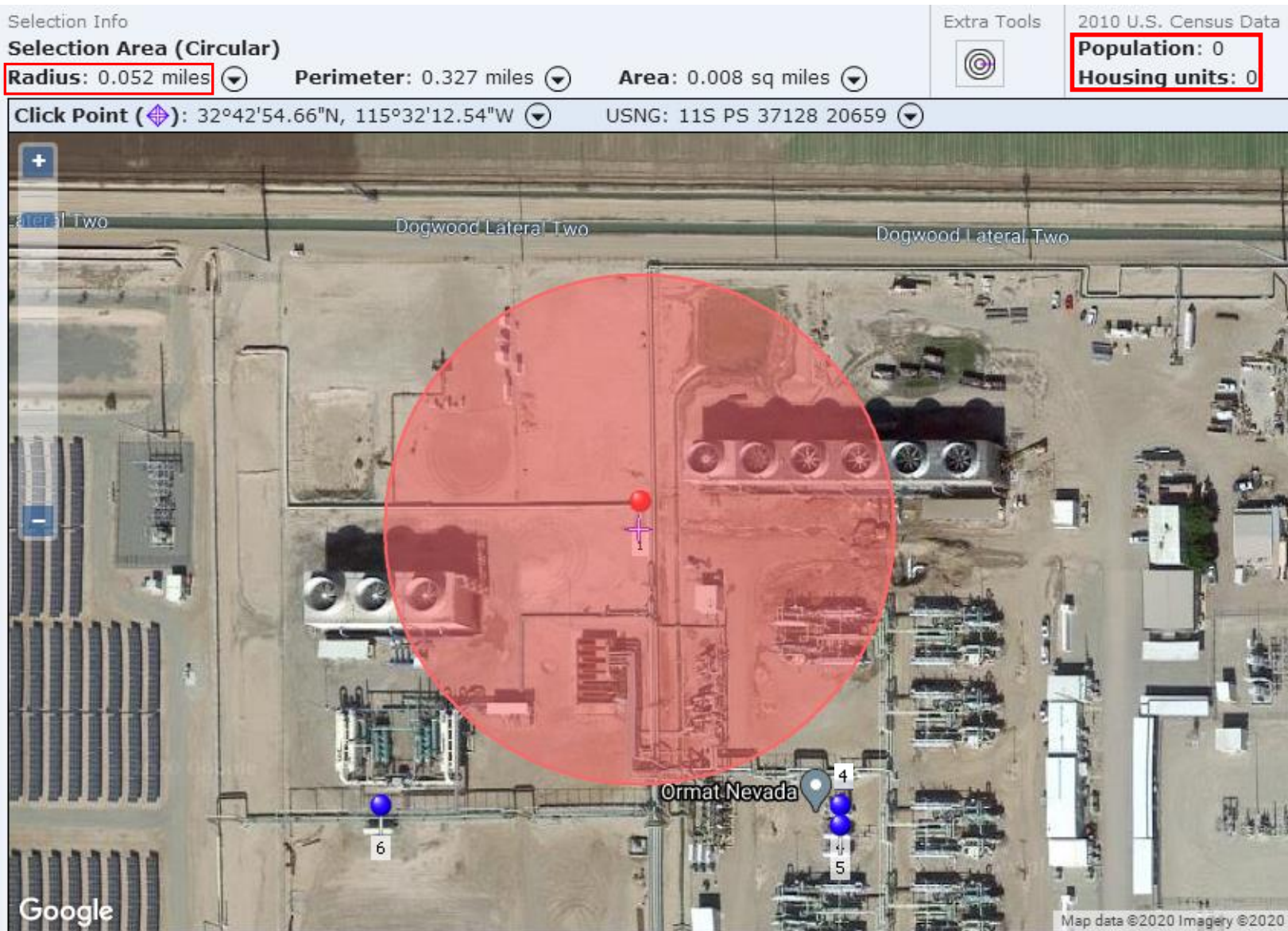


Figure 7: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2

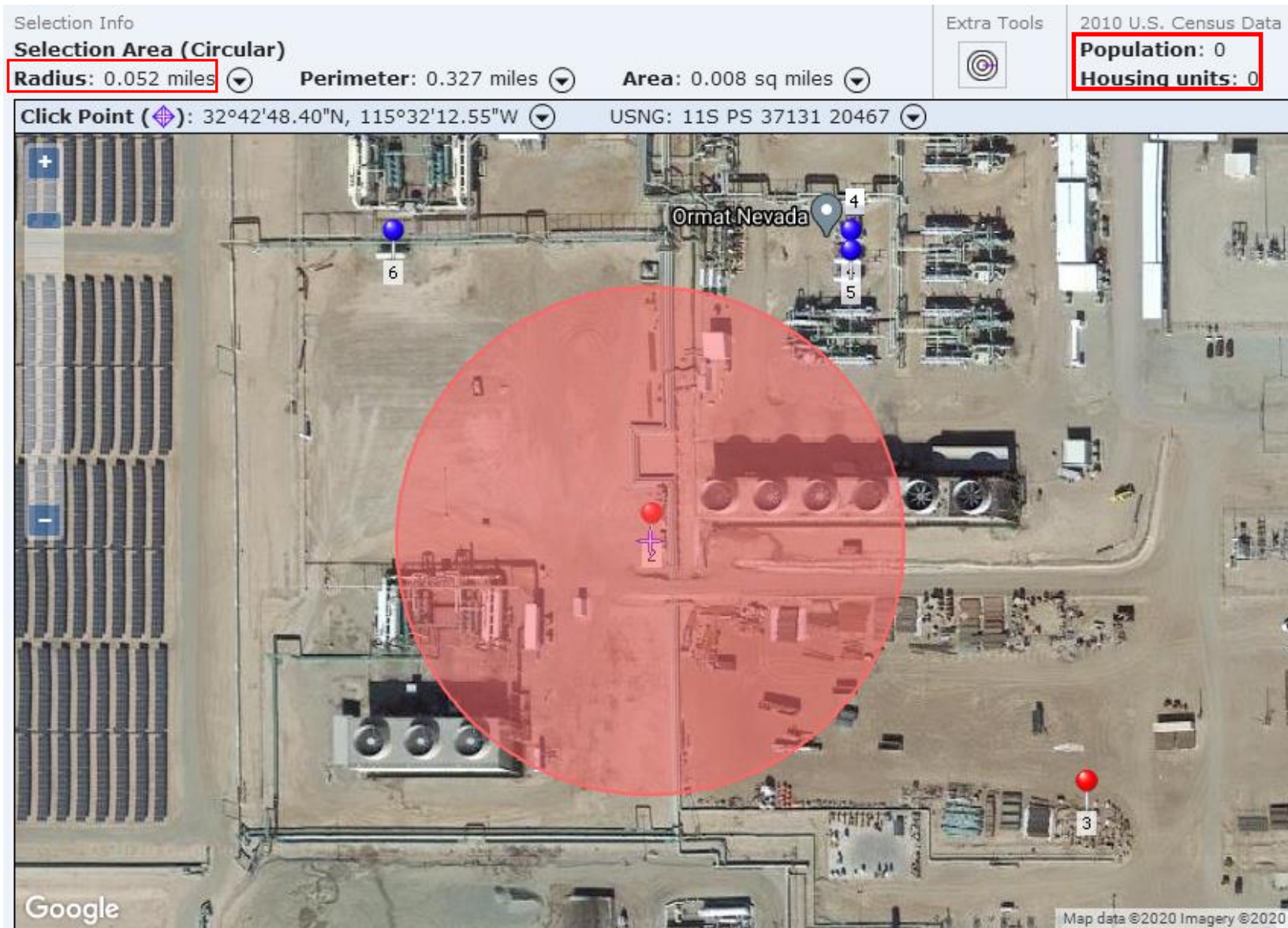


Figure 8: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3

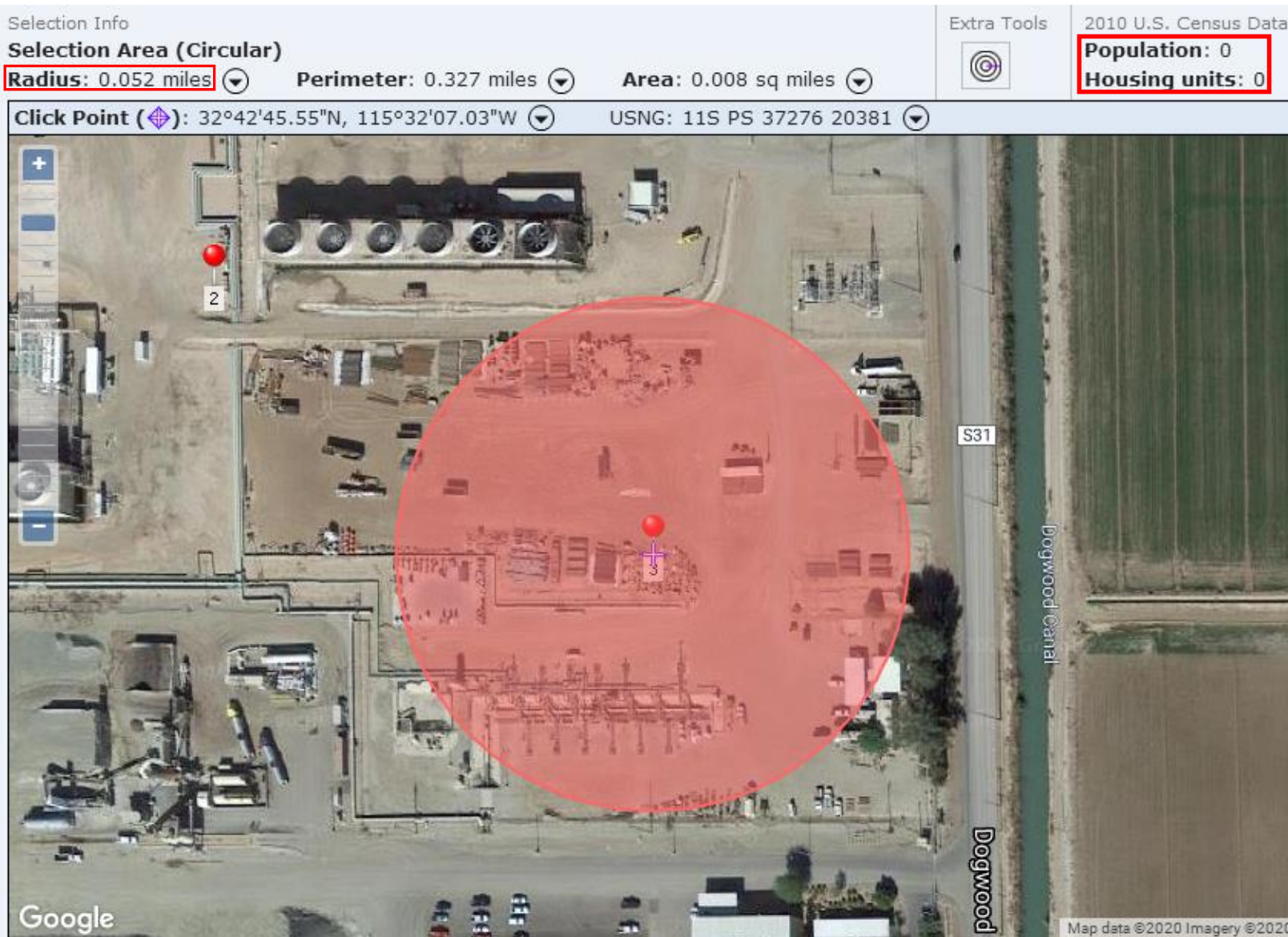


Figure 9: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #4

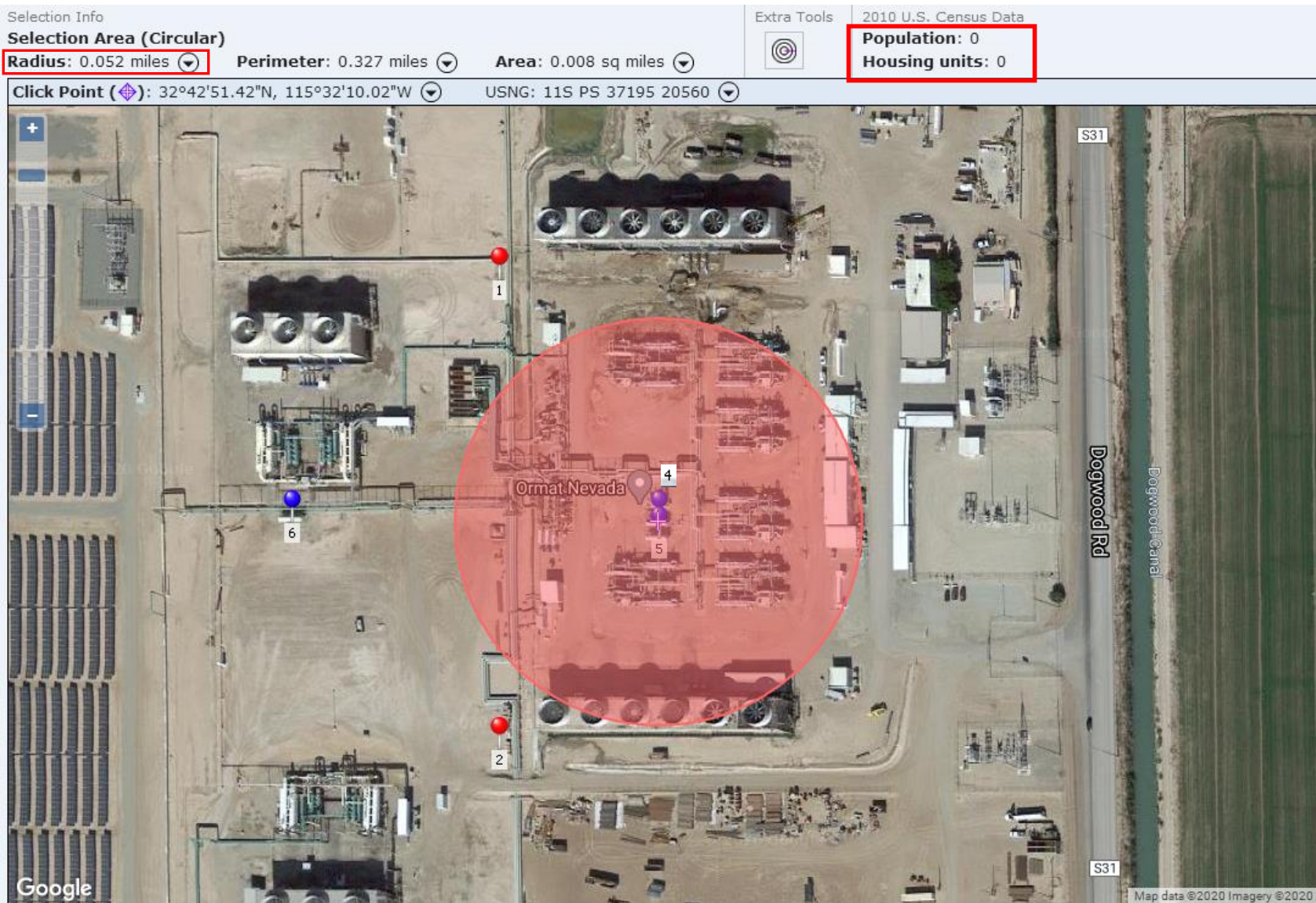


Figure 10: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #5

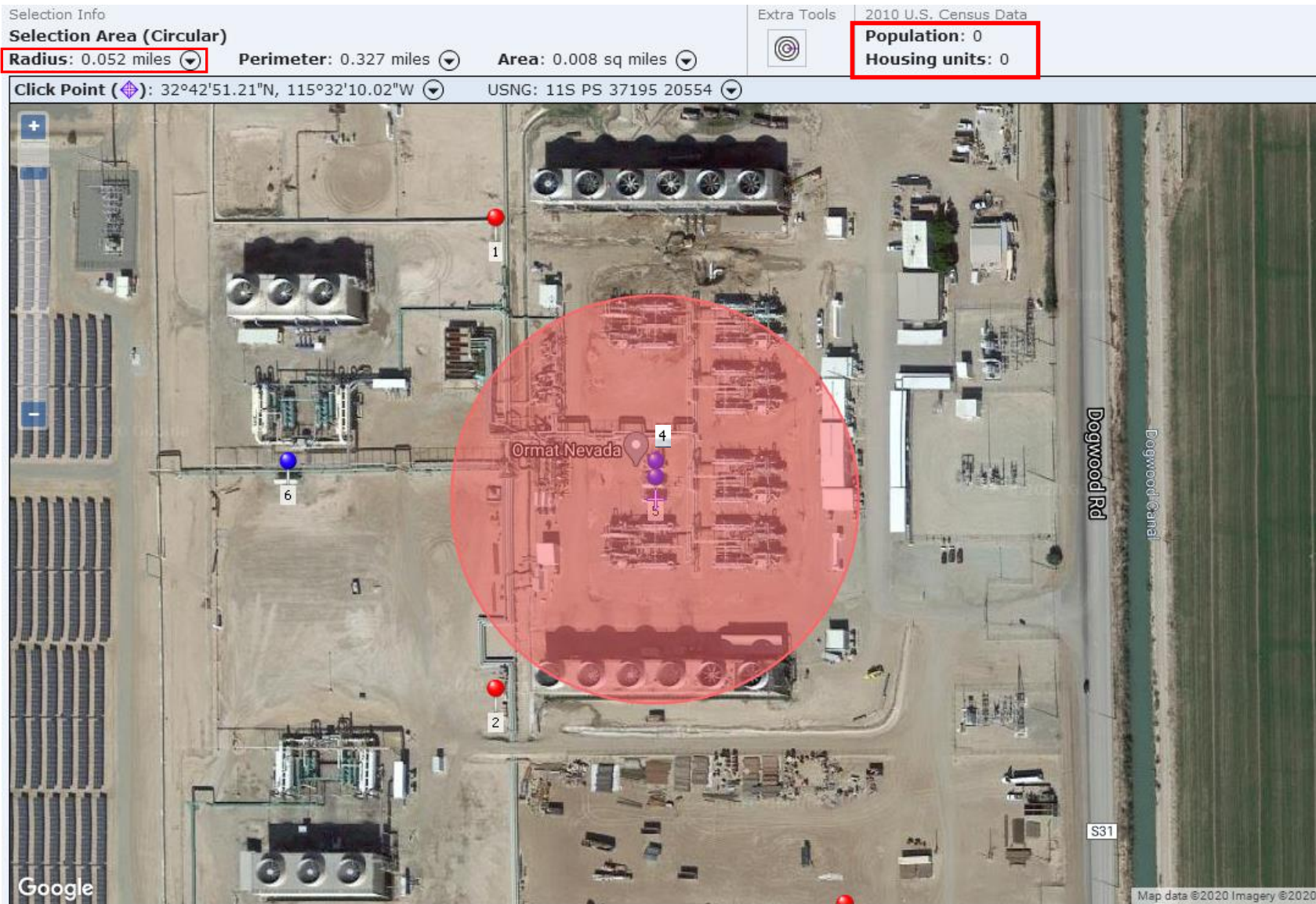


Figure 11: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #6

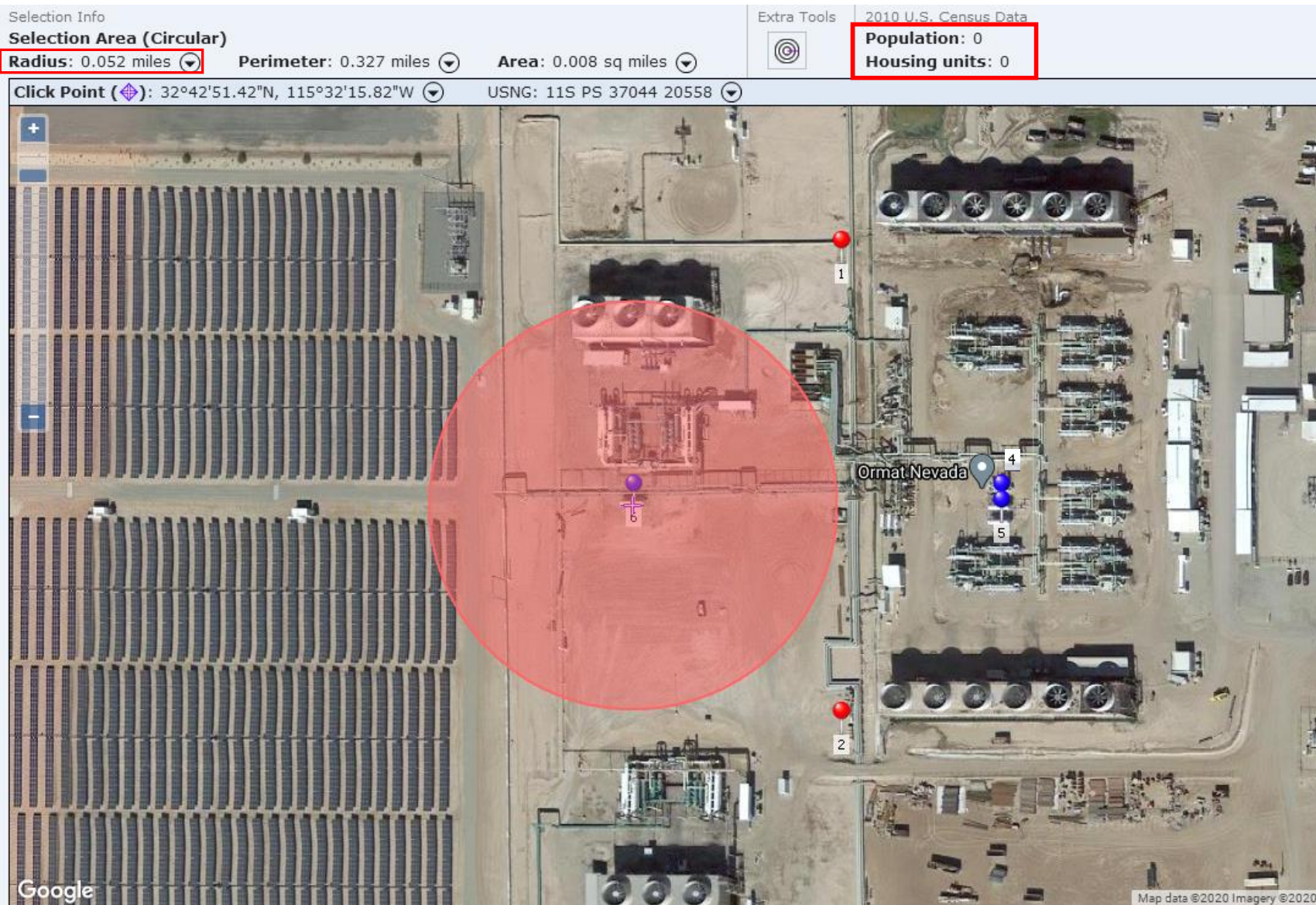


Figure 12: WCS Vulnerability Maps Overlaid for Isopentane Storage Vessels #1, #2, #3, #4, #5, & #6



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 ft³). 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:

$$V_L = A_L \times L$$

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

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

Where:

V_L = Volume of liquid within the Tank (ft³)

A_L = Area of liquid (ft²)

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:

$$V_L = 2,970 \text{ gallons} = 397 \text{ ft}^3$$

$$R = 4 \text{ ft.}$$

$$L = 33.5 \text{ ft.}$$

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:

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

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

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

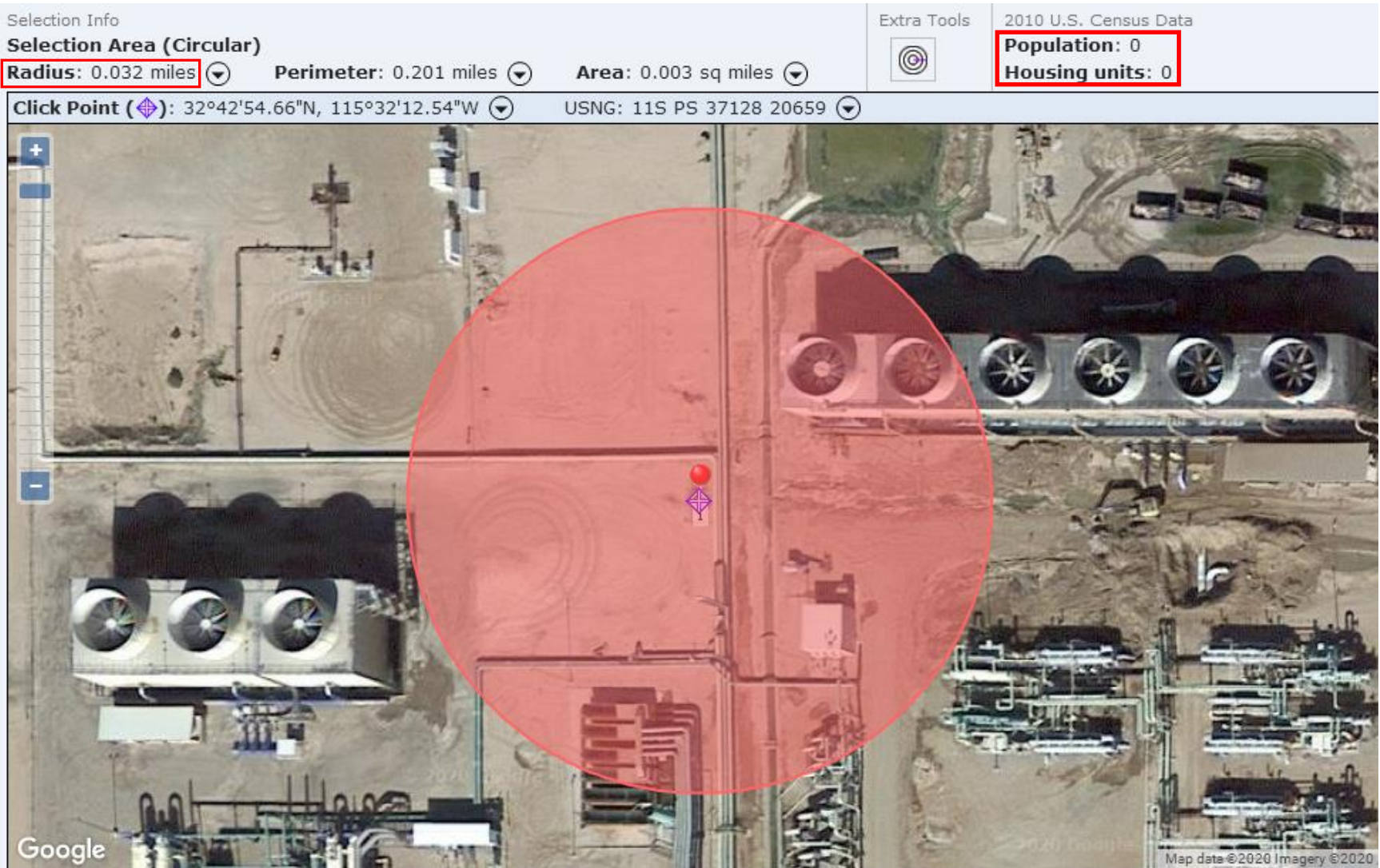


Figure 14: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2

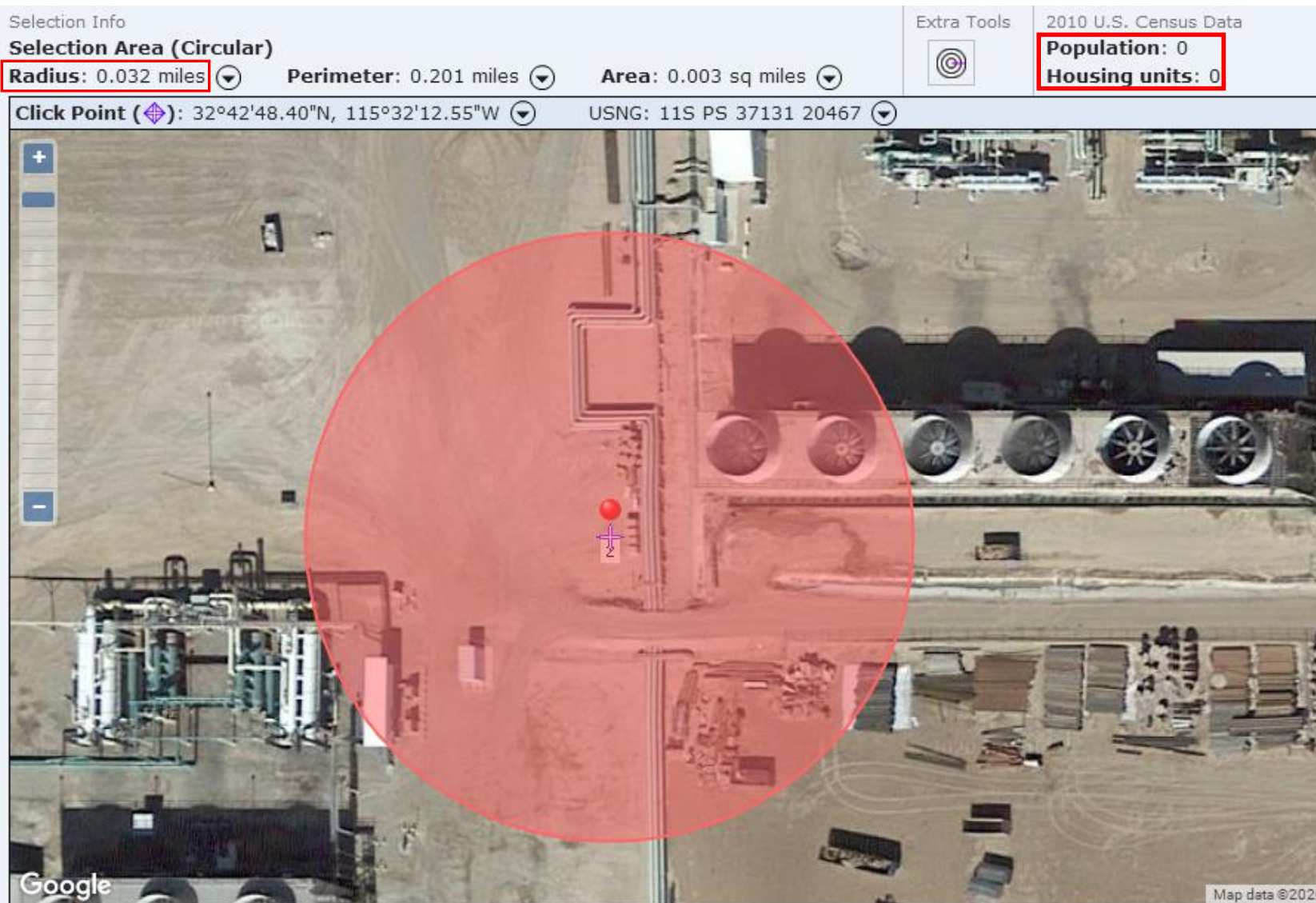


Figure 15: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3

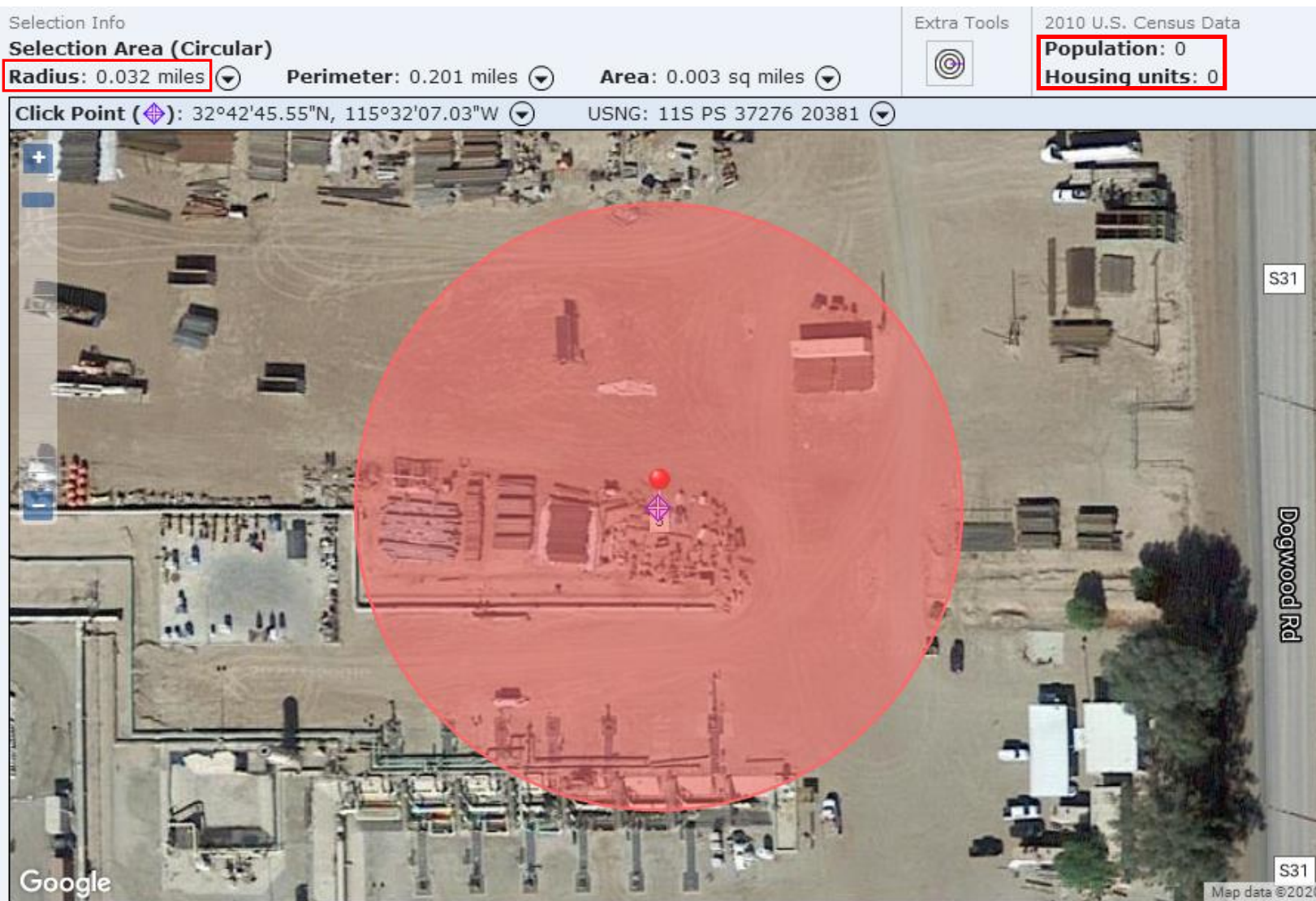


Figure 16: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #4

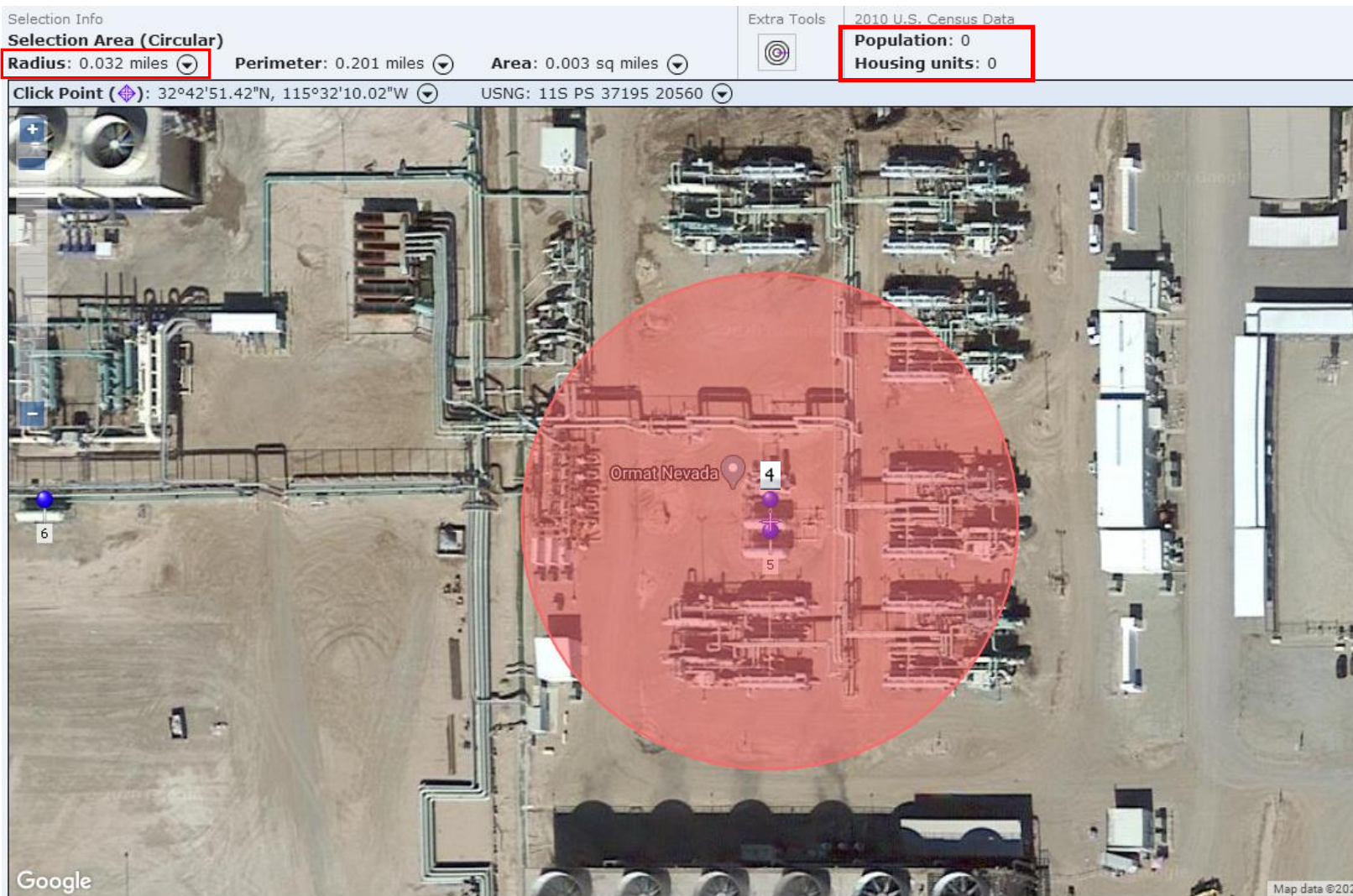


Figure 17: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #5

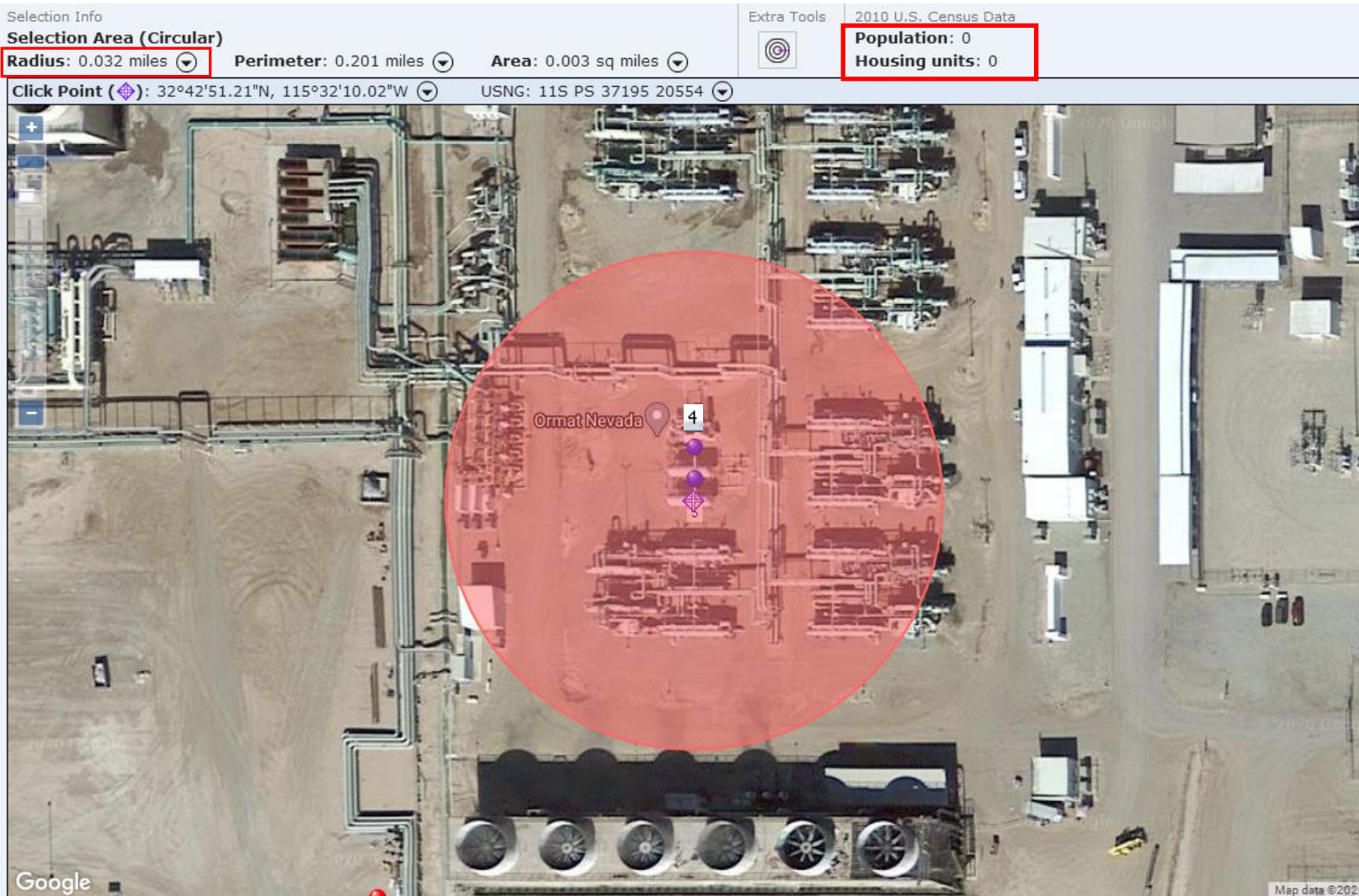
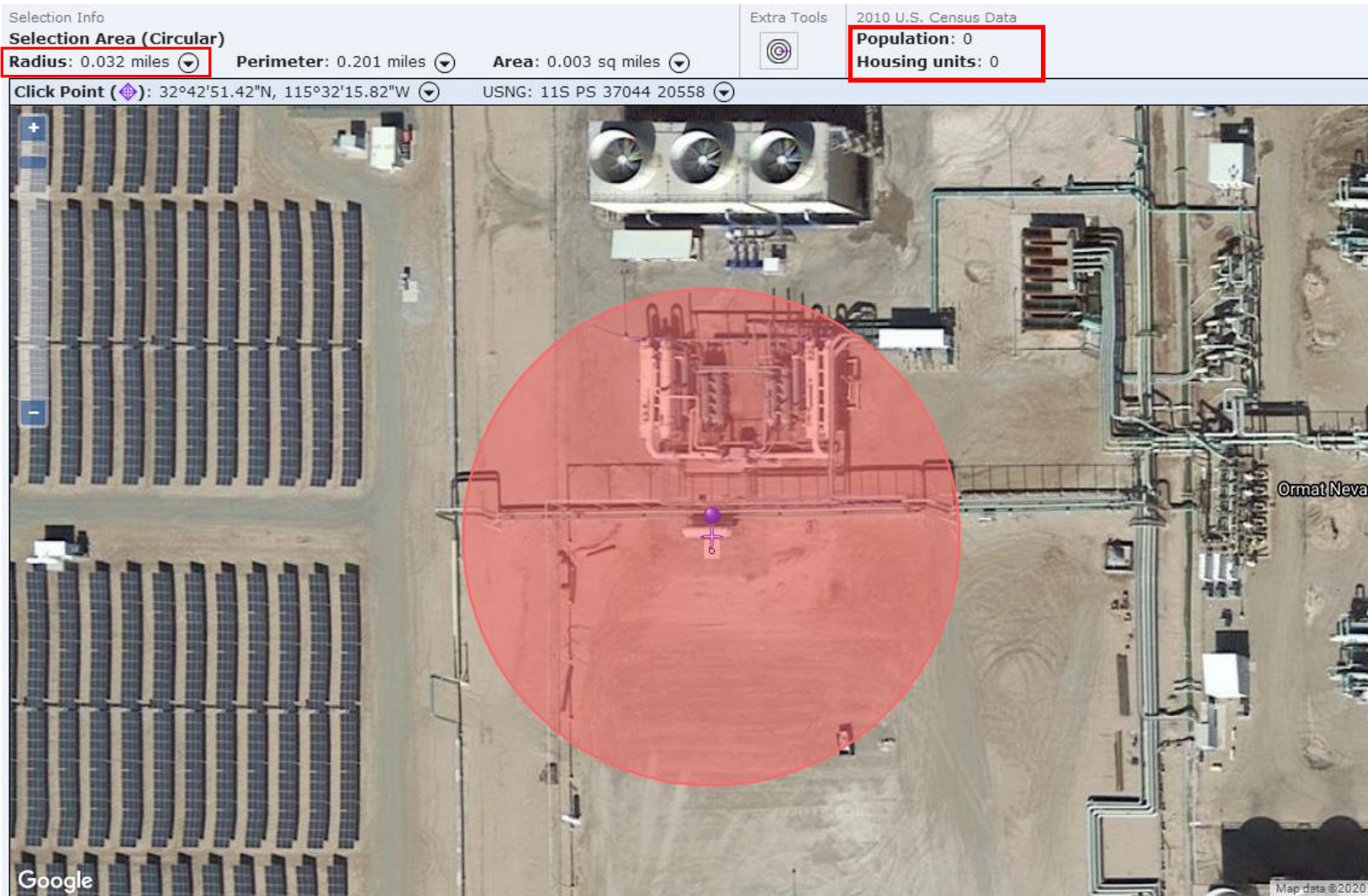


