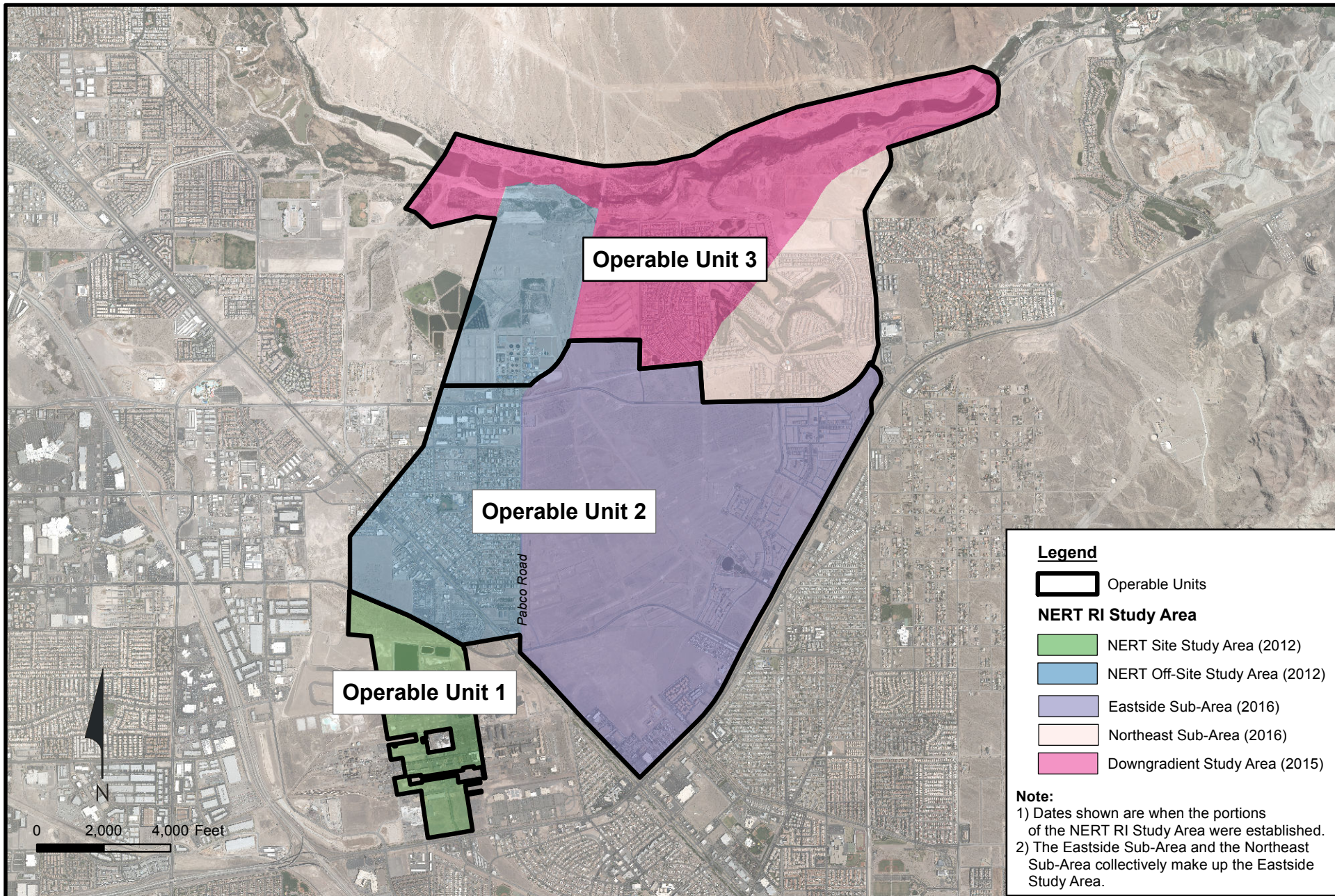


Baseline Health Risk Assessment
for OU-2 Soil Gas and Groundwater
Nevada Environmental Response Trust
Henderson, Nevada

FIGURES



NERT RI Study Areas and Operable Units

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
ES-1

Drafter: RS

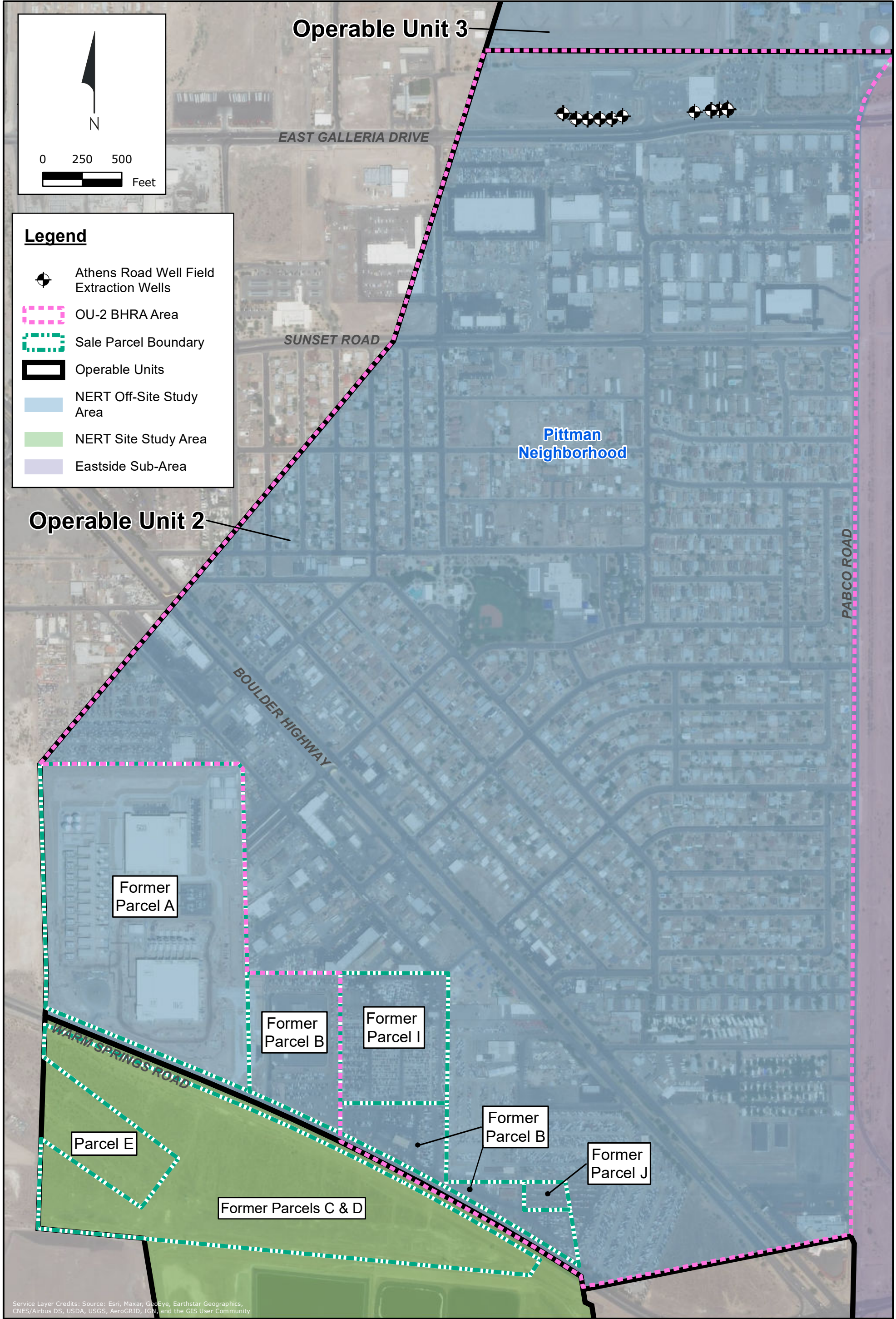
Date: 12/29/2020

Contract Number:

1690020169-007

Approved:

Revised:

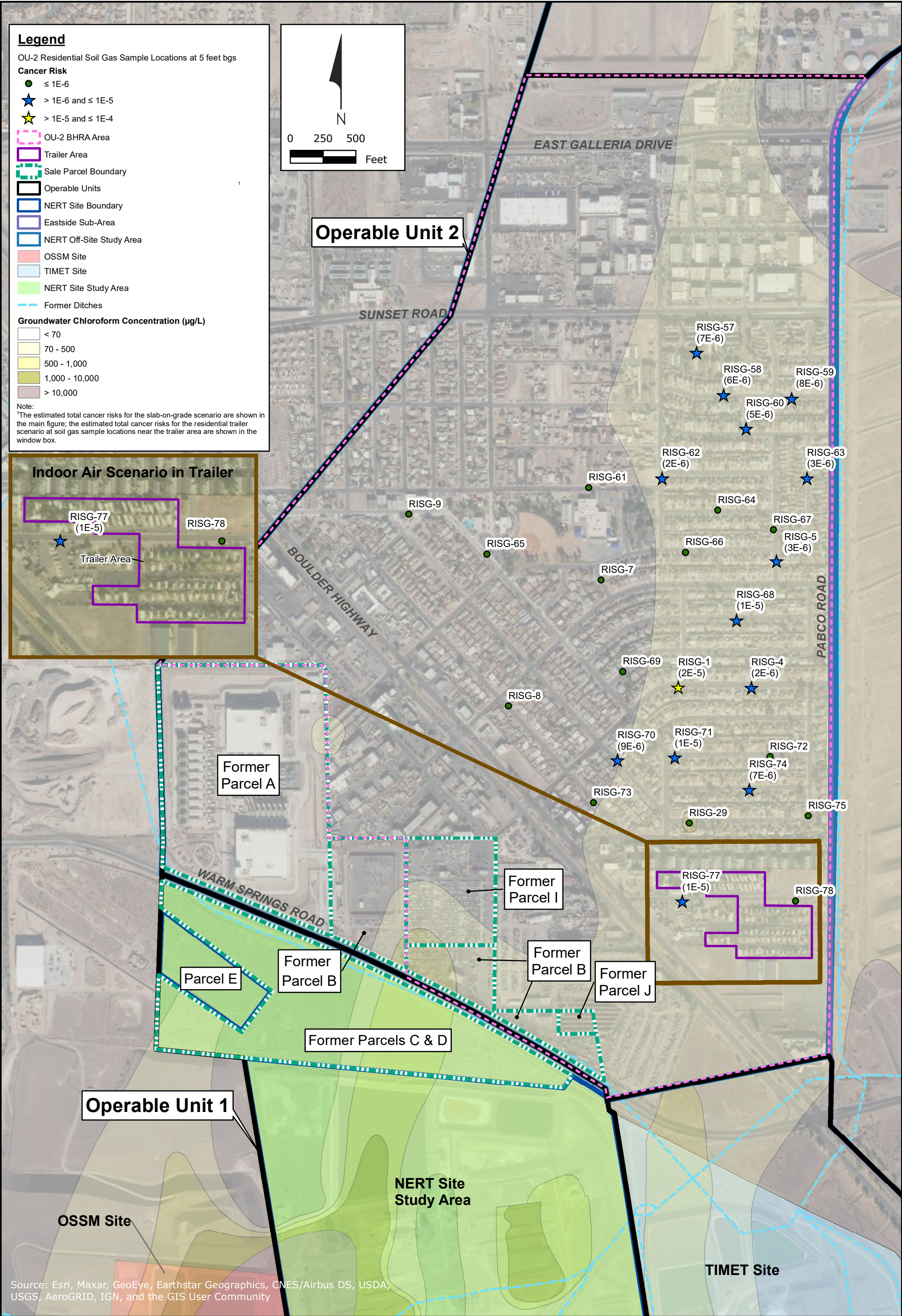


H:\Petomane\NERT\Risk Assessment-Human Health\Offsite_NERT_Study Area\Maps\Results\Fig 1-4_Offsite Study Area_6.10.2021.mxd



Layout of the OU-2 BHRA Area
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
ES-2



\\\\WCE\\LFP51\\eng\\LePetomane\\NERT\\Risk Assessment-Human Health\\2018 BHRA\\OU-2 Soil Gas and Groundwater BHRA\\GIS\\Figure ES-3 Cancer Risk Res 5 ft bgs SG.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Estimated Total Cancer Risk for Residents Exposed to VOCs in Soil Gas at 5 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

ES-3

Drafter: JA

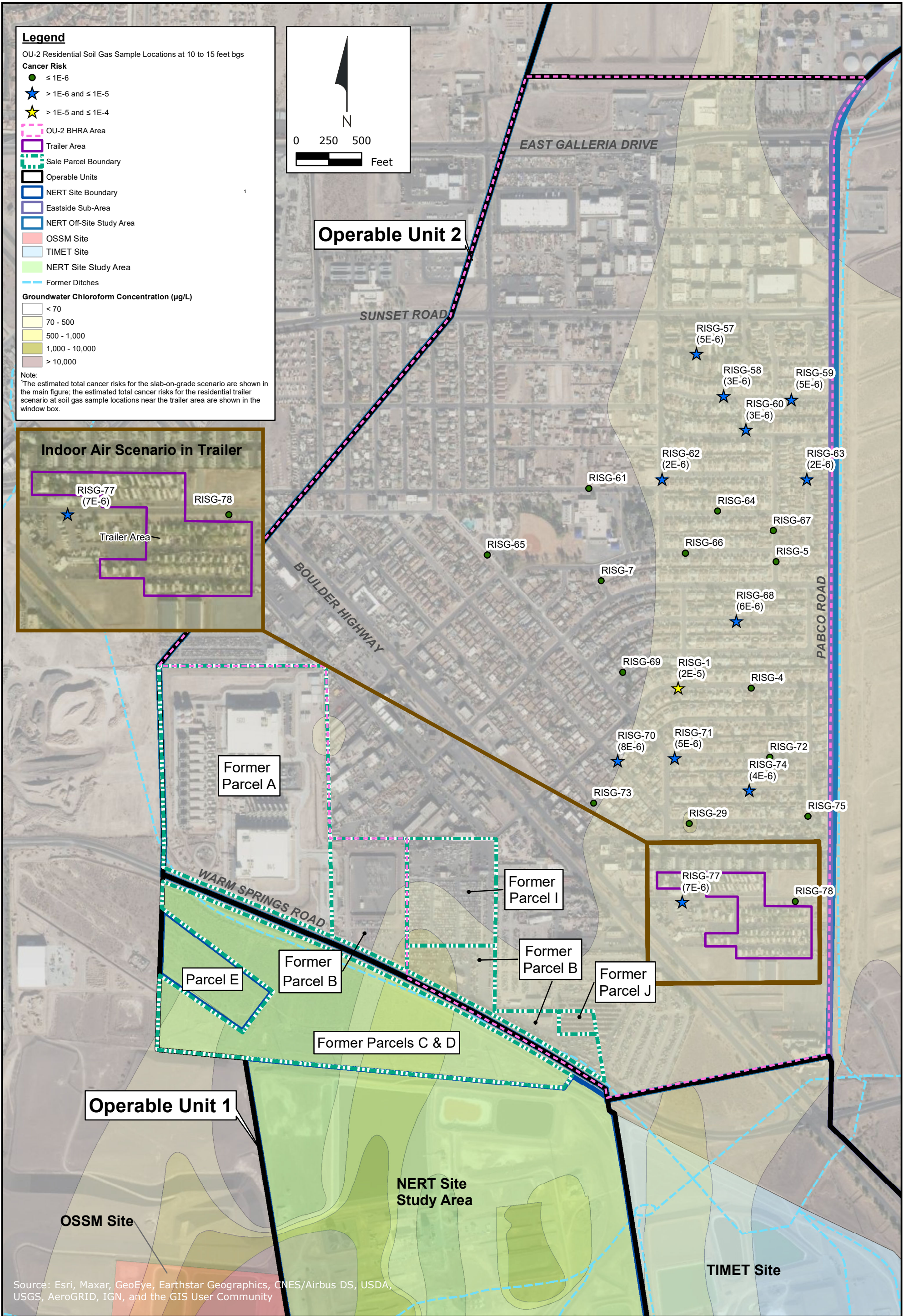
Date: 7/22/2021

Contract Number: 1690020169-007

Approved by:

Revised:

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Estimated Total Cancer Risk for Residents Exposed to VOCs in Soil Gas at 10 to 15 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

ES-4

Drafter: JA

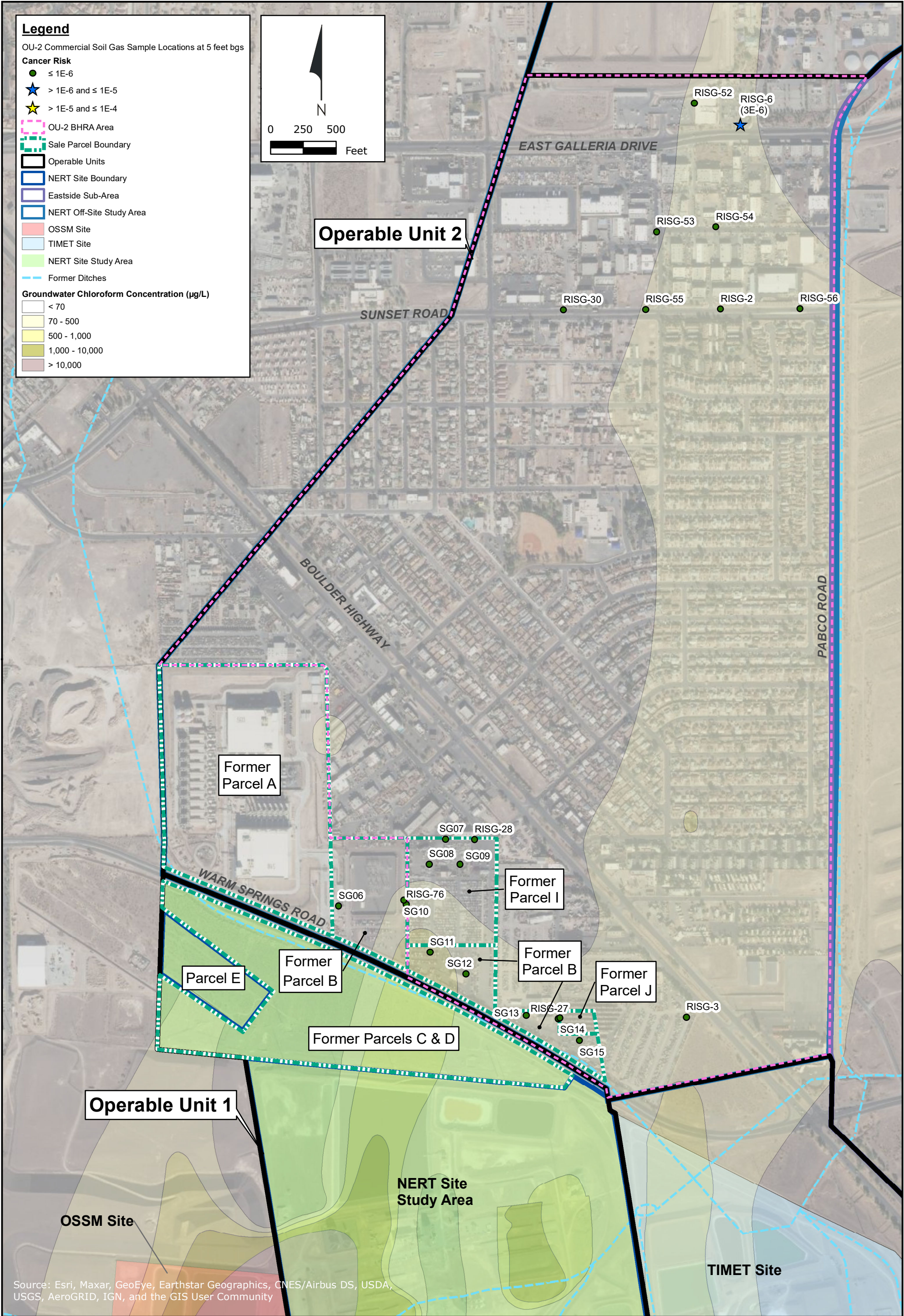
Date: 7/23/2021

Contract Number: 1690020169-007

Approved by:

Revised:

\\WCEV\FPS1\eng\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRA\GIS\Figure ES-5 Cancer Risk Com 5 ft bgs SG.mxd



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



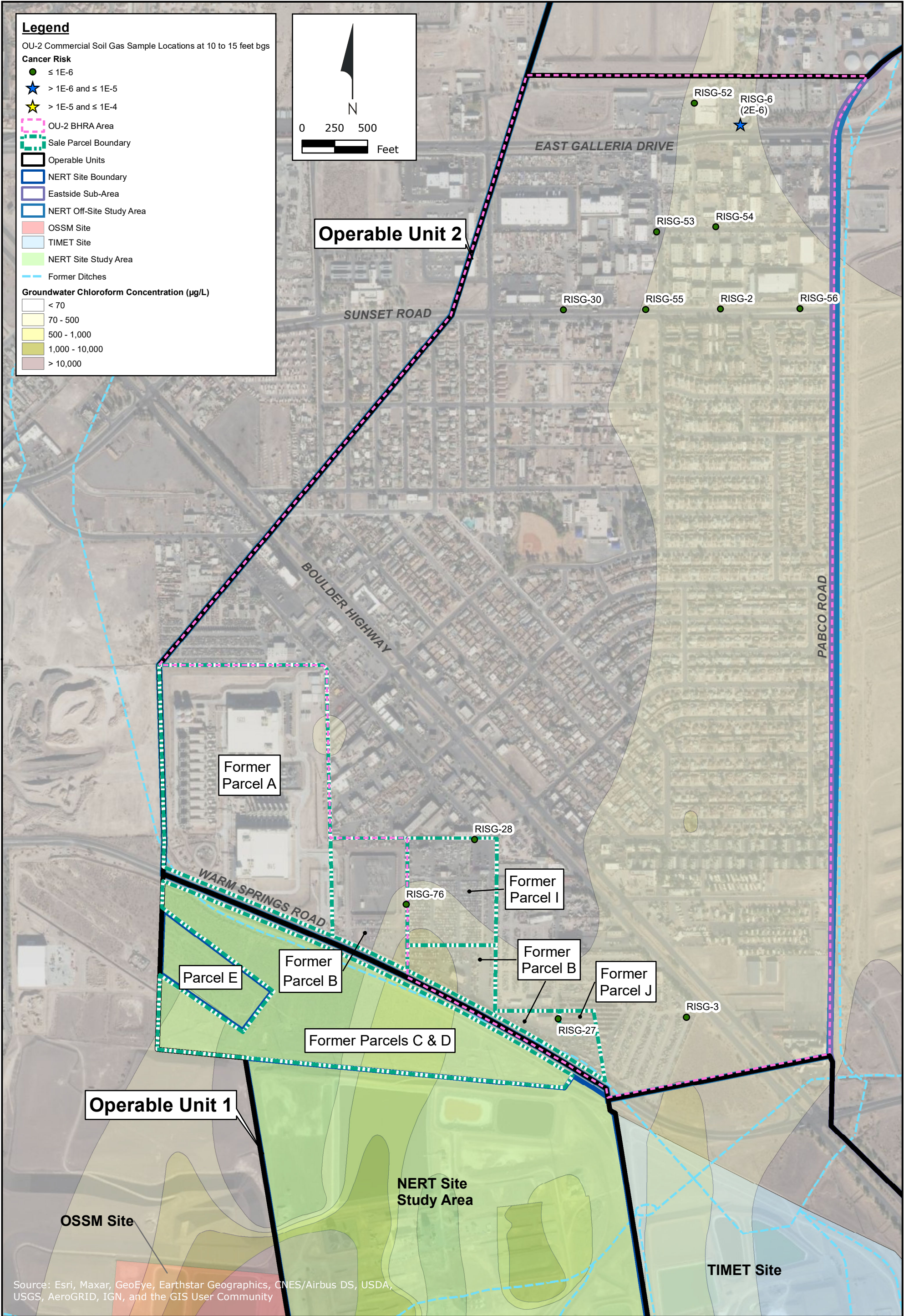
Estimated Total Cancer Risk for Indoor Commercial/Industrial Workers Exposed to VOCs in Soil Gas at 5 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

ES-5

Drafter: JA Date: 7/23/2021 Contract Number: 1690020169-007 Approved by: Revised:

\\WCEV\FPS1\eng\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRA\GIS\Figure ES-6 Cancer Risk Com 1.5 ft bgs SG.mxd



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Estimated Total Cancer Risk for Indoor Commercial/Industrial Workers Exposed to VOCs in Soil Gas at 10 to 15 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

ES-6

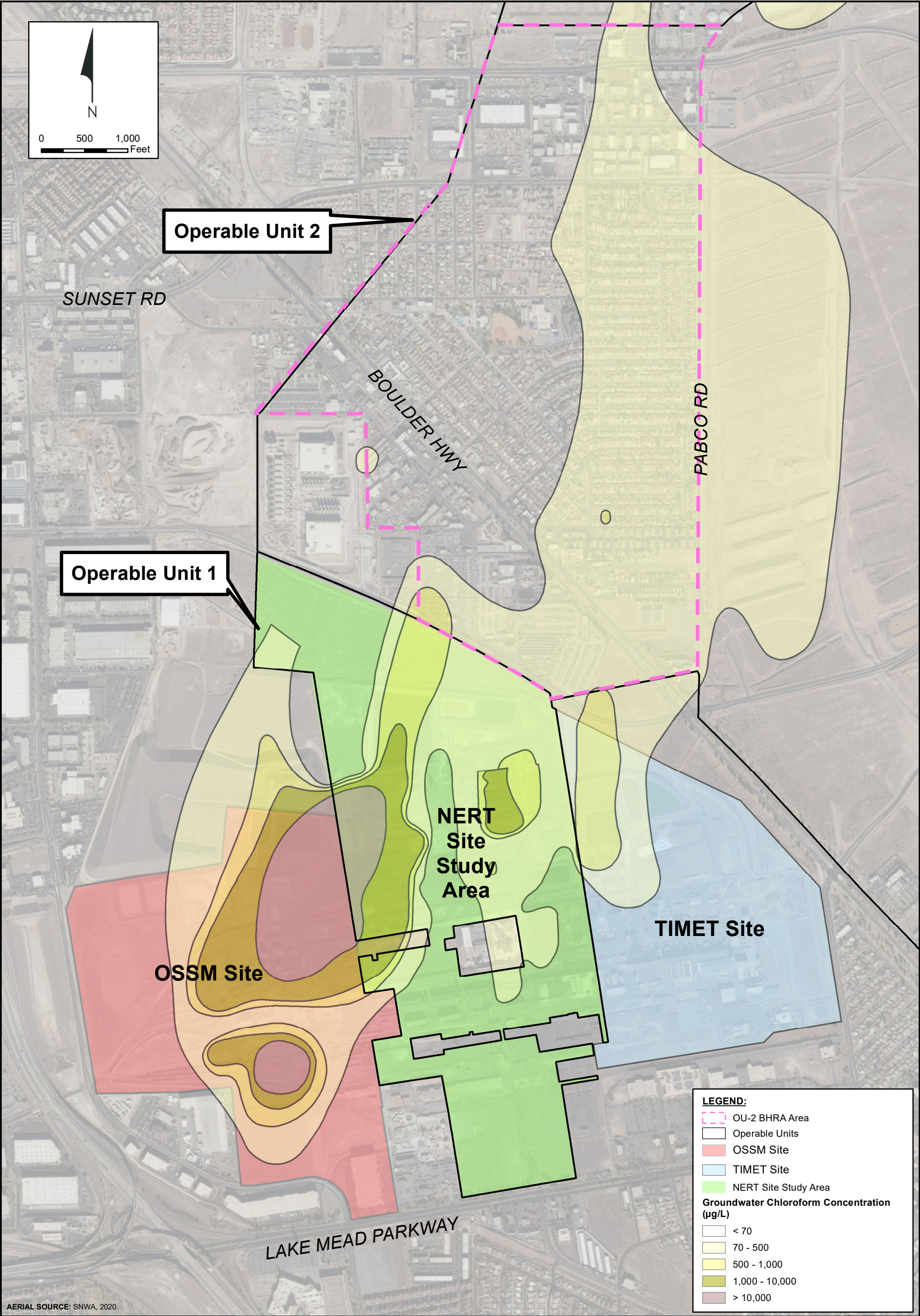
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Date: 7/23/2021

Contract Number: 1690020169-007

Approved by:

Revised:



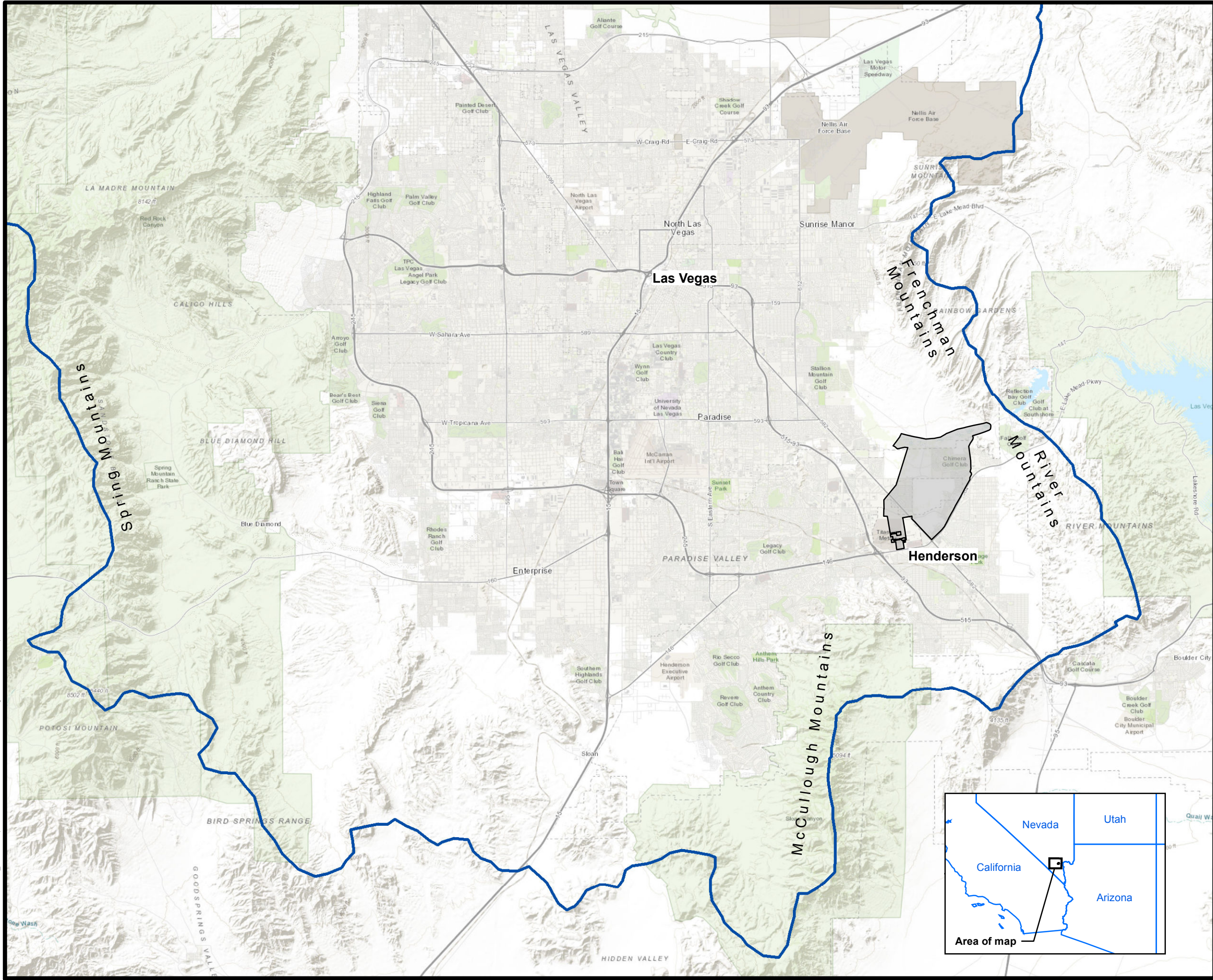
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**Chloroform Source Areas Upgradient of OU-2 BHRA Area
(Chloroform Plume as Depicted in 2020)**
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
ES-7

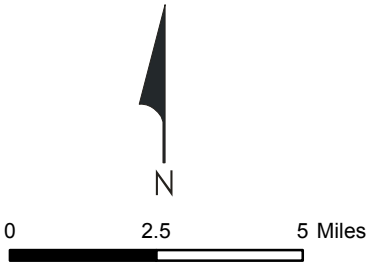
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LEGEND:

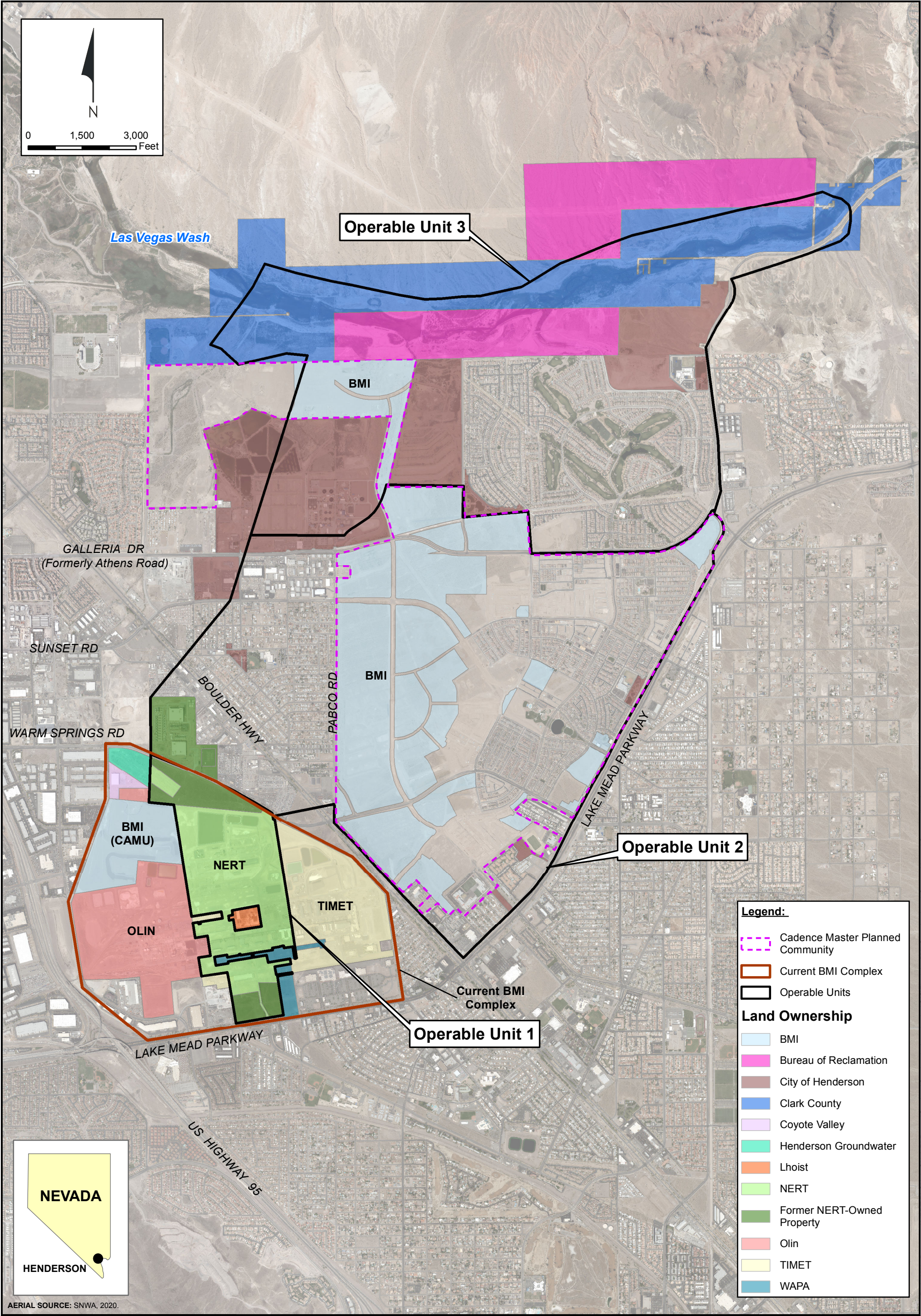
-  Las Vegas Valley Hydrologic Basin
-  NERT RI Study Area

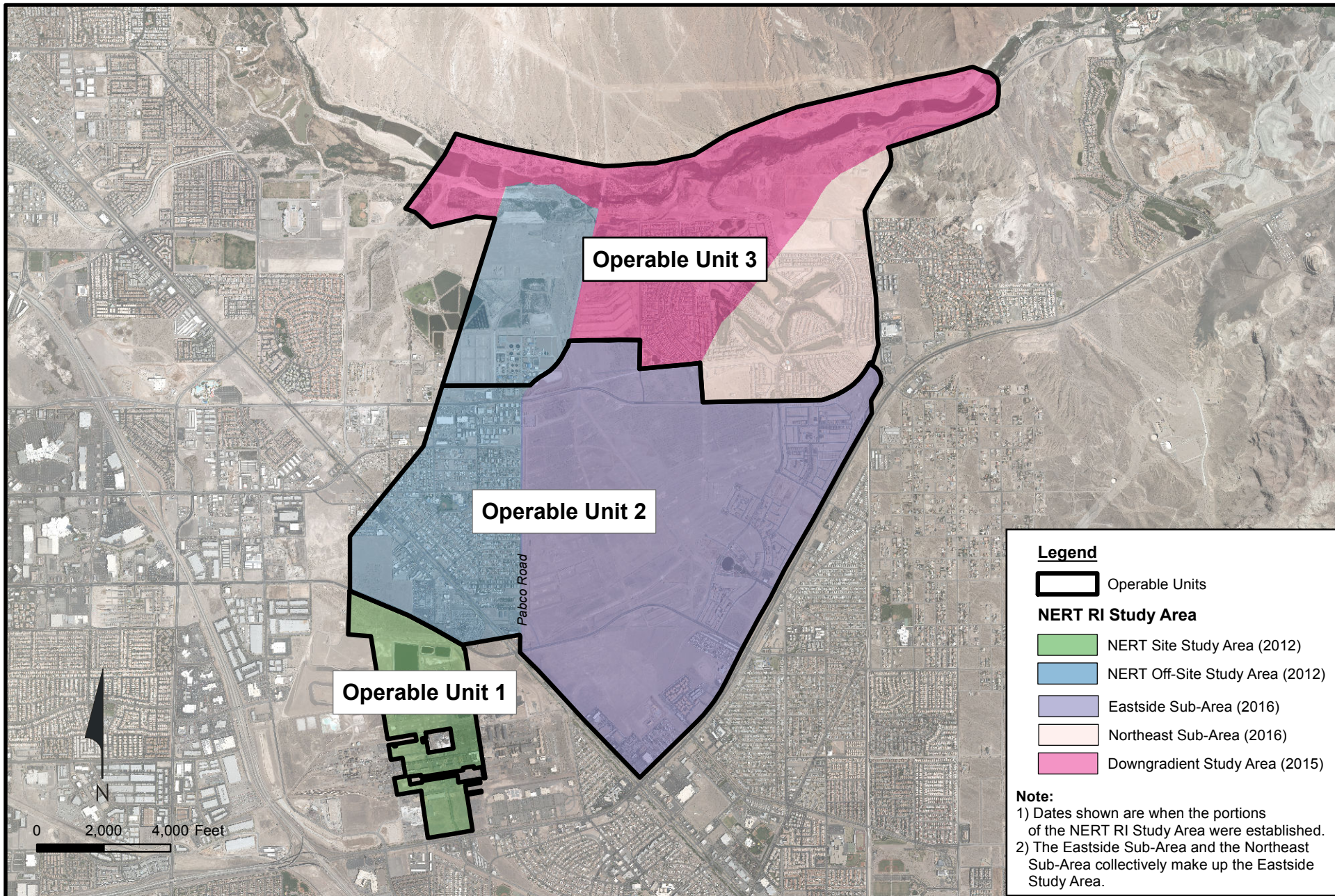
Note:
See Figures 1-2 and 1-3 for NERT RI Study Area details.



NERT RI Study Area Location Map
Nevada Environmental Response Trust Site
Henderson, Nevada

Date: 5/4/2020	Contract Number: 1690020169-007		Figure 1-1
Drafter: RS	Approved:	Revised:	





NERT RI Study Areas and Operable Units

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

1-3

Drafter: RS

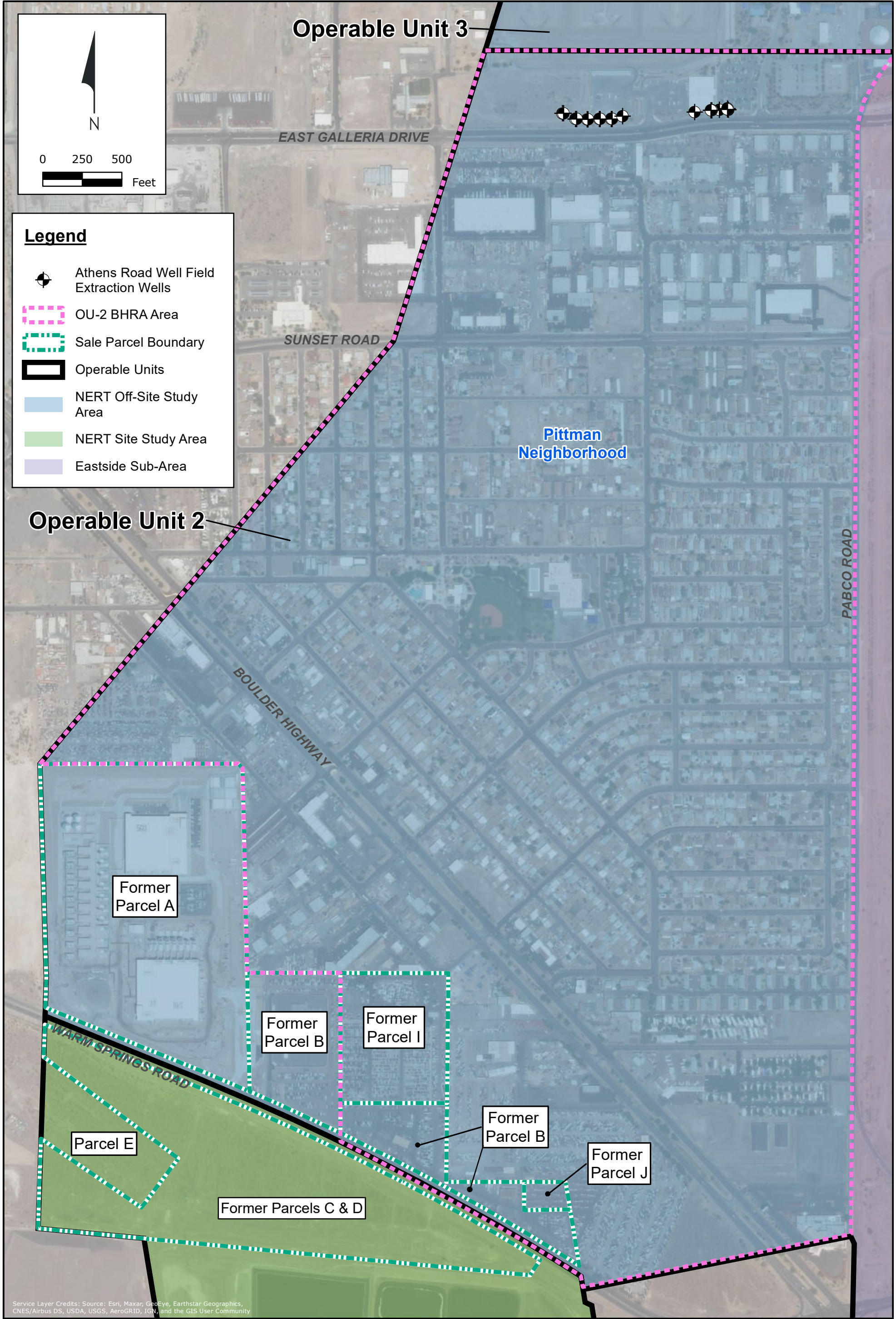
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Contract Number:

1690020169-007

Approved:

Revised:

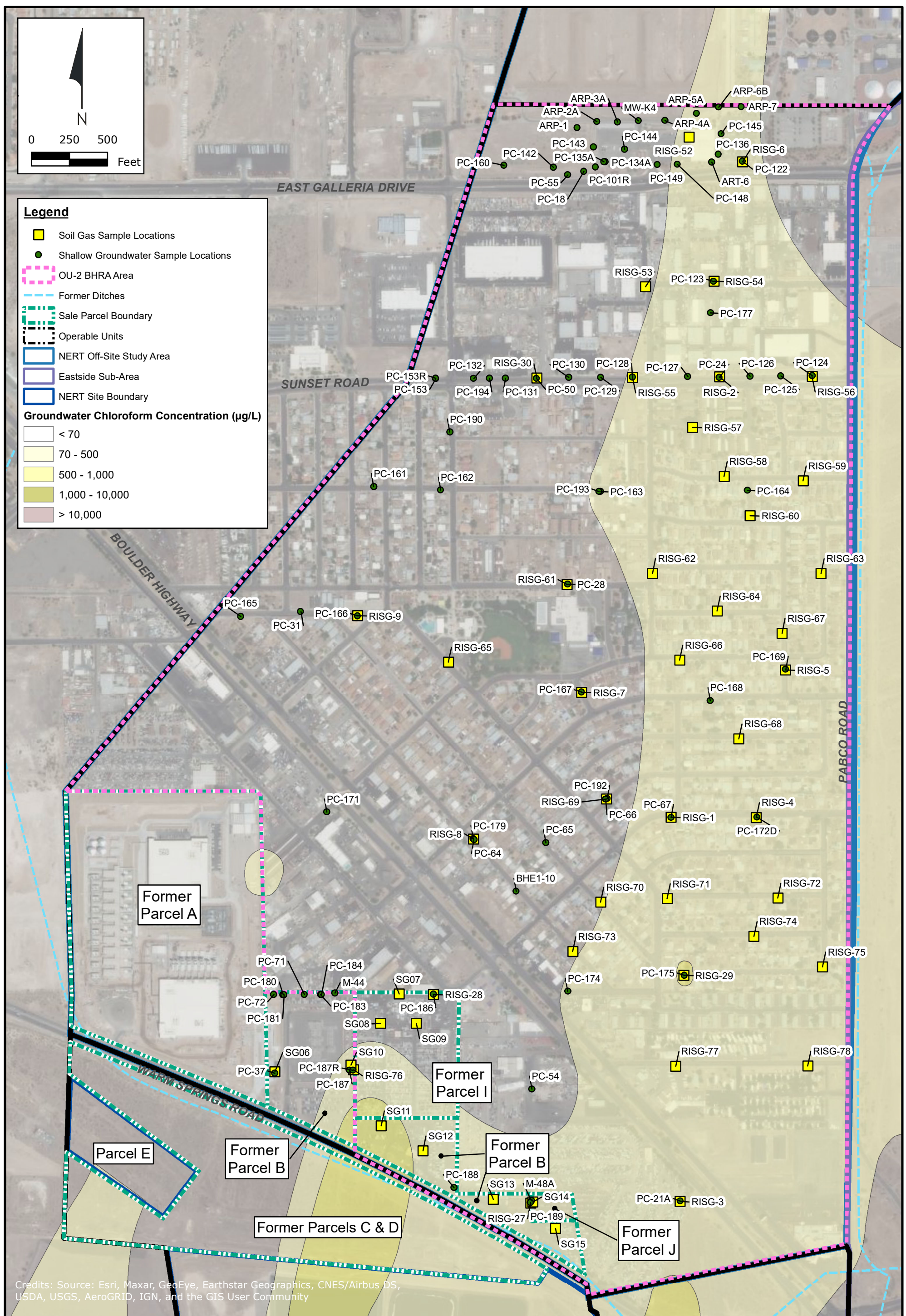


H:\LePetomane\NERT\Risk Assessment-Human Health\Offsite_NERT_Study Area\Maps\Results\Fig 1-4_Offsite Study Area_6.10.2021.mxd

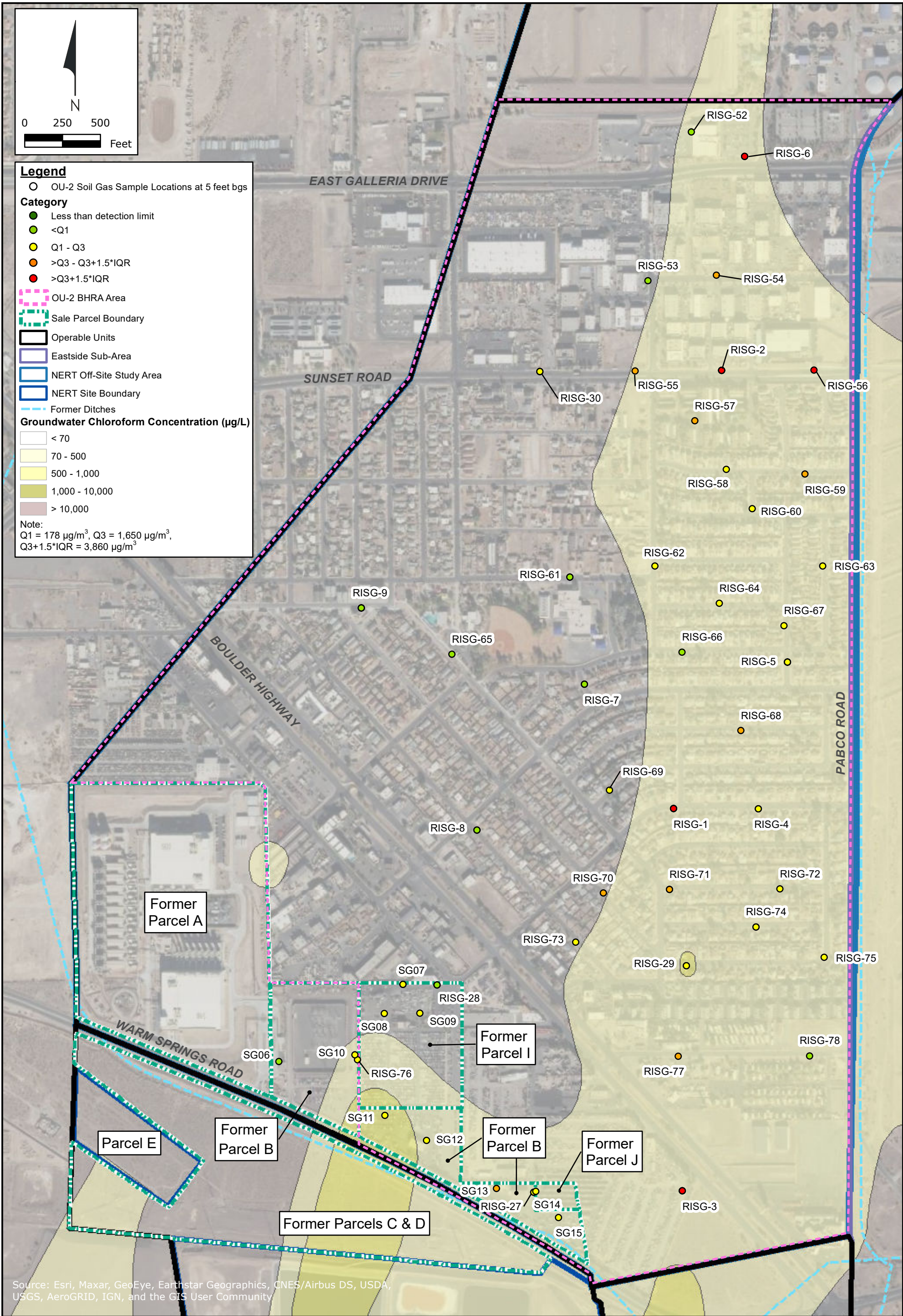


Layout of the OU-2 BHRA Area
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
1-4



H:\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRAs\GIS\Fig 4-2 SG Chloroform Quartile Plot - 5 ft_04.01.2021_.mxd



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Spatial Quartile Plot for Chloroform in Soil Gas Samples at 5 feet bgs
(Chloroform Plume as Depicted in 2020)**
Nevada Environmental Response Trust Site, Henderson, Nevada

Drafter: SS

Date: 7/22/2021

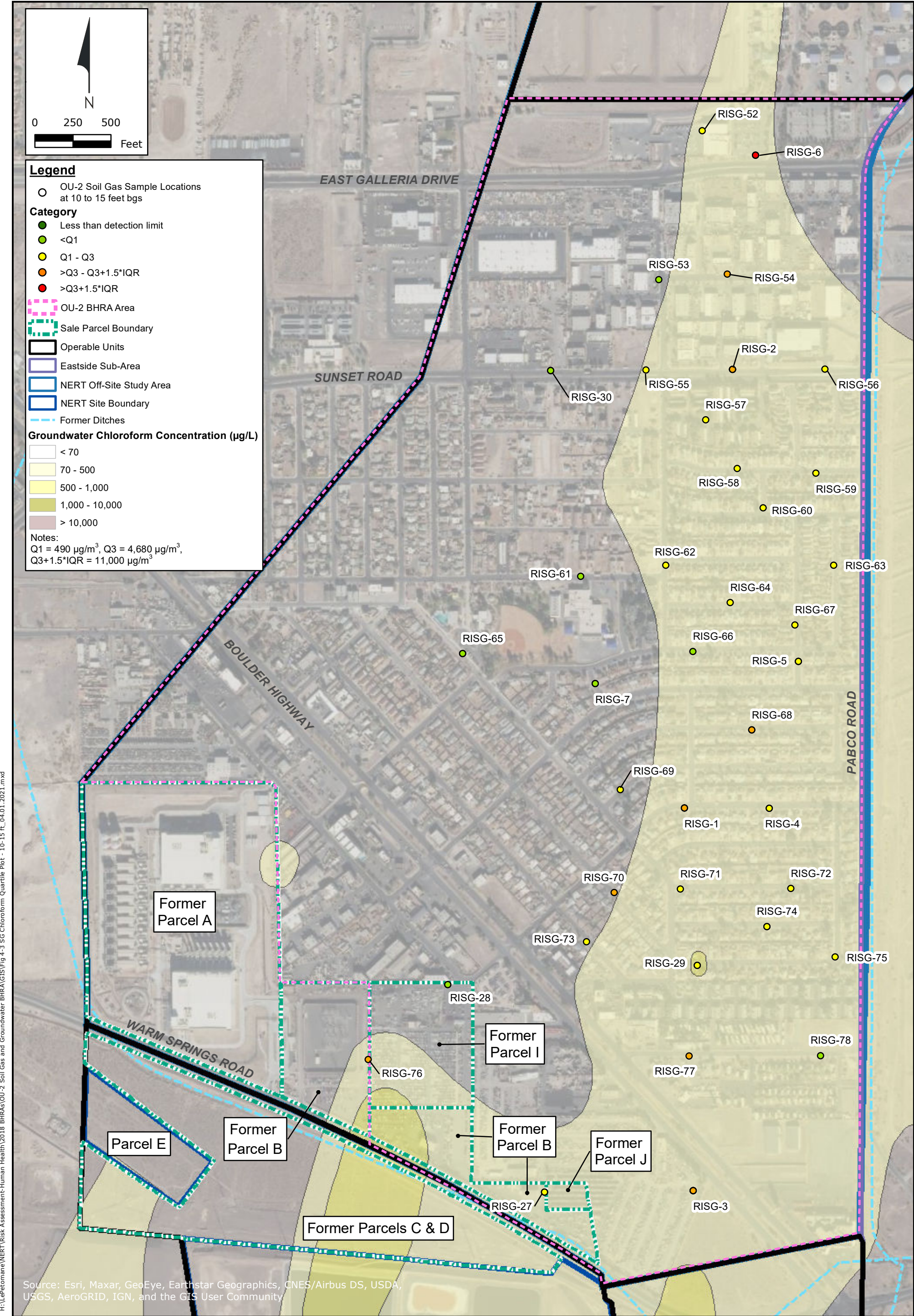
Contract Number: 1690020169-007

Approved by:

Revised:

Figure

4-2



H:\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRAs\GIS\Fig 4-3 SG Chloroform Quartile Plot - 10-15 ft_04.01.2021.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Spatial Quartile Plot for Chloroform in Soil Gas Samples at 10 to 15 feet bgs
(Chloroform Plume as Depicted in 2020)**
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

