PRELIMINARY GEOTECHNICAL EVALUATION AND SLOPE STABILITY ANALYSIS

SOUTHWEST VILLAGE VTM-2 (BORROW/FILL SITE) SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

TRI POINTE HOMES
SAN DIEGO, CALIFORNIA

JULY 2, 2021
PROJECT NO. 06847-42-04

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Project No. 06847-42-04
July 2, 2021

Tri Pointe Homes
13400 Sabre Springs Parkway, Suite 200
San Diego, California 92128

Attention: Ms. April Tornillo

Subject: PRELIMINARY GEOTECHNICAL EVALUATION
AND SLOPE STABILITY ANALYSIS
SOUTHWEST VILLAGE VTM-2 (BORROW/FILL SITE)
SAN DIEGO, CALIFORNIA

Dear Ms. Tornillo:

In accordance with your authorization, we have performed a preliminary geotechnical evaluation and slope stability analysis for VTM-2 of the proposed Southwest Village project in the San Ysidro area of San Diego, California. The intent of the study was to provide preliminary information regarding slope stability as it relates to the San Ysidro Landslide Complex that borders the south margin of the proposed project. The information provided herein supplements previous geotechnical reports and will be augmented with a future geotechnical field investigation.

Based on previous geotechnical studies and the preliminary results of this investigation, it is our opinion that the proposed project can be developed as planned provided the conclusions presented in this report are confirmed during future studies.

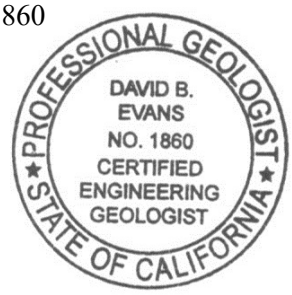
If you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Rodney C. Mikesell
GE 2533

David B. Evans
CEG 1860



RCM:DBE:arm

(e-mail) Addressee
(e-mail) Rick Engineering Company
Attention: Mr. Tim Gabrielson

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PRELIMINARY GEOTECHNICAL EVALUATION AND SLOPE STABILITY ANALYSIS

1. PURPOSE AND SCOPE

This report presents the findings of a preliminary geotechnical evaluation for the Southwest Village Vesting Tentative Map 2 (VTM-2, Borrow/Fill Site) project located in South Otay Mesa, San Diego, California (see Vicinity Map, Figure 1). There are two other phases of the overall project which consists of VTM-1 and the eastward extension of Beyer Boulevard into VTM-1 (see Vicinity Map, Figure 1). We prepared a supplemental study for VTM-1 entitled *Supplemental Geotechnical Investigation and Slope Stability Analysis, Southwest Village VTM-1, San Diego, California*, dated June 25, 2021. The geotechnical aspects of the extension of Beyer Boulevard will be addressed in a forthcoming study.

The purpose of this study was to evaluate the stability of the mesa top and adjacent San Ysidro landslide complex that borders the southern margin of VTM-2. We understand that the VTM-2 area will initially be used as a borrow/fill site to support the grading of VTM-1 with respect to site balancing.

A geotechnical investigation associated with VTM-2, including exploratory borings and the placement of groundwater monitoring wells is commencing this summer which will be the basis for future geotechnical analyses and confirmation of this study. In the mean time we have performed this preliminary study to evaluate the proposed project based on a hypothetical model using information obtained during several prior geotechnical studies (Reference Nos. 7, 9 and 10) and an assumed development plan. As development concepts progress, update studies will be prepared to address the new plans.

Since this report is a supplement to previous studies (Reference Nos. 7 and 9), we did not attempt to re-present information contained in the referenced study but rather provide the salient information which focuses on a hypothetical evaluation of the potential impact of the proposed development, if any, on the current landslide stability and vise versa. In this regard, a discussion of faulting, stratigraphy and other geologic information can be found in the referenced geotechnical reports.

The scope of the preliminary geotechnical evaluation included a review of previous geotechnical reports and published geologic literature with respect to the landslide complex (see list of references), preparing a geologic map and cross section of the study area and evaluating the stability of the hillside adjacent to the VTM-2 project site based on hypothetical conditions. We also used infiltration and laboratory test results, as well as groundwater level information obtained during our previous studies to formulate our geotechnical opinions regarding the proposed development.

Laboratory test results from selected samples obtained from the borings during our December 2020/January 2021 field investigation (June 25, 2021 report) are provided in Appendix A. Infiltration test results from the same study are provided in Appendix B. Slope stability figures relating to VTM-2 are provided in Appendix C. A hypothetical geologic cross section, which was the basis for our slope stability analysis, is presented on Figure 11. The letter designation (CC-CC') was selected to differentiate the current cross section from those presented in previous reports.

As part of the referenced June 25, 2021 study, Dudek & Associates was retained to perform a groundwater evaluation of Landslide A and the surrounding area. Their study was based on a site reconnaissance, our bore-hole and infiltration data and published documents. The intent of their study was to assess the current groundwater elevations in the VTM-1 area and comment on the potential impacts project development on the mesa may have on the regional groundwater system, specifically the landslides. The Dudek report is contained in Appendix D. Their report will also be updated once the proposed geotechnical investigation for VTM-2 and monitoring period is complete.

Rick Engineering Company also performed a hydrology analysis of the Southwest Village VTM-1 project and surrounding landslide areas as part of our June 25, 2021 study (Reference No. 14). They evaluated the pre-project and post-project conditions with respect to infiltration of storm water and irrigation. The Rick Engineering report is contained in Appendix E.

In addition to Dudek and Rick Engineering's study, the groundwater elevation in each boring performed during our December 2020/January 2021 field investigation was measured by Geovision Geophysical Services using bore-hole geophysical techniques. This information was used in the analysis presented in Reference No. 10.

2. BACKGROUND

The overall proposed Southwest Village development is located adjacent to the San Ysidro Landslide Complex which is one of the largest landslide features in San Diego County (See Figures 1 through 6). Although studied relatively extensively by prominent geologists and geotechnical firms, to our knowledge, prior to our December 2020/January 2021 field investigation (June 25, 2021 report), the base of the landslide complex had only been identified once during an investigation by Geocon Incorporated for the Intermodal Transportation Center located southwest of the mesa (see Reference No. 6).

With the exception of our December 2020/January 2021 investigation, the primary focus of previous geotechnical studies performed by Geocon Incorporated was to define the headscarp of the landslide adjacent to the proposed development to establish the building setback limit along the edge of the mesa (see Reference No. 7). Large-diameter borings were advanced along the proposed development

limits to demonstrate that beyond the landslide headscarp, intact sedimentary bedrock units exist (i.e. stable conditions). In addition, during the referenced investigation, the headscarp was mapped in detail and surveyed to record its location. A 50-foot setback from the surveyed location of the headscarp was established.

3. GEOLOGIC CONDITIONS AND GEOMORPHIC FEATURES

The following discussion presents general observations made during this study and our interpretation of the boring logs from our December 2020/January 2021 field investigation, stereographic photographs (anaglyphs; Figures 4 and 8, note: color anaglyphic glasses needed for viewing), color/reflectance terrain models generated from Lidar information (Figures 9 and 10), geomorphic features and our experience with similar mass movements. Future studies will further evaluate the geologic conditions in the VTM-2/borrow/fill site area as well the eastern extension of Beyer Boulevard into the project.

The results of our December 2020/January 2021 study indicates that the northern portion of the San Ysidro Landslide Complex is approximately 350 to 400-feet-thick near its head scarp southwest of VTM-1. It is suspected that a slightly less thickness is present along the southern landslide apron since the adjacent Spring Canyon drainage/toe of the landside is approximately 100 feet higher in elevation than the toe of the complex to the west, and the mesa above the entire slide complex is relatively level. The difference in elevation of the base of the slides suggest that the causative bedding plane shear within the Otay Formation for the southern slide complex may occur approximately 100 feet above that of the failure to the west.

Characteristic landslide morphology of steep back-scarps and bulging, hummocky topography, as well as deflected drainages and closed surface depressions are evident within the hillsides that surround the entire mesa. Based on surface topography, we have separated the landslide complex into three components based on observed geomorphological differences between areas (Landslides A, B and C, see Figures 2, 3, 5, and 6).

Landslide A appears to be the most developed feature with respect to past horizontal displacement as evidenced by its more subdued/relaxed topography, especially along its distal portion. It is postulated/hypothesized that the Landslide A mass has moved down dip along its slip surface in "glacier-like" fashion with progressive failure occurring northeastward. The upper, steeper part of this slide appears to be comprised of detached blocks of cemented sandstone/siltstone and terrace-derived conglomerate suspended in a matrix of clay and silt. The head scarp of this feature is well expressed and is curvilinear.

In contrast, Landslide B expresses robust topography and appears to be less developed with respect to horizontal displacement. Its apparent limited detachment from the mesa top suggests that portions of this slide are incipient consisting of a relatively minor block-glide type movement with less horizontal displacement than Landslide A. The maximum head scarp differential elevation of this feature is approximately 50 feet below the mesa compared to Landslide A which is approximately 100 feet below the mesa. The topography within the slide mass consists of elevated promontories and prominent lobate-shaped ridges.

With respect to geomorphic expression, it appears that the Landslide C area, the focus of this preliminary study, is intermediate between Landslide A and B. The terrain exhibits a robust profile with some similar morphologies as Landslide A suggesting that a series of detached blocks have relaxed in a progressive fashion sliding southward from the mesa top. The amount of horizontal displacement also appears to be intermediate between Landslide A and B and the westernmost feature exhibits a well expressed curvilinear head scarp (see Figures 7 through 10). Down-cutting of the natural slopes by the Spring Canyon drainage along the toe of the hillside appears to be the likely mechanism which triggered landsliding on both sides of the canyon.

With respect to the composition of the slide mass, the cores obtained from our Landslide A study revealed that the main body of the slide mass at the location studied consists of a mixture of sandstone, siltstone, claystone and gravel/cobble conglomerate derived from the Otay and San Diego Formations, and overlying Terrace Deposits. Sheared bentonitic claystone and sections of disturbed Otay gritstone were noted in several of the borings. Abundant highly fractured and blocky textures were also observed.

The cores also revealed that the basal shear zone of Landslide A consists of plastic/viscous deformation features ranging from sheared bentonite and remolded clay planes to disturbed mixtures of sand, clay and gravel. The underlying Otay Formation consisted of thinly bedded micaceous sandstone with an apparent relatively low angle. We suspect that the slide composition and basal shear zone of Landslide C may be similar to that of Landslide A.

The landside geometry and basal slip surface modeled on our geologic cross section was interpreted based on geomorphology and the projection of information from our June 25, 2021 report. The dip of the basal surface used in our slope stability analysis was modeled at 1.5 degrees along section to simulate conditions encountered during our December 2020/January 2021 study. The source for the ground surface topography was a combination of relatively recent flown topo for the project and 1999 SANGIS. Since the slide mass is heterogeneous, we did not attempt to model separate geologic/soil materials on the cross section and in our slope stability analysis.

4. SLOPE STABILITY EVALUATION

4.1 General

A cross section was analyzed to make a preliminary assessment regarding the stability of Landslide C (Section CC-CC'). The location of the cross section is considered a worst-case location. The geology and basal slide surface was determined from geomorphic interpretation and application of features observed during our December 2020/January 2021 field investigation. The groundwater elevation used in the analysis was based on a similar saturation model as encountered during the aforementioned study.

The computer program SLOPE/W distributed by Geo-Slope International was utilized to perform the slope stability analyses. This program uses conventional slope stability equations and a two-dimensional limit-equilibrium method to calculate the factor of safety against deep-seated failure. For our analysis, Spencer's Method with a block failure mode was used for failure along landslide basal surface. Spencer's Method satisfies both moment and force equilibrium.

The computer program searches for the critical failure surface based on parameters inputted, including the location of the "left" and "right" sliding blocks. The output files and calculated factor of safety for the cross-sections analyzed are presented in Appendix C, Figures C-1 through C-9. The critical failure surface for each analysis is shown on computer-generated output. The factor of safety is shown on each figure directly above the failure surface.