Figure 18: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #6



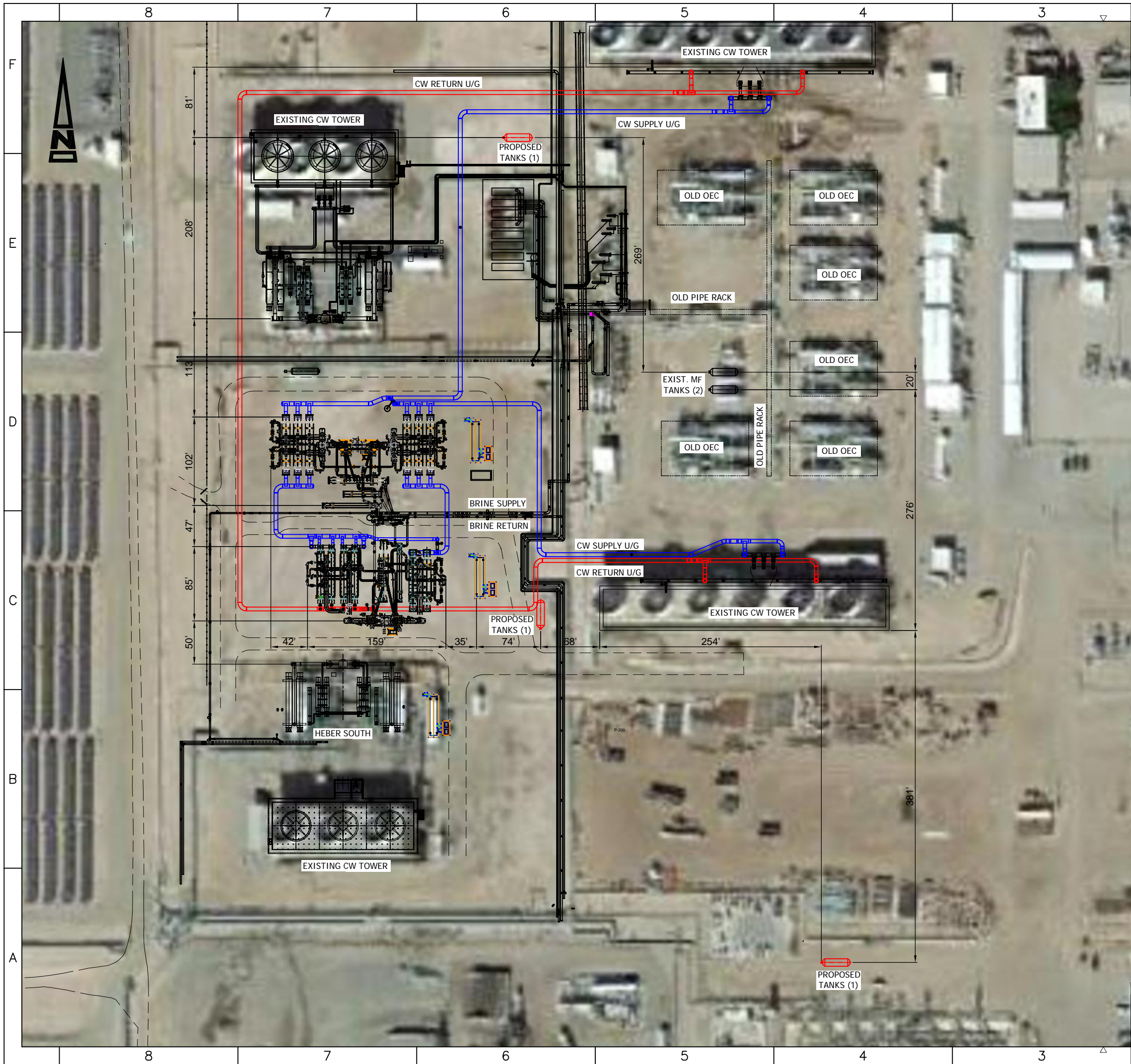
Attachment A
Table of Present and
Proposed Geothermal
Energy Generation by Unit
at the Heber 2 Complex

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

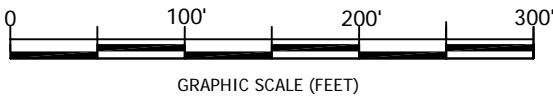
Proposed new generation: 16 MW (net), 17 MW (gross); all to occur through repowering the Heber 2 unit with no changes to Heber South and Goulds 2.

Attachment B
Site Plan with Adjusted
Isopentane Tank Locations



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



	APPROVED: A.S.		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	SHEET 1 OF 1	REV. P1
	CHECKED: S.S.			DRAWING NO. 7.910.00.001.0		
	DESIGNER: S.S. 16.JAN.2020					

Attachment C
Hazard Memorandum and
Hazard Assessment



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.

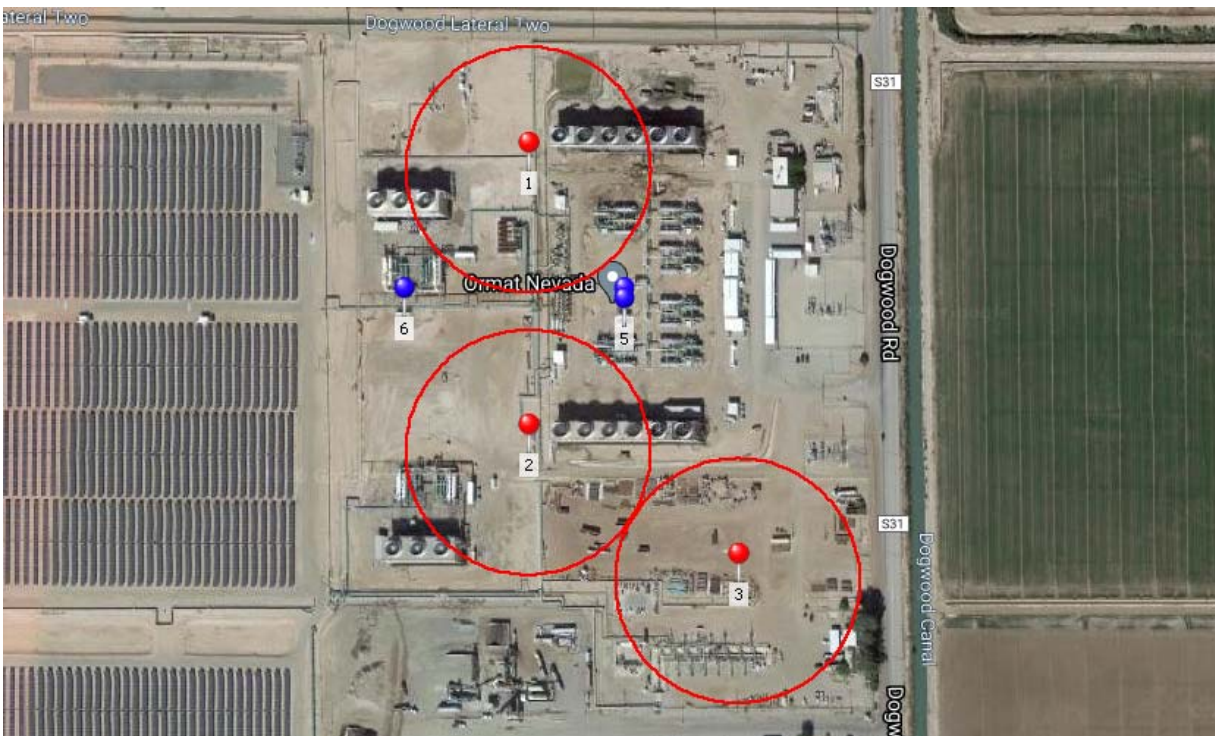
Moreover, Ormat will implement several safety-control measures into the isopentane storage system that would further reduce the potential for both initial tank failure and multi-tank failure:

- 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 borders, 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

**ORMAT, HEBER 2
GEOHERMAL 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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Phone: 949-282-0123 – E-mail: Client.Services@RMPCorp.com

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Appendix A: Worst-Case Scenario Calculations

Appendix B: Alternative Case Scenario Calculations

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/m² 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).

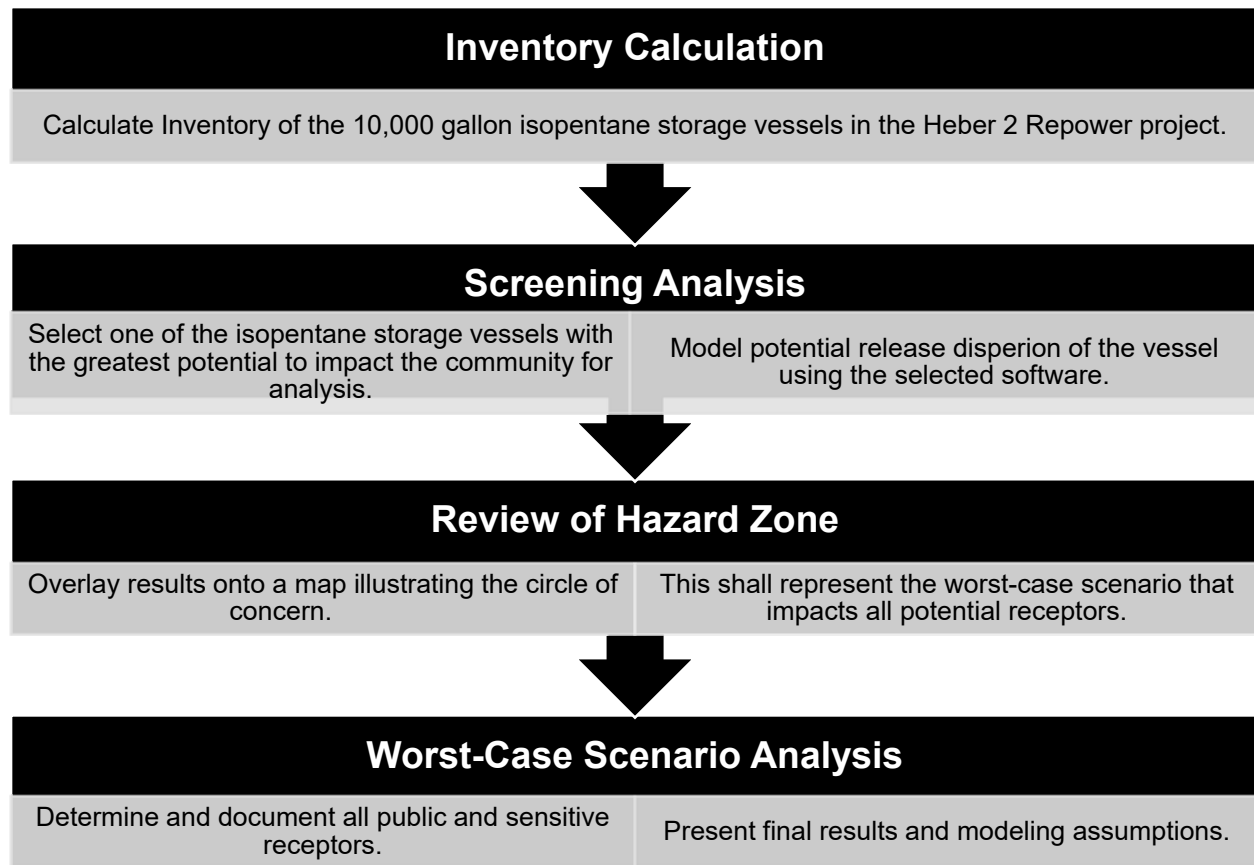
4.1 Worst-Case Scenario Selection Process

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/m².
- **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/m² 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/m²) 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 Phillips 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	77°F (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	122°F	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.*