4-3

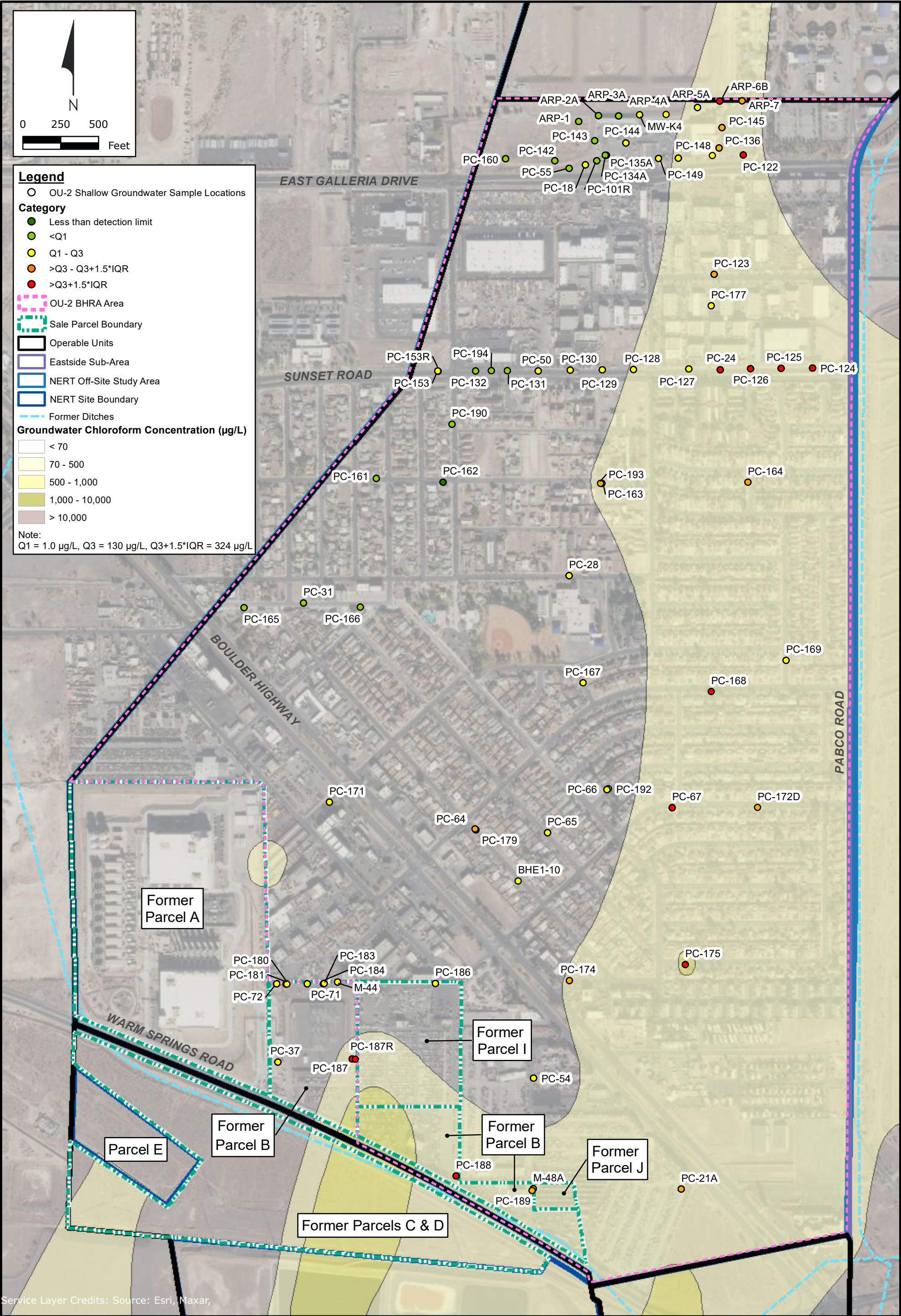
Drafter: SS

Date: 7/22/2021

Contract Number: 1690020169-007

Approved by:

Revised:



H:\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRAs\GIS\Fig 4-4 GW Chloroform Quartile Plot_04.01.2021_.mxd

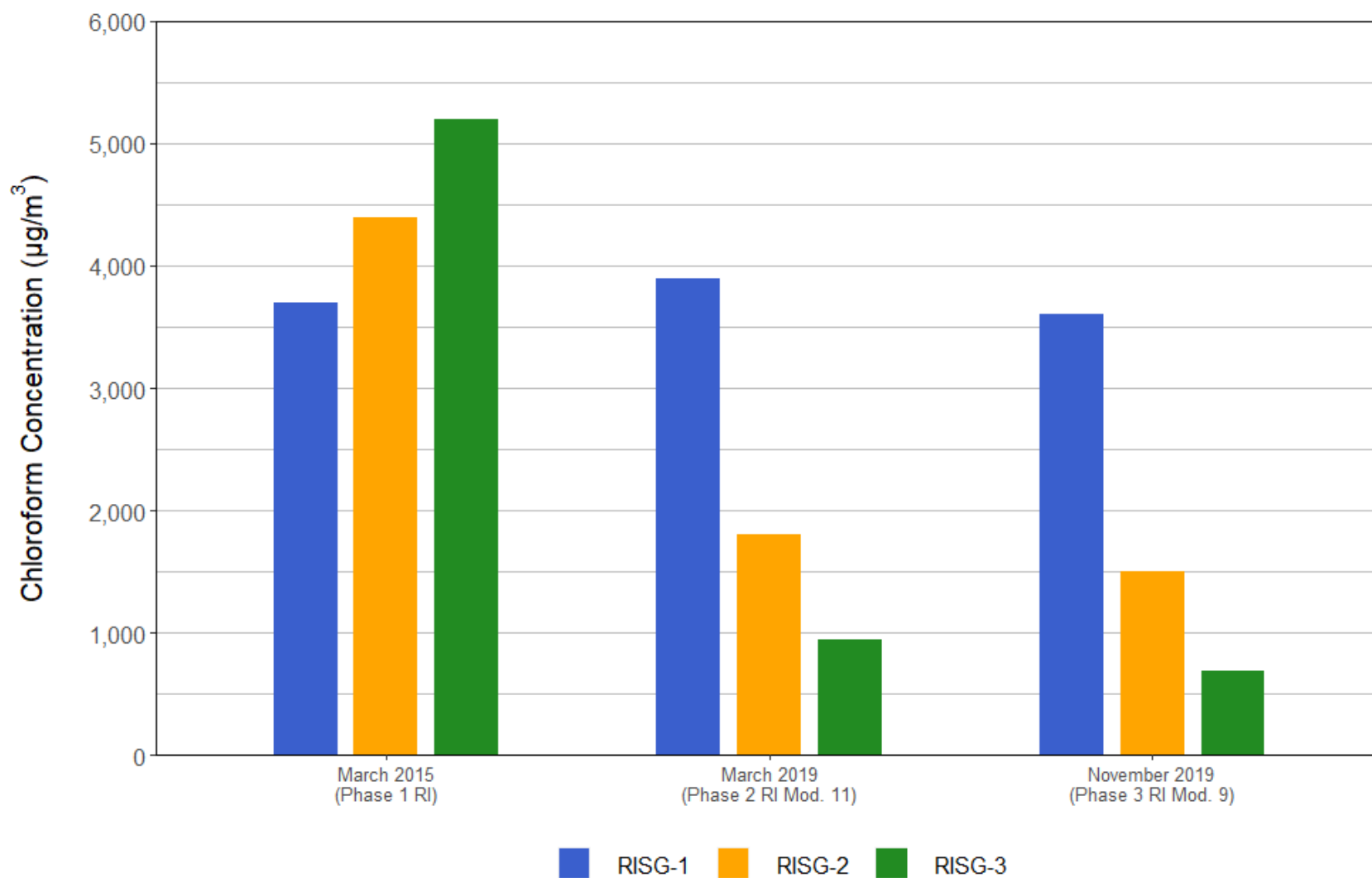
Service Layer Credits: Source: Esri, Maxar,



Spatial Quartile Plot for Chloroform in Groundwater Samples
(Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Drafter: SS Date: 7/22/2021 Contract Number: 1690020169-007 Approved by: Revised:

Figure
4-4



Temporal Distribution of Chloroform Concentrations at Selected 5 feet bgs Soil Gas Sample Locations

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

4-5

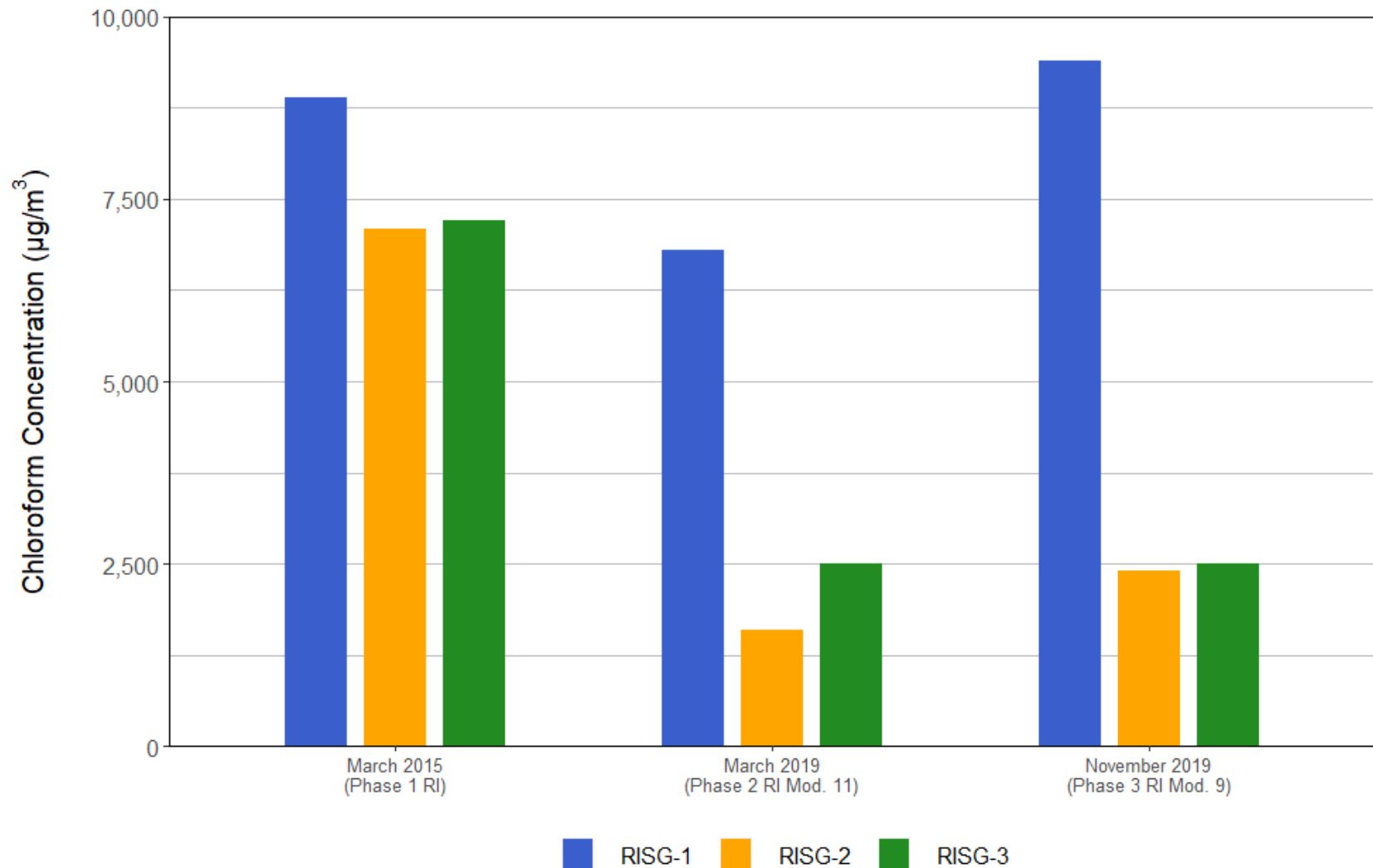
Drafter: JA

Date: 4/7/2021

Contract Number: 1690020169-007

Approved by:

Revised:



Temporal Distribution of Chloroform Concentrations at Selected 10 to 15 feet bgs Soil Gas Sample Locations

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

4-6

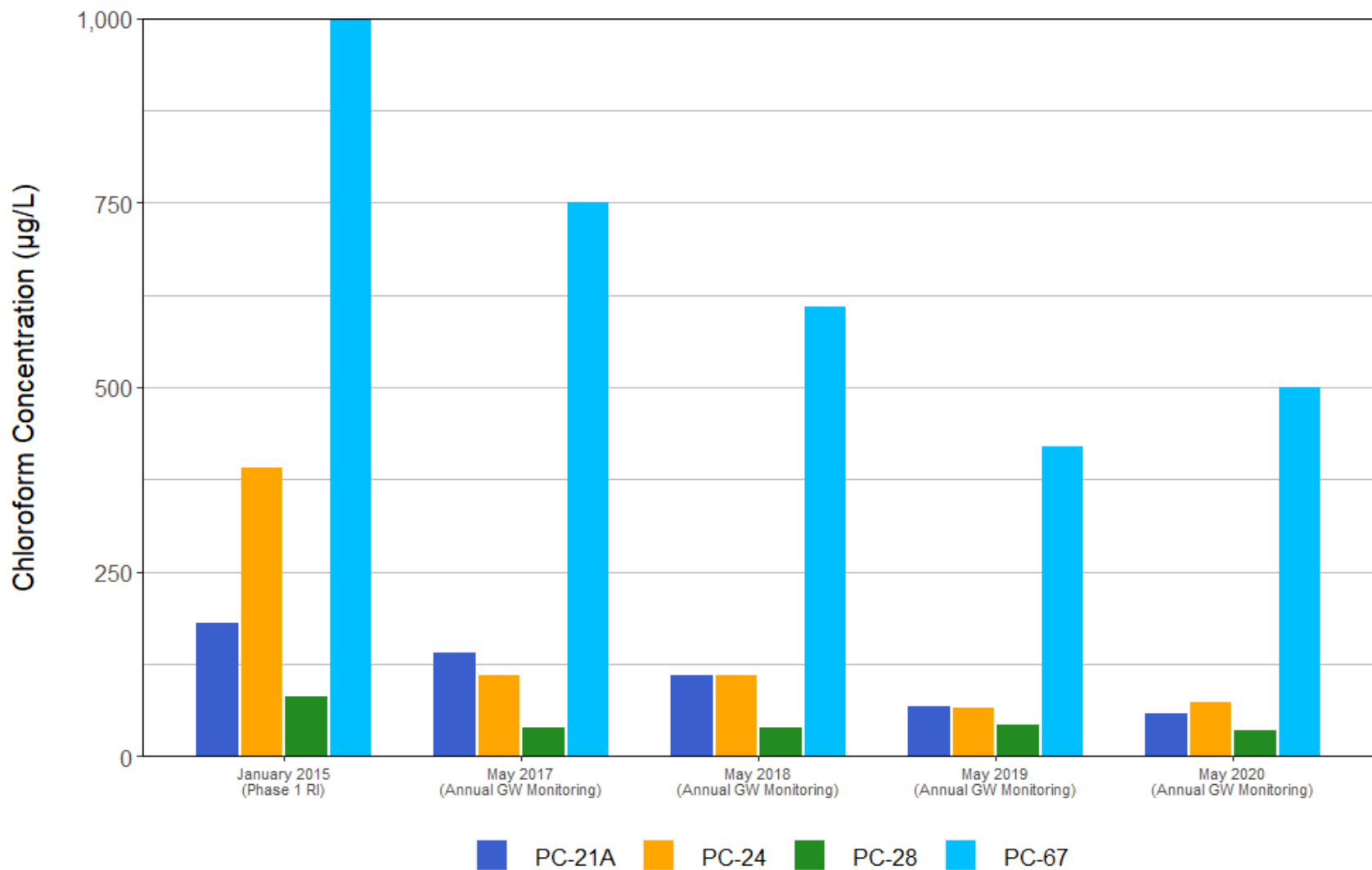
Drafter: JA

Date: 4/7/2021

Contract Number: 1690020169-007

Approved by:

Revised:



Temporal Distribution of Chloroform Concentrations in Selected Shallow Groundwater Samples

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

4-7



Drafter: JA

Date: 4/7/2021

Contract Number: 1690020169-007

Approved by:

Revised:

Soil Gas			Groundwater		
Boring ID	Sample Date	Chloroform Concentration (µg/m ³)	Well ID	Sample Date	Chloroform Concentration (µg/L)
RISG-1	3/11/2019	3,900	PC-67	5/10/2019	420
RISG-2	3/14/2019	1,800	PC-24	5/13/2019	66
RISG-3	3/15/2019	940	PC-21A	5/10/2019	67
RISG-6	3/22/2019	7,500	PC-122	5/8/2019	320
RISG-8	3/21/2019	17	PC-64	5/10/2019	1.50
RISG-9	3/14/2019	34.5 *	PC-31	5/9/2019	0.70
RISG-27	3/15/2019	830	M-48A	5/10/2019	250
RISG-30	3/15/2019	110	PC-50	5/9/2019	1.5

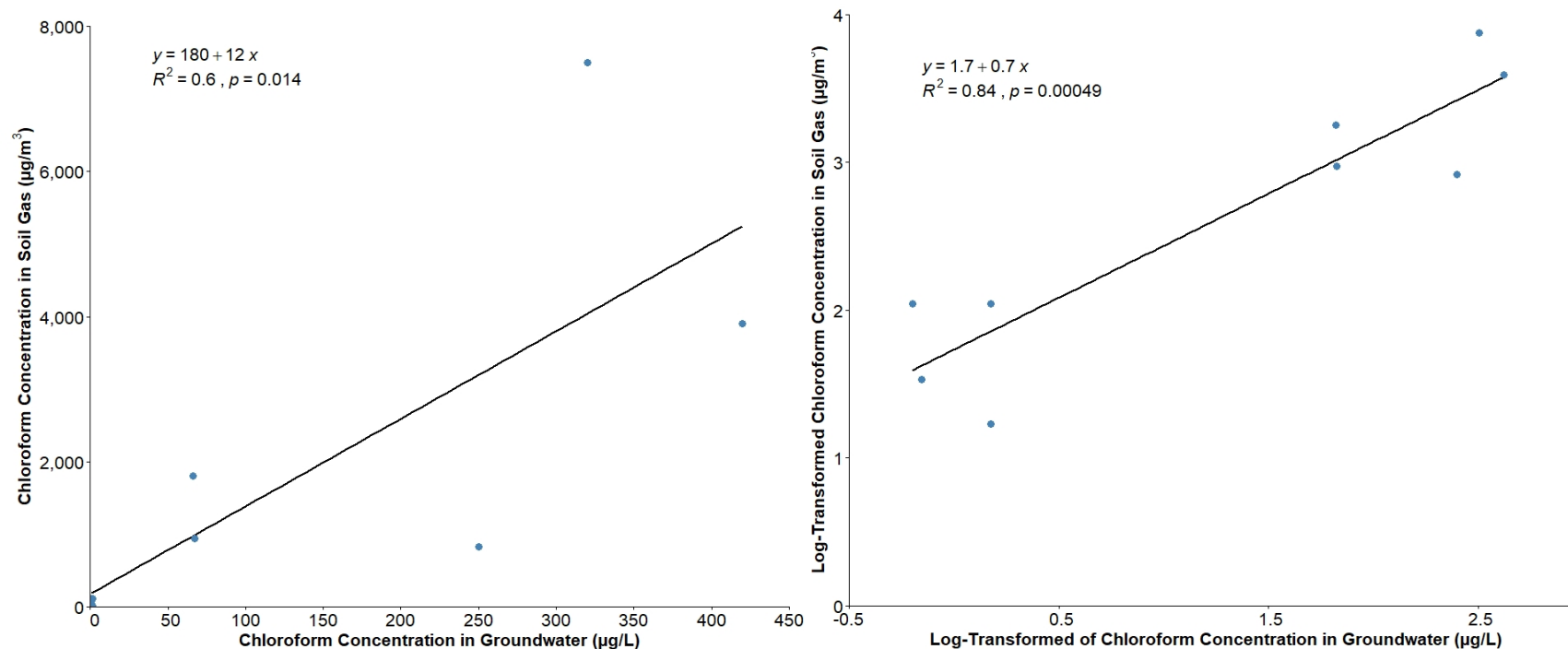
Notes:

µg/m³ = microgram per cubic meter

µg/L = microgram per liter

ft bgs = feet below ground surface

* A field duplicate was collected at this location, and the average concentration between the primary sample and the field duplicate sample was used.



Scatterplot of Chloroform Concentrations in Co-located Soil Gas (5 ft bgs) and Shallow Groundwater Samples

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

4-8

Drafter: JA

Date: 4/22/2021

Contract Number: 1690020169-007

Approved by:

Revised:

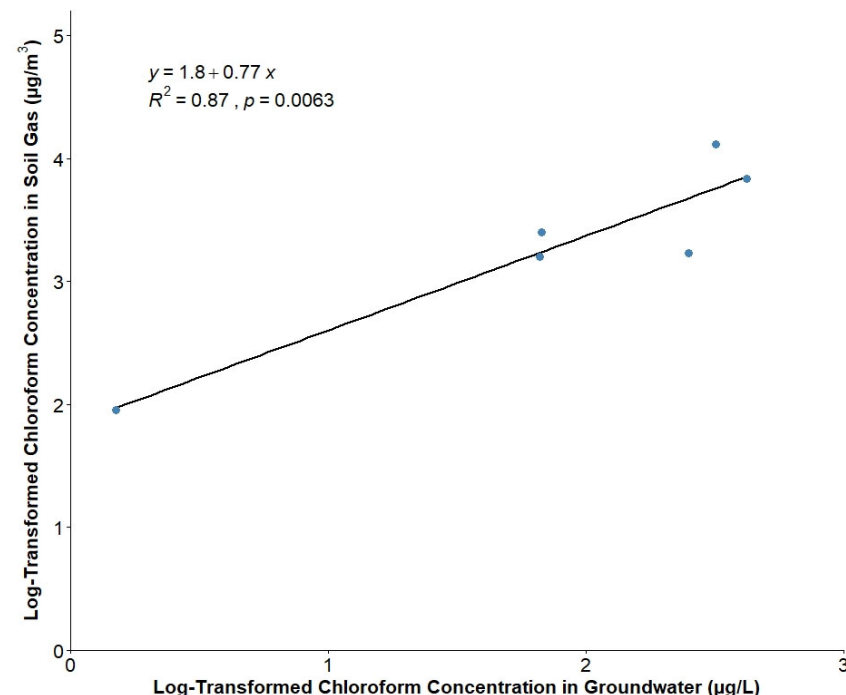
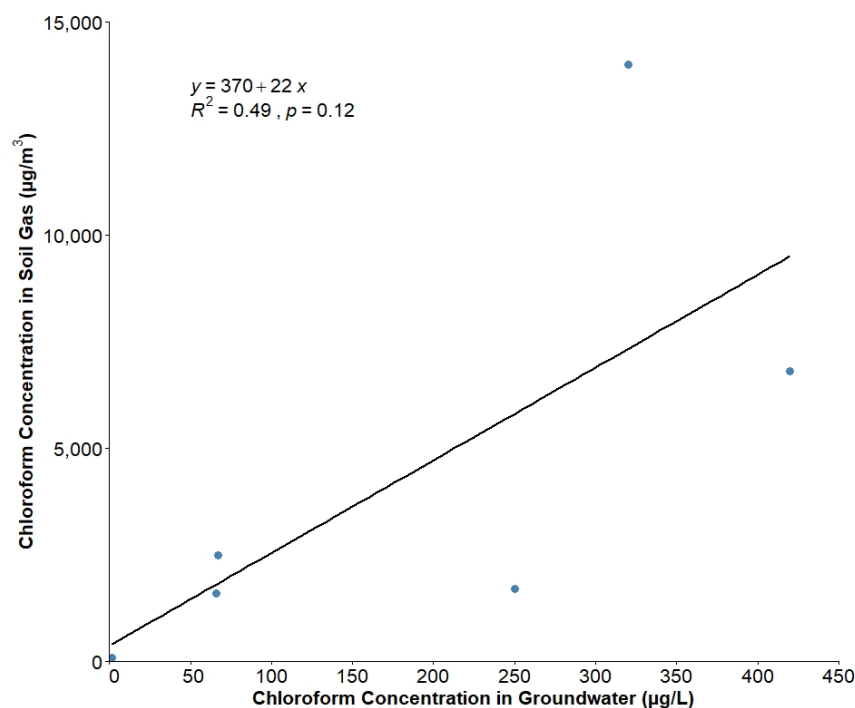
Soil Gas			Groundwater		
Boring ID	Sample Date	Chloroform Concentration (µg/m³)	Well ID	Sample Date	Chloroform Concentration (µg/L)
RISG-1	3/11/2019	6,800	PC-67	5/10/2019	420
RISG-6	3/22/2019	14000 *	PC-122	5/8/2019	320
RISG-27	3/15/2019	1,700	M-48A	5/10/2019	250
RISG-3	3/15/2019	2,500	PC-21A	5/10/2019	67
RISG-2	3/14/2019	1,600	PC-24	5/13/2019	66
RISG-30	3/15/2019	90	PC-50	5/9/2019	1.5

Notes:
µg/m³ = microgram per cubic meter

µg/L = microgram per liter

ft bgs = feet below ground surface

* A field duplicate was collected at this location, and the average concentration between the primary sample and the field duplicate sample was used.



Scatterplot of Chloroform Concentrations in Co-located Soil Gas (10 to 15 ft bgs) and Shallow Groundwater Samples

Nevada Environmental Response Trust Site, Henderson, Nevada

Drafter: JA

Date: 4/22/2021

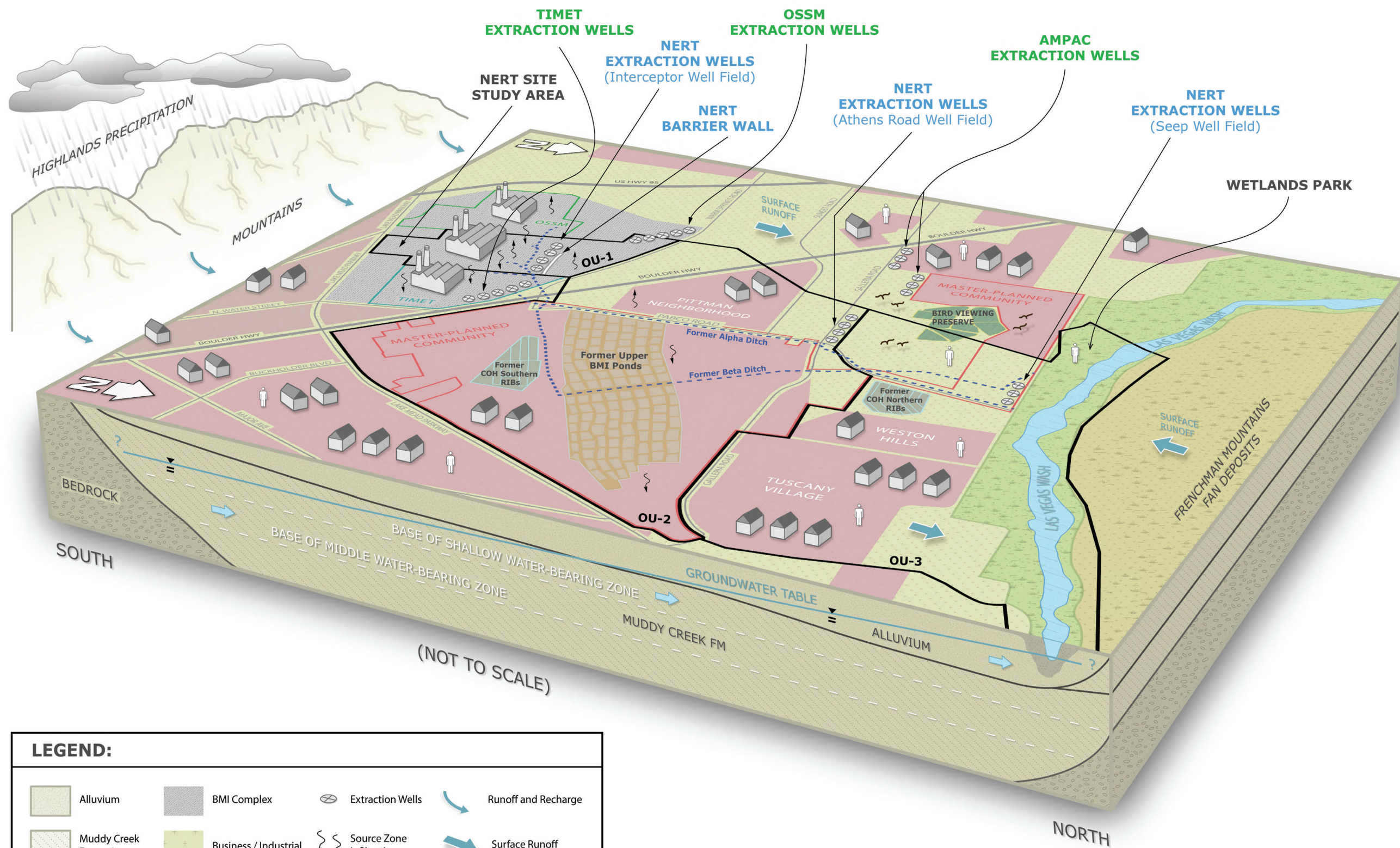
Contract Number: 1690020169-007

Approved by:

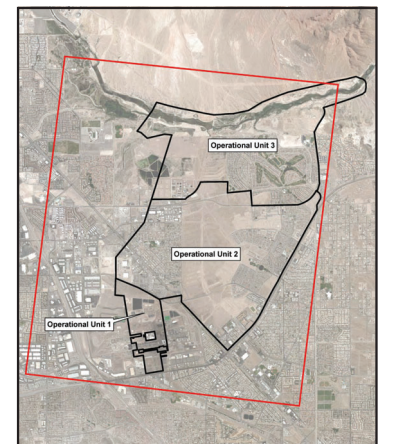
Revised:

Figure

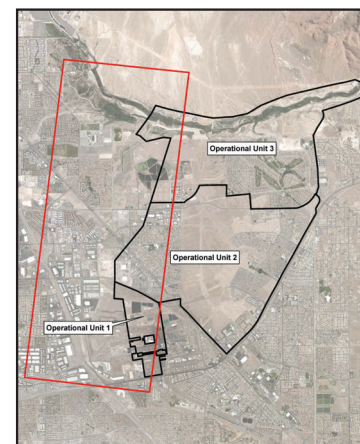
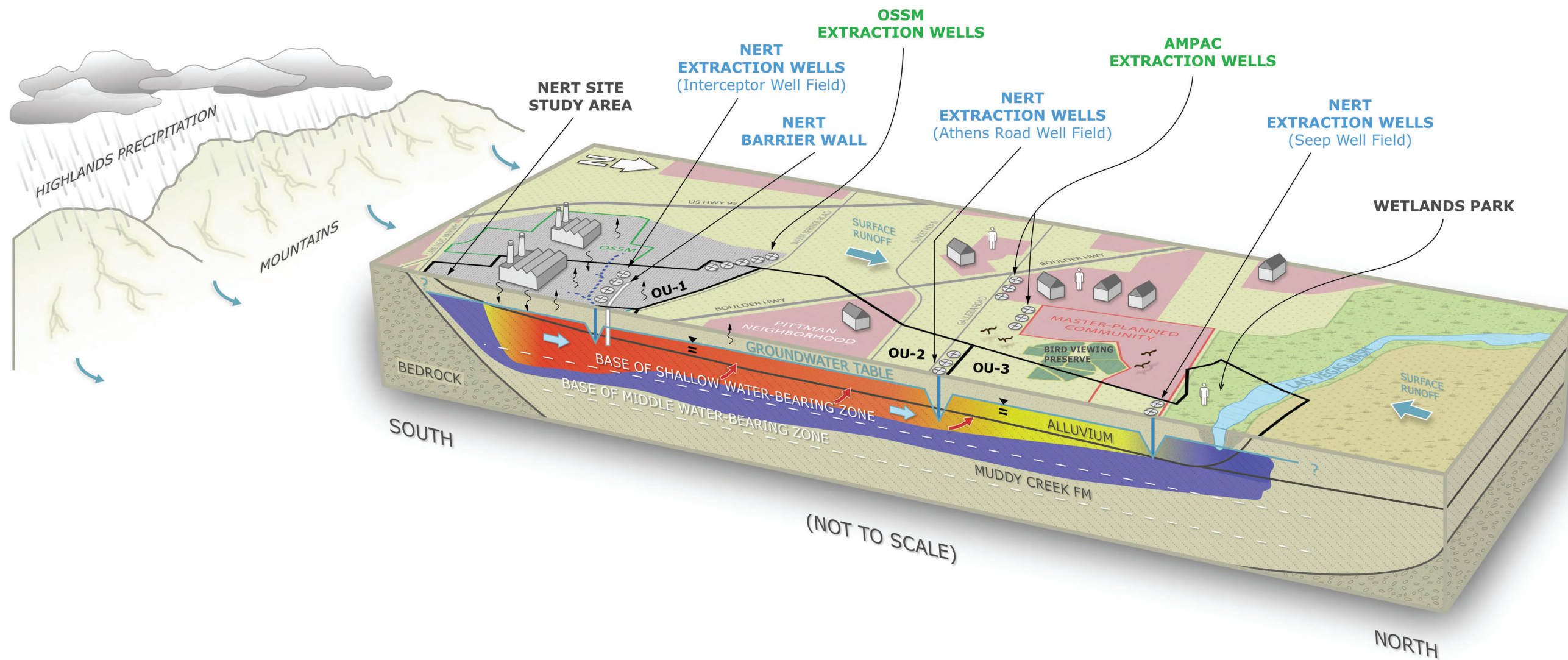
4-9



LEGEND:



Conceptual Site Model: NERT RI Study Area
Nevada Environmental Response Trust Site, Henderson, Nevada



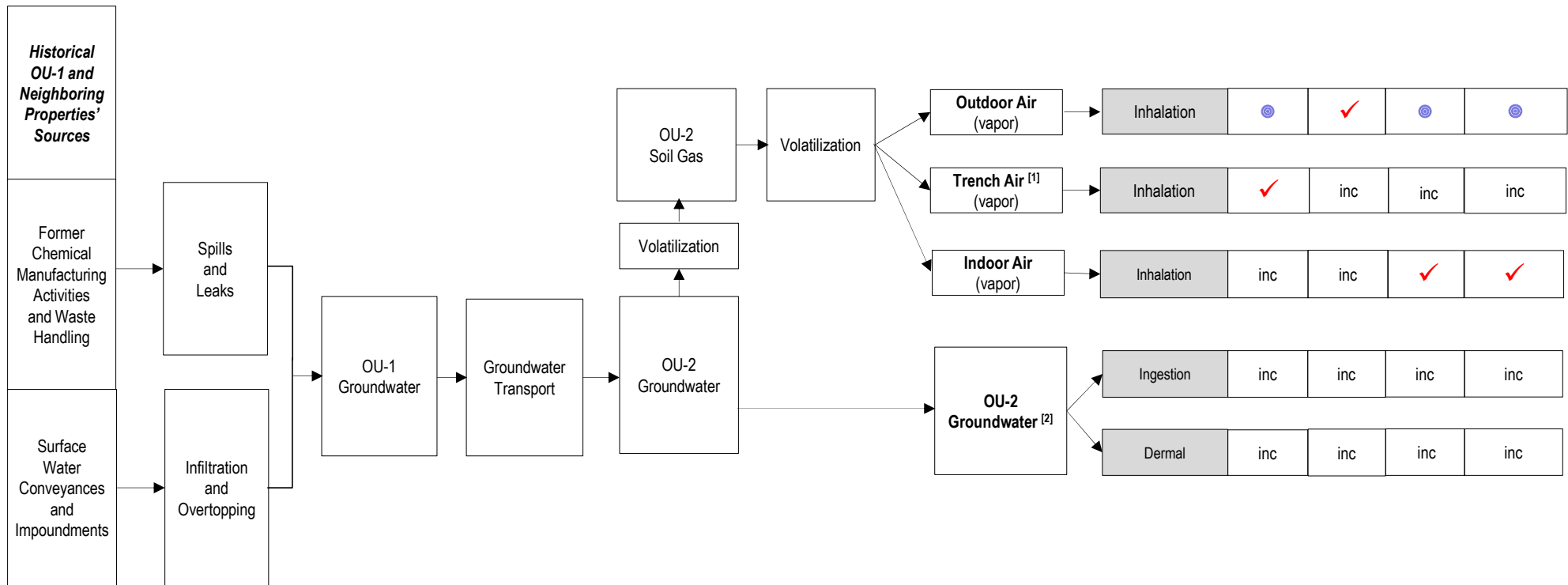
Conceptual Site Model: NERT Site Study Area to Las Vegas Wash
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

4-11

PRIMARY SOURCE	PRIMARY RELEASE MECHANISM	PRIMARY IMPACTED MEDIUM	SECONDARY RELEASE MECHANISM	SECONDARY IMPACTED MEDIUM	TERTIARY RELEASE MECHANISM	EXPOSURE MEDIUM
----------------	---------------------------	-------------------------	-----------------------------	---------------------------	----------------------------	-----------------

EXPOSURE ROUTE	OU-2 RECEPTOR			
	Construction Worker	Outdoor Commercial/Industrial Worker	Indoor Commercial/Industrial Worker	Resident ^[3]



Conceptual Site Model for Human Exposures in the OU-2 BHRA Area

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
5-1

Drafter: KZ

Date: 5/9/2021

Contract Number: 1690020169-007

Approved by:

Revised:

Notes:

BHRA Baseline health risk assessment
bgs below ground surface
ft Feet
OU Operable unit
VOC Volatile organic compound

- [1] To be conservative, construction workers are assumed to be exposed to vapors migrating from soil gas/groundwater while standing in a 10-foot trench in the unsaturated zone, placing them closer to the potential sources.
- [2] Exposure via domestic use of groundwater is not evaluated because groundwater in OU-2 is not and will not be used as a source of drinking water. Incidental ingestion of and dermal contact with groundwater during short-term construction activities are not considered complete exposure pathways in most of the OU-2 BHRA Area because depth to groundwater is >10 feet below ground surface (bgs). Depths to groundwater in a very limited area near monitoring wells PC-161 and PC-162 were identified to be shallower than 10 ft bgs in OU-2. Due to limited numbers of wells with depth to groundwater shallower than 10 ft bgs in OU-2 and the low concentrations detected at these two wells, significant health risks are not expected to occur through the groundwater direct contact pathway in this area. Health risks associated with this pathway are not quantitatively evaluated but semi-quantitatively discussed in the uncertainty analysis in the OU-2 BHRA Report.
- [3] The exposure to VOCs migrating to indoor air for the residents are evaluated under both a slab-on-grade building scenario and a trailer home scenario.

Key:

inc Incomplete exposure pathway

✓ Complete exposure pathway; evaluated quantitatively in the BHRA.

⊙ The exposure to VOCs in outdoor air is not quantitatively evaluated for construction workers and indoor commercial/industrial workers, or residents because it is expected to be much lower than the exposure to VOCs in trench air or indoor air.

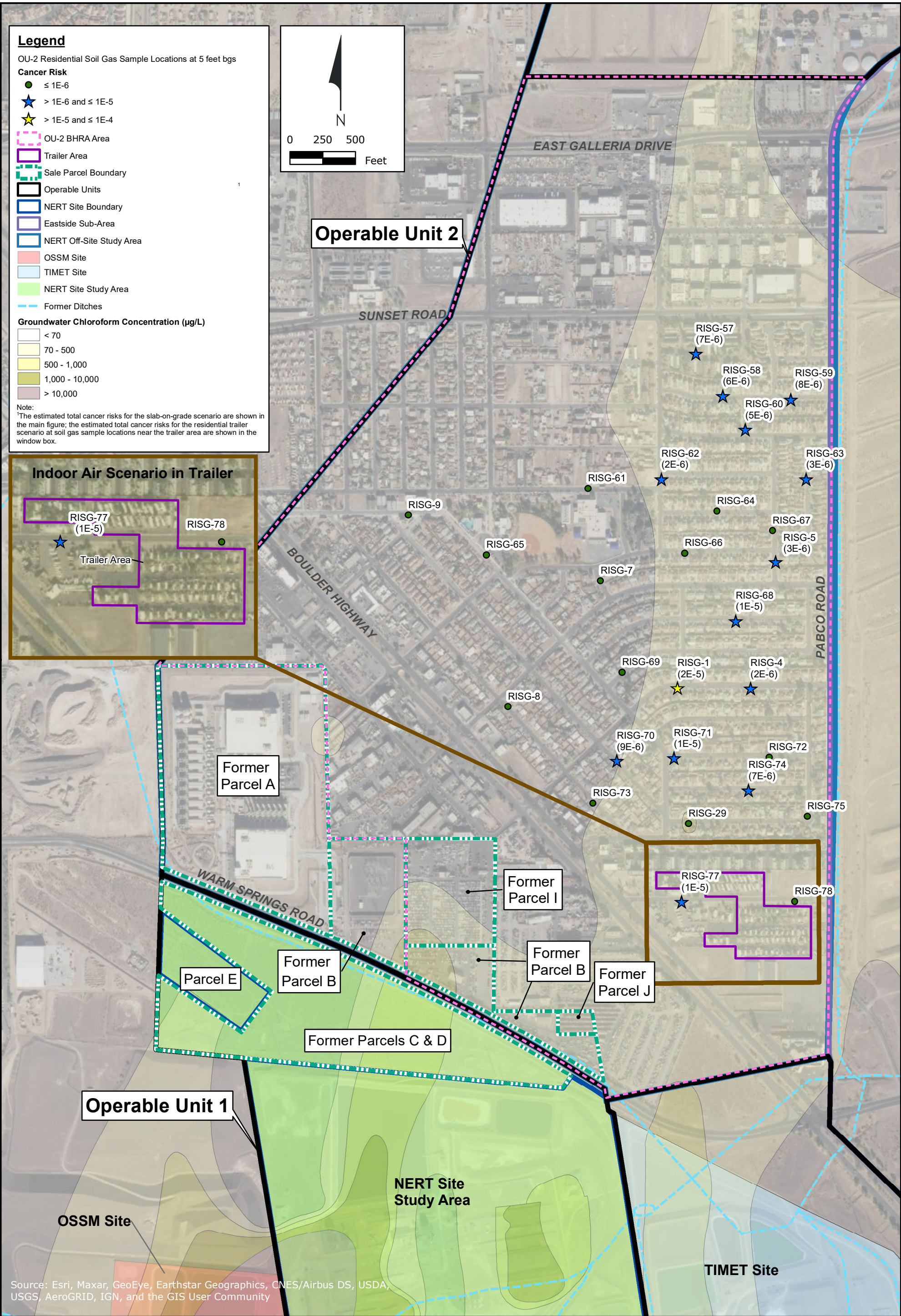


Conceptual Site Model for Human Exposures in the OU-2 BHRA Area
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
5-1

Drafter: KZ Date: 5/9/2021 Contract Number: 1690020169-007 Approved by: Revised:

\\WCE\LPSP1\eng\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRAs\Figure ES-3 Cancer Risk Res 5 ft bgs SG.mxd



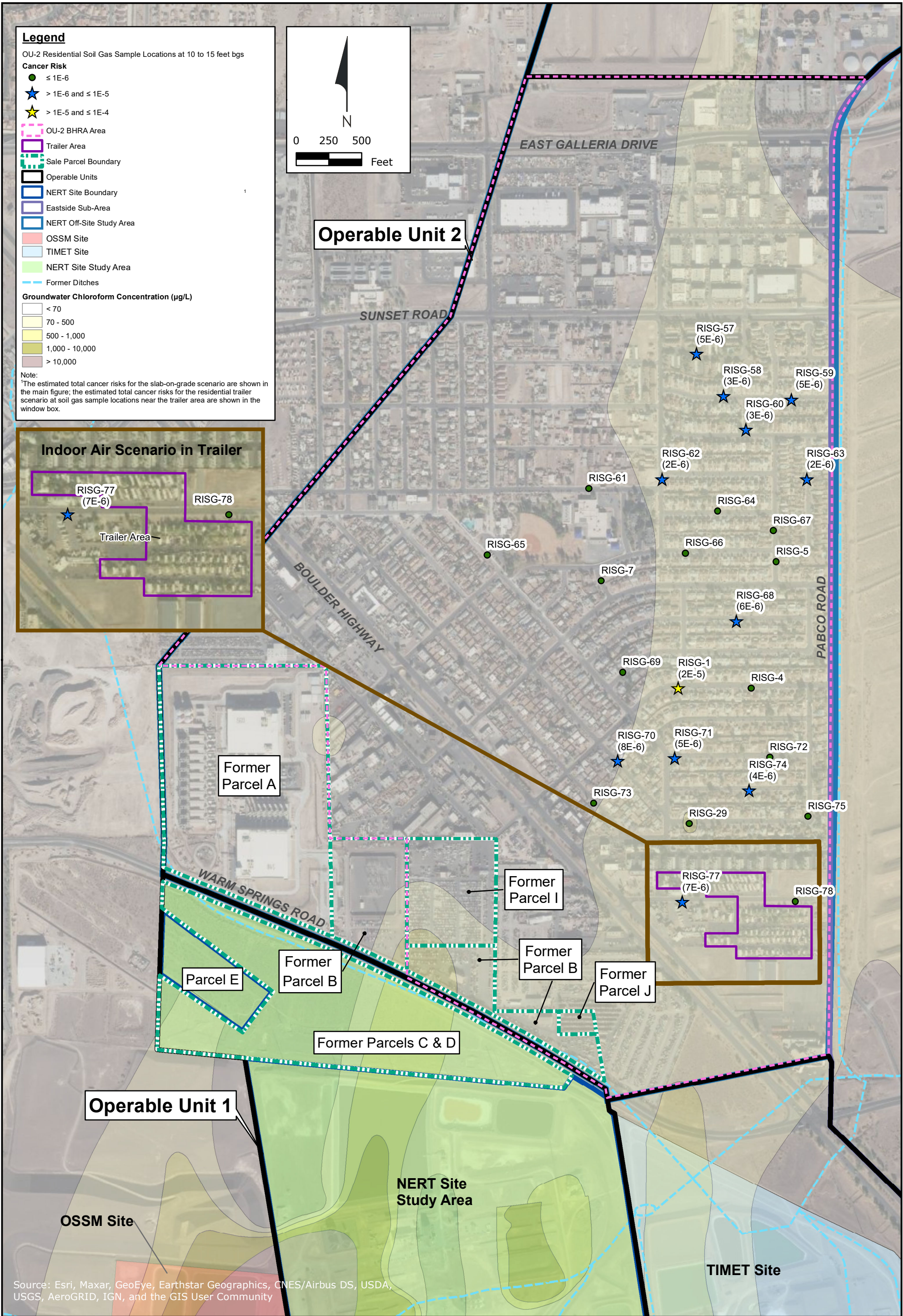
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Estimated Total Cancer Risk for Residents Exposed to VOCs in Soil Gas at 5 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
5-2

