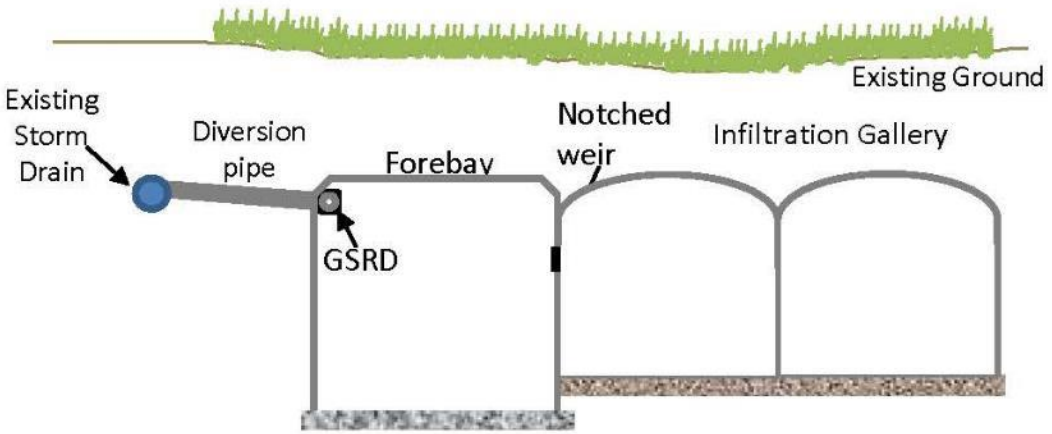
PROJECT DESIGN

Current Status

06

ORIGINAL EWMP CONCEPT

PLAN VIEW



PROFILE VIEW

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COMPLETED ITEMS TO DATE

- Geotechnical Investigation
- Preliminary Liquefaction Analysis
- Topographic Survey
- Utility Research
- Tree Survey and Tree Analysis
- Preliminary Water Quality Analysis
- Alternative Site Evaluation
- Alternative Layouts

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EXISTING SITE STUDIES | 07

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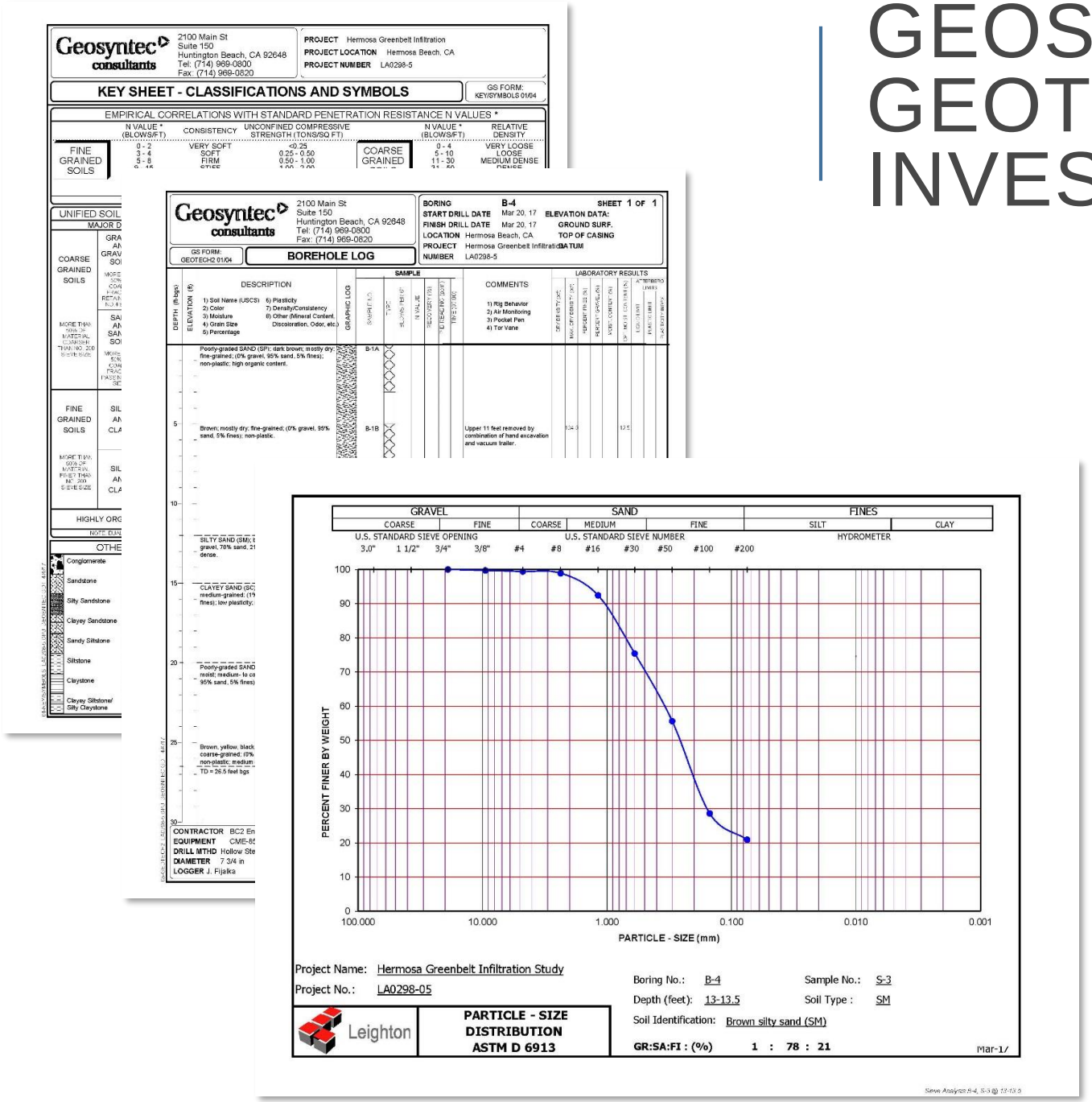
GEOSYNTEC GEOTECHNICAL INVESTIGATION