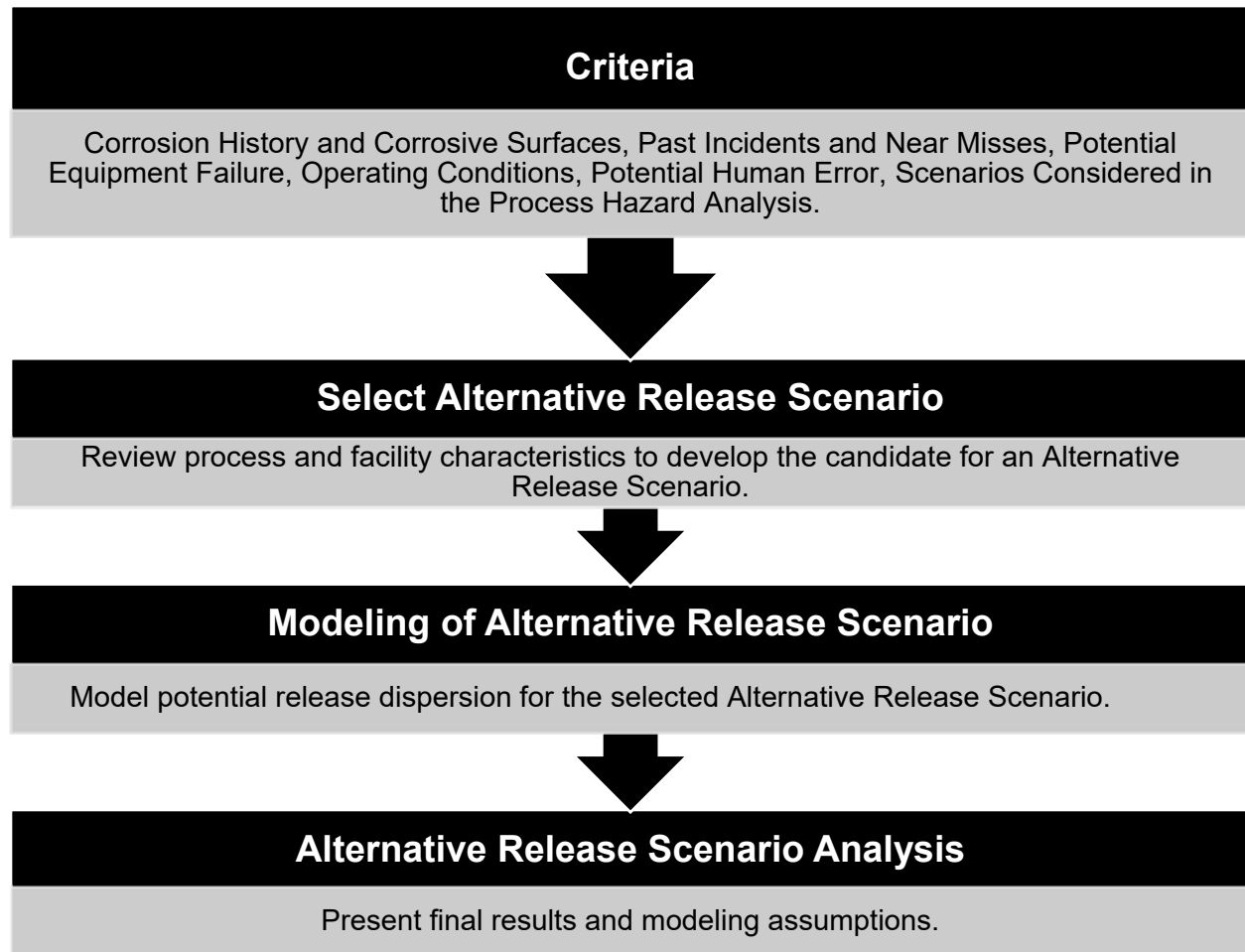
For alternative release scenarios, active mitigation systems, such as interlocks, shutdown systems, pressure relieving devices, flares, emergency isolation systems, and fire water and deluge systems, as well as passive mitigation systems are considered, if they were applicable. In order to be credited, 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. 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	77°F (25°C)	As per EPA RMP Offsite Consequence Analysis Guidance, for an alternative scenario, “this guidance assumes 25°C 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 borders 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 ft²), 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 6: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #1

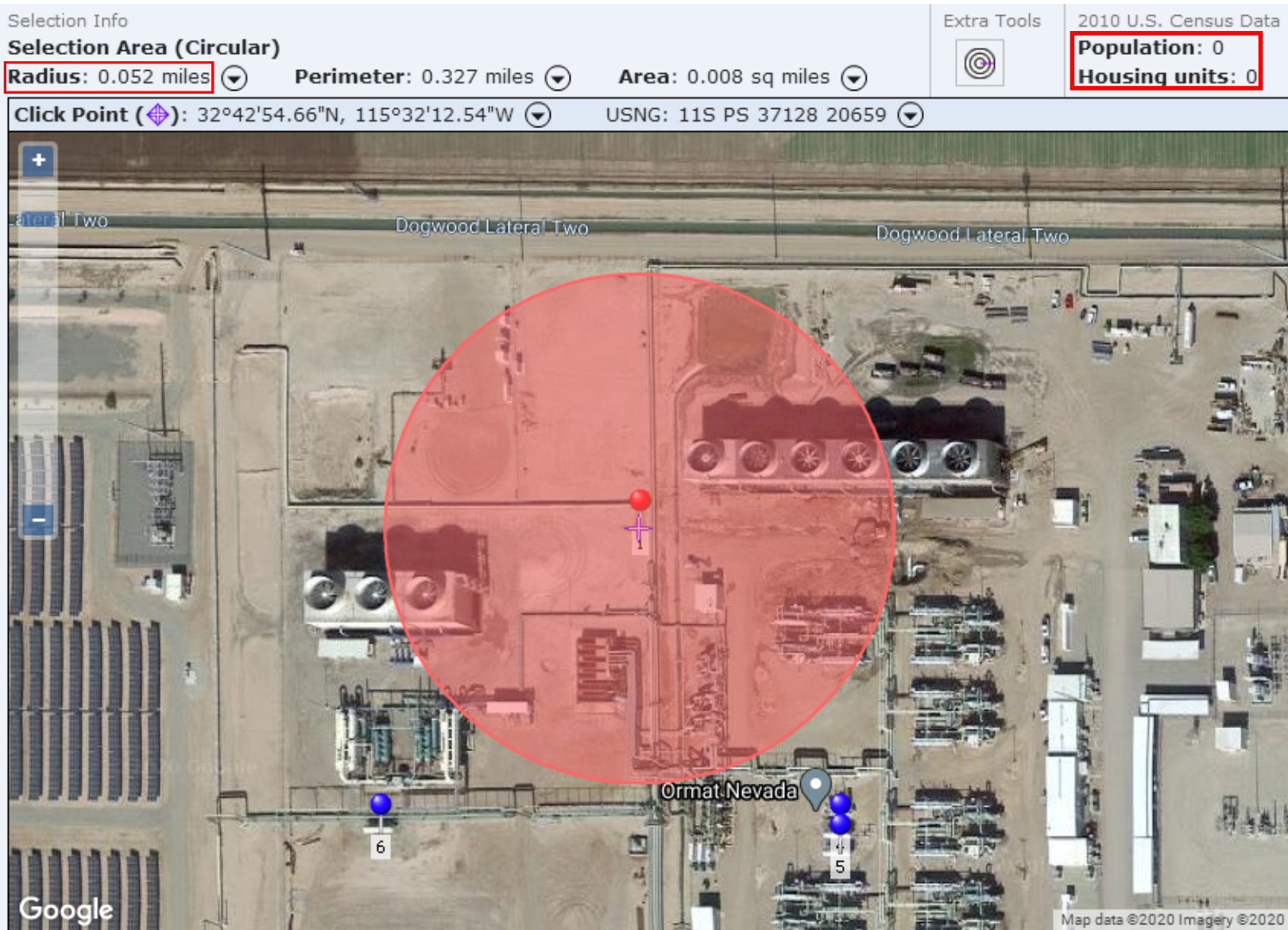


Figure 7: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2

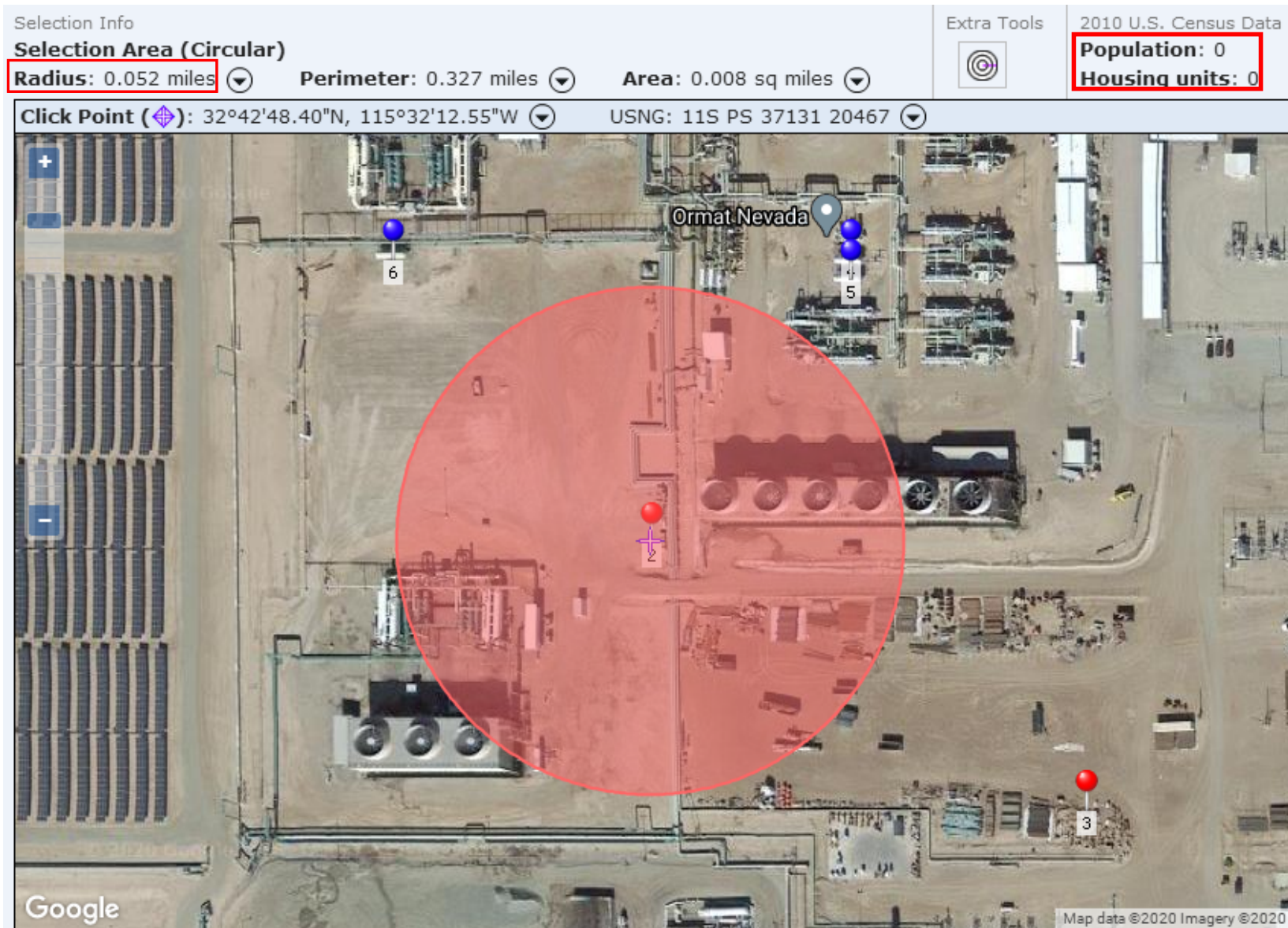


Figure 8: WCS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3

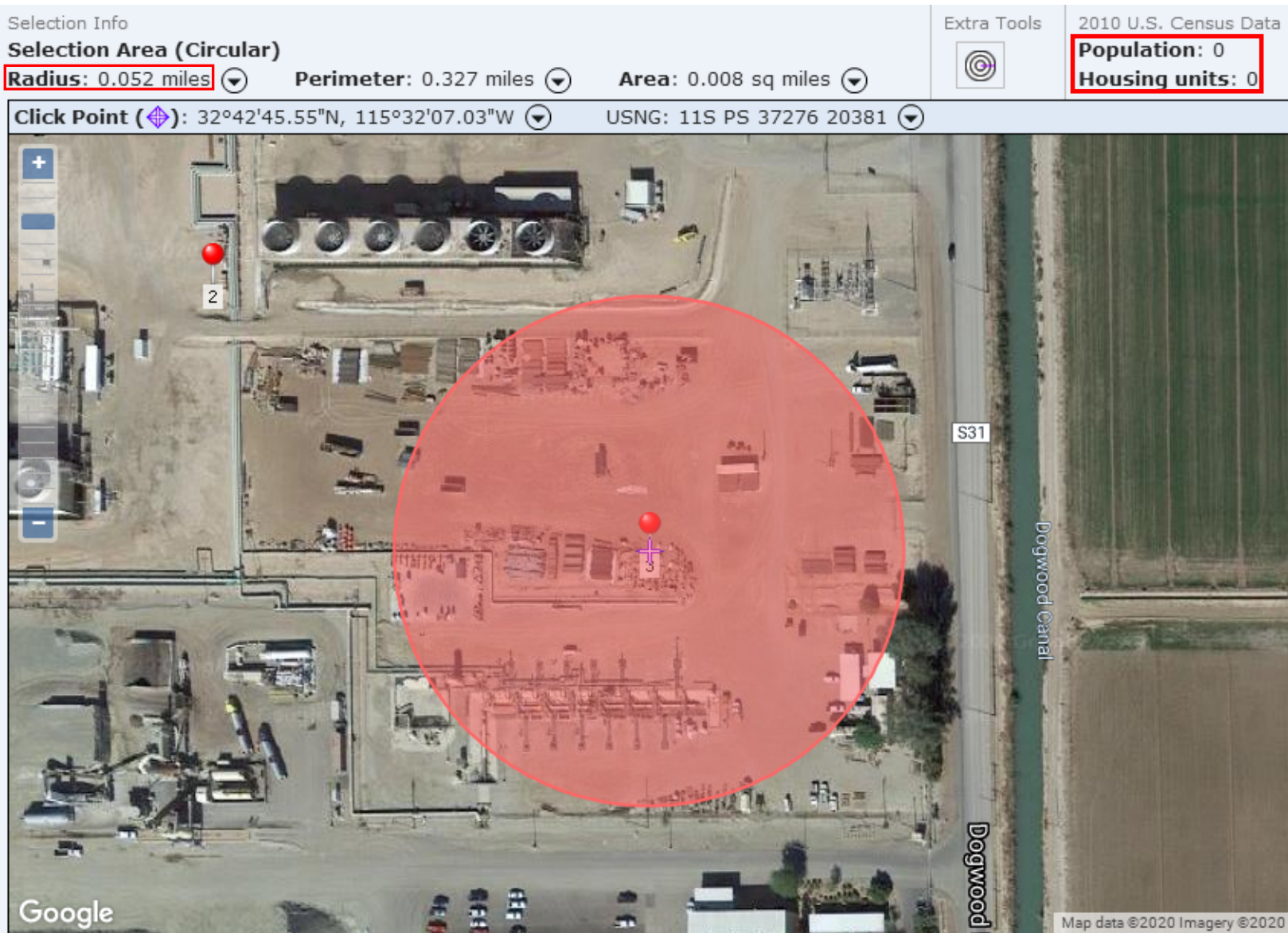


Figure 9: WCS Vulnerability Maps Overlaid for Isopentane Storage Vessels #1, #2, #3



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 ft³). 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:

$$V_L = A_L \times L$$

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

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

Where:

V_L = Volume of liquid within the Tank (ft³)

A_L = Area of liquid (ft²)

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:

$$V_L = 2,970 \text{ gallons} = 397 \text{ ft}^3$$

$$R = 4 \text{ ft.}$$

$$L = 33.5 \text{ ft.}$$

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:

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

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

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

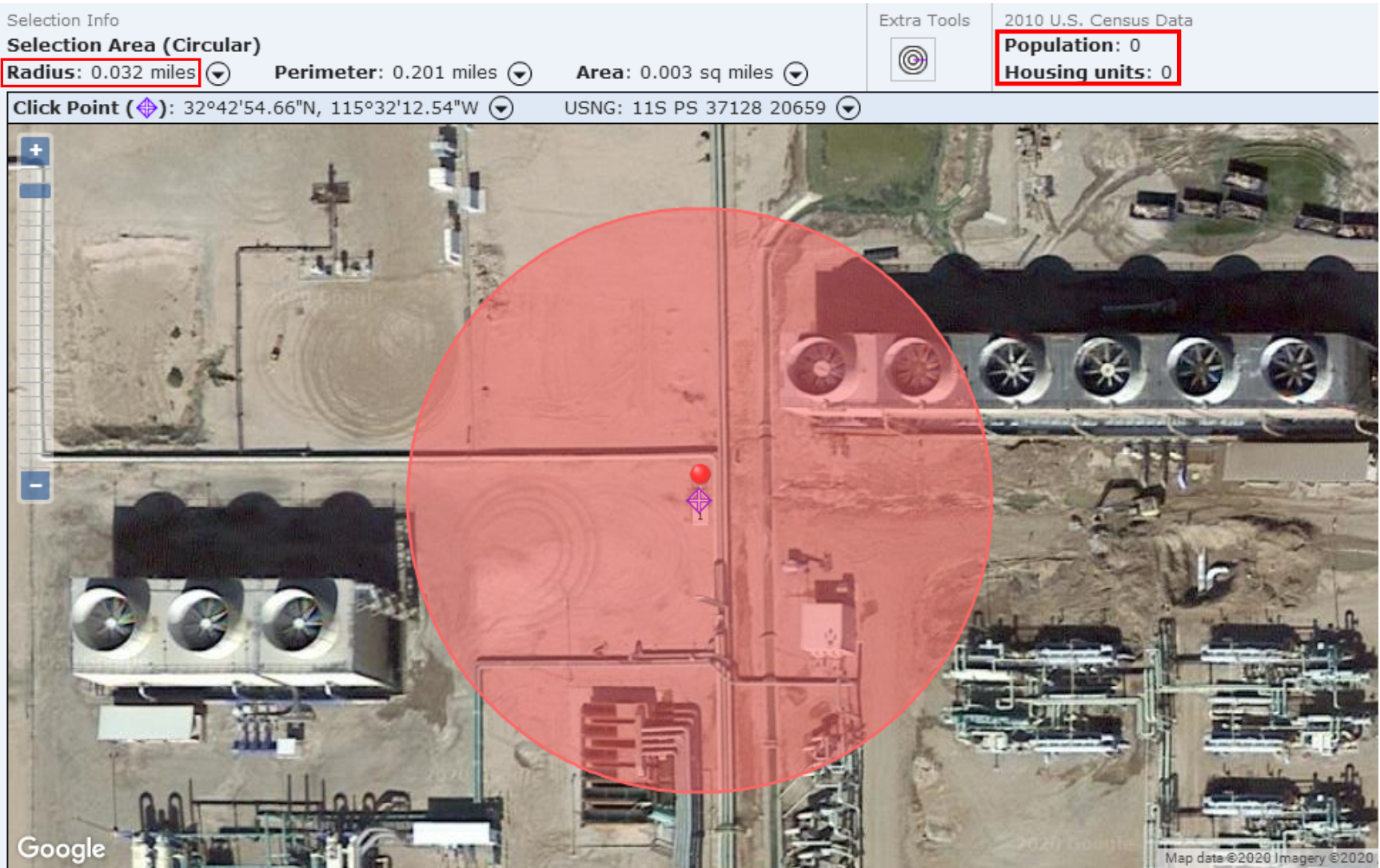


Figure 12: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #2

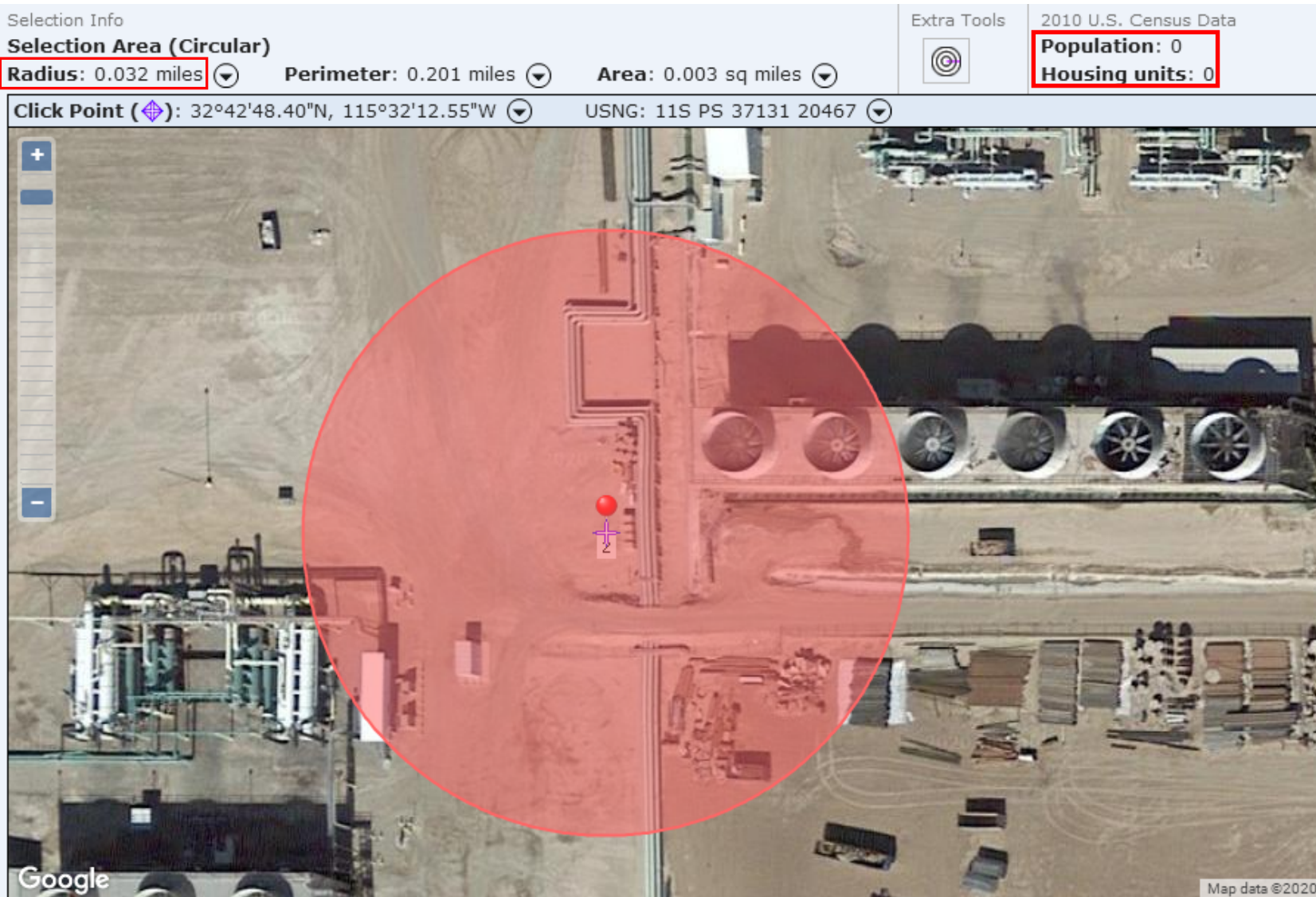
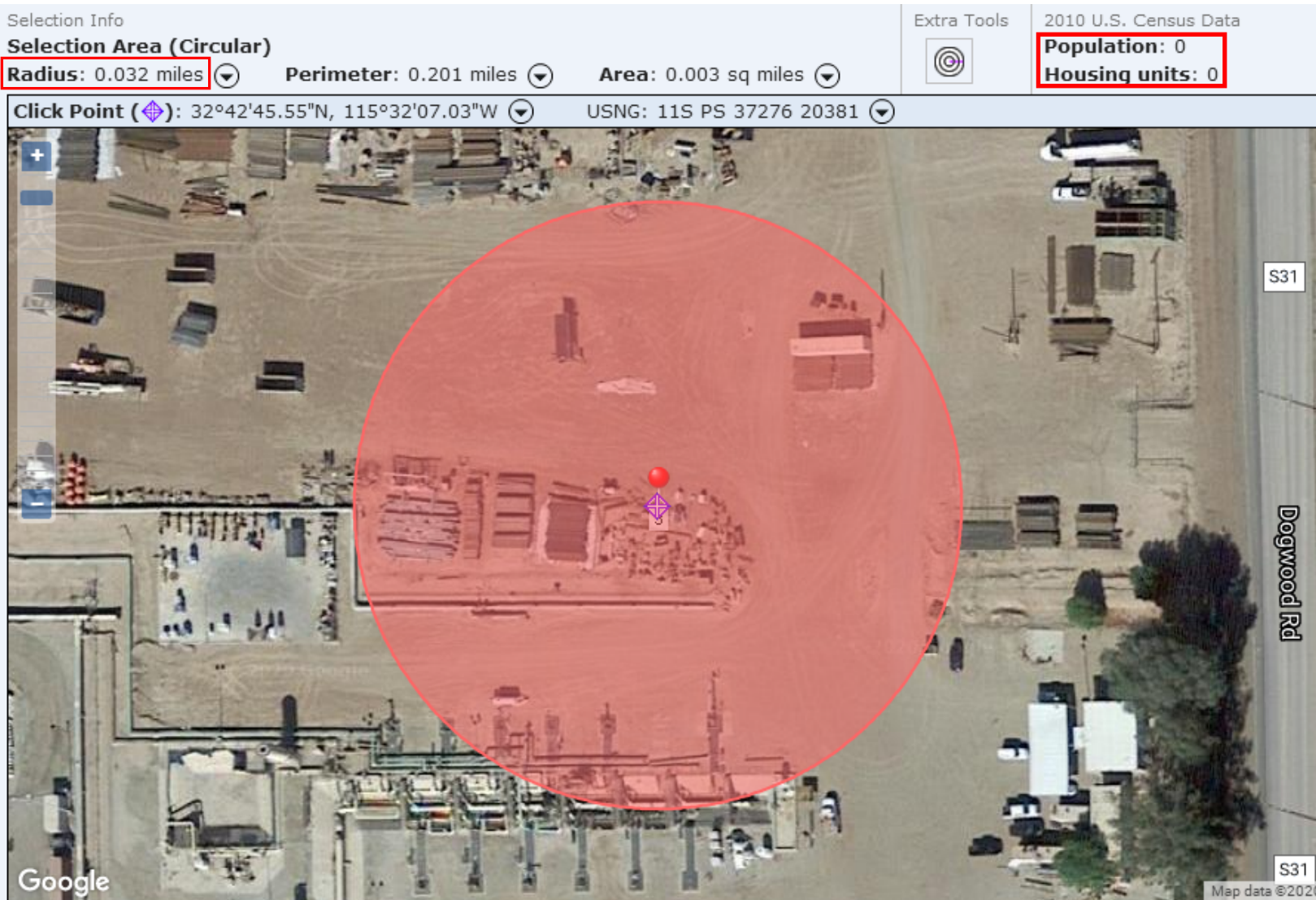


Figure 9: ARS MARPLOT 5.1.1 Map for Isopentane Storage Vessel #3



Attachment D
California Department of
Conservation Concurrence

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



Attachment E

Air Quality Memorandum

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)

Emission Source	PM		NOX		CO		SO2		VOC	
	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 (CO₂e). 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

¹The 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. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Ormat Heber 2	BY:	J. Firebaugh
	PROJECT NO:	346-2	PAGE:	OF: SHEET:
	SUBJECT:	2019 Re-Power Emissions	1	4 Emis_Calcs
			DATE:	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

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

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

Isopentane Emission Calculations

Emission Units

OEC / ITLU	Rating (MW, each)	# of Units	Gross Power	MF Volume*	GF Flow Rate*	Permitting Status
			MW (total)	gallons (total)	gal/hr	
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)

	# of days	Maintenance		Purging		Fugitive		Facility Total		Isopentane Density
		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		620 mg/ml 0.00835 (lb/gal)/(mg/ml) 5.17 lb/gal
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	

Site-Specific Isopentane Emission Factor Calculation

Previous 2 Years Emissions	Basis	Isopentane Emissions		Existing Isopentane Volume		Calculated Site-Specific Emission Factor
		lbs/day	tons/year	gallons	Units Included	
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)	Emission Factor	Expected Reduction Due	Isopentane Emissions		Change in Emissions	
	gallons	(lb/day)/1,000 gal	to Fewer Emission Units	lbs/day	tons/year	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

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Ormat Heber 2	BY: J. Firebaugh
	PROJECT NO: 346-2	PAGE: 3 OF: 4 SHEET: Emis_Calcs
	SUBJECT: 2019 Re-Power Emissions	DATE: 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 Heber 1 OEC-14 ATC Application
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

Description	Water Flow		PM		PM ₁₀		PM _{2.5}	
	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. 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

SO₂ Emission Factor Calculation (mass balance):

$$\begin{array}{|c|c|c|c|}
 \hline
 7,000 \text{ Btu} & 1 \text{ lb diesel} & 15 \text{ lb S} & 1.998 \text{ lb SO}_2 \\
 \hline
 1 \text{ hp-hr} & 19,300 \text{ Btu} & 1,000,000 \text{ lb diesel} & 1 \text{ lb S} \\
 \hline
 \end{array} = 1.09\text{E-}05 \text{ lb SO}_2/\text{hp-hr}$$

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)