\\WCEV\FPS1\eng\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRA\OU-2 Soil Gas and Groundwater BHRA\GIS\Figure ES-4 Cancer Risk Res 15 ft bgs SG-2.mxd



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Estimated Total Cancer Risk for Residents Exposed to VOCs in Soil Gas at 10 to 15 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

5-3

Drafter: JA

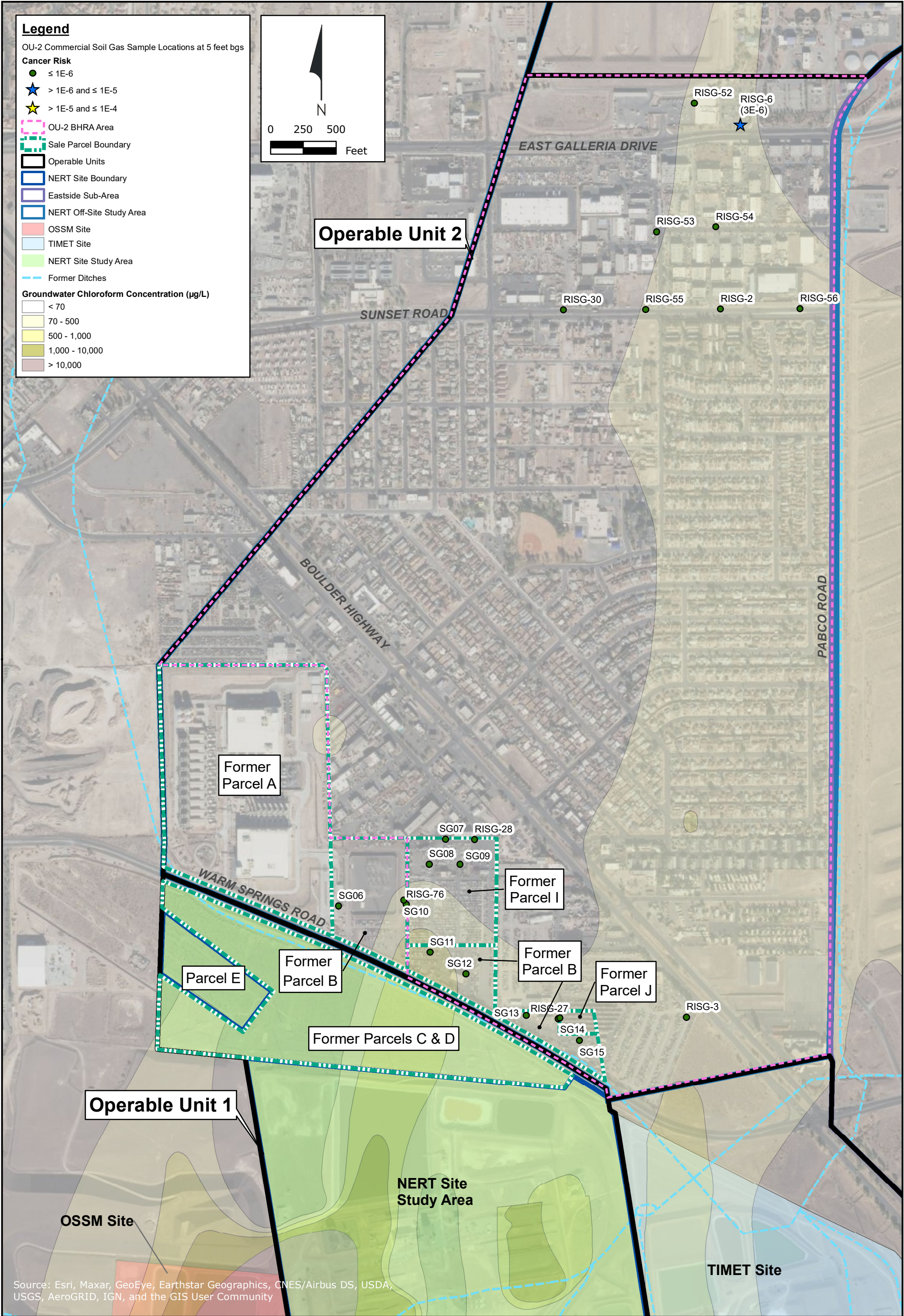
Date: 7/23/2021

Contract Number: 1690020169-007

Approved by:

Revised:

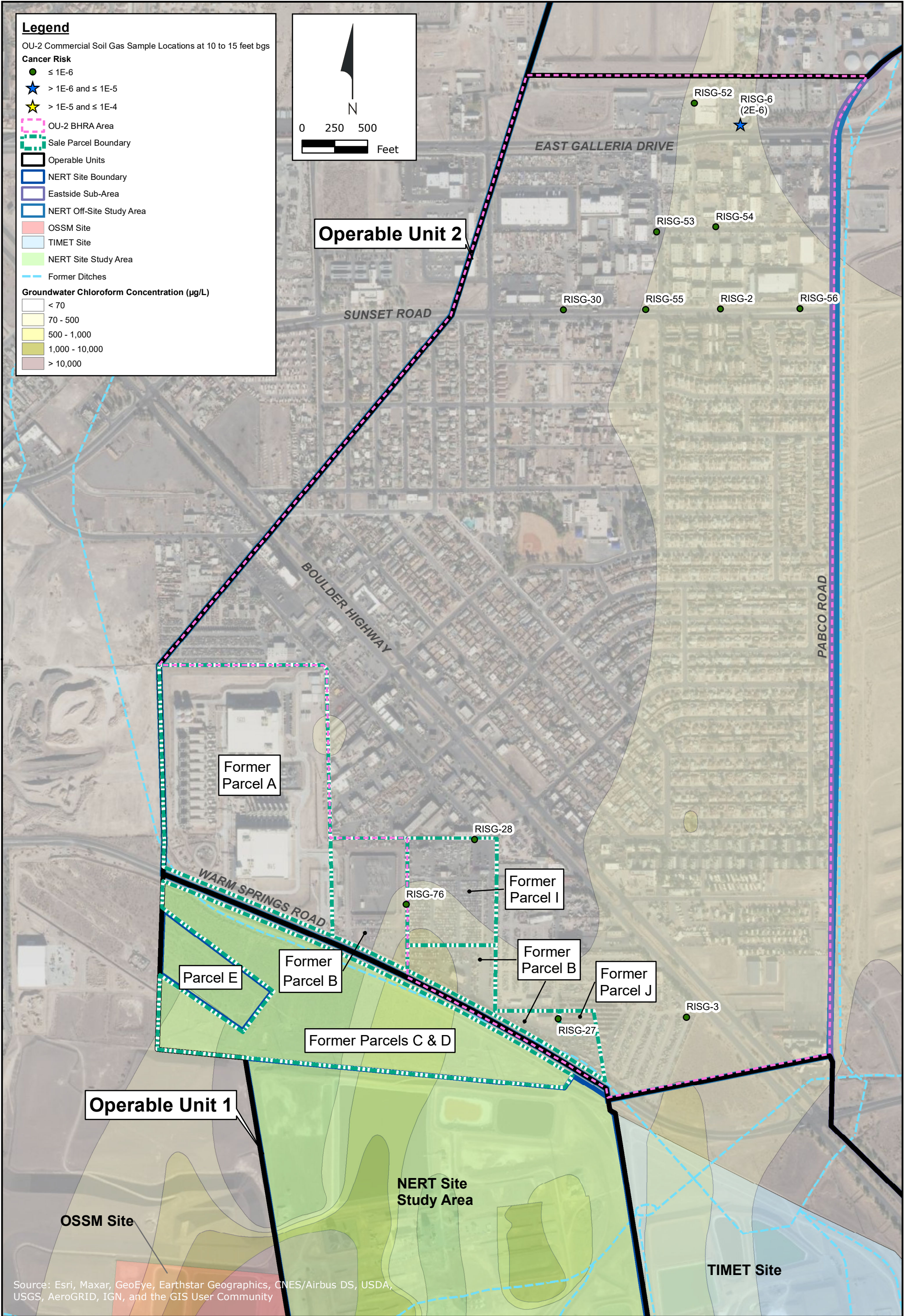
\\WCEV\FPS1\eng\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRA\GIS\Figure ES-5 Cancer Risk Com 5 ft bgs SG.mxd



Estimated Total Cancer Risk for Indoor Commercial/Industrial Workers Exposed to VOCs in Soil Gas at 5 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
5-4

\\WCEVLPSP1\eng\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRAs\OU-2 Soil Gas and Groundwater BHRAs\OU-2 Soil Gas and Groundwater BHRAs\Figure ES-6 Cancer Risk Com 1.5 ft bgs SG.mxd



Estimated Total Cancer Risk for Indoor Commercial/Industrial Workers Exposed to VOCs in Soil Gas at 10 to 15 feet bgs Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Drafter: JA

Date: 7/23/2021

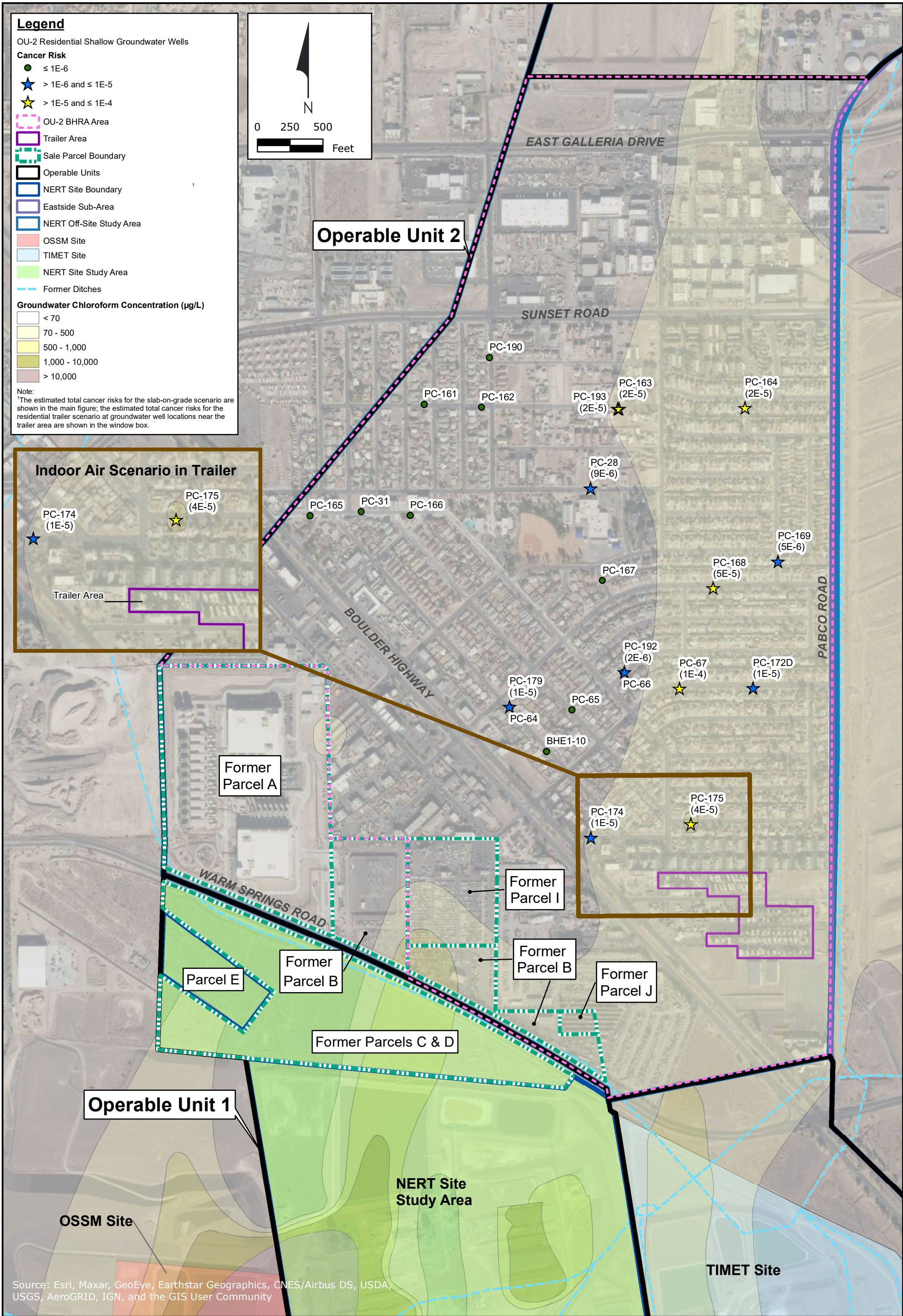
Contract Number: 1690020169-007

Approved by:

Revised:

Figure
5-5

\\WCE\LPSP1\eng\LePetomane\NERT\Risk Assessment-Human Health\2018 BHRA\OU-2 Soil Gas and Groundwater BHRA\GIS\Figure 5-6 Cancer Risk Res GW.mxd



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Estimated Total Cancer Risk for Residents Exposed to VOCs in Shallow Groundwater Migrating to Indoor Air (Chloroform Plume as Depicted in 2020)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure

5-6

Drafter: JA

Date: 7/23/2021

Contract Number: 1690020169-007

Approved by:

Revised:

