5.5 Geologic Hazards and Resources

This section discusses the PHPP's potential effects on geologic resources and the potential geologic hazards that may be encountered by the Project.

5.5.1 LORS Compliance

This section addresses the LORS applicable to geologic hazards and resources that are relevant to the Project. Table 5.5-1 summarizes the LORS that are expected to apply to the Project. The Project will comply with applicable LORS during construction and operation.

Table 5.5-1 LORS Applicable to Geological Resources and Hazards

LORS	Applicability	Where Discussed in AFC
Federal:		
Uniform Building Code	The Uniform Building Code specifies acceptable design criteria for structures and excavations with respect to seismic design and load bearing capacity.	Section 5.5.3
State:		
California Building Code	Specifies acceptable design criteria for structures and excavations with respect to seismic design and load bearing capacity.	Section 5.5.3
Alquist-Priolo Earthquake Fault Zoning Act	Identifies areas subject to surface rupture from active faults. Prevents construction of buildings for human occupancy in these areas.	Section 5.5.3
Local:		
City of Palmdale Municipal Code	The Palmdale Department of Building and Safety regulates the construction of all buildings.	Section 5.5.3

5.5.1.1 Federal LORS

The Uniform Building Code (UBC) specifies acceptable design criteria for structures with respect to seismic design and load bearing capacity. The State has adopted these provisions in the California Building Code (CBC).

5.5.1.1 State LORS

The Project is subject to the applicable sections of the CBC. The City of Palmdale is responsible for implementing the CBC for the Project.

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was passed in 1972 to prevent the construction of buildings used for human occupancy on the surface traces of active faults. The Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. Project structures to be used for human occupancy are not located within areas identified as subject to surface rupture from active faults (i.e., Alquist-Priolo Earthquake Fault Zones), and the Project will be in compliance with the Alquist-Priolo Act.

5.5.1.2 Local LORS

The Project is subject to the City of Palmdale's requirements for building permits. Grading permits are needed for excavation or fill activities which are greater than three feet in depth or involve the movement of more than 20 cubic yards of earth (Palmdale Municipal Code 8.04.265 Chapter 70 Excavation and Grading).

5.5.1.3 Involved Agencies

The agency and person to contact for building and grading permits is identified in Table 5.5-2.

Table 5.5-2 Agencies and Agency Contacts

Agency Contact	Phone/E-mail	Permit/Issue
Shane Walter, Director City of Palmdale Department of Building and Safety 38250 Sierra Highway Palmdale, CA 93550	(661) 267-5353 / swalter@cityofpalmdale.org	Building and grading permits.

5.5.1.2 Required Permits and Permit Schedule

Building and grading are required by the City of Palmdale Department of Building and Safety. According to the Building and Safety staff, the time needed to process these permit applications varies with the complexity of the project. Permit applications will be submitted at least six weeks prior to the start of construction to assure sufficient processing time for the PHPP.

5.5.2 Affected Environment

This section discusses the existing geologic environment of the Project site (i.e., plant site and linear facilities). Underlying geologic structures, seismicity, and geologic hazards are discussed.

5.5.2.1 Geology

Regional

The site is located in the Antelope Valley in the western Mojave Desert, within the greater Mojave Desert Geomorphic Province of California. The Mojave Desert Province occupies approximately 25,000 square miles and consists of broad basins filled by alluvial deposits derived from the surrounding mountains. The Mojave Desert Province is a wedge-shaped area bordered on the southwest by the San Gabriel and San

Bernardino Mountains and on the northwest by the Tehachapi Mountains. These surrounding mountains range up to 10,080 feet in altitude, while the interior desert has relatively low relief.

The structural geology and fault patterns within the western Mojave Desert are relatively uniform and internally consistent, comprised of a series of northwest-southeast trending faults. Major fault zones in the study area include the San Andreas and Garlock fault zones to the southwest and northwest, respectively.

Lithologically, the region is dominated by alluvial-filled basins overlying Paleozoic and Mesozoic igneous and metamorphic basement rocks. The basement rocks are exposed at the surface in isolated mountain ranges throughout the desert. The geology of the Project area is depicted in Figure 5.5-1.

Plant Site

The plant site is relatively flat with a gentle slope trending downhill to the northeast. Surface elevations range from approximately 2,495 feet above mean sea level (amsl) in the northeast corner of the site to 2,535 feet amsl in the southwest corner. The site is underlain by Quaternary-age alluvium which is anticipated to be in excess of 500 feet thick. According to a 2007 preliminary geotechnical study of the plant site by Kleinfelder, Inc. (see AFC Appendix B), the plant site is underlain by alluvial soil deposits, generally comprised of alternating layers of various combinations of sand and silt. There are no bodies of water located on the plant site.

Offsite Linear Facility Routes

The proposed routes for the Project's reclaimed water and gas supply pipelines also lie within the Antelope Valley and the geology is similar to that in the vicinity of the plant site. The topography of the water and gas pipeline routes is relatively flat and crosses an alluvial-filled basin overlying Paleozoic and Mesozoic igneous and metamorphic basement rocks. The proposed transmission line route first crosses portions of the Antelope Valley and then traverses the northeastern edge of the San Gabriel Mountains before connecting to the Southern California Edison (SCE) transmission system at the Vincent Substation. The bedrock geology of the San Gabriel Mountains generally consists of several generations of plutonic rocks with subsidiary metamorphics.

5.5.2.2 Seismicity

The Project site is located in seismically active Southern California, a region that has experienced numerous earthquakes in the past. The location of the Project facilities in relation to designated Alquist-Priolo Fault Zones is shown in Figure 5.5-2. No known active faults have been identified for the plant site or along the proposed reclaimed water pipeline route. According to Alquist-Priolo Fault Zone maps for the Palmdale area, the proposed transmission line route crosses two fault zones. The route crosses the Llano Fault Zone near Pearblossom, California, just west of where the route crosses Highway 138. The transmission line route also crosses the San Andreas Fault Zone south of Littlerock, California, roughly in the area of the intersection of 77th St E and Mount Emma Road. The proposed natural gas pipeline route runs adjacent to the San Andreas Fault Zone near the pipeline's southern terminus.

An "active" fault is defined as a fault that has experienced seismic activity during historical times (since roughly 1800) or exhibits evidence of surface displacement during the Holocene Epoch (approximately 9600 BC to present). According to the preliminary geotechnical report (Kleinfelder, Inc., 2007), there are 47 active

faults within a radius of 62 miles of the PHPP plant site. Table 5.5-1 presents a list of 11 significant faults within 31 miles of the proposed plant site that are identified by Kleinfelder, Inc. as having the greatest potential to impact on the site. Figure 5.5-3 shows fault zones in the project region. Other currently unknown active faults without surface expression (blind faults) that are capable of generating seismic activity also may be present.

Table 5.5-3 Significant Faults in Project Region

Fault Name	Approximate Distance from Site Miles	Maximum Moment Magnitude (M)	Slip Rate (mm/yr)
San Andreas-1857 Rupture	5.2	7.8	Not Available
San Andreas-Mojave	5.2	7.1	30.0
Sierra Madre	21.3	7.2	2.0
Sierra Madre-San Fernando	21.6	6.7	2.0
San Andreas-Carrizo	23.4	7.4	34.0
San Gabriel	23.9	7.2	1.0
Clamshell-Sawpit	24.0	6.5	0.5
Verdugo	25.1	6.9	0.5
Santa Susana	28.2	6.7	5.0
Holser	29.6	6.5	0.4
Northridge-East Oak Ridge	30.6	7.0	1.5

Based on information provided in the preliminary geotechnical report, a chronology of significant earthquakes that occurred within a 62-mile radius of the site between 1800 and 2005 is presented in Table 5.5-4. A search of historic earthquakes by Kleinfelder, Inc. indicated that 668 earthquakes with magnitude equal or greater than 4.0 occurred within 62 miles of the plant site between 1800 and 2005.

Table 5.5-4 Significant Earthquakes (M > 5.5) Near Project Vicinity

Date	Magnitude	Location	Approximate Distance from the Site Miles (Km)
May 1803	5.5	San Gabriel Mission	30.4
January 16, 1857	6.3	Palmdale	9.1
May 12, 1880	5.9	Gorman-Palmdale	17.3
February 9, 1971	6.6	San Fernando	23.2
June 28, 1991	5.8	Sierra Madre	26.9

5.5.2.3 Geologic Hazards in Plant Site Vicinity

Seismic Groundshaking

The plant site is located in a seismically active area and there is a potential that the proposed power plant structures may experience one or more moderate to severe ground shaking events during the design life of the project. The estimated Peak Ground Acceleration (PGA) at the plant site with 10 percent probability of being exceeded in 50 years is 0.58 times the force of gravity (0.58 g) (California Geologic Survey, 2008). Potential hazards related to ground shaking include ground rupture, liquefaction, and slope instability.

Ground Rupture

No known active faults have been identified for the plant site, and the potential for ground rupture at the site is considered to be low. It should be noted that while ground rupture most likely would occur along previously established fault traces, future ruptures could occur at other locations.

Liquefaction

Liquefaction is a phenomenon that may occur because of ground shaking at locations where loose sandy soils are present and groundwater levels are shallow. Based on information in the preliminary geotechnical report, the proposed site is generally underlain by medium-dense to dense sand and silty sand deposits, except for an upper stratum of potentially collapsible soils. During the preliminary geotechnical investigation conducted by Kleinfelder, Inc., groundwater was not encountered in borings ranging up to 76.5 feet below ground surface (bgs). Monitoring wells located on Air Force Plant 42, immediately adjacent to the east of the plant site, had reported depths to groundwater in 2007 of between 360 and 375 feet bgs (ENSR, 2008). Due to the relatively deep groundwater levels in the vicinity of the plant site, the potential for liquefaction is considered low.

Slope Instability

The plant site consists of generally flat terrain which is not prone to significant mass wasting or slope stability problems.

Subsidence

Subsidence due to groundwater withdrawal has been documented in various regions of the Mojave Desert, particularly in the area stretching from Lancaster through the southern portion of Edwards Air Force Base (Leighton and Phillips, 2003). However, Leighton and Phillips report that no measureable subsidence has occurred in the area around Palmdale. They suggest that the lack of subsidence in the Palmdale area may indicate that compressible sediments may not exist there or that water levels in the area may not have declined to the level at which permanent compaction of the sediments would occur. Based on this information, subsidence due to groundwater withdrawal in the plant site area is considered unlikely.

Collapsible Soils

Alluvial soils in arid and semi-arid environments are prone to collapse when their moisture content increases. The plant site is located in an area were the potential exists for collapsible soils. Based on

collapse potential tests by Kleinfelder, Inc. of 11 samples collected from 6 to 26 feet bgs, soils at the plant site have a moderate to high collapse potential. However, with implementation of planned mitigation measures for sub-grade improvements, as discussed in Section 5.5.4 below, potential for damage due to collapsible soils is considered low at the proposed plant site.

Expansive Soils

Expansive soils consist of fine-grained clay which is subject to swelling and shrinkage, varying in proportion to the amount of moisture present in the soil. Soils at the plant site are composed mainly of combinations of sand and silt. Due to the lack of a significant clay component, the expansion potential of the soil at the plant site is considered low.

Erosion

Erosion is the displacement of solids (soil, mud, rock, and other particles) by wind, water, or ice and by downward or down-slope movement in response to gravity. Due to the generally flat terrain of the plant site, it is not considered prone to significant mass wasting due to gravity. However, soil characteristics at the plant site allow for the potential for wind and water erosion. For more details on potential wind and water erosion associated with the project and mitigation measures that will be implemented to reduce any potentially significant erosion impacts to less than significant levels, see Section 5.12, Soils.

5.5.2.4 Geologic Hazards Along Linear Facility Routes

Seismic Groundshaking

As with the plant site, the Project's linear facility routes are located in seismically active areas and therefore will likely be subjected to ground shaking from movement along one or more of the active or potentially active faults in the region. The estimated PGAs for the soils beneath the water line route are as high as 0.69g (at its southern terminus). The estimated PGAs for the soils beneath the gas pipeline route are as high as 0.78g (at its southern terminus). The estimated PGA for the portion of the transmission line route in the vicinity of the San Andreas Fault Zone is 0.80g (California Geological Society, 2008).

Ground Rupture

As described in Section 5.5.2.2, portions of the proposed transmission and gas pipeline routes run across or adjacent to designated Alquist-Priola Fault Zones, areas at heightened risk for ground rupture.

Liquefaction

California Geological Survey (CGS) Seismic Hazard Zone Reports for the Alpine Butte (2005a), Lancaster East (2005b), Littlerock (2003a), Pacifico Mountain (2003b), and Palmdale (2003c) Quadrangles provide information on zones of heightened liquefaction potential in the Project area. The CGS process for zoning for liquefaction hazards uses a combination of Quaternary geologic mapping, historical groundwater information, and subsurface geotechnical data. According to the CGS reports the proposed gas and water routes do no cross liquefaction zones. The transmission route crosses liquefaction zones in several areas, specifically in the floodplain of Big Rock Creek, in the two areas where the route crosses Little Rock Wash,

and where it crosses several other washes in the San Gabriel Mountains. These locations are depicted in Figure 5.5-4.

Slope Stability

With the exception of the portion of the transmission line route in the San Gabriel Mountains, the majority of the linear facility routes traverse terrain that is generally flat. Significant mass wasting or slope stability problems in these flat areas are unlikely, as are mass movements such as landslides, although there is some potential for slope instability in localized areas along stream banks. Portions of the transmission line route that cross steep slopes may be at heightened risk for earthquake-induced landslides. According to the CGS Seismic Hazard Zone Reports for the Project area, the transmission line route does not cross any areas that have been identified as having experienced landslide movement in the past. Careful route selection for the transmission line will help minimize the slopes encountered and the risk of impacts from landslides.

Subsidence

As discussed in Section 5.5.2.3, although subsidence has been documented in various regions of the Mojave Desert, no measurable subsidence has occurred in the Palmdale area. Based on this information, subsidence along the linear facility routes is considered unlikely.

Expansive Soils

Soils beneath the linear facility routes are composed mainly of sands, silty sands, and sand with silt. Due to the lack of a significant clay component, the expansion potential of the soil is generally low.

Erosion

Over most of the linear facility routes, the terrain is generally flat and has low potential for mass wasting due to gravity. The portions of the transmission line route in the San Gabriel Mountains may have higher potential for erosion due to gravity. Soil characteristics beneath the linear routes allow for the potential for wind and water erosion. Erosion potential is further discussed in Section 5.12, Soils.

5.5.2.5 Geologic Resources

Mineral deposits within the Mojave Desert region include ores within bedrock deposits, lake bottom evaporates, and sand and gravel deposits within alluvial basins (Dibblee, 1980). Figure 5.5-5 depicts the location of mineral deposits in the Project region identified in the U.S. Geological Survey's (USGS) Mineral Resources Data System (MRDS). Table 5.5-5 provides details on major commodities produced and the development status at each of the mineral deposits in the Project region identified in the MRDS.

The MRDS does not indicate the presence of mineral deposits at or within two miles of the plant site. Although the plant site is known to be underlain by sandy soils (Kleinfelder, Inc., 2007), the primary production areas for aggregate materials (sand and gravel) in the Project region are located along an area of Little Rock Wash approximately 10 miles southwest of the plant site (see Figure 5.5-5). The majority of the mineral deposits identified in the MRDS are within the southern portion of the Project region; portions of the transmission line and natural gas pipeline are located near several of these deposits, as depicted in

Figure 5.5-5. However, these linear facilities take up relatively small amounts of space and do not directly cross any of the deposits identified in the MRDS. Thus, there are no significant impacts expected on the availability of mineral resources.

Table 5.5-5 MRDS Mineral Deposits in the Project Region

Deposit Name	Major Commodity	Development Status
Alpine	Gypsum-Anhydrite	Producer
Alpine	Gypsum-Anhydrite	Past Producer
Antelope Valley Pit	Sand & Gravel	Past Producer
Antelope Valley Pit	Sand & Gravel	Past Producer
Arrow Rock Pit	Sand & Gravel	Past Producer
Black Cat	Gold	Producer
Black Cat	Gold	Past Producer
Boulder Claim	Limestone	Occurrence
Breslin Greenstone Quarry	Sand & Gravel	Past Producer
Breslin Greenstone Quarry	Stone	Past Producer
Crystalaire	Copper	Prospect
Evert Deposit	Chromium	Occurrence
Fire Pulp Plaster Co.	Gypsum-Anhydrite	Past Producer
Irwindale Plant	Sand & Gravel	Producer
Littlerock Pit	Sand & Gravel	Past Producer
Littlerock Pit	Sand & Gravel	Past Producer
Littlerock Pit	Sand & Gravel	Past Producer
Littlerock Wash Pit	Sand & Gravel	Past Producer
Littlerock Wash Pit	Sand & Gravel	Past Producer
Nickel Greenstone Quarry	Sand & Gravel	Prospect
Nickel Greenstone Quarry	Stone	Past Producer
Palm Development Co.	Copper, Gold, Silver	Occurrence
Palm Development Co.	Copper	Prospect
Palmdale Pit	Sand & Gravel	Past Producer
Palmdale Pit	Sand & Gravel	Producer
Sheba Fertilizer Deposit	Sand & Gravel	Prospect
Sheba Fertilizer Deposit	Calcium	Prospect
Stewart Jasper Deposit	Semiprecious Gemstone	Occurrence
Transit Mixed Concrete Co.	Sand & Gravel	Past Producer
Unnamed Gravel Pit	Sand & Gravel	Past Producer

Based on a review of California Division of Oil, Gas, and Geothermal Resources (DOGGR) oil and gas maps, there are no known oil or gas resources beneath the plant site or along the linear facility routes.

Recreational and scientific geologic resources typically include rock or mineral collecting areas, volcanoes, surface hydrothermal features, or surface expression of geologic features unique enough to generate recreational or scientific interest (natural bridges, caves, waterfalls, canyons, etc.). Based on a review of geologic literature, topographic maps, and the California State Parks and Recreation website, there are no known recreational or scientific geologic resources associated with the plant site or along the linear facility routes.

5.5.3 Environmental Impacts

Significance criteria were developed based on CEQA Guidelines and evaluated using professional judgment. The significance criteria used in evaluating potential geologic-related impacts are shown below. Impacts would be considered significant if:

- Surface rupture occurred as a result of faulting or due to mass movements or settlement from seismic shaking;
- Liquefaction occurred as a result of shallow groundwater and seismic shaking;
- Subsidence occurred as a result of existing soil conditions or seismic shaking;
- Mass wasting occurred as a result of landsliding and soil creep; and
- Construction of the Project interfered with access to mineral resources.

Water-related seismic hazards, such as a tsunami or seiche, are not discussed because the proposed Project site is not located near any large bodies of water.

5.5.3.1 Construction

Construction-related impacts to the geologic environment are primarily related to terrain modification (cuts, fills, or drainage diversion measures) and dust generation. No major unique geologic or physical features have been identified in the Project areas. Grading for the Project will not require import or export of earthen materials to/from the site. Thus, significant impacts are not expected on geologic hazards or resources during construction. Soils at the plant site have a moderate to high collapse potential; however, with implementation of planned mitigation measures for sub-grade improvements, described in Section 5.5.4, potential for damage due to collapsible soils is considered less than significant at the proposed plant site.

The Project site is in a seismically active area of southern California and the Project areas are subject to groundshaking from earthquakes along faults in the region. The potential for earthquake-related impacts would begin during Project construction. However, seismic impacts would be of greater concern during long-term Project operation than during the limited duration of the Project construction phase and these impacts are discussed below.

5.5.3.2 Operations

Regional and local geologic conditions will not be altered significantly by the long-term operation of the Project. No major unique geologic or physical features have been identified at the plant site or along the linear facility routes. The Project areas may be underlain by deposits of sand and gravel, as discussed in Section 5.5.2.5, and these resources could not be recovered and used during the active life of the Project. No other impacts to the geologic environment have been identified.

The Project area is subject to ground shaking from nearby and distant earthquakes. Ground accelerations of 0.58g may be anticipated at the plant site and may be as high as 0.80g along the portion of the transmission line route where it crosses the San Andreas Fault Zone. These levels of ground acceleration represent the potential for moderate to severe shaking. The site is located in Seismic Zone 4, the zone with the highest potential for seismic ground shaking. Project structures will be designed to meet the seismic design standards appropriate for Seismic Zone 4. No faults have been identified with a ground rupture potential at the plant site and thus, no impacts resulting from fault rupture at the plant site are anticipated there. Due to the anticipated depth to groundwater at the plant site and along most of the linear facility routes, with the exception of those areas discussed in Section 5.5.2.4, the risk of liquefaction is expected to be low.

No evidence of ground subsidence has been noted at the plant site or along linear facility routes. The potential for local settlement due to groundwater withdrawal may be present at the plant site if the regional groundwater table were to be lowered significantly. However, the Project will not utilize significant groundwater resources and the potential for settlement due to groundwater withdrawal at the Project locations is considered minimal. Soils at the plant site and along the linear routes show a moderate to high collapse potential. To ensure that collapse potential is minimized, all foundations for plant facilities will be designed in accordance with preliminary and subsequent geotechnical investigations, including over-excavation and re-compaction where necessary, as discussed in Section 5.5.4.

In summary, the only identified potential geologic hazards at the plant site are ground shaking from earthquakes and the potential for localized soil collapse or liquefaction. Construction of facilities in accordance with the mitigation measures identified below in Section 5.5.4 will ensure that earthquake-related impacts and impacts from potential soil collapse or liquefaction are minimized. The Project impacts are considered less than significant.

5.5.3.3 Cumulative Impacts

The Project will be designed and constructed to meet UBC/CBC requirements for industrial facilities located in Seismic Zone 4 and will adhere to sound professional practices and appropriate regulatory requirements related to geologic hazards. For these reasons, the Project is not expected to have significant cumulative impacts on geologic hazards or resources. Other projects in the same vicinity also would be expected to adhere to the appropriate professional building standards and regulatory requirements. As such, the Project would not be expected to contribute to significant cumulative effects on geologic resources and hazards during either construction or operation.

5.5.4 Mitigation Measures

Geologic impacts associated with the construction and operation of the Project are expected to be less than significant. Moreover, site-specific geotechnical and seismic conditions will be appropriately addressed in the detailed design and construction of Project facilities and equipment. The following mitigation measures are proposed to ensure that impacts are less than significant.

GEOL–1 Power plant structures and equipment as well as offsite linear facilities (natural gas, reclaimed water, and electrical transmission lines) will be designed in accordance with Seismic Zone 4 requirements.

GEOL-2 Project foundations will be designed in accordance with recommendations provided in the Project's preliminary geotechnical report (e.g., over-excavation and re-compaction beneath Project structures and paved areas where necessary) and as amended by future geotechnical investigations with respect to collapsible soil conditions and liquefaction hazards at the plant site and along linear facility routes.

5.5.5 References

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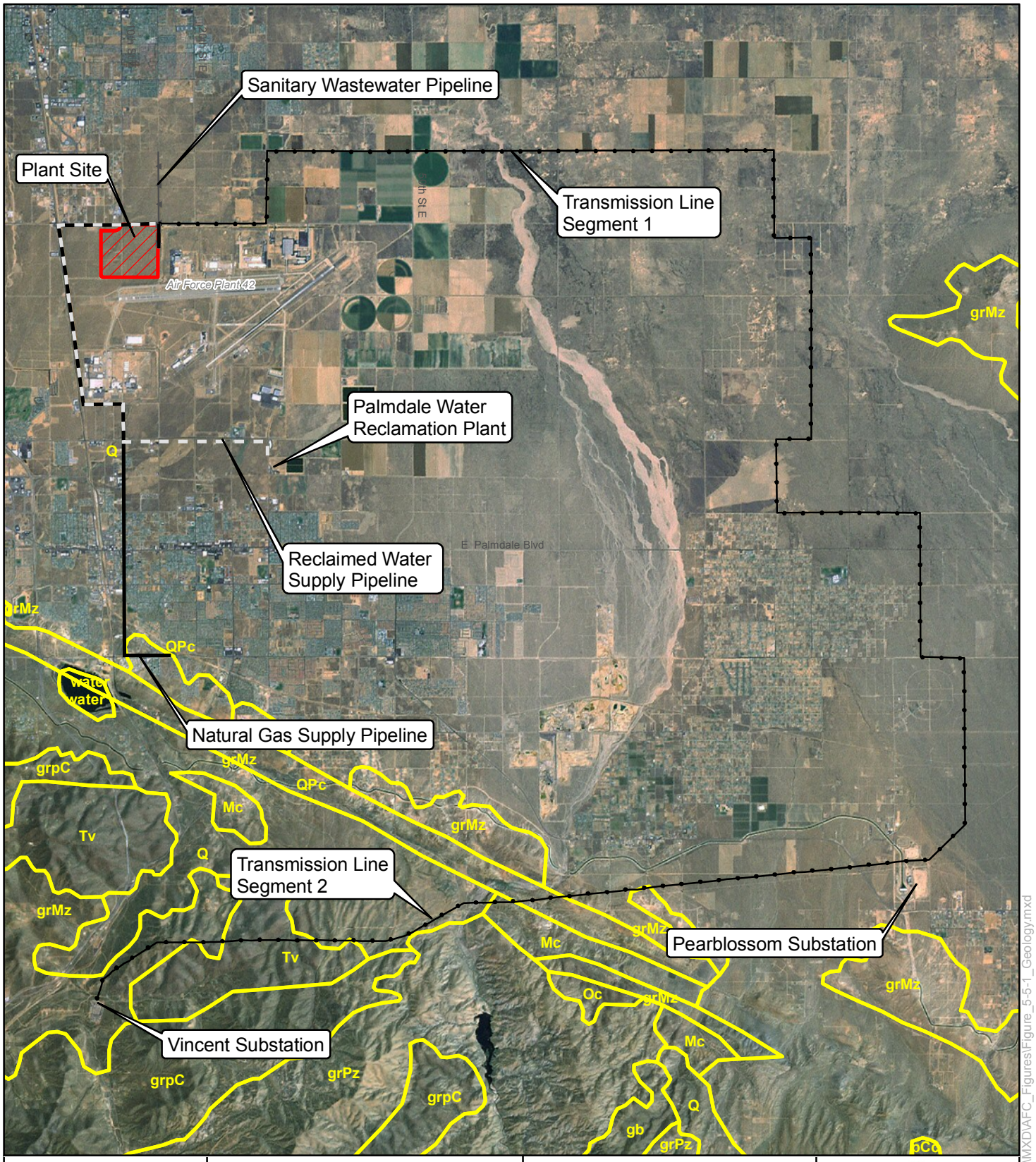

Map Location

Legend

- Plant Site
- Stratigraphic Unit Boundary
- Natural Gas Supply Pipeline
- Reclaimed Water Supply Pipeline
- Sanitary Wastewater Pipeline
- Transmission Line

N W E S

Palmdale Hybrid Power Project

Figure 5.5-1
Project Site Geology

1:120,000

0 1 2 Miles

PALMDALE
a place to call home

Inland Energy, Inc.

ENSR | AECOM

Project: 10855-002
Date: July 2008

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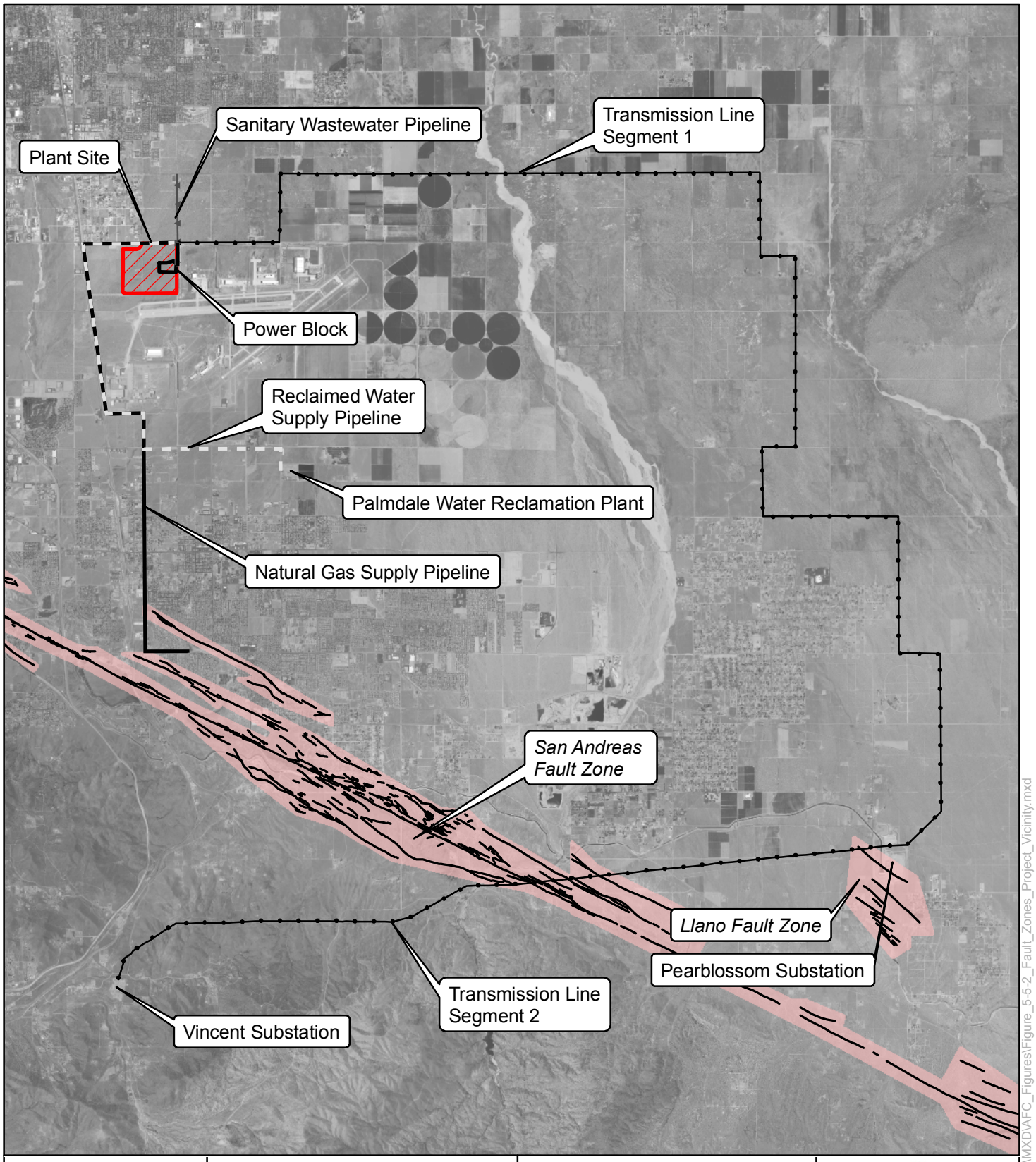
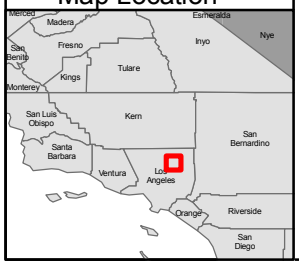
Project Site Geology Legend

MAP LABEL	UNIT AGE	ROCK TYPE 1	ROCK TYPE 2
Q	Pliocene to Holocene	alluvium	terrace
Q	Pliocene to Holocene	alluvium	terrace
grMz	Permian to Tertiary; most Mesozoic	granodiorite	quartz monzonite
QPc	Miocene to Pleistocene	sandstone	conglomerate
QPc	Miocene to Pleistocene	sandstone	conglomerate
grMz	Permian to Tertiary; most Mesozoic	granodiorite	quartz monzonite
grpC	Middle Proterozoic	anorthosite	gabbro
Tv	Tertiary (19-23 Ma)	basalt	andesite
Mc	Oligocene to Pleistocene	sandstone	conglomerate
grMz	Permian to Tertiary; most Mesozoic	granodiorite	quartz monzonite
grMz	Permian to Tertiary; most Mesozoic	granodiorite	quartz monzonite
Tv	Tertiary (19-23 Ma)	basalt	andesite
Mc	Oligocene to Pleistocene	sandstone	conglomerate
grPz	Late Triassic	quartz monzonite	quartz monzodiorite
grMz	Permian to Tertiary; most Mesozoic	granodiorite	quartz monzonite
grpC	Middle Proterozoic	anorthosite	gabbro
grMz	Permian to Tertiary; most Mesozoic	granodiorite	quartz monzonite
Oc	middle Eocene to early Miocene	sandstone	conglomerate
grMz	Permian to Tertiary; most Mesozoic	granodiorite	quartz monzonite
grpC	Middle Proterozoic	anorthosite	gabbro
Mc	Oligocene to Pleistocene	sandstone	conglomerate
Q	Pliocene to Holocene	alluvium	terrace
gb	Triassic to Cretaceous	gabbro	diorite
grPz	Late Triassic	quartz monzonite	quartz monzodiorite
pCc	Early Proterozoic to Miocene	gneiss	granitoid
water	Holocene	water	
water	Holocene	water	



Map Location



Legend

- Plant Site
- Power Block
- Natural Gas Supply Pipeline
- Reclaimed Water Supply Pipeline
- Sanitary Wastewater Pipeline
- Transmission Line
- AP Fault Zones
- AP Fault Lines

N W E S

Palmdale Hybrid Power Project

Figure 5.5-2

Alquist-Priolo Fault Zones in the Vicinity of the Project Site and Linears

1 inch equals 2 miles

0 1 2 3 Miles

PALMDALE a place to call home

Inland Energy, Inc.

ENSR | AECOM

Project: 10855-002
Date: July 2008

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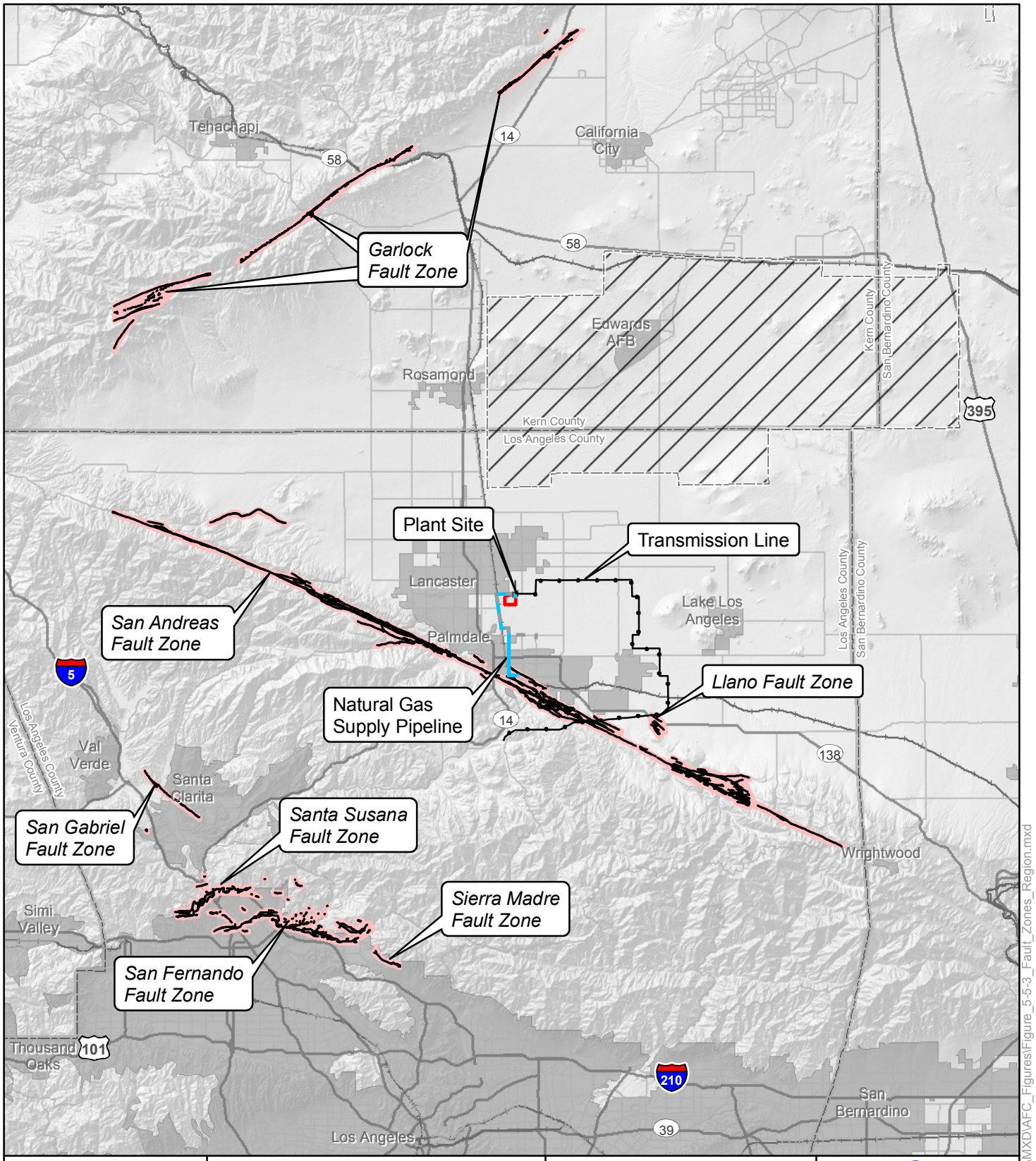

Map Location

Legend

- Natural Gas Supply Pipeline
- Reclaimed Water Supply Pipeline
- Sanitary Wastewater Pipeline
- Transmission Line
- Plant Site
- AP Fault Lines
- AP Fault Zones

1 inch equals 10 miles

0 10 20 Miles

Palmdale Hybrid Power Project

Figure 5.5-3

Alquist-Priolo Fault Zones in the Project Region

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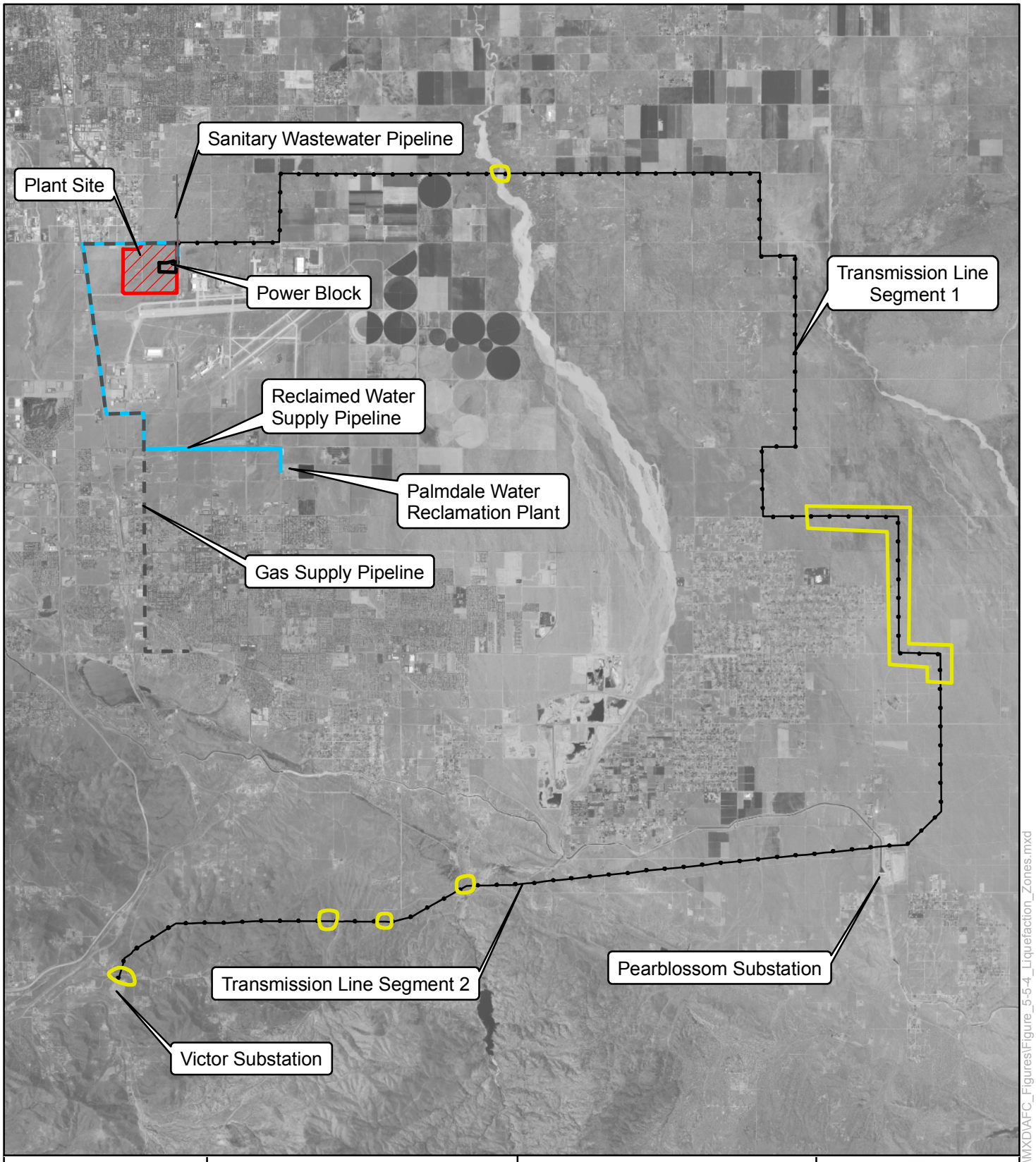
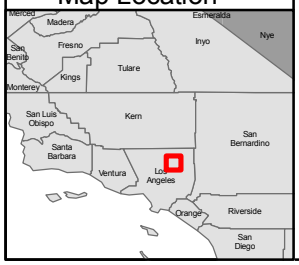


Map Location



Legend

- Plant Site
- Power Block
- Sanitary Wastewater Pipeline
- Transmission Line
- Natural Gas Supply Pipeline
- Reclaimed Water Supply Pipeline
- Liquefaction Zones (Area of Heightened Liquefaction Potential per USGS)

N W E S

Palmdale Hybrid Power Project

Figure 5.5-4

Areas of Heightened Liquefaction Potential

1 inch equals 2 miles

0 1 2 3 Miles

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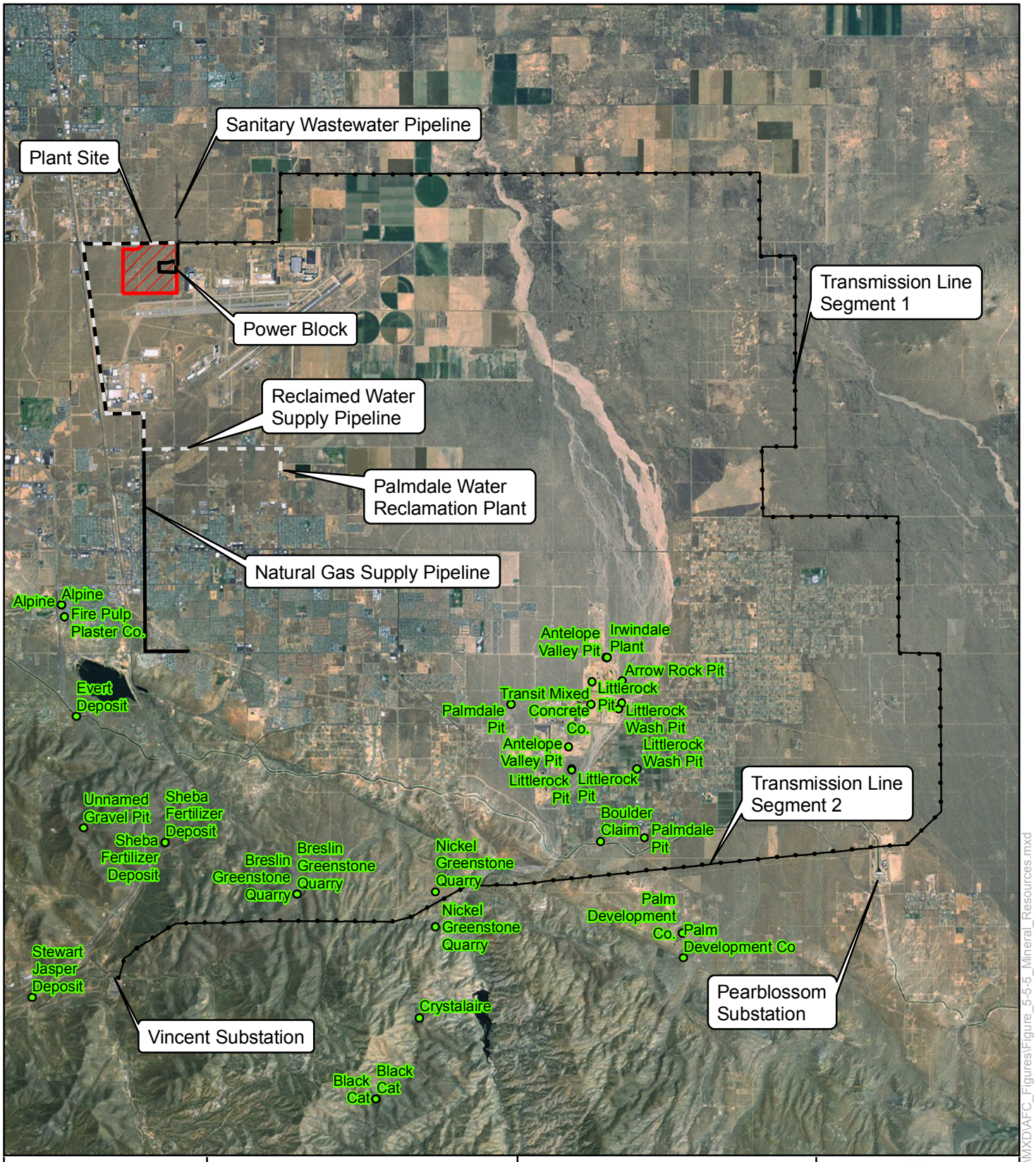
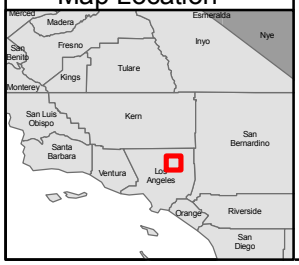


Map Location



Legend

- Plant Site
- Power Block
- Natural Gas Supply Pipeline
- Reclaimed Water Supply Pipeline
- Sanitary Wastewater Pipeline
- Transmission Line
- Mineral Resource

N W E S

Palmdale Hybrid Power Project

Figure 5.5-5

Mineral Resources in the Vicinity of the Project Site and Linears

1 inch equals 2 miles

0 1 2 3 Miles

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