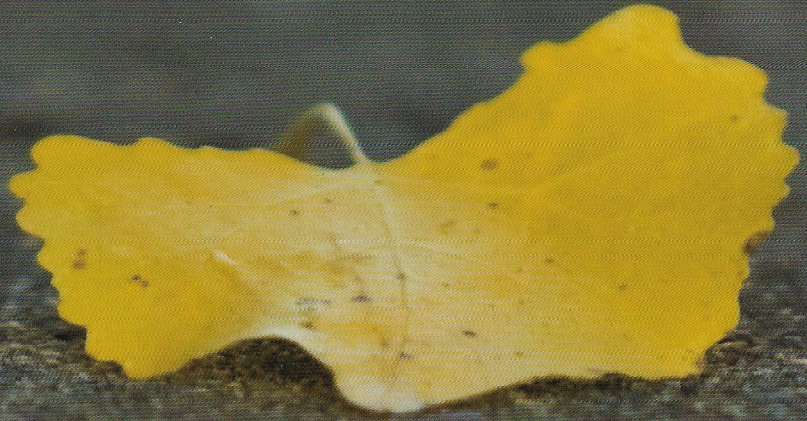
Type	Engine Make & Model	PM	PM ₁₀	PM _{2.5}	NO _x	CO	SO ₂	VOC
Emergency Generator	Cummins KTA19G2	0.5	0.5	0.5	14.3	1.5	0.0074	0.48
Fire Pump	Detroit Diesel DDFP-L6AT-7017V	0.7	0.7	0.7	9.5	2.0	0.0033	0.77
Emergency Generator	John Deere 6090H	0.1	0.1	0.1	2.0	0.29	0.0028	0.058
Emergency Pump	Clarke JW6H-UF40	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

Attachment F
CEQA Deskbook
Reference Evaluation for
Related Activities in a
CEQA Document



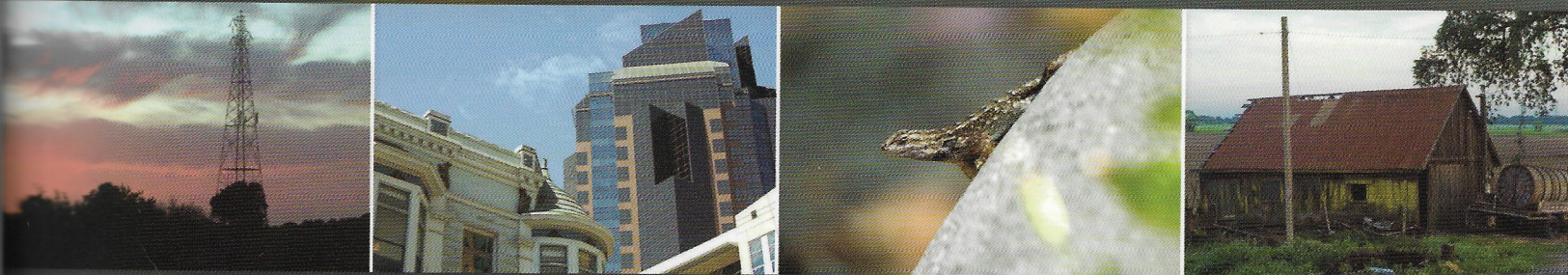
Updates
available at
www.solano.com

CEQQA

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)

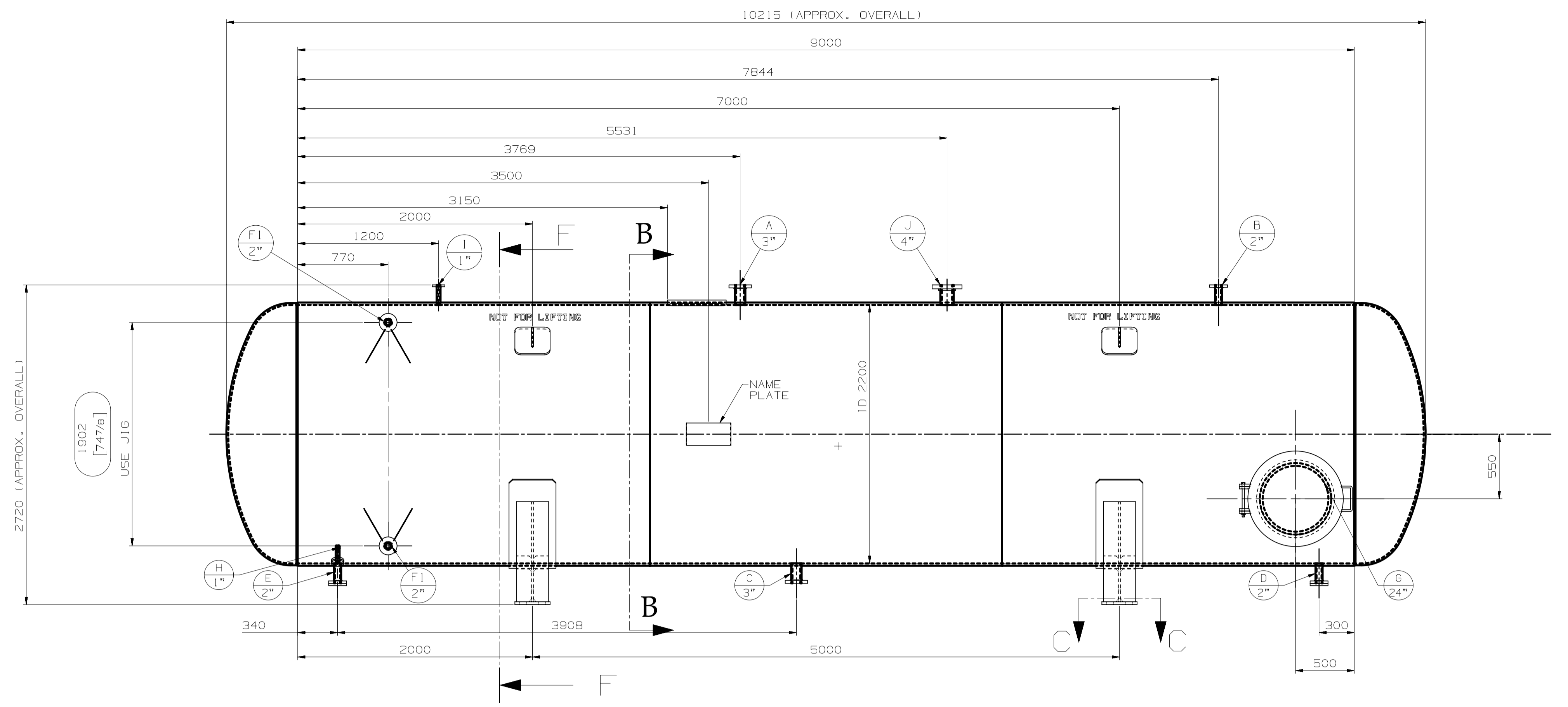
When "Action A" is part of a large highway project with logical termination points and independent utility and does not foreclose consideration of alternatives

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)

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	x	
REGISTRATION AT NATIONAL BOARD	x	

NOT REQUIRED, EXEMPTED BY			
IMPACT TEST	UG-20(f)	UCS-66	UHA-51
	N/A	x	N/A
PWHT	UCS-56		UHA-32
	x		N/A

REQUIRED, FOR ITEMS	
IMPACT TEST	FOR SA-516/70
PWHT	N/A

- ABRASIVE BLASTING BEFORE WELDING. ALL CARBON STEEL PLATE SHALL BE BLASTED TO SSPC-SP-10/CLASS 2 1/2
- TACK WELDINGPROC.24.3.6.009
- WELDINGPROC.24.3.6.009
- P.T.EXAMINATIONPROC.21.1.8.010
- RADIOGRAPHY: NONE

JOINT EFFICIENCY TABLE

	SHELL	CAPS
LONGITUDINAL SEAMS	0.7	0.85
CIRCUMFERENTIAL SEAMS	0.65	0.65

- MACHINING INSPECTIONPROC.21.1.8.019
- DIMENSIONAL CHECK AND TOLERANCES...PROC.21.1.8.013
- BUBLE TESTPROC.21.1.8.009
- BOLTS TIGHTENINGPROC.21.1.8.042
- HYDROSTATIC TESTPROC.21.1.8.008, HOLDING TIME 1 HOUR

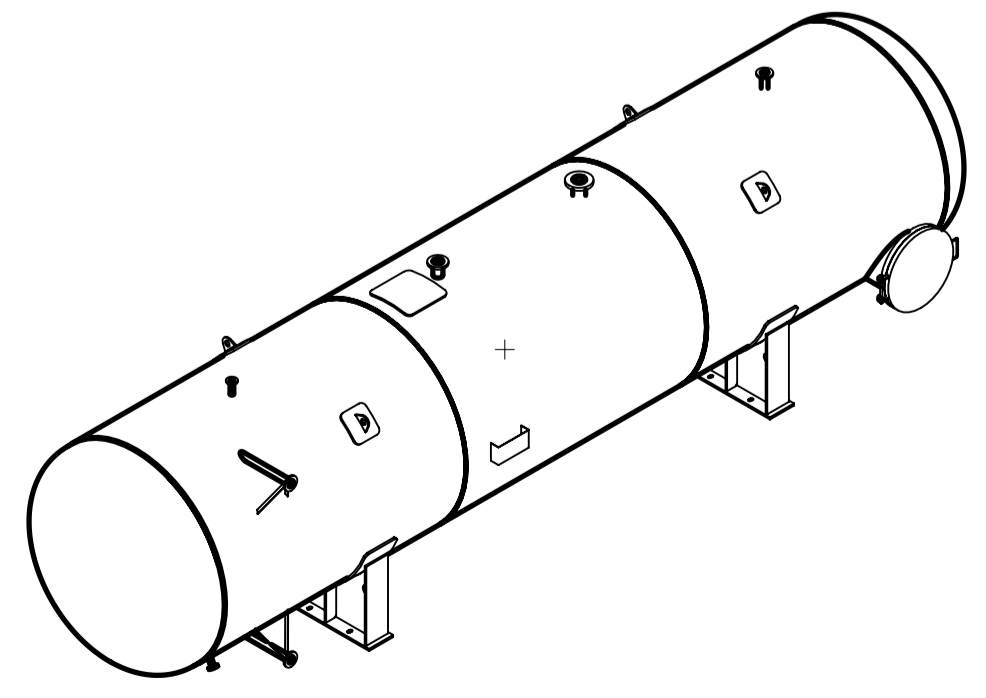
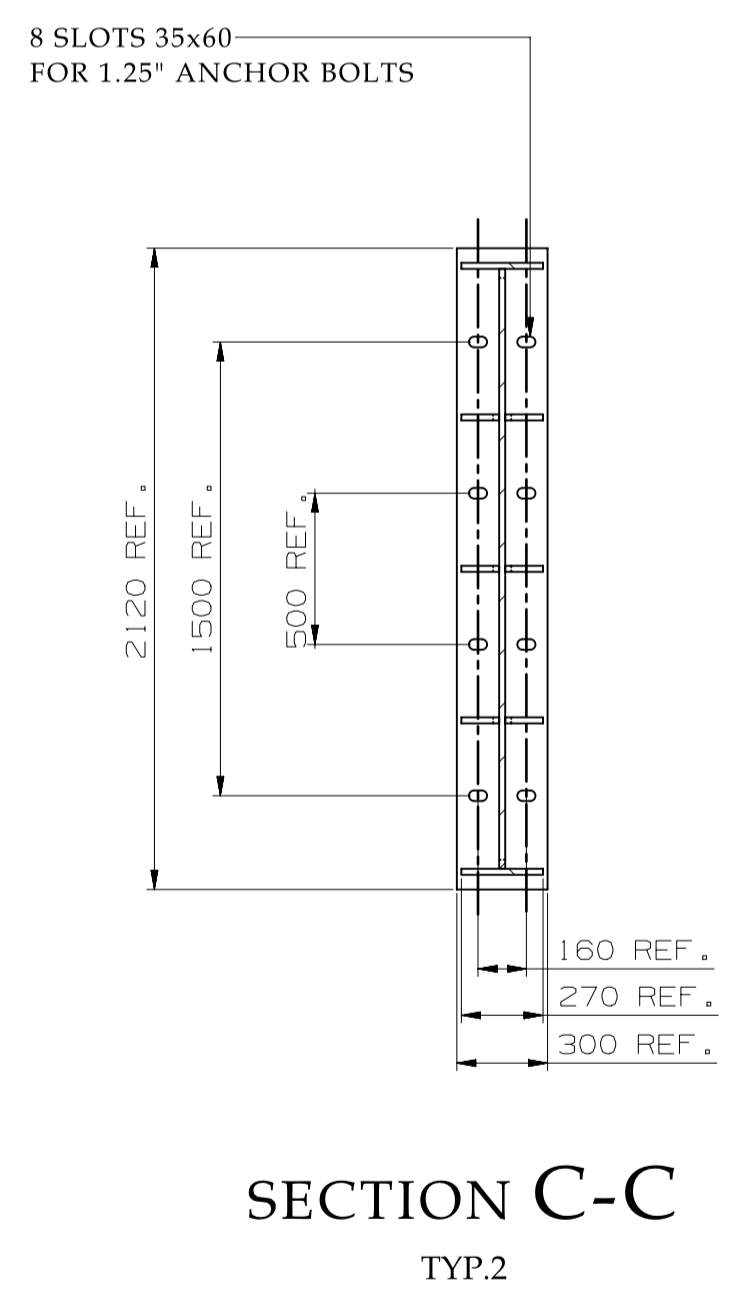
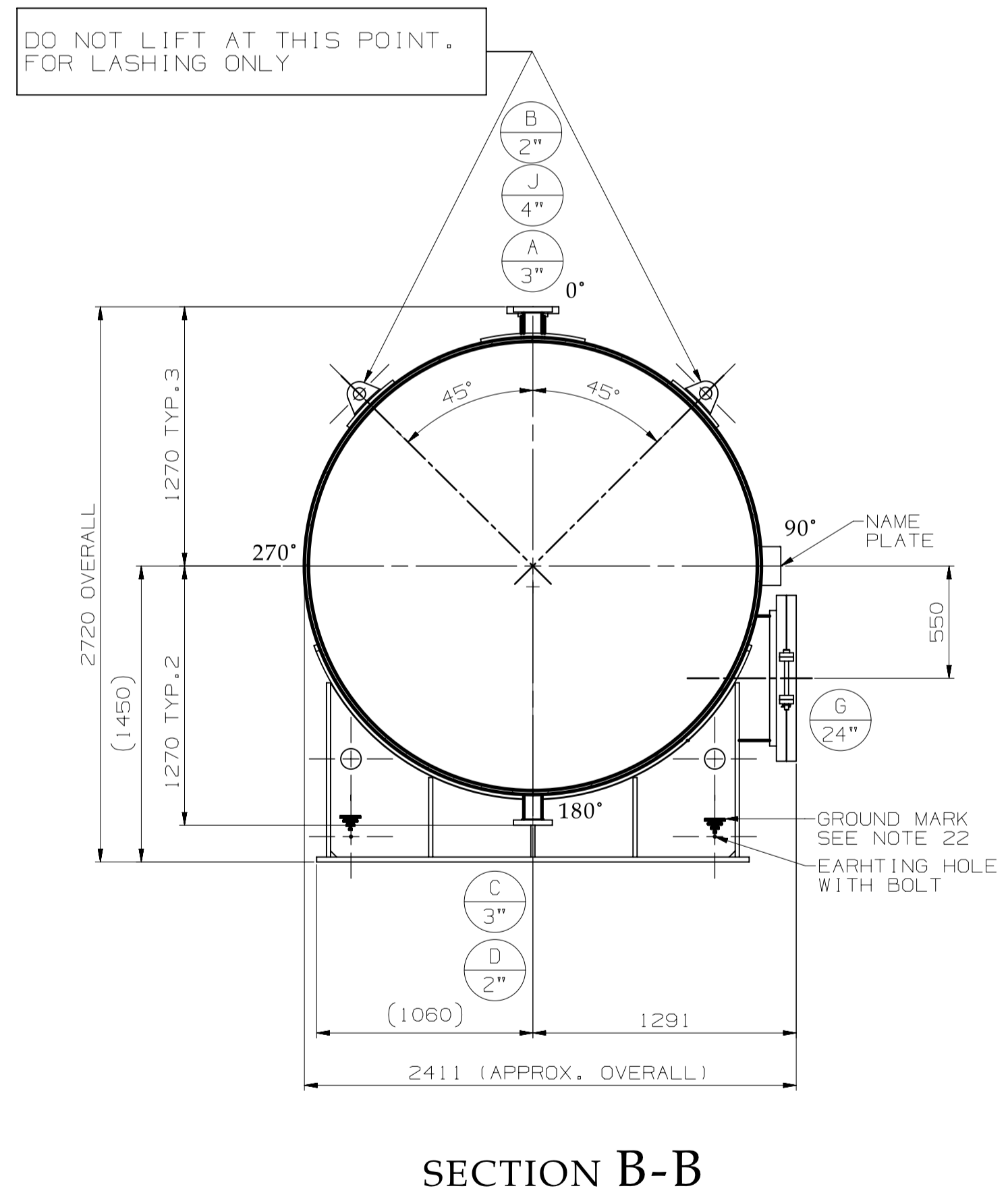
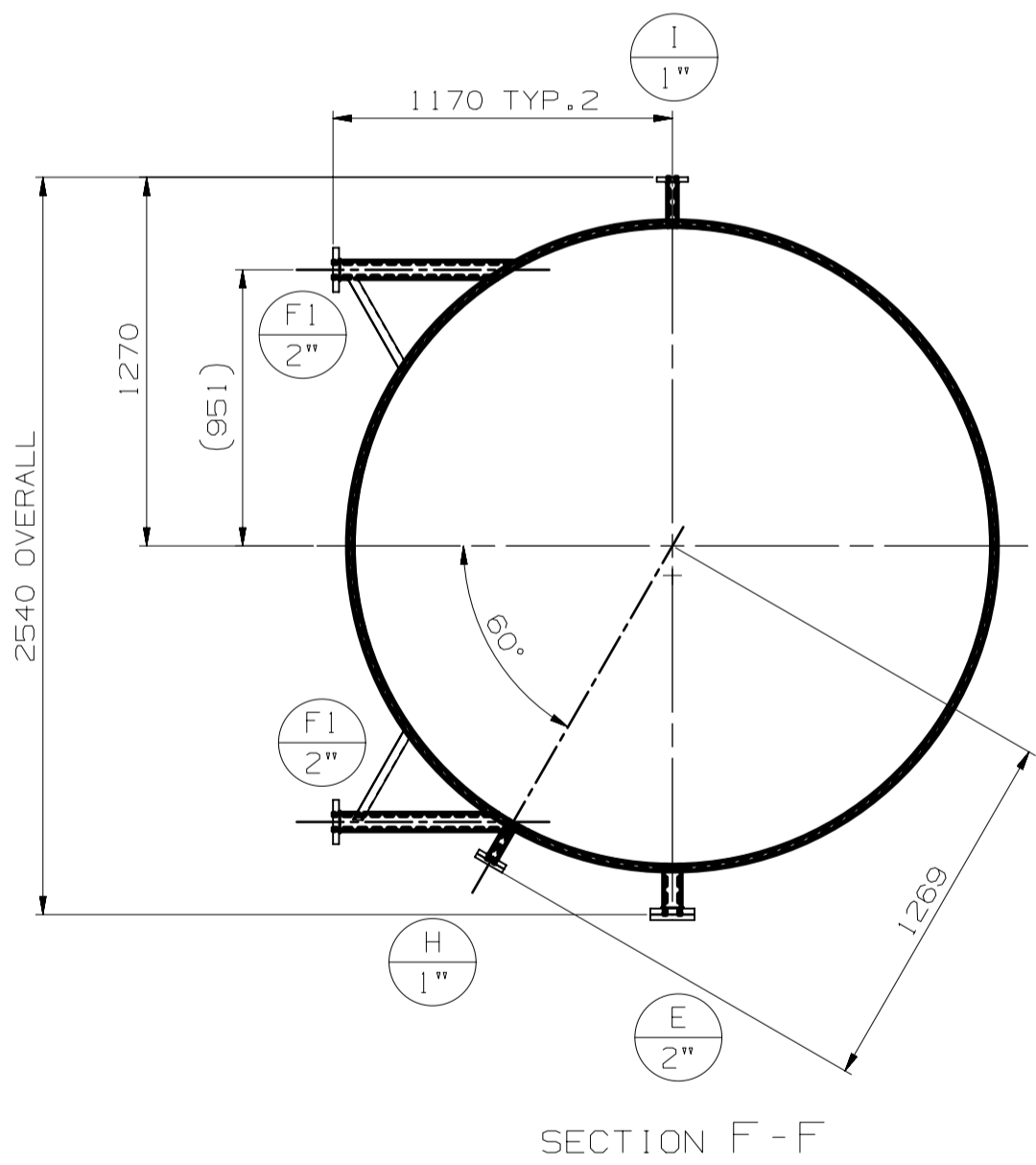
		SHELL	
HYDROSTATIC PRESSURE (psig/barg)		160/11	
HYDROSTATIC TEST POSITION	HORIZONTAL	VERTICAL	
	x		-

