From: noreply@granicusideas.com <noreply@granicusideas.com>
Sent: Monday, October 8, 2018 4:07 PM
To: Ann Yang <anny@hermosabch.org>
Subject: New eComment for City Council Meeting (Closed Session - 6:00 P.M. and Regular Meeting - 7:00 P.M.)

New eComment for City Council Meeting (Closed Session - 6:00 P.M. and Regular Meeting - 7:00 P.M.)

Alex Reizman submitted a new eComment.

Meeting: City Council Meeting (Closed Session - 6:00 P.M. and Regular Meeting - 7:00 P.M.)

Item: 6a) REPORT 18-0616 CONSIDERATION OF ALTERNATIVE LOCATIONS FOR THE GREENBELT INFILTRATION PROJECT (Environmental Analyst Kristy Morris)

eComment: Please see the attached two letters which discuss liquefaction and groundwater level concerns pertaining to the Greenbelt Infiltration Project.

View and Analyze eComments

Alex Reizman, PE
501 Herondo Street
Hermosa Beach, CA 90254

October 8, 2018

Hermosa Beach City Council Members
City of Hermosa Beach
1315 Valley Drive
Hermosa Beach, California 90254

Subject: Concern Regarding Liquefaction

References:

1) Geosyntec Letter, Subject: Infiltration Testing and Preliminary Geotechnical Investigation Hermosa Greenbelt Project, Hermosa Beach California, April 7, 2017
2) US Geological Survey, Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins, Scientific Investigations Report 2010–5102,

Dear City Council Members:

The Tetra Tech presentation given to the City Council on June 19th has created a lack of clarity and confusion regarding liquefaction potential at the Greenbelt. The liquefaction potential is mapped on following website:

https://maps.conservation.ca.gov/cgs/EQZApp/app/.

One should take note of the following statement on that website:

> "6. Information on this map is not sufficient to serve as a substitute for the geologic and geotechnical site investigations required under Chapters 7.5 and 7.8 of Division 2 of the California Public Resources Code."

The maps are meant to be used as a guide and tool by municipalities and individuals to assess seismic risks. The maps are not intended to replace geotechnical investigations that are required by Building Codes.

What do we know from geotechnical site investigations? Geosyntec report sent to Kristy Morris on April 7, 2017 (Ref. 1), discusses and documents that soil boring taken from the Greenbelt are susceptible to liquefaction. We know that Tetra Tech pointed out that Geosyntec considered an outdated (smaller Design Earthquake) earthquake for their liquefaction evaluation. We know that Tetra Tech did their own liquefaction study (considering the larger Maximum Considered Earthquake). A couple of slides from the June 19 Tetra Tech presentation are included as Figures 1 and 2. Please review the disclaimer Note on the bottom left corner of the first slide. Seismic hazards have increased significantly over the past years, as is reflected in the newer Building Codes. This is in part due to discoveries of new faults and additional learned knowledge that has been acquired. Most importantly it

is due to the fact that older Building Codes required a seismic evaluation based on 475-year return period (10% probability of non-exceedance over 50 years). The newer Building Codes require a seismic evaluation based on 2,500-year return period (2% probability of non-exceedance over 50 years). The 2,500-year earthquake is much bigger and therefore more likely to cause liquefaction.

For the issue of an infiltration project impact on adjacent properties, please see the Reference 2 USGS study. The study evaluates the mounding size under the infiltration project. The mounding represents an estimate of the shape of the groundwater underneath an infiltration site. This report very technical but the main takeaways are as follows:

- A height increase of 0.25' is assigned as "significant". From page 16, "Groundwater mounding of at least 0.25 ft was chosen as the lower limit of mounding considered to be significant. A 0.05 ft difference between pre- and post-development water levels caused by stormwater infiltration is not detectable under field conditions when recharge from precipitation outside of an infiltration structure is increasing water levels by tenths of a foot or more. The value of 0.25 ft was chosen as the amount of significant groundwater level change based on the NJDEP stormwater regulation that sets 0.1 ft as the maximum acceptable change for surface water."
- The 10 acre results are more applicable to the Greenbelt scenario because of the modeled infiltration gallery size
- There is significant range in results based on the various assumptions that are made.
- Figure 5 summarizes the horizontal spread of the mound. A maximum spread of 200 to 300 feet is computed for 0.25' water height increase. Meaning the infiltration will cause a 0.25 foot rise in groundwater at 200 to 300 feet away from the edge of the gallery.
- Lots of variation and uncertainty, therefore maximum rather than average values should be considered.

As a reminder the LA County Infiltration Regulation state:

> Stormwater infiltration shall not increase the potential for static settlement of structures on or adjacent to the site. Laboratory testing should be performed to evaluate the anticipated settlement and hydrocollapse potential of soils 10 feet below the proposed invert of infiltration.
>
> Stormwater infiltration shall not increase the potential for seismic settlement of structures on or adjacent to the site. Liquefaction potential shall be evaluated considering the design volume of stormwater infiltration.