Existing Soil Conditions

- Layers of medium dense to dense poorly graded sands
- Intermittent layers of well-graded sand, clayey sands, and silty sand

Active Faults

- Compton Fault – 1.5 mi away
- Palos Verdes Fault – 2.5 mi away
- Low potential for fault ground rupture

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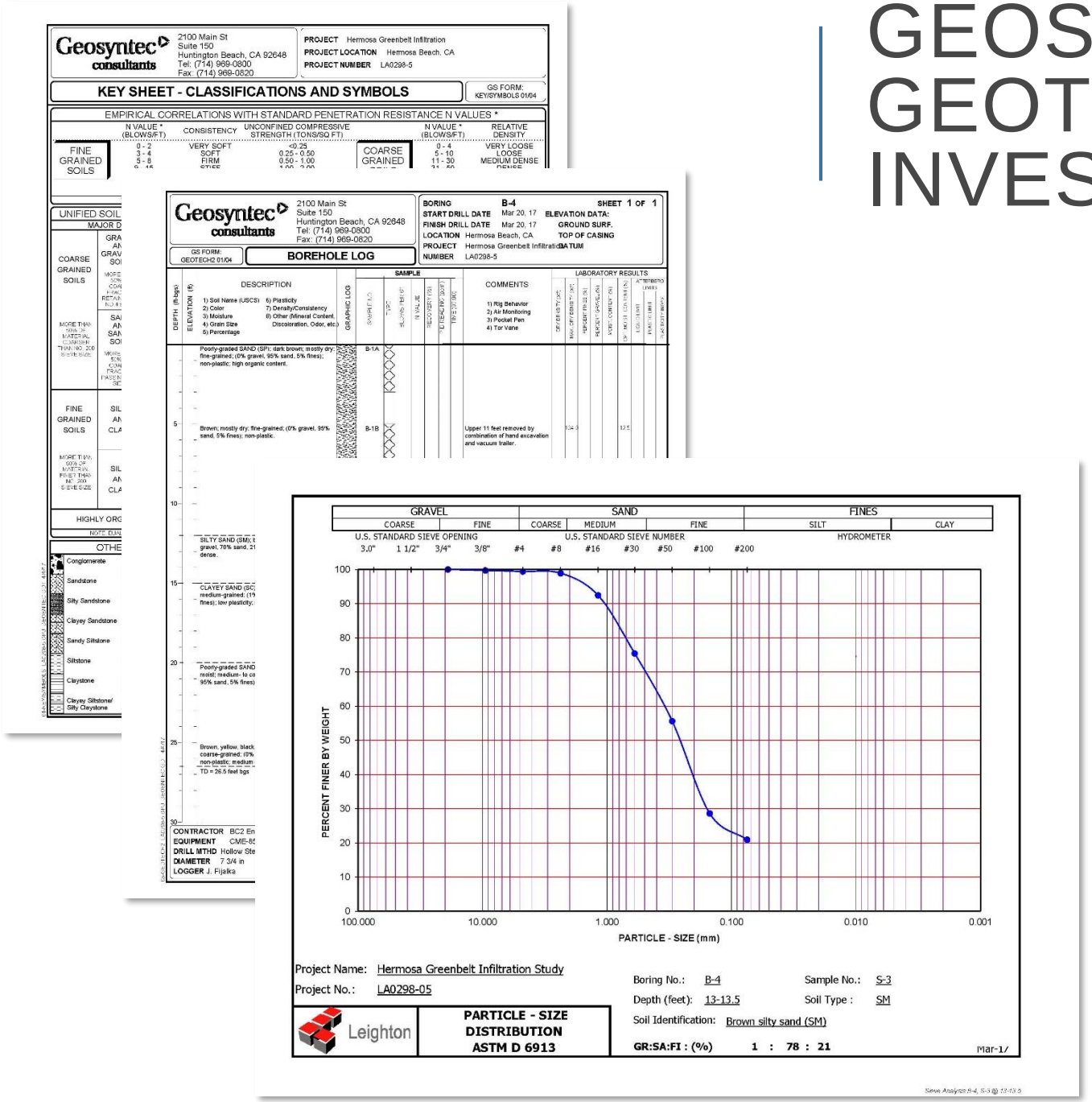
GEOSYNTEC GEOTECHNICAL INVESTIGATION



Groundwater Level

- Encountered at 24.5’ to 27’ bgs
- Historic high groundwater at 10’ bgs

Liquefaction

- Found to occur in 2 borings
- Large liquefaction zone is not expected but a further advanced liquefaction analysis is recommended during the design

Infiltration Rate

- 4.4 in/hr for design

bgs = below ground surface

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TETRA TECH REVIEW OF GEOSYNTEC GEOTECHNICAL INVESTIGATION

Infiltration

- Adjusted design infiltration rate – 0.5 in/hr
- Adjusted in accordance with the County of LA guidelines

Liquefaction

- Soils between 10’ and 51.5’ bgs are susceptible to liquefaction

Additional Testing Recommendations

- Large scale percolation testing
- Corrosion testing

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GROUNDWATER INVESTIGATION

- Tt encountered groundwater at 24’ to +31.5’ bgs during field exploration
- Geosyntec’s site-specific information indicates groundwater depth greater than 20’ bgs
- Several wells show groundwater depth at 21’ bgs
  - LACDPW Well 704E – 21.6’ bgs in April 1980 (shallowest depth)
- Groundwater elevation contours (Figure 2.1) of the Regional Groundwater Monitoring Reports by the Water Replenishment District (WRD) of Southern California
  - Meant for regional studies – not site-specific
  - All monitoring wells used to develop contours are east of the project site
    - Closest well is located approximately 1.5 miles northeast of the project site
  - **Conclusion – Contours are not necessarily accurate for this project site and must be used with caution**

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GEOSYNTEC PHASE 1 ENVIRONMENTAL SITE ASSESSMENT (ESA)

- No evidence of Recognized Environmental Conditions (RECs)
- Potential for environmental impacts and/or contaminated underlying soils with contaminants of concern (COCs) at the following locations:
  - Onsite due to past use as a rail corridor
  - West of site (across Valley Drive) due to historic presence of a gas generation and distribution facility
  - Within 500' of the site due to the presence of 2 oil and gas wells
    - Status of wells is listed as "plugged"
    - Violations and/or leaks were not documented
  - AES Redondo Beach – natural gas power plant
    - Listed on the Dept. of Toxic Substances Control (DTSC) database as an active cleanup site with potential COCs
    - Groundwater monitoring is required at facility

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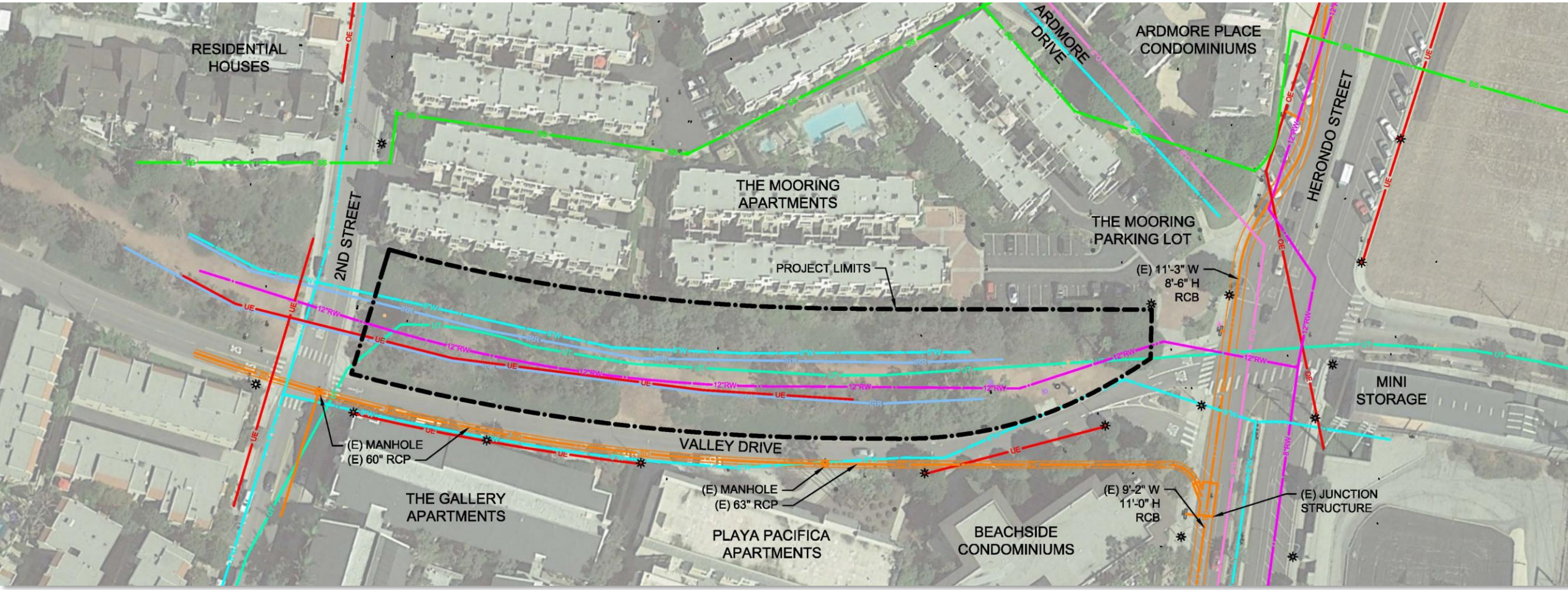
UTILITY ANALYSIS

LEGEND

- UE — (E) UNDERGROUND ELECTRICAL
- OE — (E) OVERHEAD ELECTRICAL
- G — (E) NATURAL GAS
- SS — (E) SANITARY SEWER
- SD — (E) STORM DRAIN
- IRR — (E) IRRIGATION
- W — (E) WATER
- RW — (E) RECLAIMED WATER
- UT — (E) UNDERGROUND TELECOMMUNICATIONS
- (E) LIGHT POLE



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UTILITY RELOCATION

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TREE SURVEY

LEGEND

(E) TREE IN GOOD HEALTH	(44)
(E) TREE SUITABLE TO BE RELOCATED	(14)
(E) TREE IN POOR HEALTH	(53)

Tree survey performed by American Arbor Care (report dated 2/5/2018)

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TORREY PINE


PORTUGAL LAURAL


CALIFORNIA FAN PALM


BRAZILIAN PEPPER

TREE SURVEY

Species

- 21 species found onsite
- Most (19) are not native to CA

Native Trees

- California Fan Palm
- Torrey Pine*

Invasive Trees

- Brazilian Pepper
- Portugal Laurel

* Planted outside of its natural habitat

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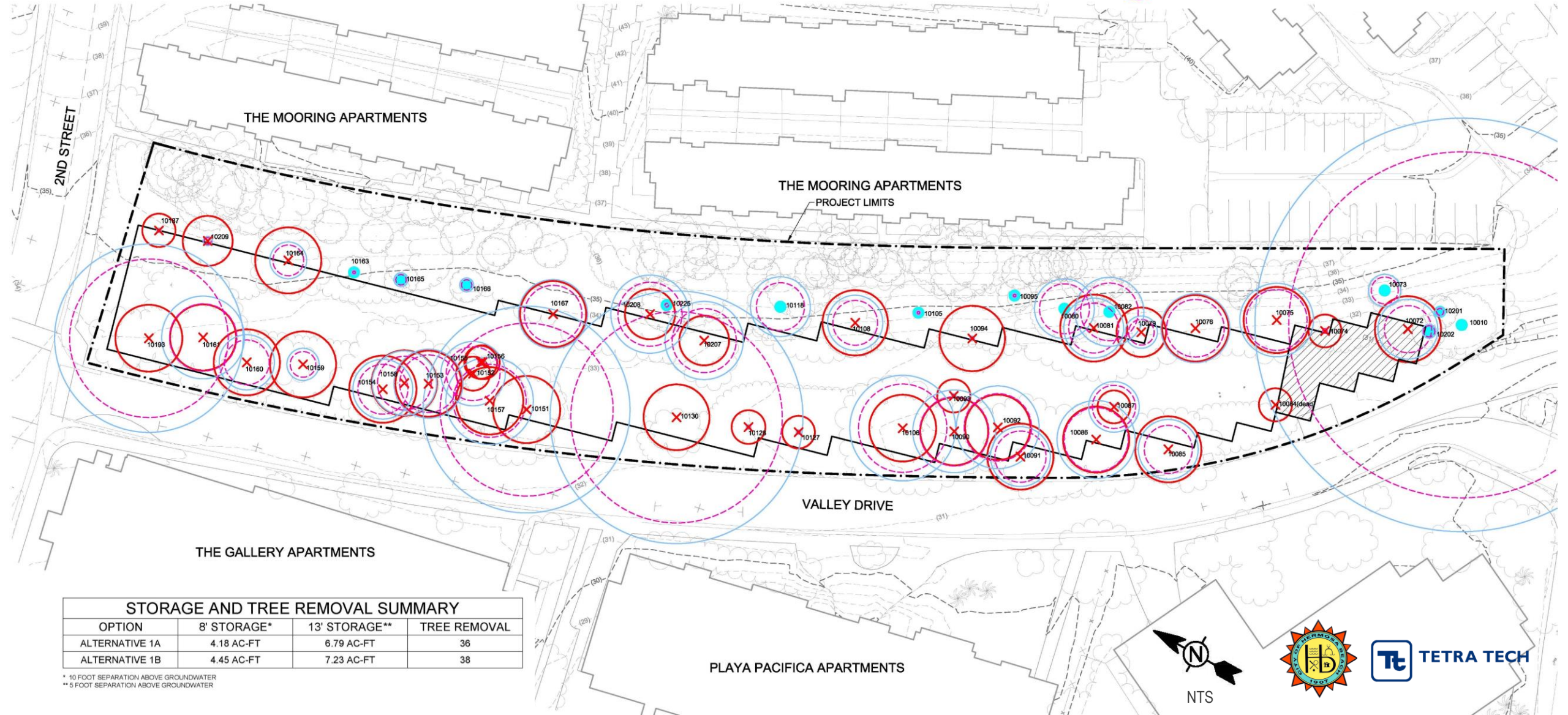
TREE PROTECTION ANALYSIS



STORAGE AND TREE REMOVAL SUMMARY			
OPTION	8' STORAGE*	13' STORAGE**	TREE REMOVAL
ALTERNATIVE 1A	4.18 AC-FT	6.79 AC-FT	36
ALTERNATIVE 1B	4.45 AC-FT	7.23 AC-FT	38

* 10 FOOT SEPARATION ABOVE GROUNDWATER
** 5 FOOT SEPARATION ABOVE GROUNDWATER

PRELIMINARY WATER QUALITY ANALYSIS

Parameter	EWMP	Tetra Tech
Watershed	1,800 acres	1,980 acres
Annual Runoff Volume Generated by Watershed	2,118 ac-ft	3,622 ac-ft
Optimum Forebay Size	-	2.0 ac-ft
Volume Captured and Infiltrated by Project	25.5%[1]	5.1%[2]
Target Pollutant	Bacteria – Fecal Coliform	
Load Reduced	15.1%[1]	5.0%[2]

[1]Infiltration rate: 12 in/hr
[2]Infiltration rate: 0.5 in/hr – adjusted to County guidelines

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ALTERNATIVE SITE STUDIES and Site Constraints

08

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ALTERNATIVE SITE STUDIES

Current Design Alternative

- Pump station (size TBD)
- 6.8 ac-ft storage and infiltration volume

Option 1A – Force Main to South Park

- 48 cfs pump station
- 7.9 ac-ft storage and infiltration volume

Option 1B – Gravity Diversion to South Park

- 10 cfs pump station at South Park
- 2.0 ac-ft storage and 5.9 ac-ft infiltration

Option 2 – Force Main to North of 2nd Street

- 10 cfs pump station
- 2.0 ac-ft storage and 5.0 ac-ft infiltration

Option 3 – Herondo Street

- 10 cfs pump station
- 2.0 ac-ft storage and 5.0 infiltration
- Deep excavation (±14’ to 51’ bgs)

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CURRENT DESIGN ALTERNATIVE

STORAGE SUMMARY		
OPTION	8' STORAGE*	13' STORAGE**
ALTERNATIVE 1A	4.18 AC-FT	6.79 AC-FT

* 10 FOOT SEPARATION ABOVE GROUNDWATER
** 5 FOOT SEPARATION ABOVE GROUNDWATER

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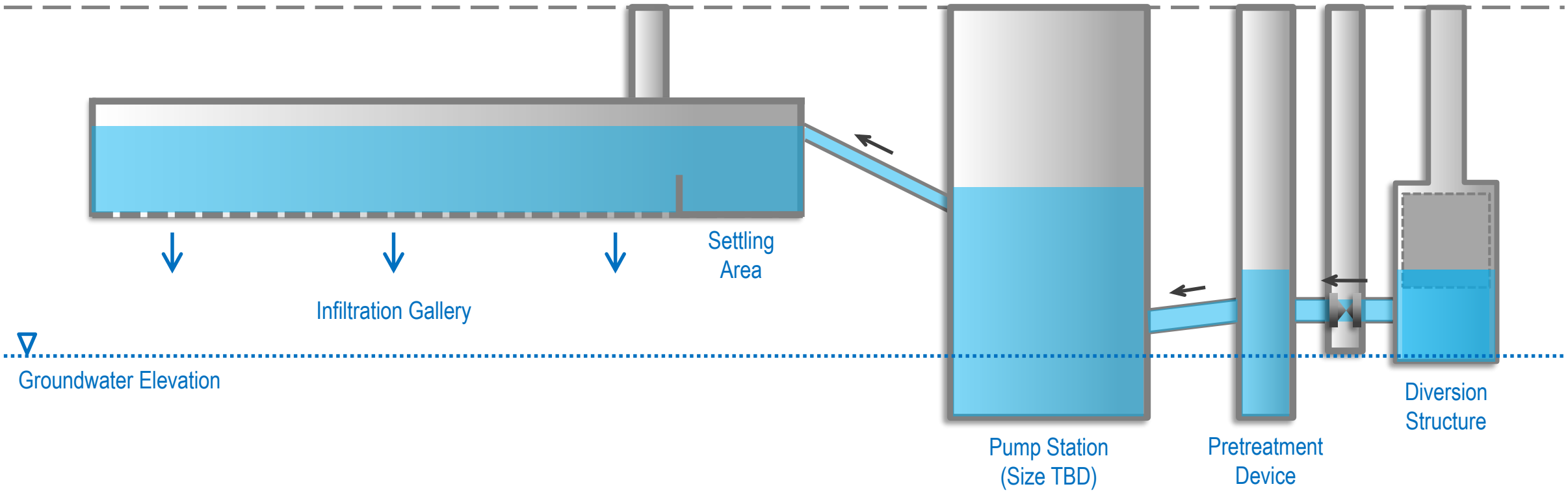
CURRENT DESIGN ALTERNATIVE



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CURRENT DESIGN ALTERNATIVE

Legend

New Tree Plantings - 52 Total

- Callistemon citrinus - Lemon Bottlebrush
- Eucalyptus ficafolia - Red Flowering Gum
- Eucalyptus sideroxylon - Red Ironbark
- Melaleuca nesophila - Pink melaleuca
- Melaleuca leucadendra - Cajeput Tree
- Metrosideros excelsa - New Zealand Chistmas Tree
- Prunus cerasifera - Purple Plum
- Pyrus kawakamii - Evergreen Pear

New Shrub Plant Massings

Agave
Echium candicans-Pride of Madera
Hemerocalis-Daylilly
Pennisetum-Fountain Grass
Kalanchoe fedtschenkoi-Paddle Plant
Lobelia laxiflora-Lobelia
Penstemon hybrid-Beard Tongue
Polystichum munitum-Western Sword Fern

New Groundcovers

- Ceanothus - California Wild Lilac
- Mahonia repens - Creeping Mahonia

Existing Trees

- Existing trees to be removed (39 Total)
- Existng trees to protect in place

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TRAILHEAD – BEFORE

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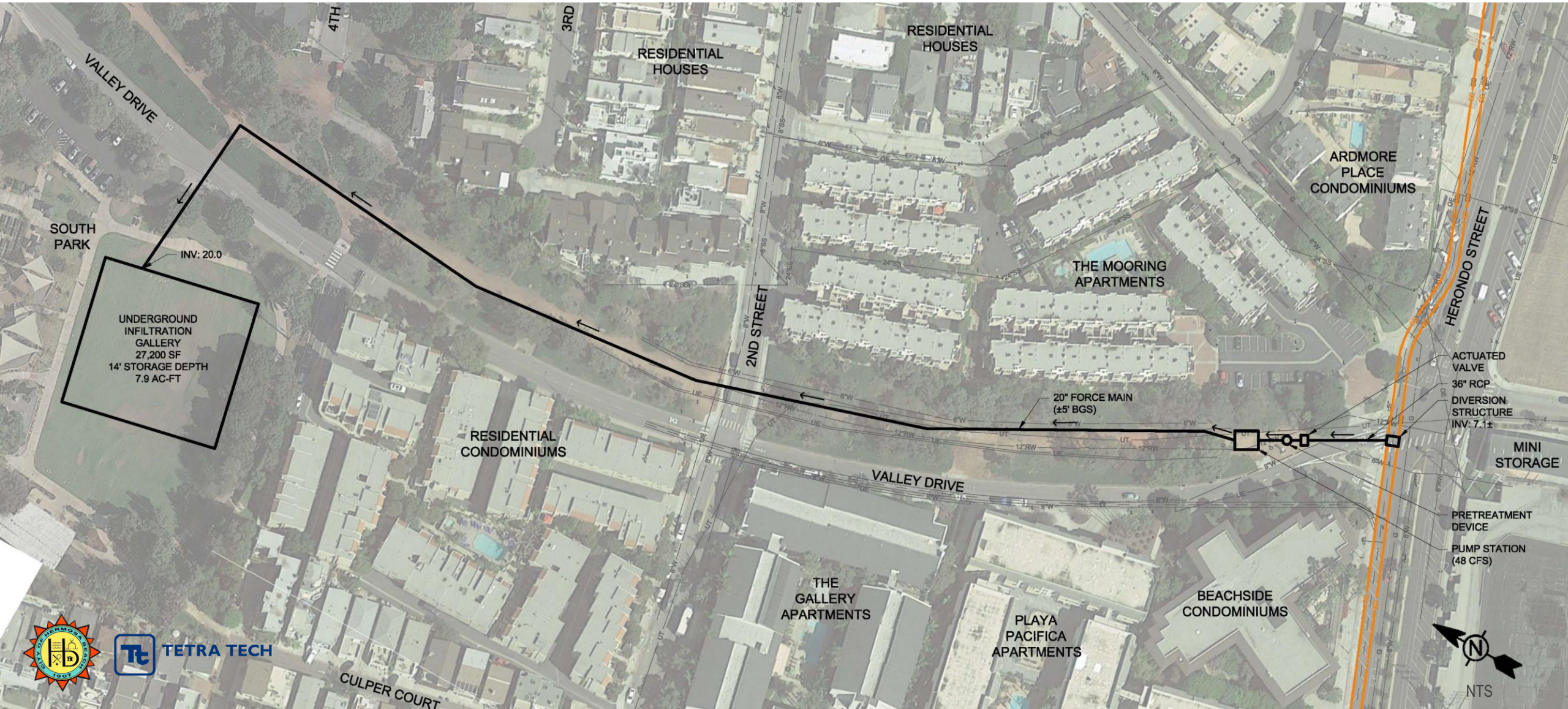
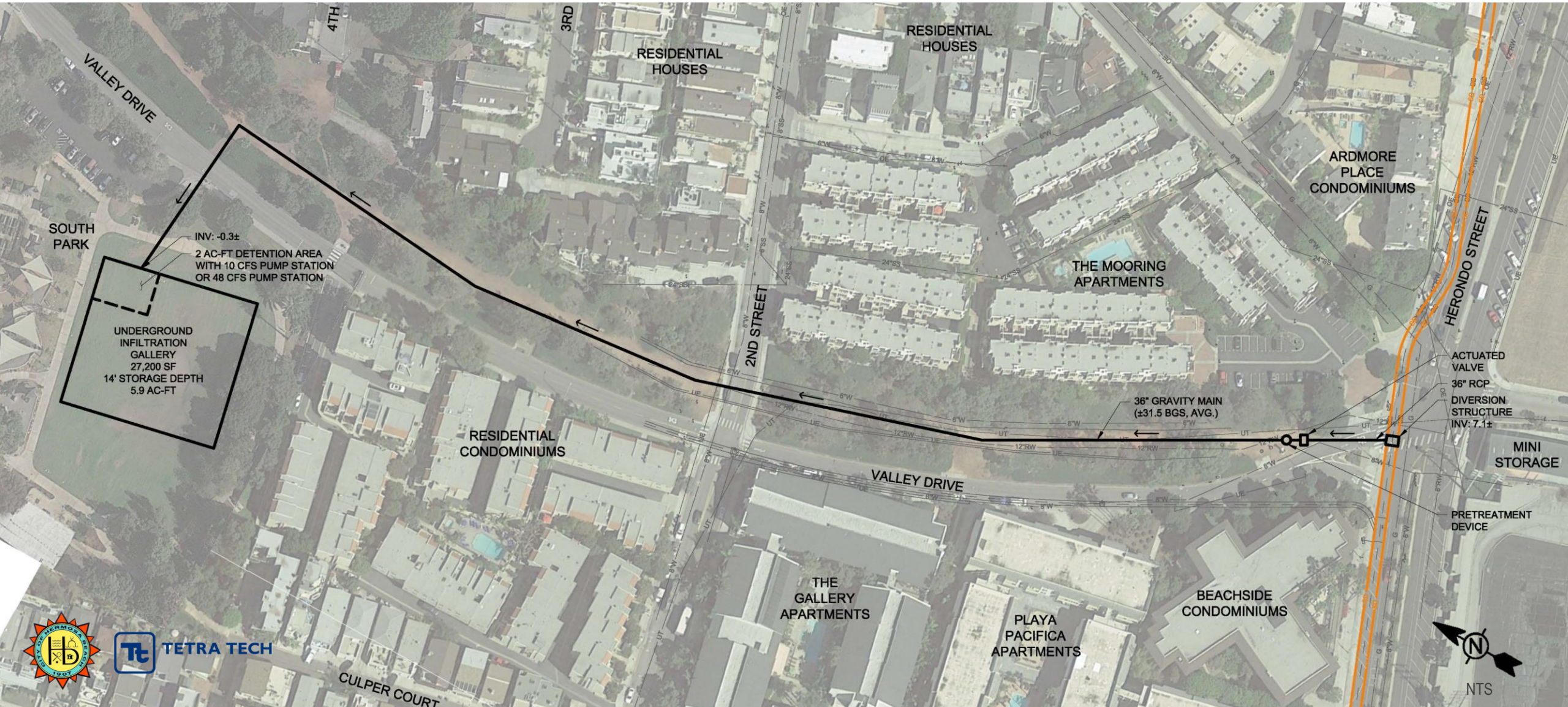
TRAILHEAD – AFTER

OPTION 1A – FORCE MAIN TO SOUTH PARK



OPTION 1B –GRAVITY DIVERSION TO SOUTH PARK



OPTION 2 – FORCE MAIN TO NORTH OF 2ND STREET

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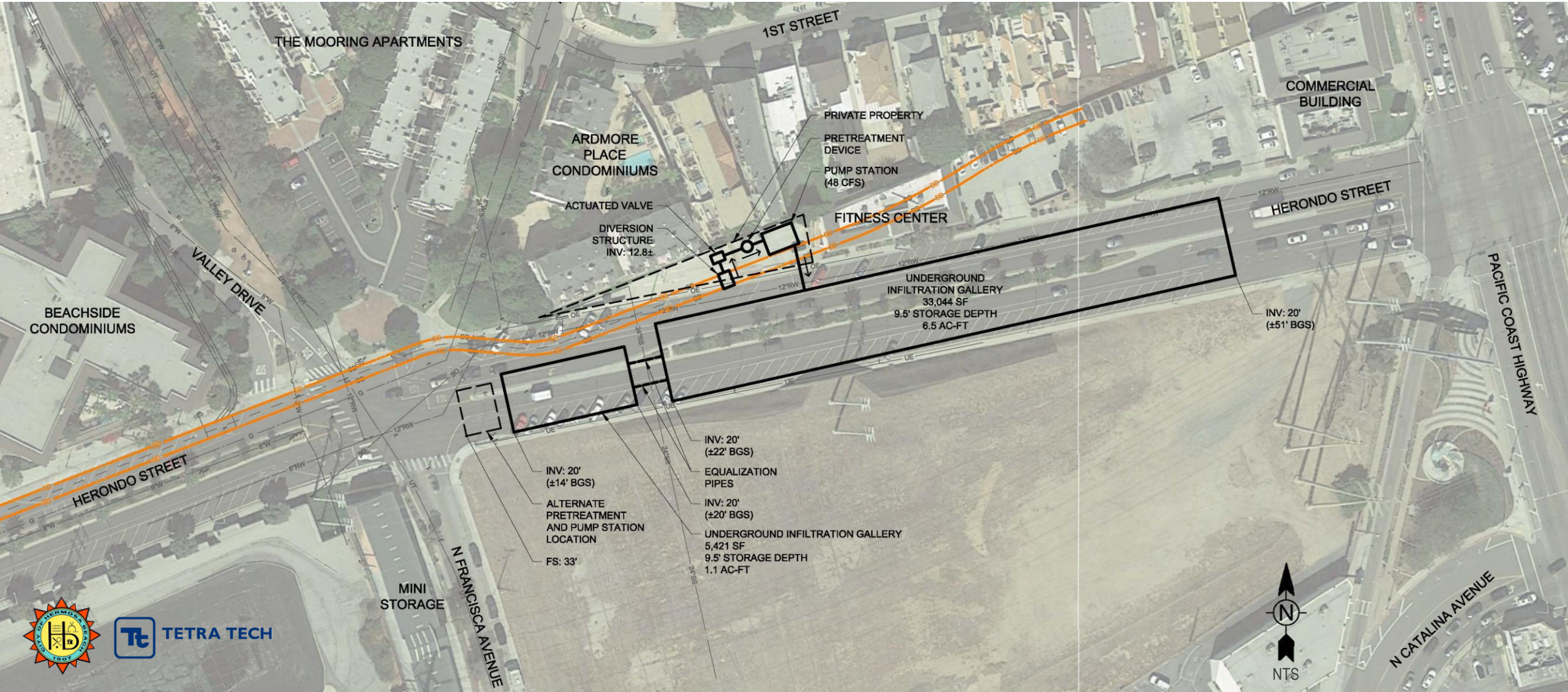
OPTION 3 – HERONDO STREET



INITIAL ASSESSMENT
of Liquefaction Impacts

09

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SEISMIC HAZARD ZONES MAP

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

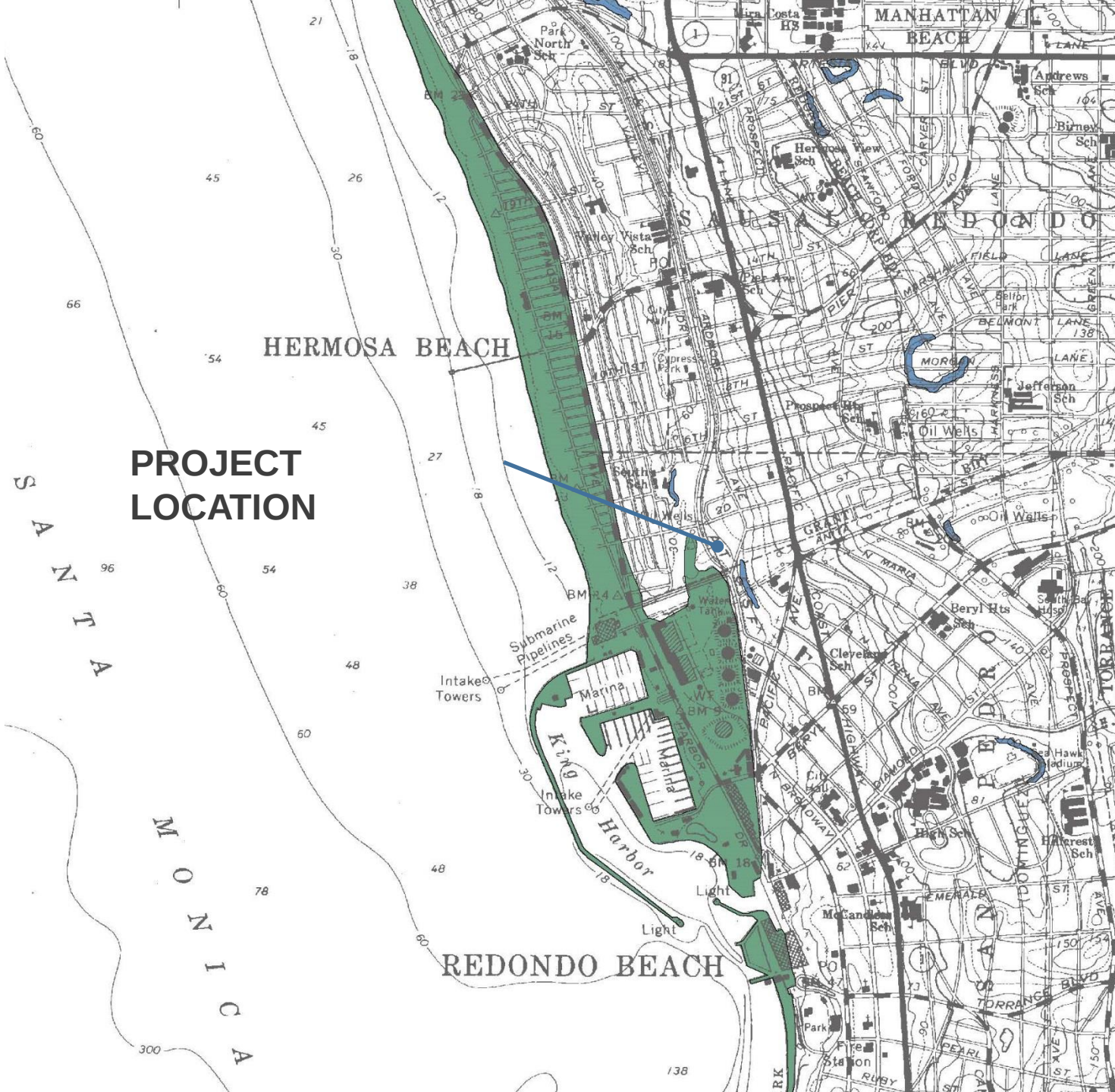
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Note:

Seismic demand per 2016 CBC has increased since this map was produced. Therefore, the areas that are likely to be susceptible to liquefaction may be larger than those indicated on the map.



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LIQUEFACTION ANALYSIS

Findings

- Onsite soils found 10’ - 51.5’ bgs are susceptible to liquefaction
- Materials above the groundwater table are not considered susceptible to liquefaction

Combined Dynamic Settlement

- Ranges from 6.9” to 9.6”
- Combination of liquefaction settlement and settlement of dry sands

Differential Settlement

- About 1.6” anticipated over a span of 10’ following a design seismic event – without liquefaction mitigation

Recommendation

- A geogrid-reinforced gravel raft placed below the infiltration units

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LIQUEFACTION ANALYSIS

Additional Notes to Keep in Mind

- Proposed project does not alter the existing liquefaction hazard at the site
- Effects of groundwater mounding below nearby existing structures at a horizontal distance of about 30’ from the perimeter of the BMP is minimal – less than 0.5’
  - Based on preliminary calculations
  - Infiltration does not change the existing groundwater conditions and liquefaction hazard below those properties
- High degree of conservatism embedded in the estimation of liquefaction triggering and associated deformations
  - Groundwater at the site has been deeper than 21’ in the last 50 years (per local well information from LACDPW and the Geosyntec field exploration)
  - Most of the seismically-induced settlement (about 60%) takes place within this 21’ zone, which is in fact not likely to experience liquefaction and the associated settlement

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NEXT DESIGN STEPS

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NEXT DESIGN STEPS

- Additional liquefaction analysis
- Pump station design
- Water quality analysis
- Aboveground equipment layout
- Plant palette
- Monitoring plan
- Predesign report

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