4.2 Shear Strength Parameters

The shear strength parameters used in the analyses are based on laboratory direct shear testing performed on samples obtained from borings during our December 2020/January 2021 study and our experience with similar soil conditions. Where direct shear tests were not performed in a soil or geologic unit, assumed strength values were used. Table 4.2.1 summarizes the shear strength tests performed by Geocon Incorporated during our previous geotechnical investigations on the property. Table 4.2.2 summarize residual shear strength values. The residual shear strength values were determined following the procedure presented in the *Journal of Geotechnical and Geoenvironmental Engineering, Drained Shear Strength Parameters for Analysis of Landslides (Stark, Choi, McCone, 2005).* However, for conservatism, we used a friction angle of 8 degrees for the basal slip surface, which is less than the values determined using the Stark, Choi, McCone (2005) procedure. Shear strength values used in our analyses are shown on Table 4.2.3.

TABLE 4.2.1
SUMMARY OF DIRECT SHEAR STRENGTH TEST RESULTS

Soil/Geologic Unit	Sample No.	Angle of Shear Resistance (degrees)	Unit Cohesion (psf)
Landslide Debris	LB1-3**	31	135
Otay Formation	*LB3-3†	32	500
	B1@215 feet	45 (peak) 39 (ultimate)	3,260 (peak) 960 (ultimate)
	B2@289 feet	38 (peak) 29 (ultimate)	1,720 (peak) 600 (ultimate)
	B3@394 feet	49 (peak) 37 (ultimate)	1,550 (peak) 1,000 (ultimate)
Remolded Shear Plane	LB4-9**	27	180
Basel Shear Plane (Residual)	B3 @ 328 – 330 feet	20	160

*Sample remolded to approximately 90 percent of maximum dry density near optimum moisture content.
†From Geocon October 2004
**From Geocon May 2006

TABLE 4.2.2
RESIDUAL SHEAR STRENGTH VALUES FOR BASAL SLIDE PLANE
BASED ON STARK, CHOI, MCCONE (2005)

Sample No.	Liquid Limit	Percent Clay	Angle of Internal Friction (degrees)	Cohesion (psf)
B1@161 – 164 feet	66	27	11	50
B2@263 feet	40	10	24	20
B3@324 feet	51	22	15	60
B3@328-330 feet	35	14	22	60

TABLE 4.2.3
SHEAR STRENGTH USED IN SLOPE STABILITY ANALYSES

Soil Type	Angle of Internal Friction (degrees)	Cohesion (psf)
Qcf (Compacted Fill)	30	300
Qal (Alluvium)	28	100
Qls (Landslide Debris)	31	135
To (Otay Formation)	34	450
Basal Slide Plane	8	50

4.3 Slope Stability Analysis

We analyzed three failure locations. The first location was along the basal slide plane and up the assumed landslide headscarp. The strength parameters used for the basal surface was also used along the landslide headscarp. The result of this analysis is shown on Figure C-1 which indicates a factor of safety of 1.21. For the second location we allowed the computer to search for the failure surface with the lowest factor of safety assuming that a bedding plane shear with the same strength parameters as the basal shear zone extends behind the landslide headscarp and beneath the mesa. The results of this analysis is shown on Figure C-2 and indicates a factor of safety greater than 1.5. The third failure location was set at the edge of the borrow/fill disposal limits (see Figure C-3). The factor of safety at the edge of the borrow/disposal limits is 1.5.

We also analyzed the cross section assuming landslide movement causes the ground surface in front of the landslide headscarp to drop thereby creating a higher exposed headscarp slope. Assuming a 50-foot elevation change in front of the headscarp, a factor of safety of at least 1.5 exists at or in front of the edge of the borrow/disposal limit (see Figure C-4).

4.4 Seismic Slope Stability

In accordance with Special Publication 117 guidelines, site-specific seismic slope stability analyses are required for sites located within mapped hazard zones. Seismic Hazard Zone maps published by CDMG, including landslide hazard zones, have not been published for San Diego County due to the relatively low seismic risk compared with other jurisdictions in Southern California. Therefore, it is our opinion that seismic slope stability analyses are not required in San Diego County. However, we performed a seismic slope stability analysis in accordance with *Recommended Procedures for Implementation of DMG Special Publication 117A: Guidelines for Analyzing and Mitigating Landslide Hazards in California*, prepared by the Southern California Earthquake Center (SCEC), dated 2008.

The seismic slope stability analysis was performed for the headscarp slope using an unweighted acceleration of 0.21g, corresponding to a 10 percent probability of exceedance in 50 years. In addition, a deaggregation analysis was performed on the 0.21g value for the site. A modal magnitude and modal distance of 6.12 and 11.5 kilometers, was determined from the deaggregation analysis. A printout of the deaggregation analysis is provided in Appendix C.

Using the parameters discussed herein, an equivalent site acceleration, k_{EQ}, of 0.101g was calculated to perform the screening analysis, as shown on Figure C-5. This equivalent site acceleration resulted in a factor of safety less than 1.0 (see Figure C-6). A slope is considered acceptable by the screening analysis if the calculated factor of safety is greater than 1.0 using k_{EQ}; therefore, the section analyzed

did not pass the screening analysis for seismic slope stability. We then performed a deformation analysis utilizing procedures outlined in Special Publication 117A.

The yield acceleration used in the deformation analysis was determined by establishing the horizontal seismic coefficient necessary to achieve a factor of safety of 1.0 (see Figure C-7). Using a yield acceleration of 0.05, an estimated slope deformation of 0 centimeters is calculated for the overall landslide slope (see Figure C-8). When we use the height of the headscarp slope (approximately 80 feet), the estimated deformation is 12 cm (see Figure C-9). Using the headscarp slope height rather than the overall slope height is conservative. According to Special Publication 117A, displacements up to 15 centimeters are unlikely to correspond to serious landside movement and damage. Additionally, the 12 centimeters deformation would occur over the length of the slide area (2,000 lineal feet) resulting in negligible deformations throughout the slide area.

4.5 Summary

The results of our preliminary analysis indicates that the existing slope along the southern boundary of VTM-2 has a factor of safety of 1.5, or greater under static conditions assuming a bedding plane shear extends behind the landslide headscarp and beneath the mesa. With respect to seismic slope stability, our analyses indicates that the expected deformation under seismic loading is not likely to cause serious landslide movement. Table 4.5 summarizes the results of the slope stability analyses. Based on our preliminary analysis, the existing slopes along the southern perimeter of VTM-2 have an acceptable factor of safety and deformation with respect to both static and seismic conditions.

TABLE 4.5
SUMMARY OF STABILITY ANALYSES

Condition Analyzed	Cross Section	Factor-of-Safety	Estimated Deformation Under Seismic Loading
Along Headscarp	CC-CC’	1.21	--
Extended Bedding Plane Shear	CC-CC’	1.50	--
At Edge of Development	CC-CC’	1.50	--
Higher Exposed Headscarp	CC-CC’	2.15 (at edge of borrow/fill limits)	--
Seismic Analysis	CC-CC’	--	0 to 12 cm

5. CONCLUSIONS

5.1 Southwest Village VTM-2 is proposed on the mesa adjacent to the southern extent of the San Ysidro Landslide Complex (Landslide C). This geotechnical evaluation was performed as a preliminary assessment of the stability of the mesa and adjacent slope for use in planning a borrow/fill site associated with the development of Southwest Village VTM-1. Our analysis is hypothetical based on an interpretation of the existing geologic conditions and uses information obtained during a recent supplemental geotechnical investigation for VTM-1. This study should be updated subsequent to a field investigation which is planned for this summer.

5.2 The Landslide C geometry was modeled based on information from previous studies as well as a geomorphic analysis of various sources (i.e. Lidar terrain, anaglyphic stereo, etc.). A cross section was developed for use in geologic characterization and performing a slope stability analysis (Cross Section CC-CC').

5.3 The results of our stability analysis indicates that the existing static factor of safety of Landslide C is 1.21. The factor of safety at the edge of the borrow/disposal site closest to the headscarp is 1.5. The factor of safety along the most critical surface is also 1.5 assuming a bedding plane shear extends beneath the mesa behind the landslide basal shear surface. The minimum factor of safety occurs approximately 240 feet northward from the landslide margin. A graphic representation of the factors of safety described above is presented on Figure 12.

5.4 With respect to seismic slope stability, the section analyzed did not pass the screening evaluation, therefore, we performed a deformation analysis utilizing procedures in Special Publication 117A. Using the overall landslide slope height (336 feet), our analysis indicates 0 cm of deformation. If we use the landslide headscarp slope height (approximately 80 feet), our analysis indicates a deformation of 12 cm. According to Special Publication 117A, displacements up to 15 centimeters are unlikely to correspond to serious landside movement and damage. Using the steeper landslide headscarp slope height in the seismic analysis rather than the overall more gentle landslide slope is a conservative approach. Additionally, the 12 centimeters deformation would occur over the length of the slide area (2,000 lineal feet) resulting in negligible deformations throughout the slide area.

5.5 The following is a list of conservative assumptions used during our slope stability analysis that were also used in our June 25, 2021 *Supplemental Investigation and Slope Stability Analysis*:

1. We used a lower phi angle for the basal slide zone than the laboratory testing during our VTM-1 study yielded (8 degrees versus an average of 18 degrees based on Stark, Choi, Mccone, 2005);

2. We used a lower shear strength for the Otay Formation than the previous laboratory testing indicated (34 degrees and 450 psf versus an average ultimate value of 35 degrees and 800 psf and average peak value of 43 degrees and 2,200 psf);

3. We assumed that a sheared bentonite bed projects behind the slide and beneath the mesa at the elevation of the basal shear zone;

4. We assumed the basal slip surface is uniformly sloping and not undulatory which is likely the actual geometry. The actual condition, if undulatory, would increase the sliding friction; and

5. We used the same groundwater saturation model as our VTM-1 study which assumes the slide is saturated below the first occurrence of seepage. The groundwater observed during our previous study is likely a perched condition rather than full saturation of the landslide mass and bedrock unit.

5.6 To address a "what if" scenario, we performed a hypothetical analysis along the cross section to evaluate the potential impact on the proposed development assuming that a significant seismically triggered horizontal displacement of the slide mass had occurred. In this exercise we lowered the elevation of the headscarp region adjacent to the development to simulate a smaller resisting landslide mass out in front of the bedrock block that is present beneath the development. Our analysis revealed that the slide mass south of the development margin would have to drop at least 50 vertical feet before lowering the factor of safety within the development area below 1.5.

5.7 A groundwater profile from the borings during our June 25, 2021 study and a nearby agricultural well on the mesa was the basis for the phreatic surface used in our slope stability analysis. We retained Dudek & Associates to evaluate the information in the June 25, 2021 study and comment on the potential for seasonal fluctuations, and any future impacts that the proposed development may have on the regional groundwater system. Specifically, they studied the existing storm water infiltration into the undeveloped mesa and surrounding area and compared it to the condition that would be present post-development considering irrigation and storm water infiltration.

5.8 Dudek concluded that the post-development vertical infiltration of storm water into the substrate would be less than the existing condition which is already relatively low as evidenced by our permeability testing, a review of existing soil survey maps and the presence of vernal pools on the mesa. This opinion is supported by the fact that the development will eventually result in a net increase in impervious surface area due to the construction of structures, pavements, etc., and the collection and conveyance of storm water into the project storm drain system that would normally soak into the exposed soils on the mesa.

5.9 Dudek also concluded that the groundwater levels measured/assumed during the June 25, 2021 study were reasonable for use in that analysis, however, additional groundwater wells would improve characterization of the phreatic surface immediately outside and within the slide mass, and would facilitate recording of the groundwater level in response to seasonal rainfall. A supplemental groundwater monitoring program is currently planned in conjunction with our geotechnical investigation to confirm the measurements obtained during our study of Landslides A and C.

5.10 As part of our June 25, 2021 study, Rick Engineering Company also performed a hydrology analysis of the project area and concluded that "considering both the infiltration of storm water, and the application of irrigation, the average infiltration volume has decreased in the post-project condition compared to the pre-project condition".

5.11 Several storm water outfall locations were contemplated during the original project design. These features were proposed to discharge storm runoff collected from the project into pronounced drainages within the landslide complex. Although the infiltration data collected from the discharge locations supported a short-term discharge without adverse effects, the potential for scour and injection of storm water into the slide mass during extreme storm events resulted in a requirement to redesign the storm drain system to discharge outside landslide areas. It is understood that one outfall is still contemplated in the Landslide C area. This storm drain system will be extended to the south to discharge into Spring Canyon.

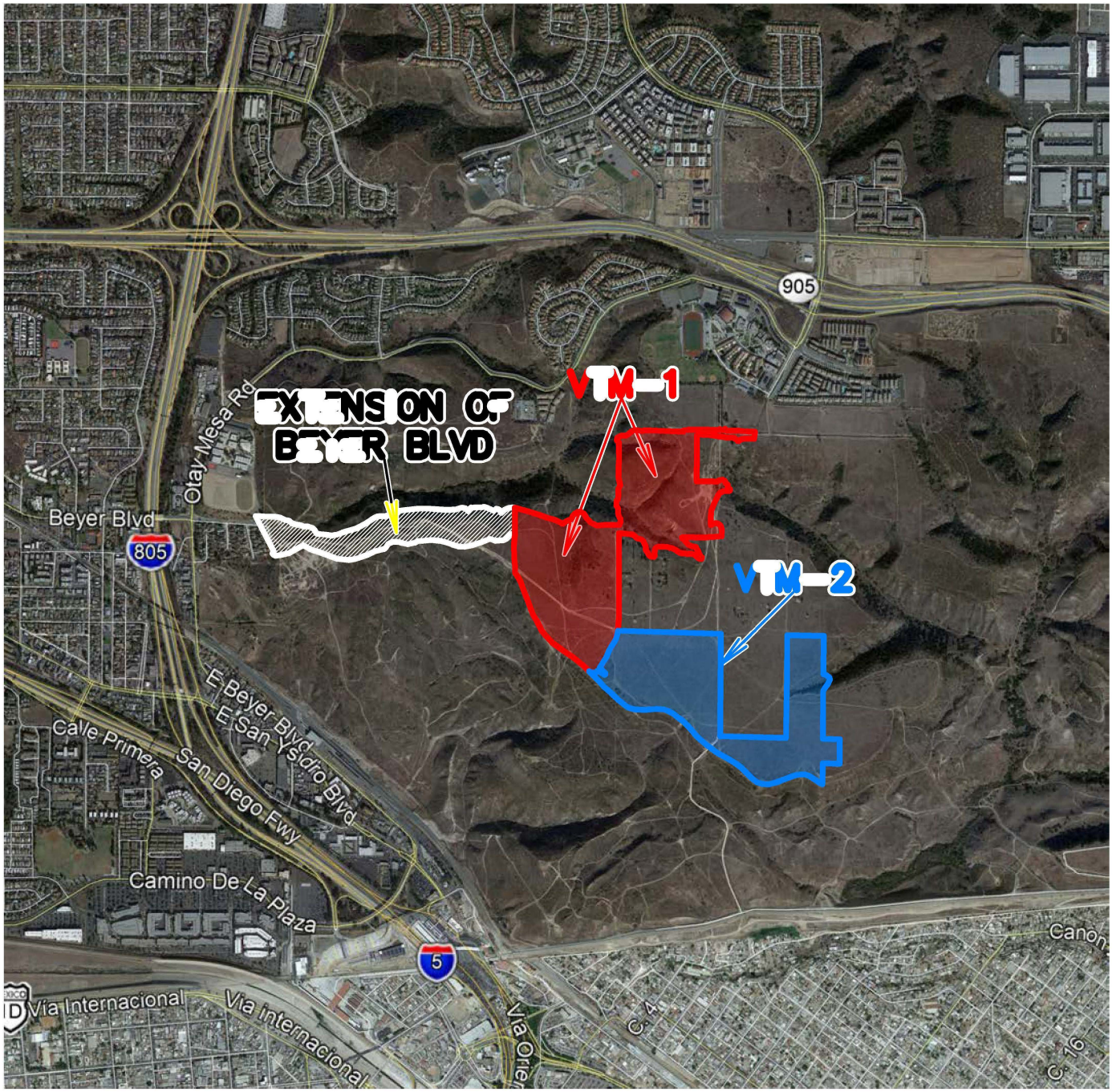
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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VICINITY MAP

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SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 1 AND 2,
BEYER BOULEVARD
SAN DIEGO, CALIFORNIA

DATE 07 - 02 - 2021	PROJECT NO. 06847 - 42 - 04	FIG. 1

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OBLIQUE VIEW OF THE SAN YSIDRO LANDSLIDE COMPLEX

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 2
SAN DIEGO, CALIFORNIA

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MAP VIEW OF THE SAN YSIDRO LANDSLIDE COMPLEX

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 2
SAN DIEGO, CALIFORNIA

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E San Ysidro Blvd

Jacob Dekema Fwy

Camino De La Plaza

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Border

Jeep Trail

Emiliano Zapata

P Rivapalacios

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SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 2
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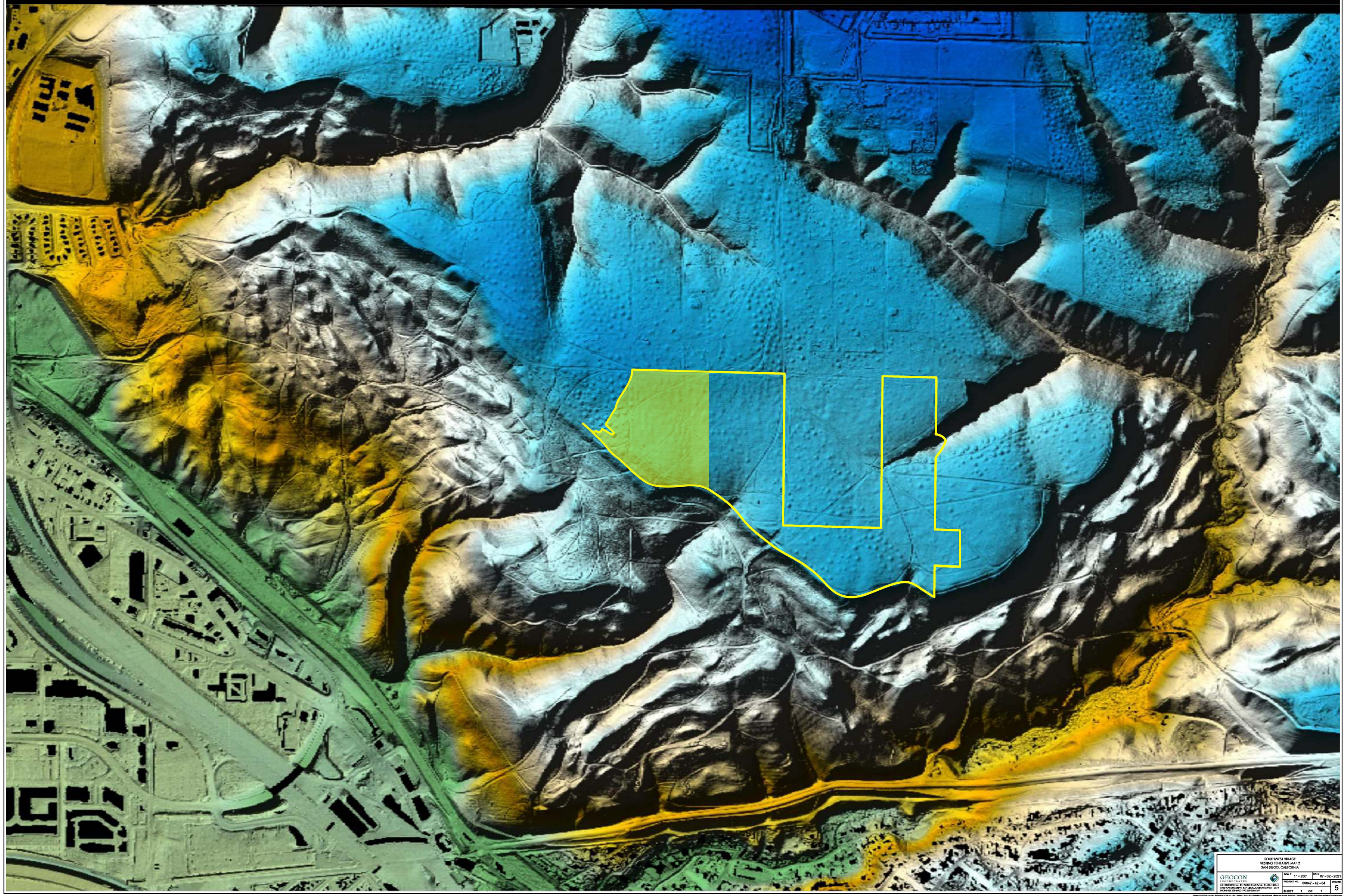
PROJECT NO. 06847 - 42 - 04
PREPD 4
SHEET 1 OF 1

VTM-2 DEVELOPMENT FOOTPRINT; COLOR TERRAIN MAP



SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 2
SAN DIEGO, CALIFORNIA

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SCALE 1" = 200' | DATE 07 - 02 - 2021
PROJECT NO. 06847 - 42 - 04 | FIGURE 5
SHEET 1 OF 1

VTM-2 DEVELOPMENT FOOTPRINT; TERRAIN REFLECTANCE MAP

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 7
SAN DIEGO, CALIFORNIA

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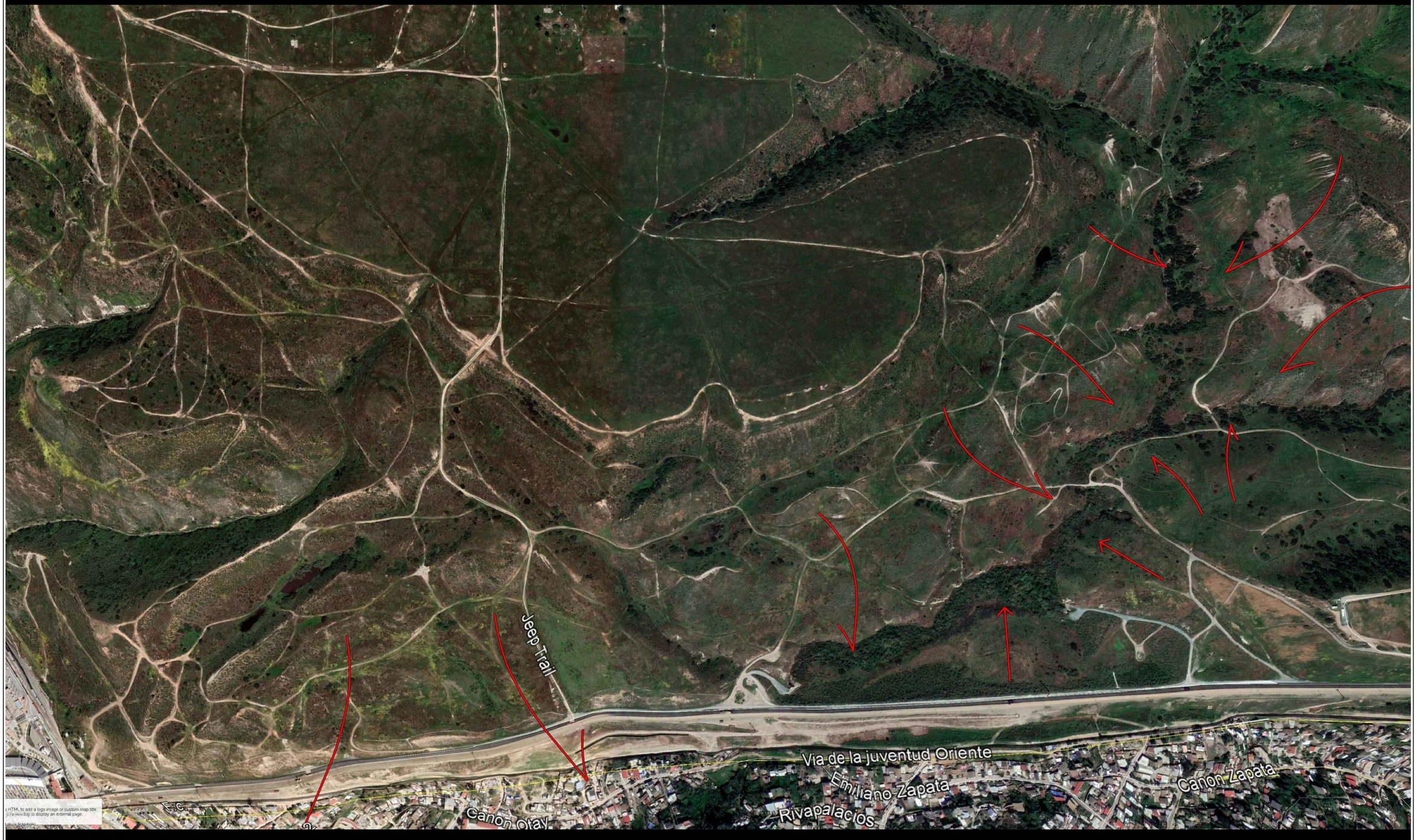
DATE 07 - 02 - 2021
PROJECT NO. 06847 - 42 - 04
PREPARED
SHEET 1 OF 1
6