The regulations are not specific in terms of what is a significant increase to risk. The 0.25' values gives us a target for what is "significant" for adjacent structures. The Tetra Tech presentation slide reproduced as Figure 3, shows a value of 0.5 feet. Keep in mind the Tetra Tech reported a preliminary number based on assumptions which have not been shared with us. As outlined above, the assumptions are critical because of the non-exact nature of this type of analysis. Additionally, the rise in the groundwater level due to the infiltration will increase the likelihood of adjacent property subsidence, even excluding an earthquake event.

Incidentally, referring back to Figure 3, Tetra Tech mentions “conservatism” in one of the bullet points and the arguments in support of their observation that there is “conservatism”. Let me be clear about this, the Building Codes do not allow this type of “hand waving” to rationalize design deficiencies because there are “conservatisms”. Yes, the Code based the major design earthquake is intended to be a once in 2,500 year event. So the chances are remote that it will strike in our life time. However, we must design for earthquakes, with understood “conservatisms”, because the consequences of not doing so are catastrophic. The regulations are specific, and must be met.

Geosyntec, Tetra Tech and I agree that there is liquefaction risk at the Greenbelt. To my knowledge, no soil borings were taken at the Moorings property. It is prudent to assume that they will show the same results.

Respectfully,

A. Reizman

Alex Reizman, PE

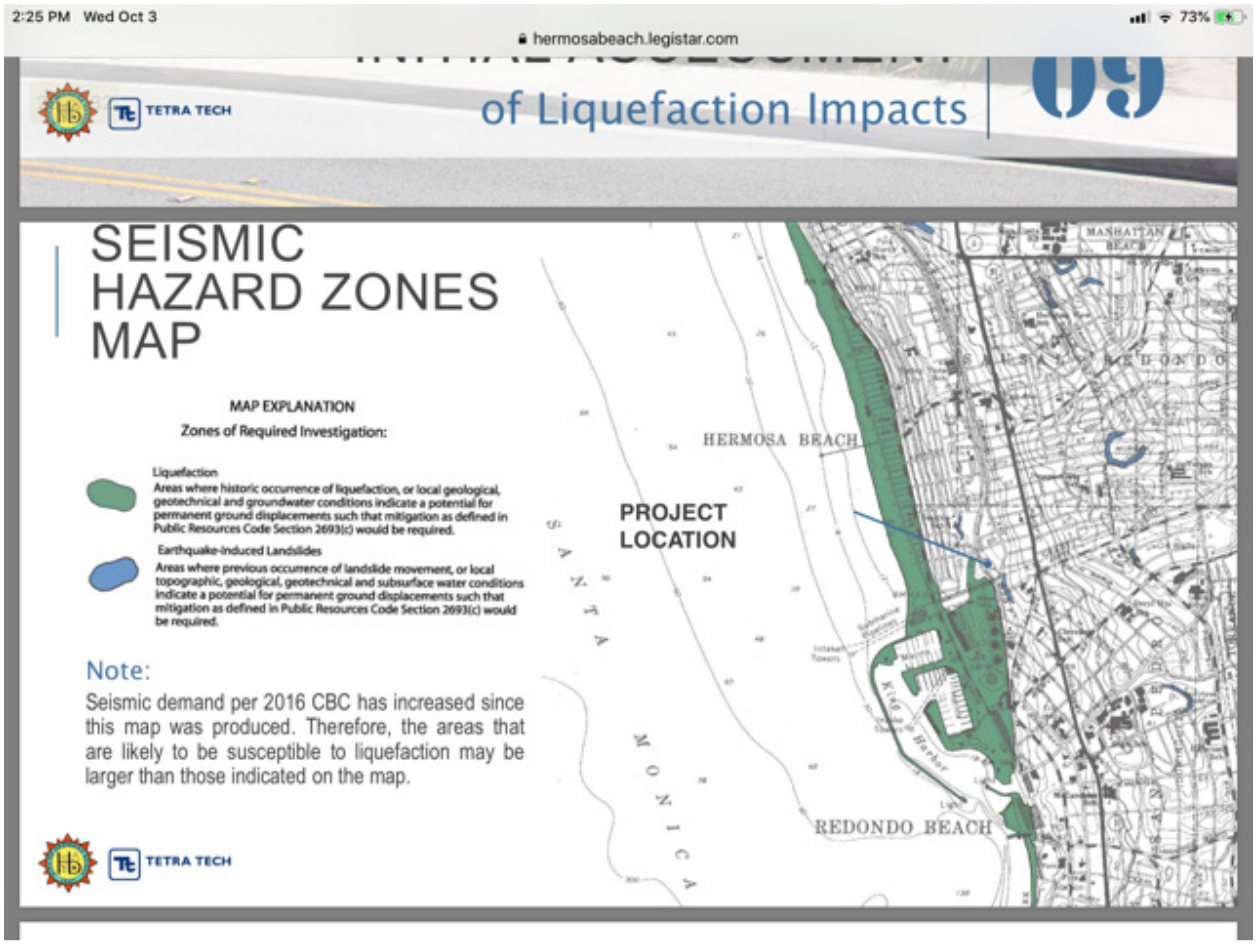

Figure 1 – Slide from Tetra Tech, June 19th Presentation

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

TETRA TECH

Figure 2 – Slide from Tetra Tech, June 19th Presentation

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

TETRA TECH

Figure 3 – Slide from Tetra Tech, June 19th Presentation

Alex Reizman, PE
501 Herondo Street
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October 5, 2018

City Council Members
City of Hermosa Beach
1315 Valley Drive
Hermosa Beach, California 90254

Subject: Greenbelt Infiltration Project between Herondo and 2nd Street – Groundwater Issue, **Updated Letter**

References:

1) Geosyntec Letter, Subject: Infiltration Testing and Preliminary Geotechnical Investigation Hermosa Greenbelt Project, Hermosa Beach California, April 7, 2017

2) County of Los Angeles Department of Public Works Low Impact Development Standards Manual, February 2014.

3) County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration, Document GS200.2, 6/30/2017.

4) DEPARTMENT OF CONSERVATION Division of Mines and Geology, SEISMIC HAZARD ZONE REPORT FOR THE REDONDO BEACH 7.5-MINUTE QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA, 1998.

5) Water Replenishment District of Southern California (WRD), http://www.wrd.org/content/regional-groundwater-monitoring-reports

6) Los Angeles Department of Public Works http://dpw.lacounty.gov/general/wells/#

7) Los Angeles County Flood Control District, EWMP, Draft EIR, page 2-4

8) Tetra Tech Presentation to Hermosa Beach on June 19, 2018.

Dear City Council Members:

This letter is written as an update to the previous letter submitted to the City of Hermosa Beach on June 14, 2018. All changes are bolded for tracking ease.

The Tetra Tech presentation given to the City of Hermosa Beach (Ref. 8), and included in the staff report to the City Council as Attachment 1, contains errors in the determination of the historic high groundwater. These errors significantly impact the viability of the Greenbelt as a proper location for a large infiltration gallery, as well as cause concern for the proposed design of the project itself. Specifically, the presentation states, "LACDPW Well 704E – 21.6' bgs in April 1980 (shallowest depth)" (8th Slide) and "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)" (30th Slide). <u>These statements are false</u>. Since 1982, the groundwater shallowest depth has been 14' bgs (below ground surface, not 21.6' bgs, as stated in the presentation. When accounting for actual groundwater levels, there is no room to infiltrate. Below, I provide a detailed analysis for both the nature of the error and its impacts on proposing the Greenbelt for this project.

Well 704E is located East of PCH, between 1st Street and 2nd Street (Ref. 6). Figure 2 of this letter shows the location of well 704E. The last measurement date for this well is 10/30/2008. The reason this well is important is because it is the closest well with detailed information regarding historic groundwater elevations pertinent to the Greenbelt Infiltration Project. Simply put, the error occurred because Tetra Tech did not realize or account for the fact that Well 704E is NOT located at the same elevation as the Greenbelt.

As any Hermosa resident knows, you have to climb a hill to get from Valley, where the Greenbelt is located, to PCH, where Well 704E is located. The proposed project site is approximately 40 feet lower in elevation than the well site. A screenshot of the data used by Tetra Tech is shown in Figure 4. The "Low Measure: 21.6 ON 04/03/1980" is highlighted. An illustrative guide to reading the well data is provided in Figure 5. The value used would have been correct if the Well 704E reference point elevation and the Greenbelt elevation were the same. But they are not. Figure 4 clearly shows that the Reference Point (RP) Elevation is 71.30'. The Greenbelt ground elevation is approximately 30'.

A much simpler, and correct measure is to extrapolate historic groundwater levels for the Greenbelt site based on the well data further up the hill is to look at the right column of Figure 4, titled "Water Surface Elevation". The values in this column are simply the difference between Reference Point Elevation (71.3') and the middle column values (subtract middle column numbers from 71.3, to match the right column values). Figure 3 of this letter shows the historic Water Surface Elevation at Well 704E.

The Greenbelt's shallowest depth (ie highest Water Surface elevation) in Figure 3 is shown to be 16 feet above Mean Sea Level (MSL). This depth has occurred on multiple occasions since 1982. With the Greenbelt ground surface elevation being at approximately 30 feet (above MSL), the historic shallowest groundwater elevation is: 30 -16 = 14 feet below ground surface (bgs). To restate, interpretation of the Well 704E data shows that the Greenbelt's historic high groundwater elevation is 14' bgs, not 21.6' bgs reported by Tetra Tech.

This 7.6-foot discrepancy will significantly impact the viability of the infiltration project design. Specifically, and as I have previously detailed in my correspondence to the City below, to maintain the 10-foot clearance required by Code between the groundwater and the invert of the infiltration unit would require that the bottom of the infiltration be located no more than 4 feet below the ground (or 14 feet groundwater elevation minus 10-foot clearance). There is no feasible way to develop an infiltration gallery that purports to infiltrate the amount of water proposed to be infiltrated by this project with only 4 feet of clearance. Tetra Tech's only solution, mentioned in passing during its oral presentation to the Council during the June 19th Study Session, would be to seek a "waiver" of the 10 foot clearance requirements – a position that poses obvious complications, as the required clearances exist to ensure that pollutants and bacteria are adequately infiltrated with proper soil levels. To do otherwise risks jeopardizing the quality of our groundwater as well as other possible impacts (for example risks of pooling).

After carefully reviewing publicly available groundwater data for the Greenbelt area and applying controlling standards and law, the planned infiltration project does not appear to be legally or physically viable. Simply put, the water table is too high to build the proposed infiltration treatment plant.

Low Impact Development projects, such as the Greenbelt Infiltration Project, are governed by LA County Department of Public Works Low Impact Development Standards Manual (LID Standards Manual) (Reference 2). The County of Los Angeles has prepared the 2014 LID Standards Manual to comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit for stormwater and non-stormwater discharges from the MS4 within the coastal watersheds of Los Angeles County (CAS004001, Order No. R4-2012-0175). According to the LID Manual (see Section 4.1), the depth to groundwater must be determined according to the most recent Geotechnical and Materials Engineering Division (GMED) Policy. The most recent policy is documented in Reference 3. For groundwater investigations, the following specific guidelines are stated (underlines are mine):

> *The invert of stormwater infiltration shall be at least 10 feet above the groundwater elevation. Procedures for determining the groundwater elevation are described later in these guidelines.*
>
> *Historic high groundwater maps may be used to verify the seasonal high groundwater elevation is greater than 10 feet below the proposed invert of infiltration. Historic high groundwater elevations may be available in the Seismic Hazard Evaluation Open-File Reports prepared by the California Geological Survey at the following link: https://goo.gl/VlESFZ.*
>
> *Existing groundwater data may also be used to verify the seasonal high groundwater elevation is greater than 10 feet below the proposed invert of infiltration. Recent data from Geotracker, Envirostar, local water companies, and other resources may be used to establish a seasonal high groundwater elevation. Current groundwater data and historical publications are available online through the State's Department*

of Water Resources Website (https://goo.gl/qu8JsG), the Water Replenishment District of Southern California (https://goo.gl/enVgJG), and others. Groundwater data for a given project may be used from sites that are within 1,000 feet of the proposed project and have been collected within the last 5 years. Existing groundwater data must be clearly presented in the report and will be subject to review and approval by GMED.

If historic high groundwater maps and existing data are not available, site-specific exploration can be performed to establish the seasonal high groundwater elevation. At least two borings must be drilled a minimum of 10 feet below the proposed invert. The borings must be monitored for a period of at least 24 hours to verify the seasonal high groundwater elevation is greater than 10 feet below the proposed invert of infiltration.

The historic high groundwater level for the proposed Greenbelt infiltration project location is only 10 feet below ground surface level. This is documented in reference #4, report plate 1.2 (see Figure 1 of this letter). The use of historic groundwater level would not allow for an infiltration project. The regulations go on to say that "existing groundwater data may also be used to verify the seasonal high groundwater elevation is greater than 10 feet…". The definition of seasonal high groundwater level is "The elevation to which the ground or surface water can be expected to rise due to a normal wet season."

Fortunately, extensive existing groundwater data is available for the Hermosa Beach area. For example, the Water Replenishment District of Southern California (WRD) publishes yearly Regional Groundwater Monitoring Reports which show groundwater trends in the Los Angeles basin (see Reference 5). Table 1 of this letter summarizes the groundwater level at Hermosa Beach, based on these yearly reports. A monitored well 704E, located close to the proposed Greenbelt project, as shown in Figure 2, was operational until 2008. The data is available from Reference 6. The groundwater level data from that well is shown in Figure 3.

Based on the above documented data gathered over the last 35 years, the seasonal high groundwater is estimated to be **16'** above Mean Sea Level (MSL). This groundwater level was reached in 2008, 2004, 1991, and 1985,a fairly frequent occurrence by any standard. The Greenbelt ground elevation at the proposed infiltration site is 30' (above MSL). Therefore, the seasonal high groundwater level is 30'-**16'=14'** below ground surface. It is important to note that the site specific Geosyntec groundwater value of 25' below ground surface (Reference 1), is a snapshot in time and should not be considered as representative of seasonal high groundwater values. The regulations specifically recognize this, and therefore only allow the use of site specific explorations if historic and existing data is not available,.and even then, with certain limitations and required adjustments for seasonal effects.

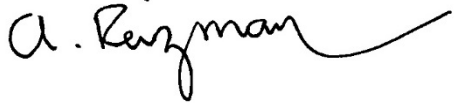
Going back to the County of Los Angeles LID regulations (Reference 3), to maintain at least 10' clearance between the groundwater and the invert of the infiltration unit would require that the bottom of the infiltration be located no more than **14'** – 10' = **4** feet below ground. Furthermore, this does not even consider or calculate for the inevitable future increase in

groundwater level due to rising ocean levels and due to the increase of water injection at the West Coast Barrier to combat saltwater intrusion.

Infiltration projects of this large size and scope are not viable in high water table areas such as those close to the beach. Perhaps that is why the LA County Flood Control District itself recognizes that recycling and reclaiming projects are preferred. "Because of the high ground water near the shore, capture and reuse regional projects or treatment BMP opportunities will be preferred...for the South Santa Monica Bay.' Reference 7, page 2-40.

When I posed this issue to Tetra Tech during the May 10 community meeting, their only response regarding how to address high groundwater levels was not to infiltrate during times when groundwater levels were high. This purported excuse for how a project can proceed where groundwater levels are too high for the project is a circular argument in the extreme, and does an injustice to the taxpayers of Hermosa Beach. First, the response assumes that the watershed group should spend millions of dollars constructing an infiltration project (to Tetra Tech's benefit) where the primary purpose of water contamination resolution will not be undertaken during the largest storm surges when pollution is undoubtedly highest. Second, it assumes that the system can accurately assess fluctuating groundwater levels during storm surge periods adequately to then allow for the safe infiltration of millions of gallons of groundwater into a fluctuating water table. All of these factors spell possible disaster for the project and residents who will have to cope with the after effects of errors. This is precisely the reason why LA regulations preclude infiltration projects of this nature in areas of groundwater levels of this height. Obviously there is simply no room available for an infiltration project that meets regulatory criteria.

Respectfully,



Alex Reizman, PE

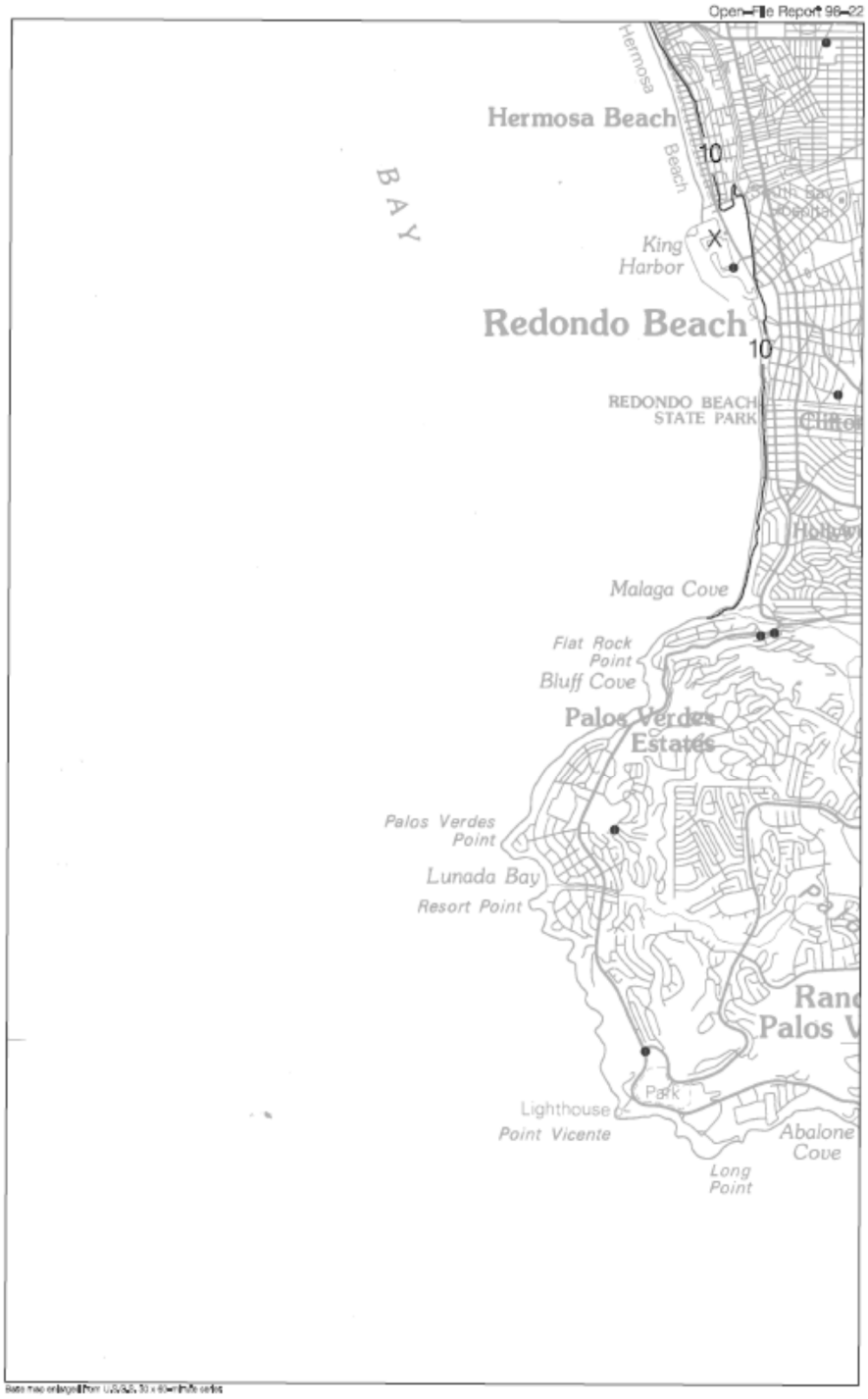


Figure 1 – Historic High Groundwater Level

Year	Groundwater (above Mean Sea Level)	Groundwater (below ground surface at Greenbelt)
2017 - Fall	5’	25’
2016 - Fall	2’	28’
2015 - Fall	2’	28’
2014 – Fall	2’	28’
2013- Fall	10’	20’
2012 – Fall	2’	28’
2011 - Fall	11’	19’
2010 – Fall	7’	23’
2009 – Fall	10’	20’
2008 - Fall	2’	28’
2008- Spring	15’	15’
2007 – Fall	12’	18’
2007- Spring	8’	22’
2006 – Fall	11’	19’
2006- Spring	10’	20’
2005 – Fall	10’	20’
2005- Spring	10’	20’

Note: see Figure 2.1 of Reference 5. Values are interpolated based on provided contours. Greenbelt ground elevation is 30’ above sea level.

Table 1- Recent Groundwater Level Data from WRD

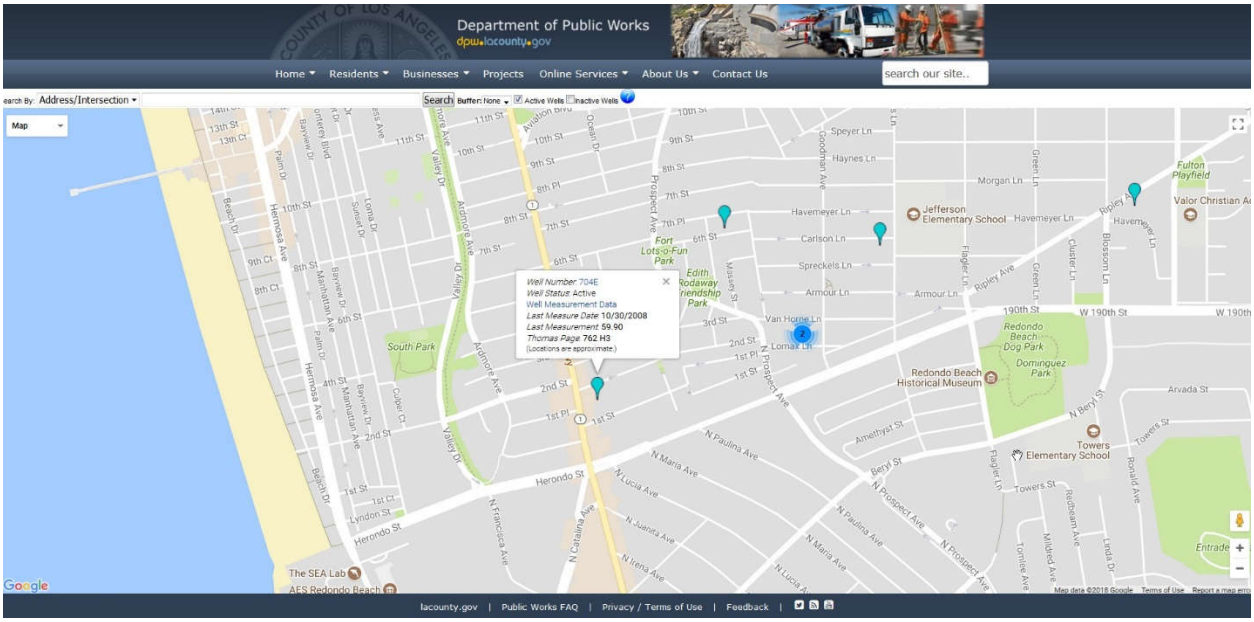


Figure 2 – Groundwater Well Close to Proposed Project (Well 704E is nearest)

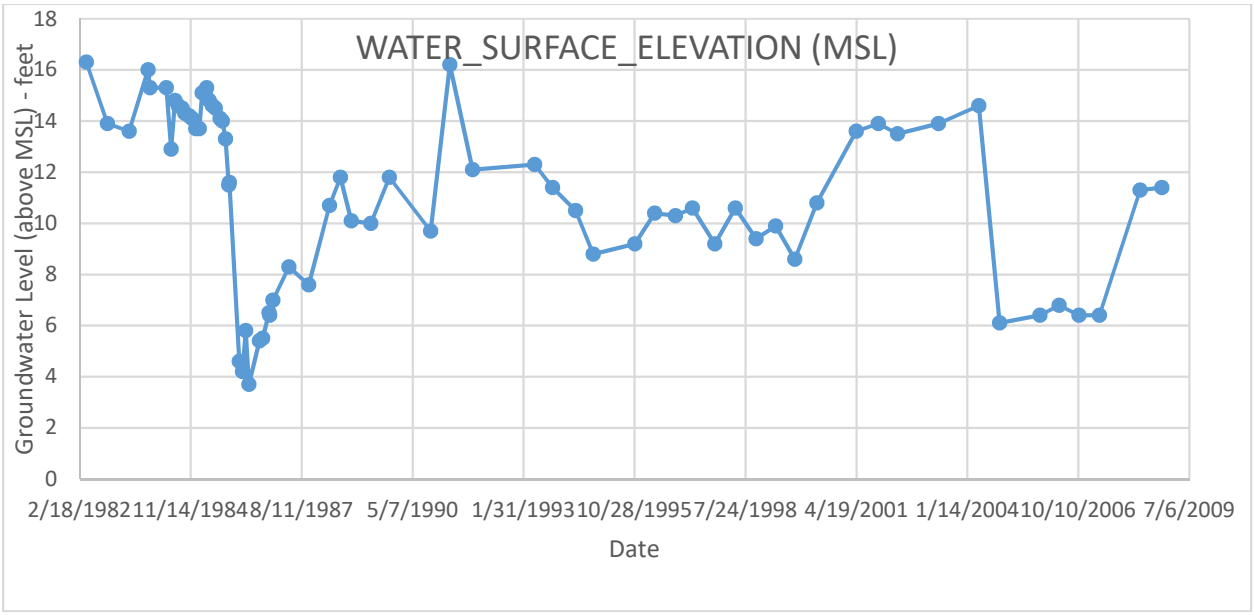
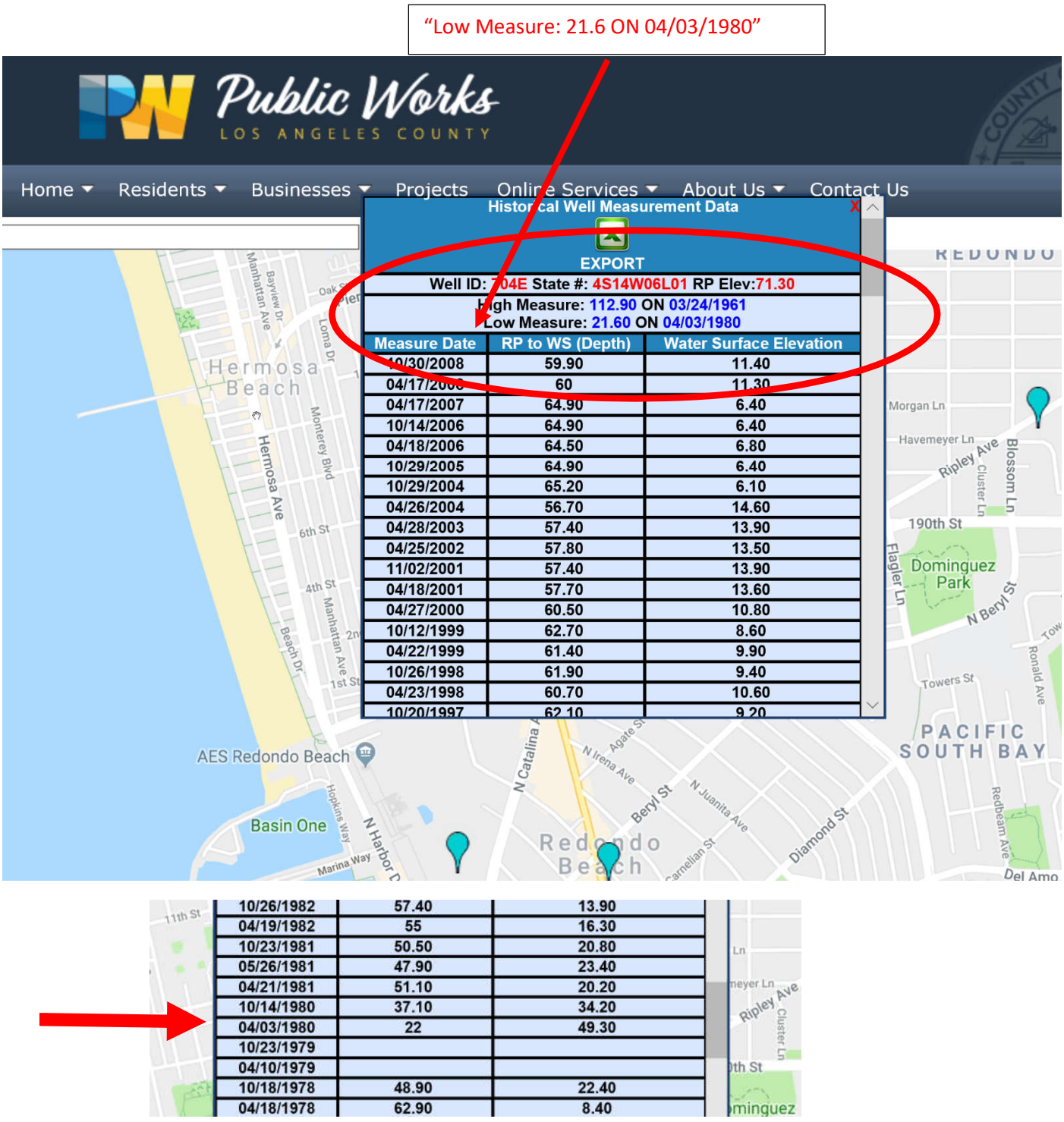