- ALL FLANGES TO ASME / ANSI B.16.5/ASME B.16.47 SERIES A ALL BOLTS & NUTS TO BE HOT DIP Zn COATED (galvanized)
- DRAINING, DRYING & NITROGEN PURGINGPROC.24.3.8.036
- FINAL CLEANING.....PROC.24.1.8.018
- PAINTINGPROC.24.3.7.080
- FINAL INSPECTION AND TESTINGPROC.21.1.8.081
- SHIPMENT AND STORAGEPROC.21.1.8.017
- TELLTALE HOLES 1/4" ON ALL REINFORCEMENT & PAD PLATES
- DIMENSIONS ARE IN mm
- APPLY GROUND MARK NEAR GROUND POINT
- NOTE "NOT FOR LIFTING" 50 MM ABOVE EACH LUG RED COLOR, RAL 3020, MINIMUM HEIGHT OF THE LETTERS IS 60 MM

- WEIGHTS AND VOLUME:
 VOLUME: 37500 L / 9906 GAL
 EMPTY WEIGHT: 12900 KG / 28440 LBS
 HYDROTEST WEIGHT: 50400 KG / 11113 LBS
 OPERATION WEIGHT: 14000 KG / 30825 LBS
 PC-ONI-116986 (0.909.51.720.0) Rev 1.0, 22-Dec-2019, Maxin Yaffe, Galit Sharvit, Approved for production

MTL :	SURFACE ROUGHNESS:	BREAK SHARP EDGES:	GENERAL TOLERANCES:
CODE MATERIAL:	FINISH:	WEIGHT:	

RPV DEP. MANAGER Ehud Ben Shlomo RPV DESIGN ENGINEER Maxin Yaffe RPV DESIGNER Dr. Yashar 22-Dec-2019	THIS DRAWING IS THE PROPERTY OF ORMAT AND MUST NOT BE COPIED OR REISSUED WITHOUT PERMISSION	TITLE: MOTIVE FLUID TANK (9906 GAL) DRAWING NO: 0.909.51.720.0 1/3 DRWG REV: 1 SHEET REV: A
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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	Dr. Yashar	Maxim Yaffe	



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

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 borders, 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

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**

- 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
<p>I. Statement of Interest</p>	<p>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.</p>	<p>No substantive technical comment provided. Comment lauds renewable energy development and subsequently criticizes the Heber 2 Repower Project.</p> <p>The IS/ND was based on site specific and technically substantiated information on the baseline conditions of the Project site and potential impacts.</p> <p>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:</p> <p>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.</p> <p>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.</p> <p>See following comments explaining why a MND is appropriate, instead of the EIR CURE requests.</p>
<p>II. An EIR Must Be Prepared</p>	<p>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.</p>	<p>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</p>

		<p>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.</p> <p>This comment identifies air quality, cumulative air quality, public health, water supply, biological resources, and impacts from 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.</p>
<p>III. The IS/ND Fails to Accurately Describe the Project</p>	<p>CURE sites that CEQA prohibits the “piecemealing” of a larger project into many smaller projects, resulting in numerous environmental reviews for a single project.</p>	<p>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.</p> <p>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.</p> <p>There are three principle tests under CEQA with respect to determine whether two projects are separate CEQA projects.</p>

		<p>In the seminal CEQA test for piecemealing, <i>Laurel Heights Improvement Association v. Regents of the University of California</i> (“<i>Laurel Heights</i>”)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.</p> <p>The first prong set forth in <i>Laurel Heights</i> 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.</p> <p>The second <i>Laurel Heights</i> 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 <i>Laurel Heights</i> case, Heber 1 and Heber 2 are separate and independent CEQA projects.</p> <p>The second important CEQA test is the “independent utility” test. In <i>Del Mar Conservancy, Inc. v. City Council of the City of San Diego</i>, 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</p>
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¹ *Laurel Heights Improvement Assn. v. Regents of University of California*, 47 Cal. 3d 376, 396 (Cal. 1988).

		<p>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”.</p> <p>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</p>
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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.

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.

These three cases are fact-specific analyses. Applying the facts in this case demonstrates that Heber 1 and Heber 2 are separate CEQA projects.

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.

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:

1. When “Action B” is reasonably foreseeable consequence of “Action A”.
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”.
3. When “Action A” cannot proceed without essential public services that would be provided by “Action B”.
4. When “Action A” and “Action B” are integral parts of the same project.

Response to CEQA Deskbook Hypothetical 1: 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).

		<p><u>Response to CEQA Deskbook Hypothetical 2:</u> 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.</p> <p><u>Response to CEQA Deskbook Hypothetical 3:</u> 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).</p> <p><u>Response to CEQA Deskbook Hypothetical 4:</u> 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.</p>
<p>III.a. The IS/ND's Description of the Project's Construction Activities is Inadequate and Flawed</p>	<p>CURE claims that a description of the proposed construction activities is provided, and that construction emissions are not calculated.</p>	<p>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.</p>

<p>III.b. The IS/ND Fails to Describe Emissions from Reclamation Activities</p>	<p>Reclamation emissions are not calculated.</p>	<p>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).</p>
<p>III.c. The IS/ND’s Numerous Errors Prohibits the Public from Fully Evaluating the Project’s Impacts</p>	<p>The IS/ND is rife with inconsistent, misleading, and confusing statements making it impossible for a reader to assess the conclusions. CURE sites:</p> <ul style="list-style-type: none"> • CURE sites a missing appendix the cultural and historic resources records review. • Figure 6 does not provide substantive support. • That Heber 1 and Heber 2 are the same facility. • The IS misuses the term “complex” and fails to disclose baseline and future generation, and incorrectly identifies the units that would be modified. 	<ul style="list-style-type: none"> • 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. • 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. • See the response to Issue III above for a discussion as to why Heber 1 and Heber 2 are entirely independent facilities. • 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

		<p>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.</p> <p>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).</p>
<p>IV. The IS/ND Fails to Accurately Describe the Project's Baseline Conditions</p>	<p>An EIR must include description of the physical environmental conditions in the Project vicinity.</p>	<p>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.</p>
<p>IV.a. The IS/ND Fails to Accurately Describe the Project's Baseline Generating Capacity and Associated Impacts, as well as Its Baseline Emissions</p>	<p>CURE attempts to provide "correct" air emissions calculations, and that the project underestimates emissions by 2/3rds.</p>	<p>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</p>

		<p>tons/year. Therefore, through the use of more efficient equipment (e.g., the new OECs) would lead to a decrease in emissions.</p>
<p>IV.b. The IS/ND Fails to Accurately Describe Biological Conditions at the Project Site</p>	<p>The County failed to make a reasonable effort to describe baseline biological conditions, and account for sensitive species on the site.</p>	<p>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, CNDDDB, 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”.</p> <p>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.</p>
<p>V. The County Has Violated CEQA by Piecemealing Environmental Review and Permitting for the Expansion of the Heber Geothermal Facilities as Separate Projects</p>	<p>CURE alleges that the IS/ND does not accurately reflect that Heber South and Goulds 2 are part of the Heber 2 Complex.</p>	<p>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</p>

		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.	<p>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.</p> <p>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.</p>
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.	<p>The IS/ND includes Best Management Practices for dust control and worker safety, including:</p> <ul style="list-style-type: none"> • 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. • Project equipment and worker vehicles would be turned off when not in use and not left idling to minimize unnecessary emissions. • Water would be applied to the development site and during site preparation and construction to control fugitive dust.

		<ul style="list-style-type: none"> • Earth moving work would be completed in phases (as necessary) to minimize the amount of disturbed area at one time. • Construction vehicles and heavy equipment that use non-surfaced facility roads/areas will be restricted to 10 mph to control fugitive dust. • During windy conditions, barriers would be constructed and/or additional watering is conducted to minimize wind-blown fugitive dust. • Vehicle access would be restricted to the disturbance area via signage/fencing. <p>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.</p>
<p>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</p>	<p>Hazard Analysis should be based on a worst-case scenario.</p>	<p>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:</p> <p>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.</p>
<p>VI.d. There is a Fair Argument that Extending the Life of the Project Could Result in Geologic Impacts</p>	<p>The IS/ND fails to analyze geologic impacts of extending the life of the facilities.</p>	<p>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</p>

		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 CO ₂ e 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

		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.	<p>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 <u>net</u> increase of only 16 MWs. See Attachment A.</p> <p>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.”</p>

		<p>(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.)</p> <p>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:</p> <p>“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 <u>that results in a 50-megawatt net increase in an existing station’s total generating capacity</u> is subject to the Energy Commission’s certification jurisdiction. (<i>Department of Water and Power, City of Los Angeles V. Energy Resources Conservation And Development Commission</i>, 2 Cal.App.4th 206, 221; emphasis added.)”</p> <p>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.</p> <p>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.</p> <p>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.</p>
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