MAP VIEW IMAGE OF LANDSLIDE C



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VESTING TENTATIVE MAP 2
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DATE 07 - 02 - 2021
PROJECT NO. 06847 - 42 - 04
FIGURE 7
SHEET 1 OF 1

ANAGLYPHIC STEREOSCOPIC IMAGE OF LANDSLIDE C

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 2
SAN DIEGO, CALIFORNIA

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SCALE: 1" = NTS
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FIGURE: 8
SHEET: 1 OF 1

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VESTING TENTATIVE MAP 2
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SCALE 1" = 100'
DATE 07 - 02 - 2021
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SHEET 1 OF 1

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VESTING TENTATIVE MAP 2
SAN DIEGO, CALIFORNIA

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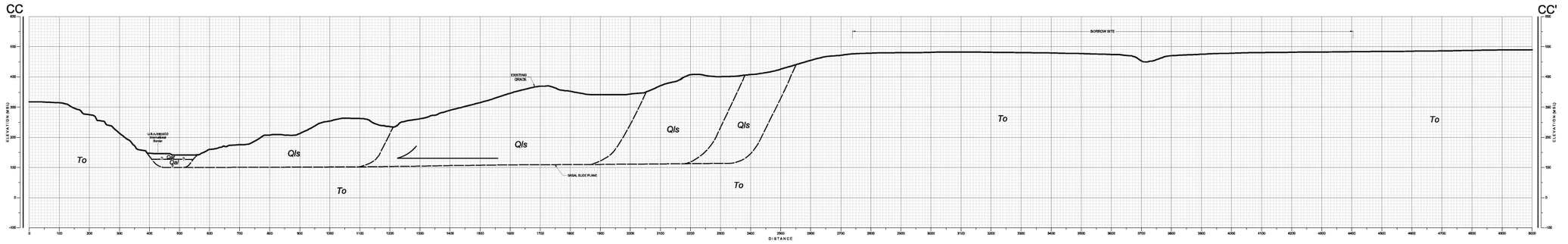
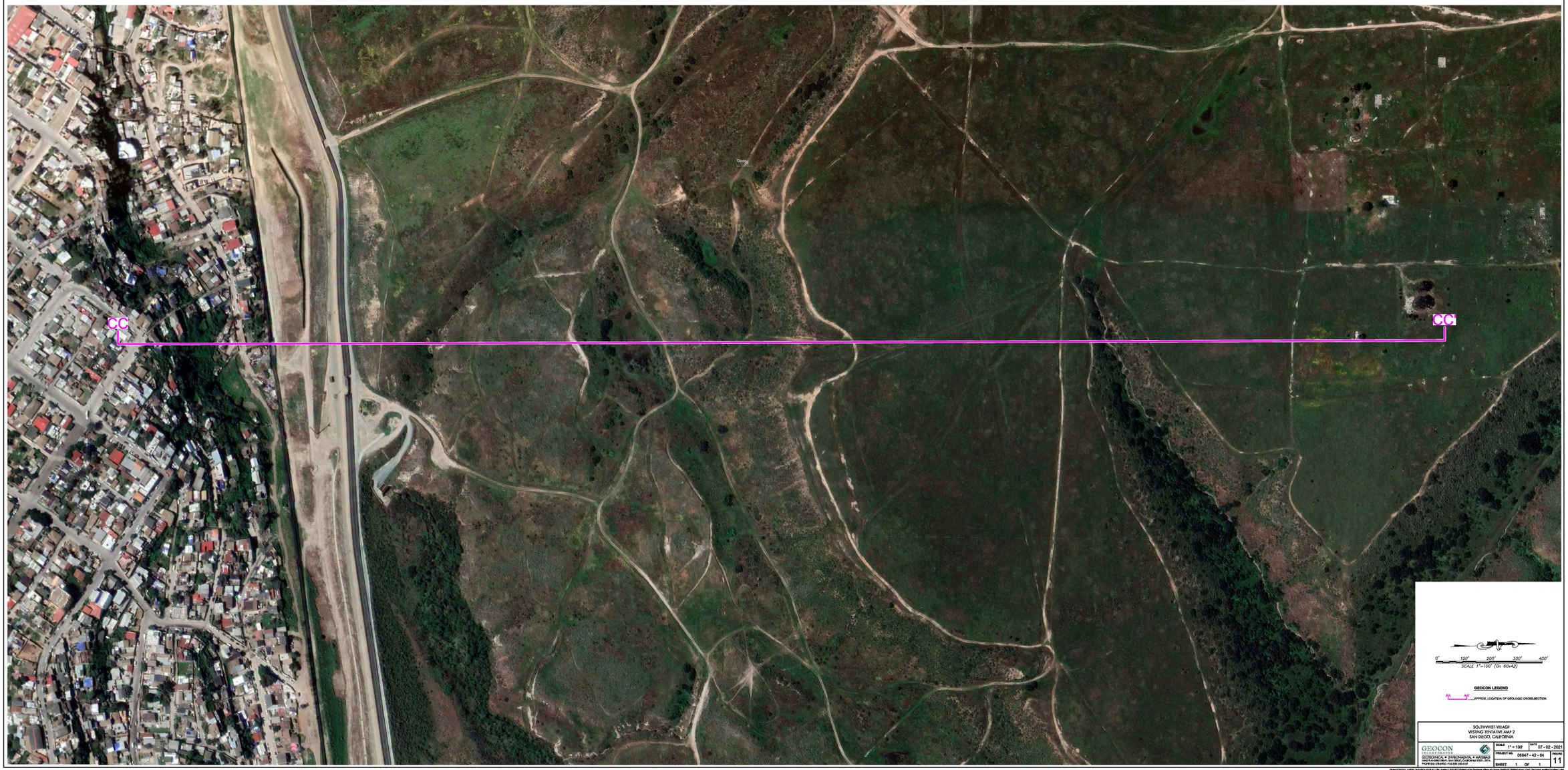
SCALE 1" = 100'
DATE 07 - 02 - 2021
PROJECT NO. 06847 - 42 - 04
REVISION 10
SHEET 1 OF 1

GEOLOGIC CROSS - SECTION CC-CC'

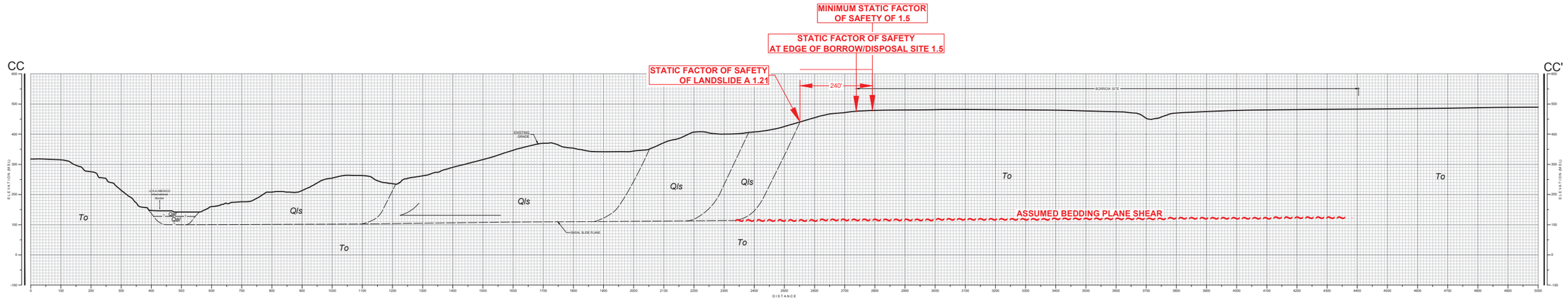


GEOLOGIC CROSS-SECTION CC-CC'

SCALE: 1" = 100' (Vert. = Horiz.)



SLOPE STABILITY SUMMARY



GEOLOGIC CROSS-SECTION CC-CC'

SCALE: 1" = 100' (Vert. = Horiz.)

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 2
SAN DIEGO, CALIFORNIA

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SCALE	1" = 100'	DATE	07 - 02 - 2021
PROJECT NO.	06847 - 42 - 04	FIGURE	12
SHEET	1 OF 1		

APPENDIX

APPENDIX A

LABORATORY TESTING

As part of our June 25, 2021 study we performed laboratory tests in general accordance with the test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected samples to evaluate in-place dry density and moisture content, direct shear strength, Atterberg limits, maximum dry density and optimum moisture content, gradation, and permeability. The results of the laboratory tests are presented in the following tables and graphs.

TABLE A-I
SUMMARY OF DIRECT SHEAR TEST RESULTS
(ASTM D 3080)

Sample No.	Geologic Unit	Dry Density (pcf)	Moisture Content (%)	Angle of Shear Resistance (degrees)	Unit Cohesion (psf)
LB3-3†*	Otay Formation	93.4	19.0	32	500
LB1-3**	Landslide Debris	101.0	25.9	31	135
LB4-9†**	Remolded Shear Plane	--	--	27	180
B1@215 ft	Otay Formation	121.2	6.1	45 (peak) 39 (ultimate)	3,260 (peak) 960 (ultimate)
B2@289 ft	Otay Formation	116.4	6.4	38 (peak) 29 (ultimate)	1,720 (peak) 600 (ultimate)
B3@394 ft	Otay Formation	113.5	8.9	49 (peak) 37 (ultimate)	1,550 (peak) 1,000 (ultimate)
B3@328–330 ft	Basal Shear Zone (Remolded)	107.4	18.3	21 (peak) 20 (ultimate)	150 (peak) 160 (ultimate)

†Sample remolded to approximately 90 percent of relative compaction near optimum moisture content.
*From Geocon October 2004
**From Geocon May 2006

TABLE A-II
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index
B1@161-164 ft	66	27	39
B2@263 ft	40	21	19
B3@324 ft	51	23	28
B3@328-330 ft	35	18	17

TABLE A-III
RESIDUAL SHEAR STRENGTH VALUES FOR BASAL SLIDE PLANE
BASED ON STARK, CHOI, MCCONE (2005)

Sample No.	Liquid Limit	Percent Clay	Angle of Internal Friction (degrees)	Cohesion (psf)
B1@161 – 164 feet	66	27	11	50
B2@263 feet	40	10	24	20
B3@324 feet	51	22	15	60
B3@328-330 feet	35	14	22	60

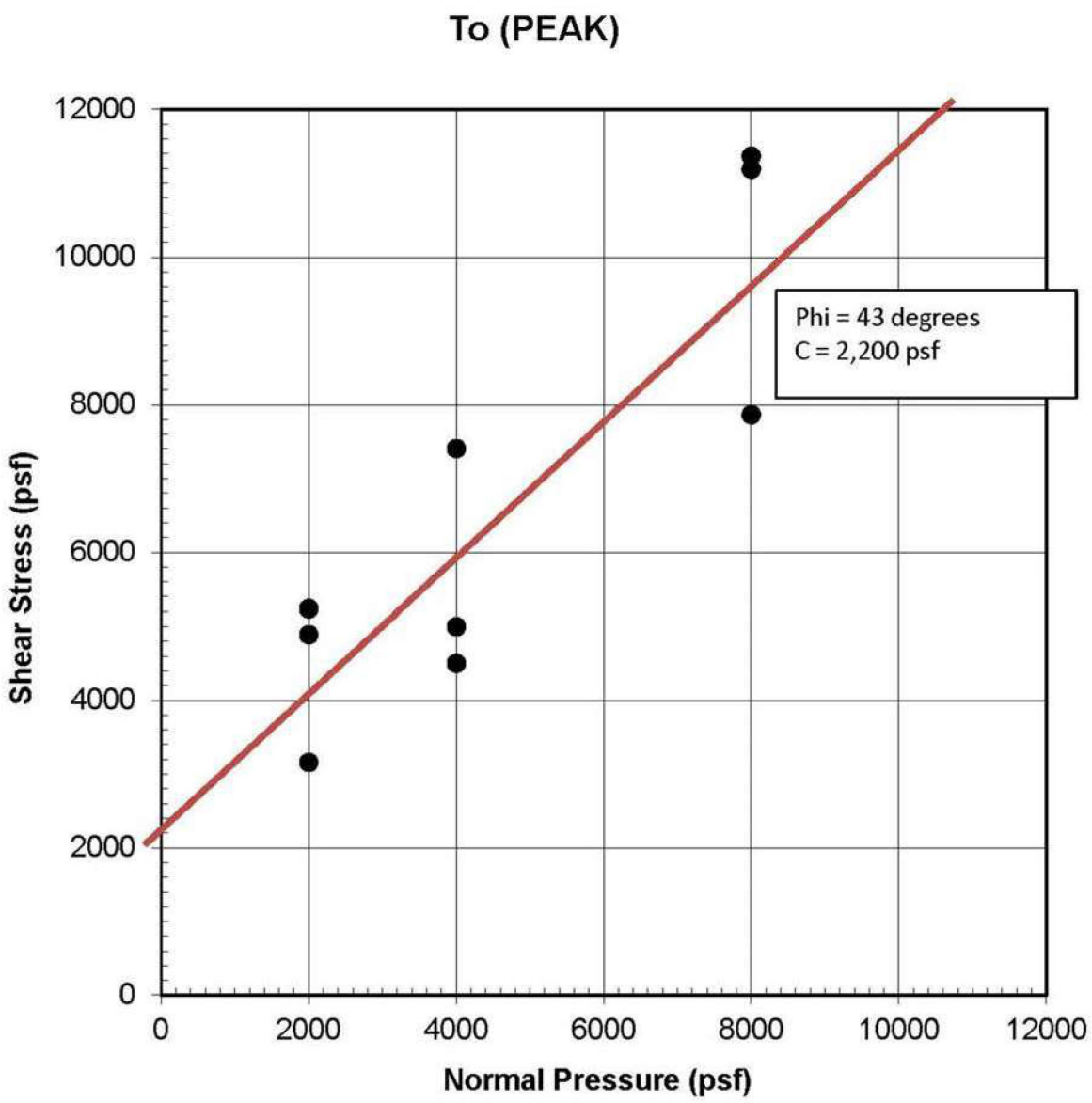
TABLE A-IV
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY
AND OPTIMUM MOISTURE CONTENT TEST RESULTS
(ASTM D 1557)

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
Perm - 1	Reddish brown, Silty, fine to coarse SAND with trace gravel	126.9	9.9

TABLE A-V
SUMMARY OF LABORATORY REMOLDED PERMEABILITY TEST
(ASTM D5084)

Sample No.	Moisture Content (%)		Dry Density (pcf)	Permeability (cm/s)
	Before Test	After Test		
*Perm - 1	10.3	17.6	111.9	6.38×10^{-4}

*Sample remolded to approximately 90 percent relative compaction near optimum moisture content



SHEAR PLOTS - PEAK

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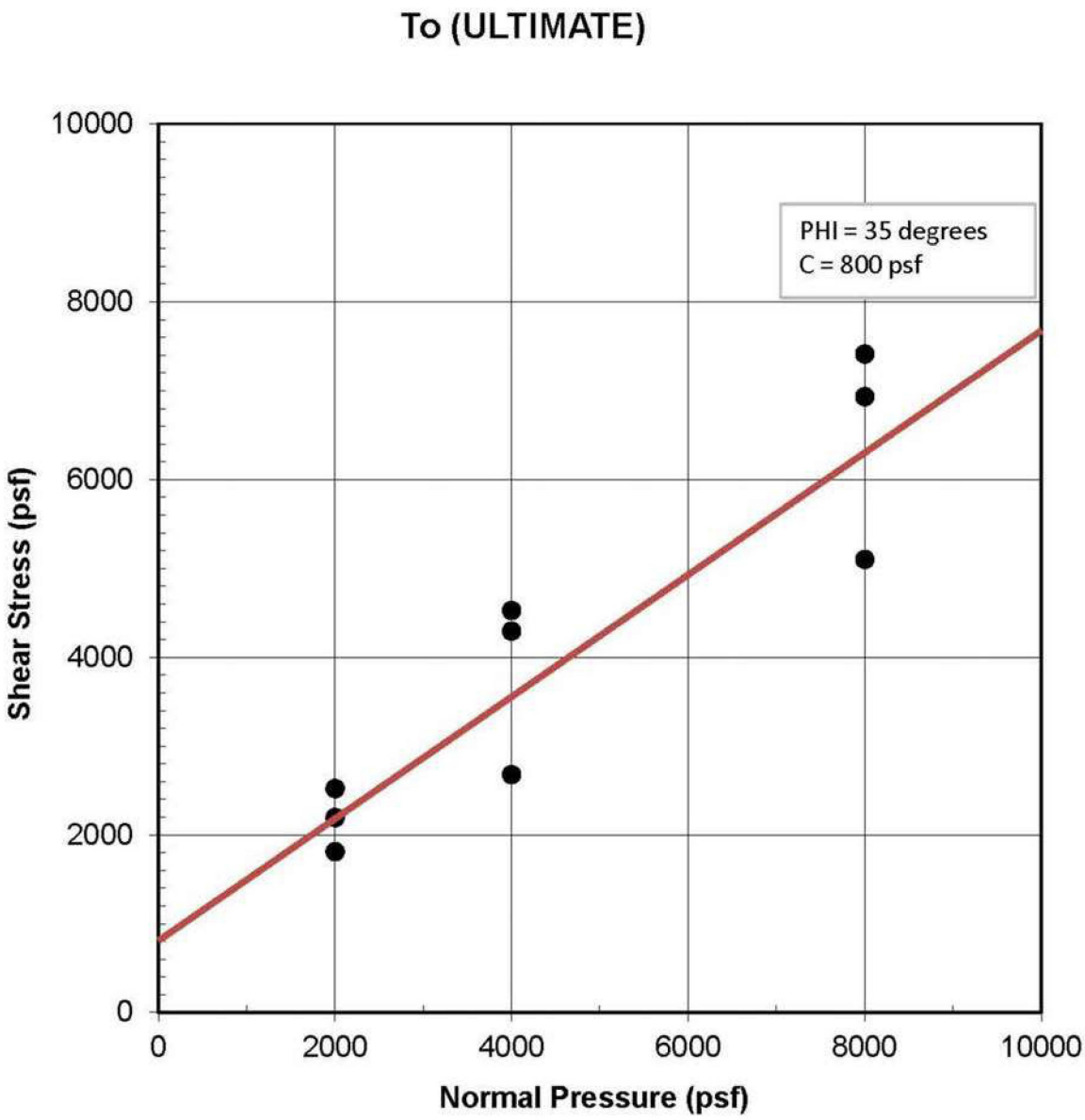
SOUTHWEST VILLAGE
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD

DATE 06 - 21 - 2021	PROJECT NO. 06847 - 42 - 04	FIG.

Plotted:06/21/2021 8:32AM | By:ALVIN LADRILLONO | File Location:W:\1_GEOTECH\06000\06800\06847-42-04\2021-06-21\Shear Plots\06847-42-04 Shear.dwg



SHEAR PLOTS - ULTIMATE

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SOUTHWEST VILLAGE
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 06 - 21 - 2021	PROJECT NO. 06847 - 42 - 04	FIG.

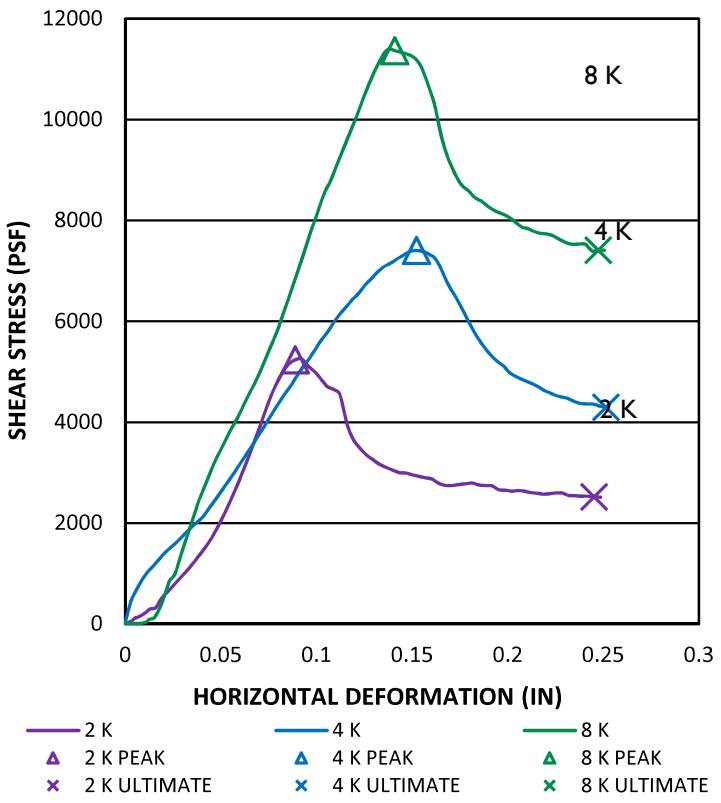
Plotted:06/21/2021 8:31AM | By:ALVIN LADRILLONO | File Location:W:\1_GEOTECH\06000\06800\06847-42-04\2021-06-21\Shear Plots\06847-42-04 Shear.dwg

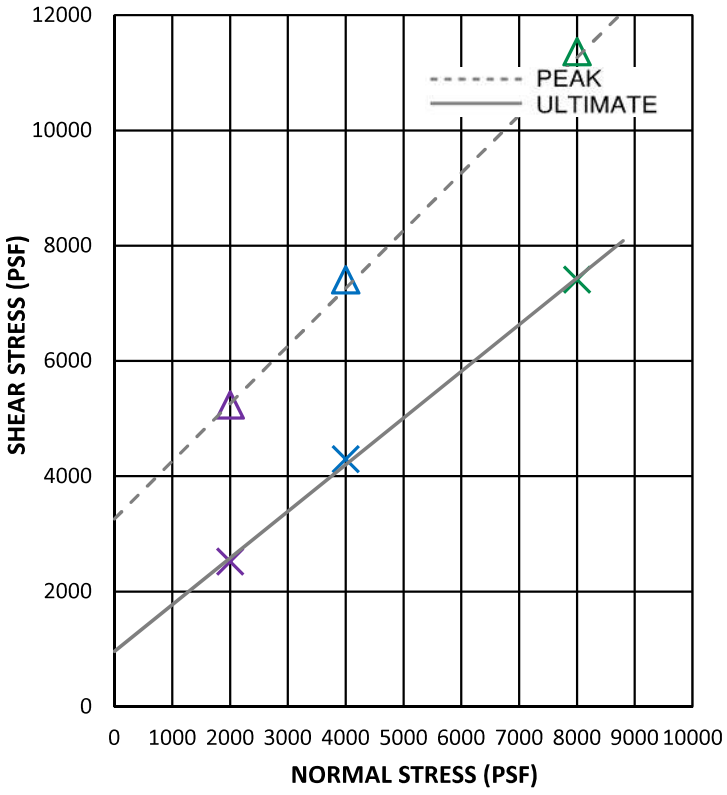
SAMPLE NO.:	**B-1**	GEOLOGIC UNIT:	**Otay Formation**
SAMPLE DEPTH (FT):	**215'**	NATURAL/REMOLDED:	**N**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
ACTUAL NORMAL STRESS (PSF):	2000	4000	8000	--
WATER CONTENT (%):	6.1	6.5	5.7	6.1
DRY DENSITY (PCF):	121.2	119.4	123.0	121.2

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
WATER CONTENT (%):	12.6	13.5	12.2	12.8
PEAK SHEAR STRESS (PSF):	5236	7406	11365	--
ULT.-E.O.T. SHEAR STRESS (PSF):	2522	4294	7412	--

RESULTS		
PEAK	COHESION, C (PSF)	3260
	FRICTION ANGLE (DEGREES)	45
ULTIMATE	COHESION, C (PSF)	960
	FRICTION ANGLE (DEGREES)	39





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DIRECT SHEAR - ASTM D 3080

SOUTHWEST VILLAGE

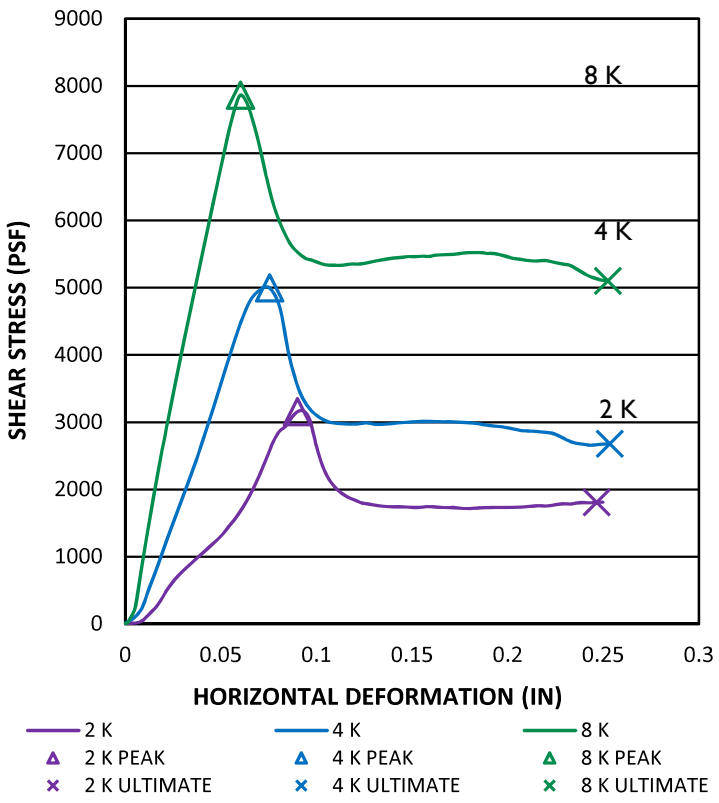
PROJECT NO.: 06847-42-04

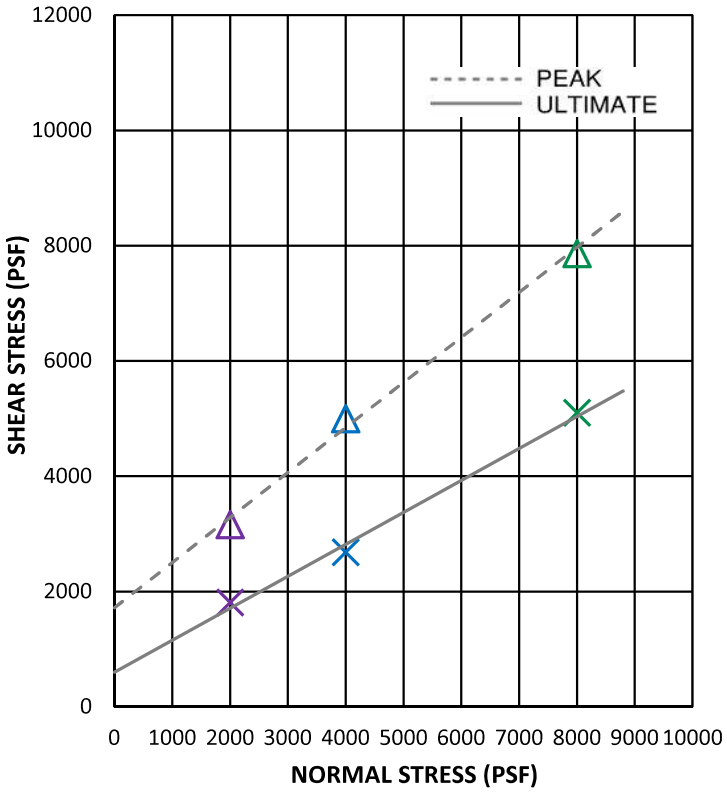
SAMPLE NO.:	**B-2**	GEOLOGIC UNIT:	**Otay Formation**
SAMPLE DEPTH (FT):	**289'**	NATURAL/REMOLDED:	**N**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
ACTUAL NORMAL STRESS (PSF):	2000	4000	8000	--
WATER CONTENT (%):	6.2	6.4	6.5	6.4
DRY DENSITY (PCF):	116.5	115.6	117.0	116.4

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
WATER CONTENT (%):	13.4	13.8	13.5	13.6
PEAK SHEAR STRESS (PSF):	3156	4996	7863	--
ULT.-E.O.T. SHEAR STRESS (PSF):	1811	2678	5100	--

RESULTS		
PEAK	COHESION, C (PSF)	1720
	FRICTION ANGLE (DEGREES)	38
ULTIMATE	COHESION, C (PSF)	600
	FRICTION ANGLE (DEGREES)	29





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DIRECT SHEAR - ASTM D 3080

SOUTHWEST VILLAGE

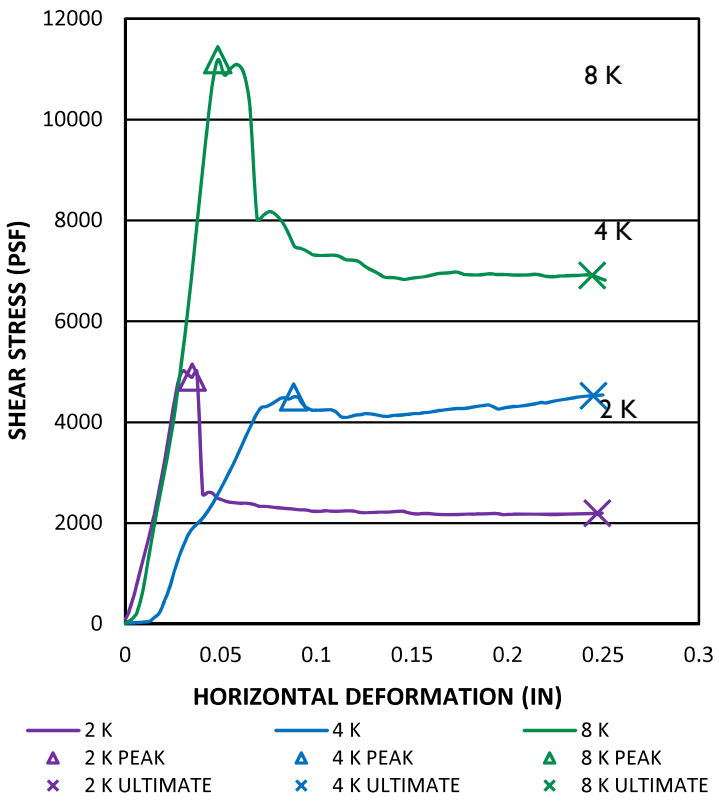
PROJECT NO.: 06847-42-04

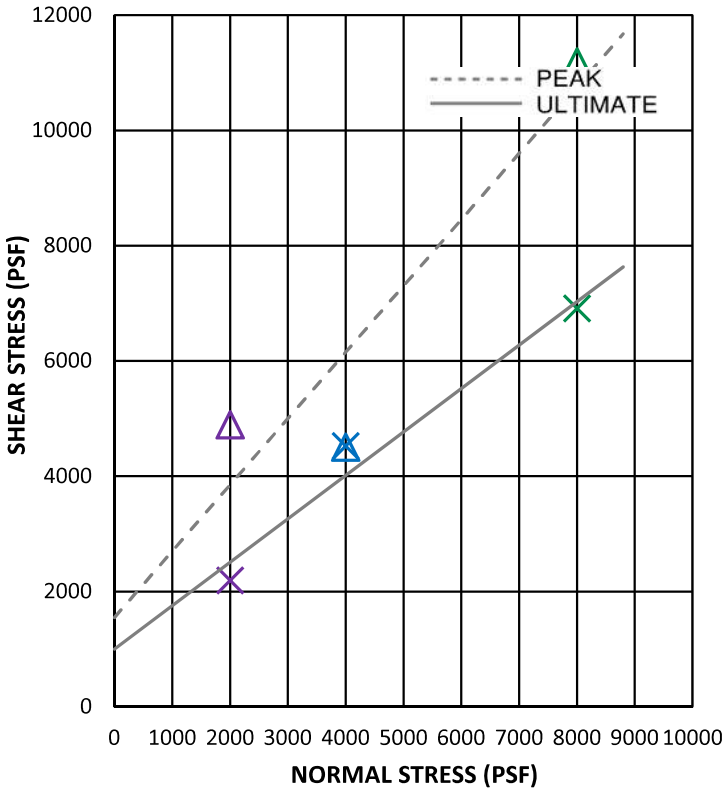
SAMPLE NO.:	**B-3**	GEOLOGIC UNIT:	**Otay Formation**
SAMPLE DEPTH (FT):	**394'**	NATURAL/REMOLDED:	**N**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
ACTUAL NORMAL STRESS (PSF):	2000	4000	8000	--
WATER CONTENT (%):	8.0	9.7	9.1	8.9
DRY DENSITY (PCF):	113.4	113.2	113.9	113.5

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
WATER CONTENT (%):	15.5	16.0	15.5	15.7
PEAK SHEAR STRESS (PSF):	4892	4502	11186	--
ULT.-E.O.T. SHEAR STRESS (PSF):	2194	4525	6913	--

RESULTS		
PEAK	COHESION, C (PSF)	1550
	FRICTION ANGLE (DEGREES)	49
ULTIMATE	COHESION, C (PSF)	1000
	FRICTION ANGLE (DEGREES)	37





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DIRECT SHEAR - ASTM D 3080

SOUTHWEST VILLAGE

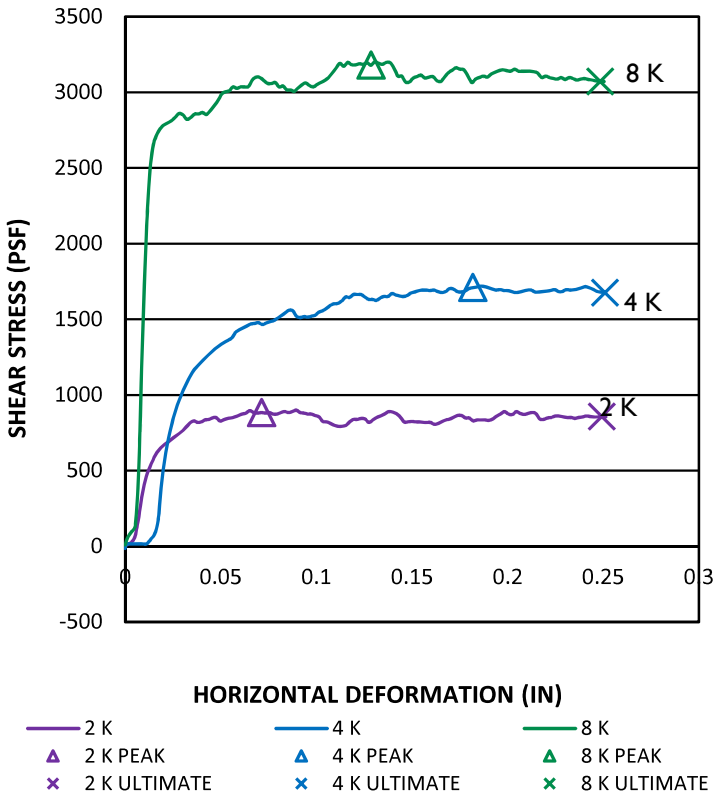
PROJECT NO.: 06847-42-04

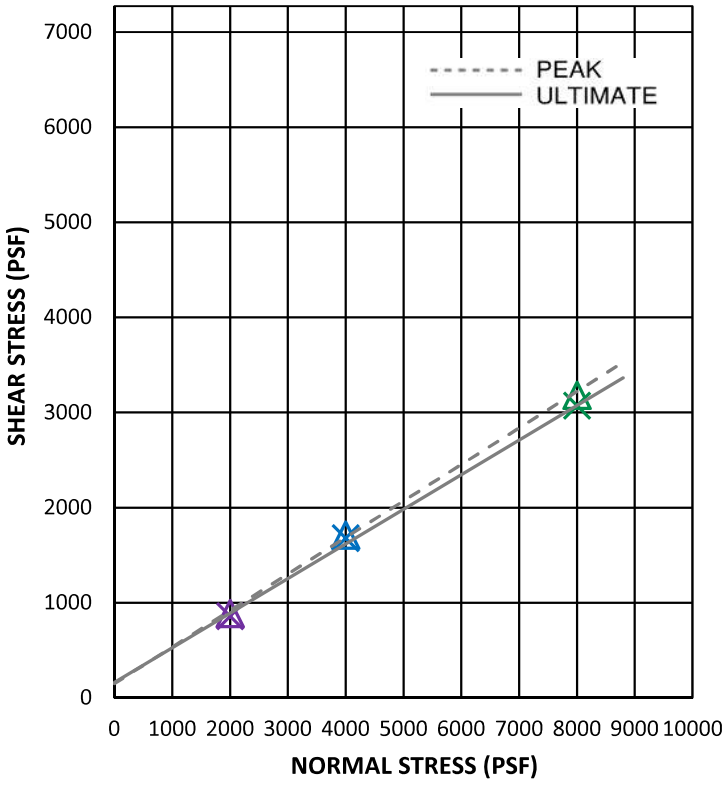
SAMPLE NO.:	**B3 @ 328-330**	GEOLOGIC UNIT:	**Shear Zone**
SAMPLE DEPTH (FT):		NATURAL/REMOLDED:	**N**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
ACTUAL NORMAL STRESS (PSF):	2000	4000	8000	--
WATER CONTENT (%):	18.3	18.3	18.3	18.3
DRY DENSITY (PCF):	107.4	107.4	107.4	107.4

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	**2 K**	**4 K**	**8 K**	**AVERAGE**
WATER CONTENT (%):	23.3	23.3	23.3	23.3
PEAK SHEAR STRESS (PSF):	884	1710	3179	--
ULT.-E.O.T. SHEAR STRESS (PSF):	858	1677	3072	--

RESULTS		
PEAK	COHESION, C (PSF)	150
	FRICTION ANGLE (DEGREES)	21
ULTIMATE	COHESION, C (PSF)	160
	FRICTION ANGLE (DEGREES)	20





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RESIDUAL SHEAR - ASTM D 3080

SOUTHWEST VILLAGE

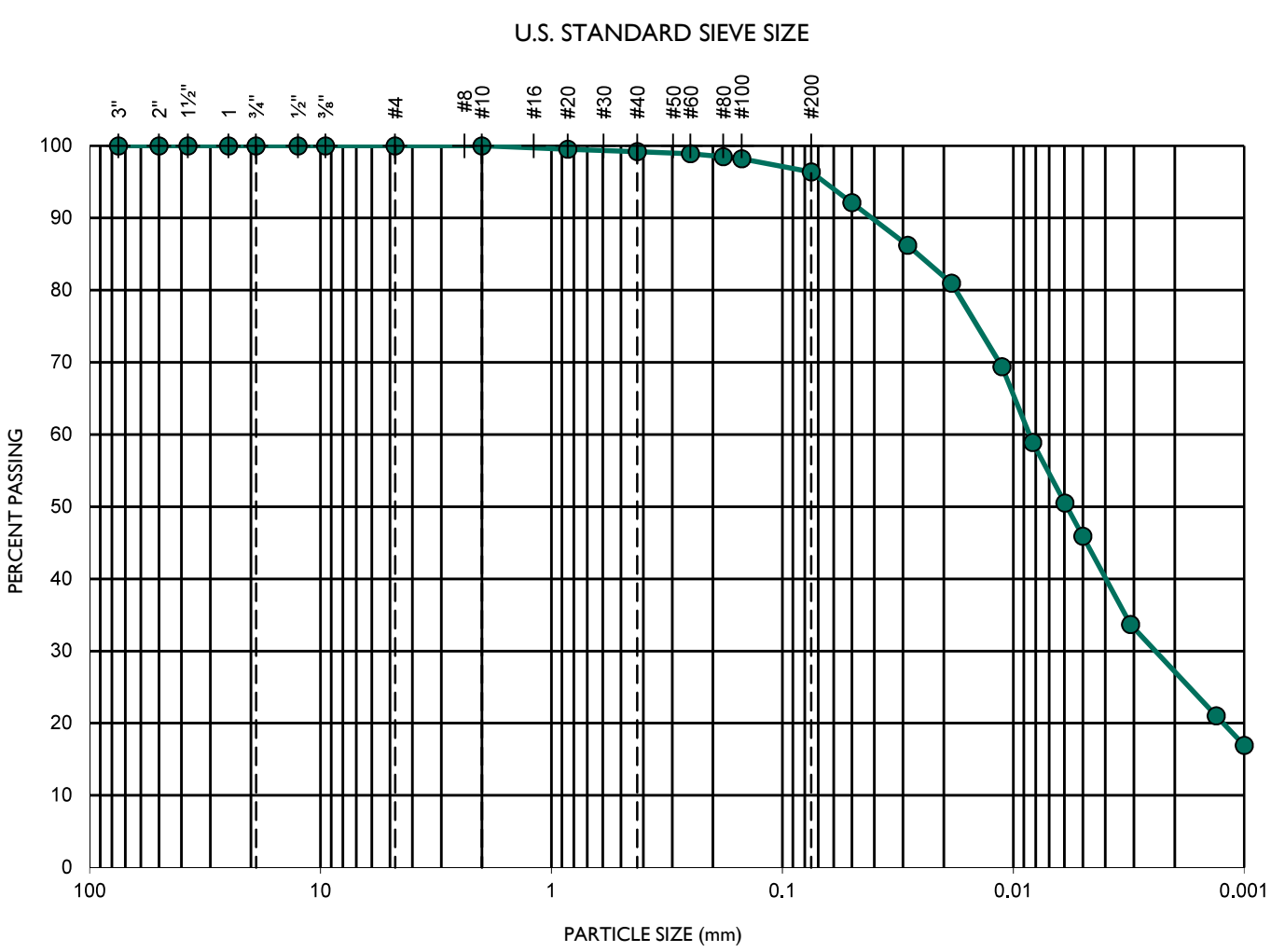
PROJECT NO.: 06847-42-04

SAMPLE NO.: **B1 @ 161-164**

SAMPLE DEPTH (FT.): **161-164**

GEOLOGIC UNIT: **Shear Zone**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.00046	0.00259	0.00854	1.7	18.6	Silty CLAY

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SIEVE ANALYSES - ASTM D 135 & D 422

SOUTHWEST VILLAGE

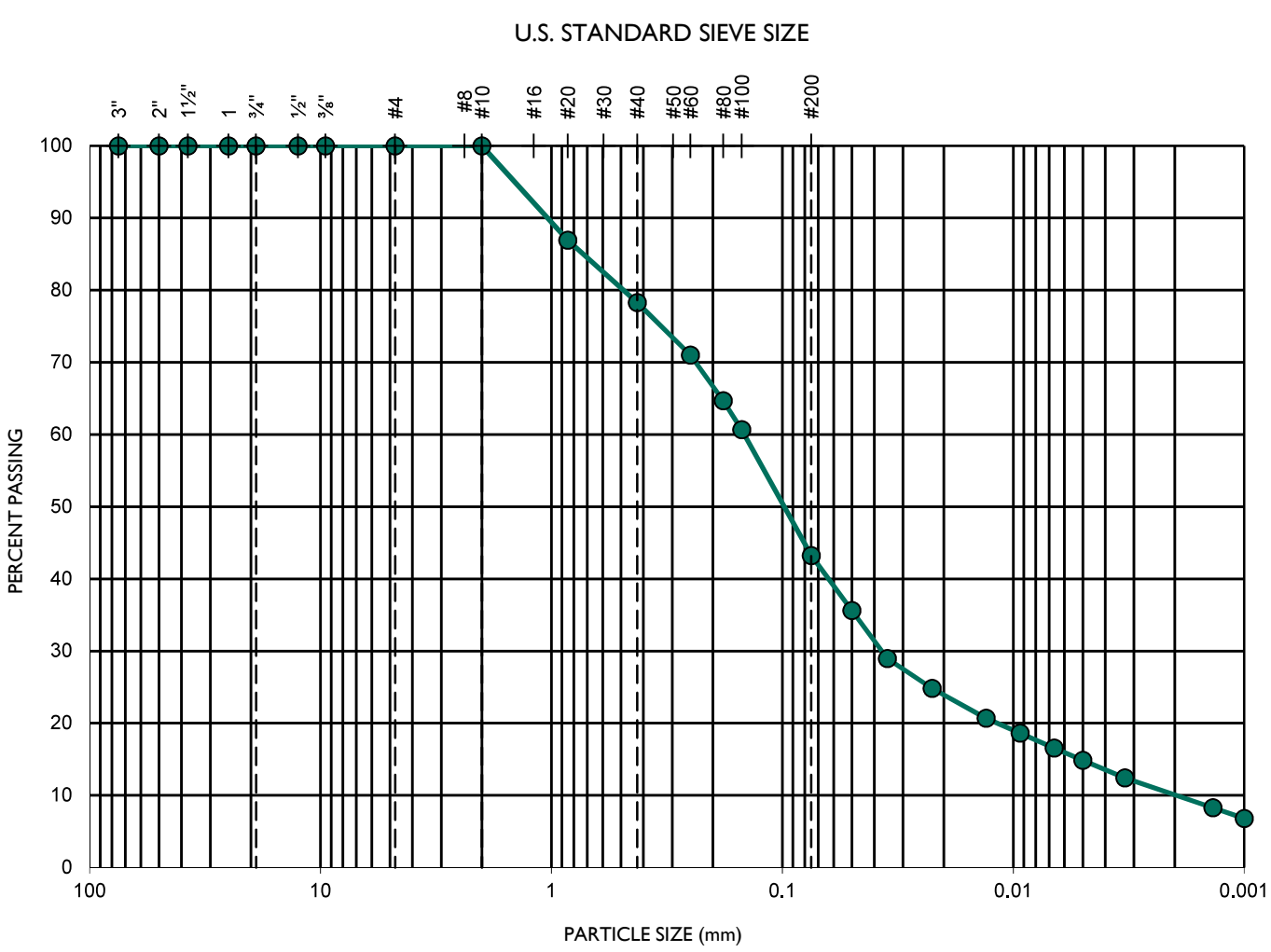
PROJECT NO.: 06847-42-04

SAMPLE NO.: **B2 @ 263**

SAMPLE DEPTH (FT.): **263**

GEOLOGIC UNIT: **Shear Zone**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.00217	0.03745	0.14714	4.4	67.8	Silty SAND

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SIEVE ANALYSES - ASTM D 135 & D 422