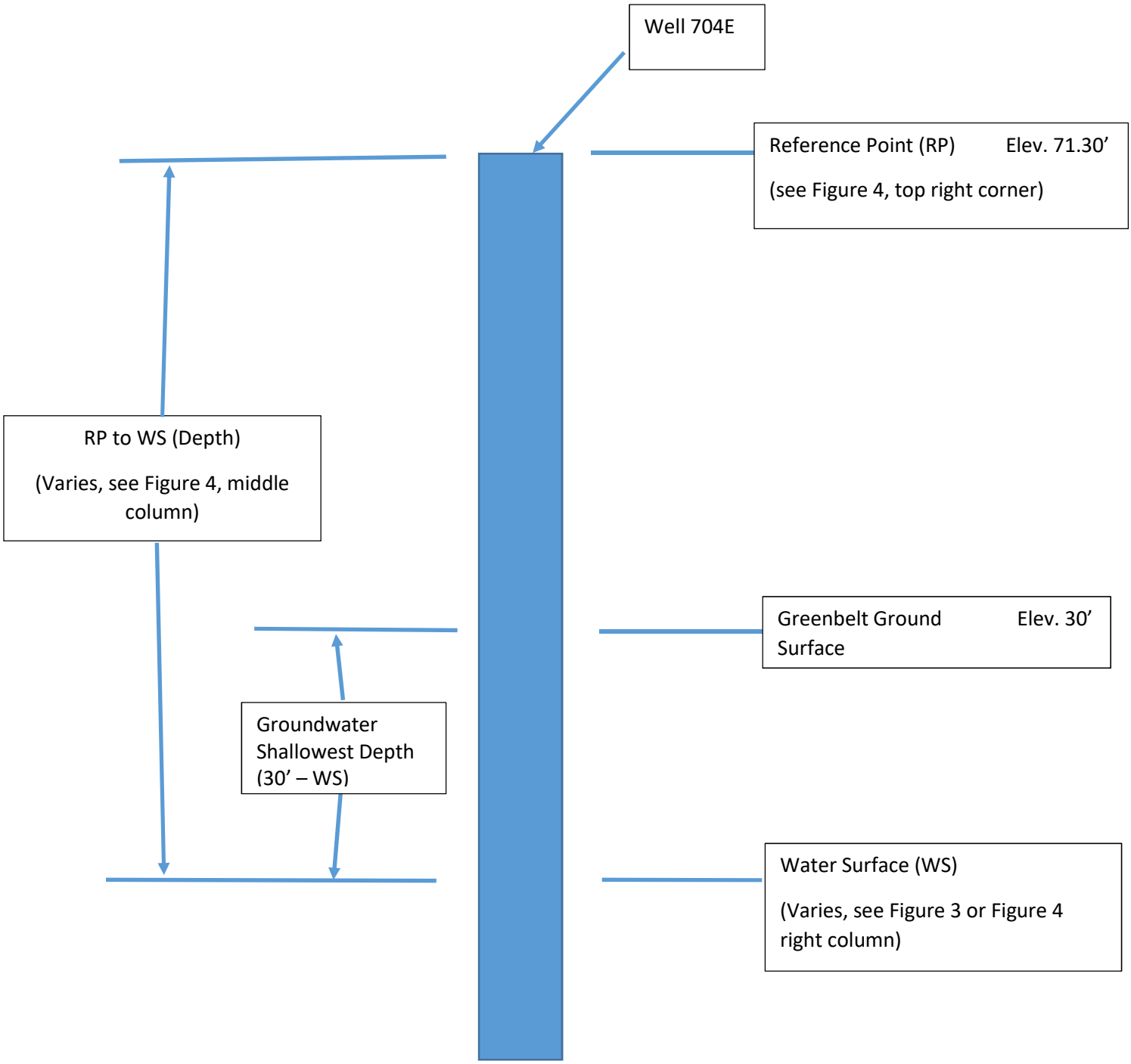
Figure 3 – Groundwater Level from Well 704E



Notation: **RP – Reference Point**

WS – Water Surface

Figure 4 –Well 704E Screen Shot of Dept. of Public Works Website [Ref. 6]



WS= 16' (Maximum from Figure 4); Greenbelt Ground Surface=30'; Therefore, Groundwater Shallowest Depth = 30-16 = 14' bgs (below ground surface)

Figure 5 –Well 704E Relative to Greenbelt Schematic