SOUTHWEST VILLAGE

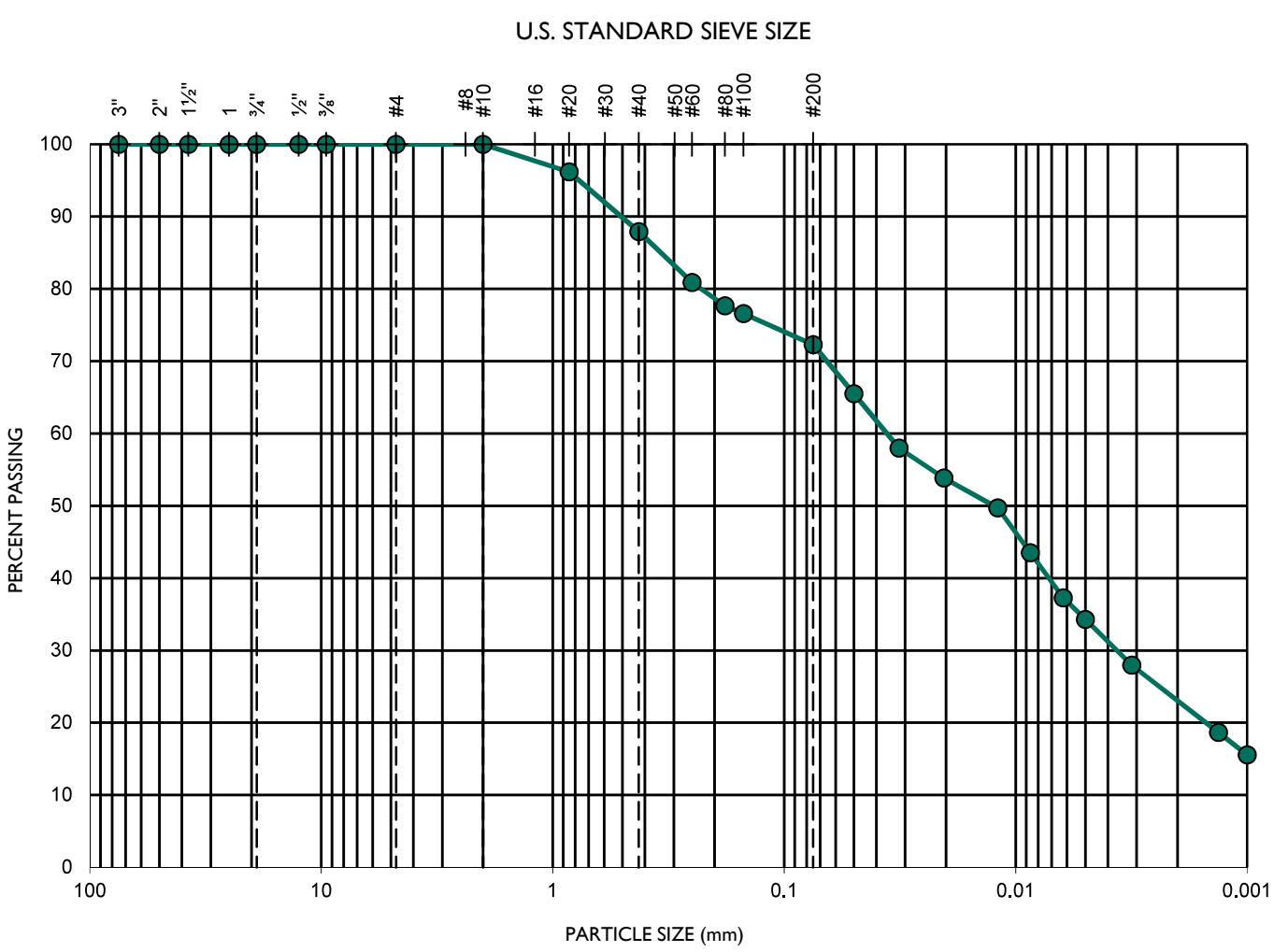
PROJECT NO.: 06847-42-04

SAMPLE NO.: **B3 @ 324**

SAMPLE DEPTH (FT.): **324**

GEOLOGIC UNIT: **Shear Zone**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.00040	0.00375	0.03673	0.9	90.8	Silty CLAY with sand

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SIEVE ANALYSES - ASTM D 135 & D 422

S0UTHWEST VILLAGE

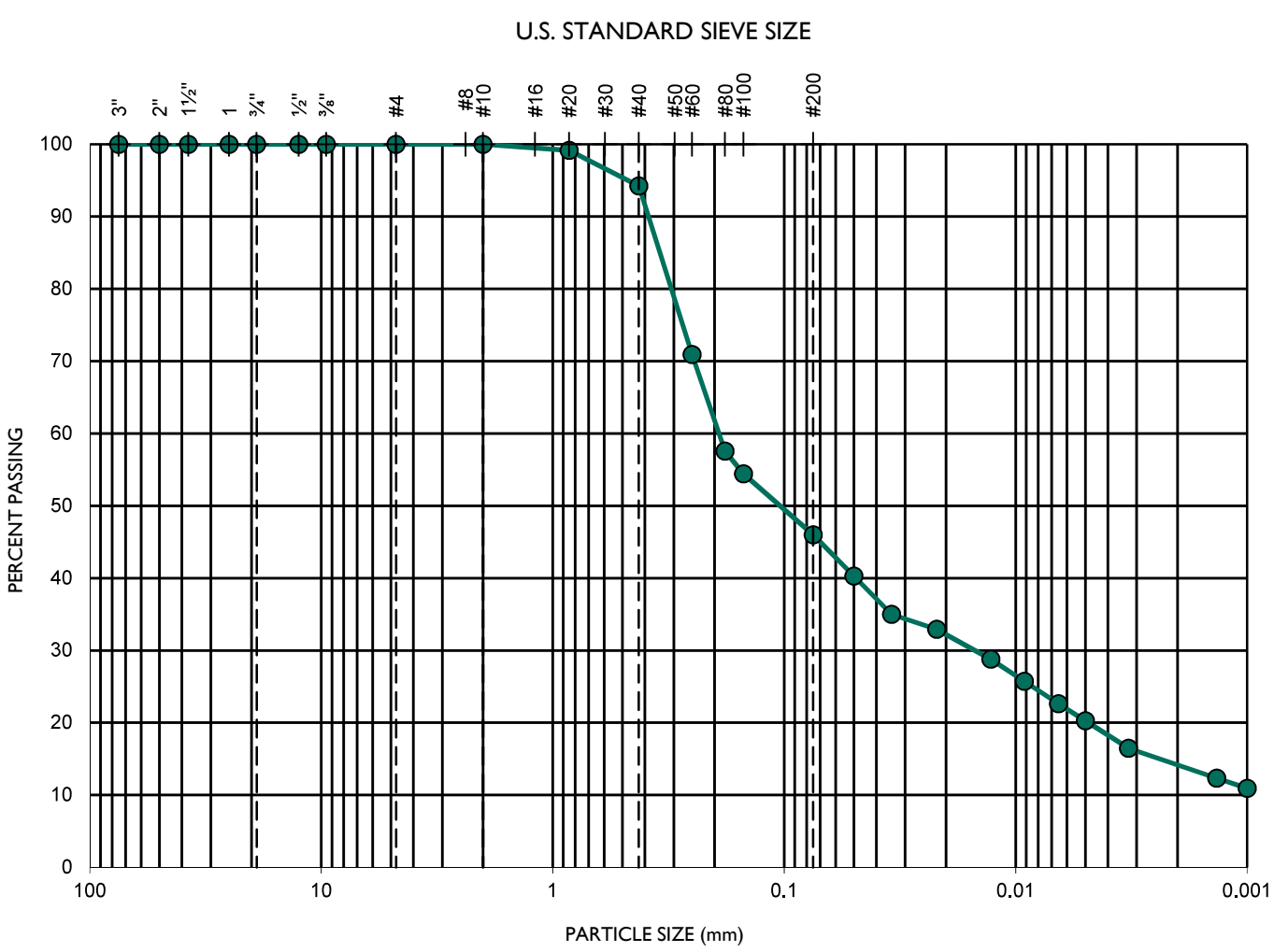
PROJECT NO.: 06847-42-04

SAMPLE NO.: **B3 @ 328-330**

SAMPLE DEPTH (FT.): **328-330**

GEOLOGIC UNIT: **Shear Zone**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.00077	0.01546	0.19277	1.6	250.6	Silty Clayey SAND

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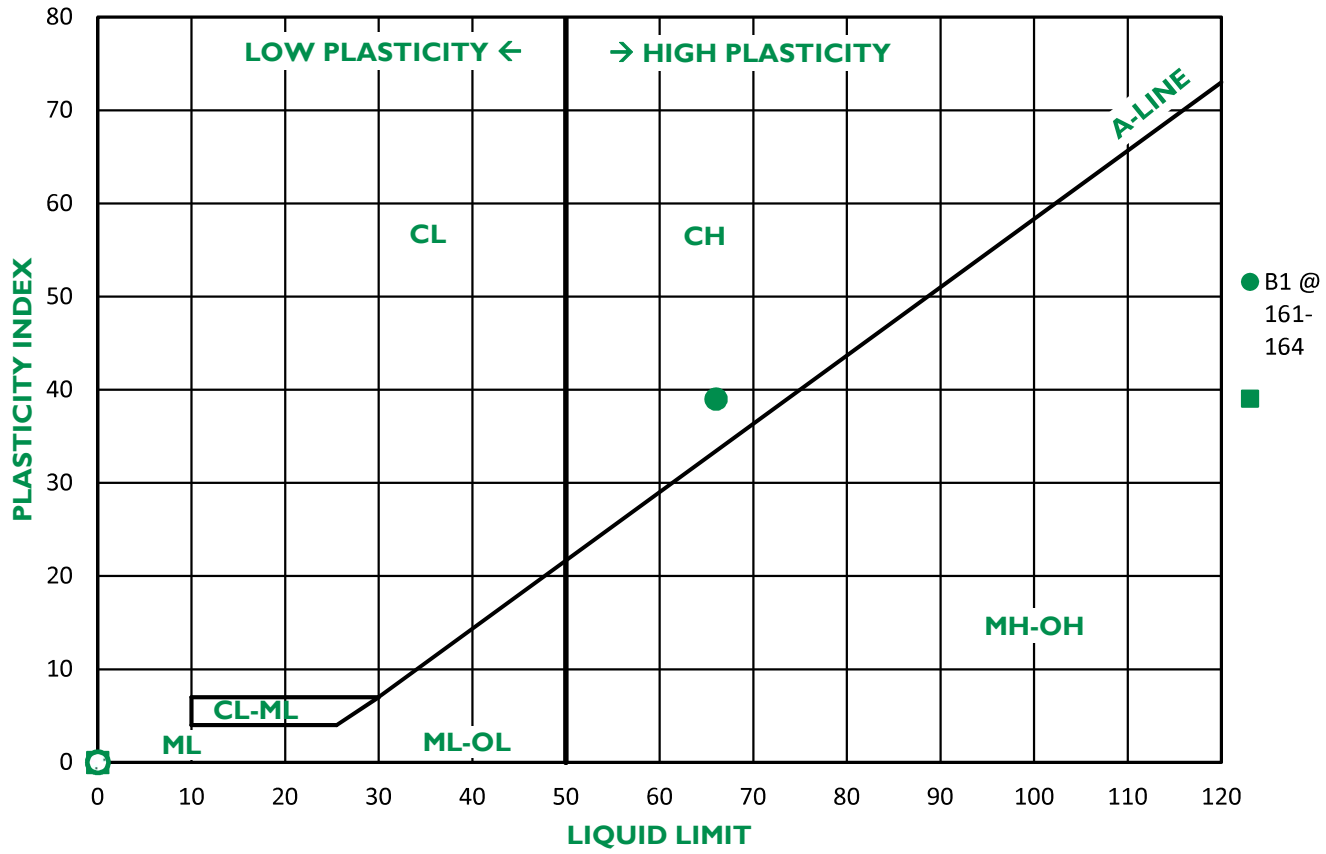
SIEVE ANALYSES - ASTM D 135 & D 422

SOUTHWEST VILLAGE

PROJECT NO.: 06847-42-04

TEST RESULTS					
SAMPLE NO.	GEOLOGIC UNIT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SOIL TYPE
B1 @ 161-164	Shear Zone	66	27	39	CH



SOIL TYPE DESCRIPTION	
CH	High-Plasticity Clay
CL	Low-Plasticity Clay
ML	Low-Plasticity Silt
CL-ML	Low-Plasticity Clay to Low-Plasticity Silt
MH-OH	High-Plasticity Silt to High-Plasticity, Organic Silt
ML-OL	Low-Plasticity Silt to Low-Plasticity, Organic Silt

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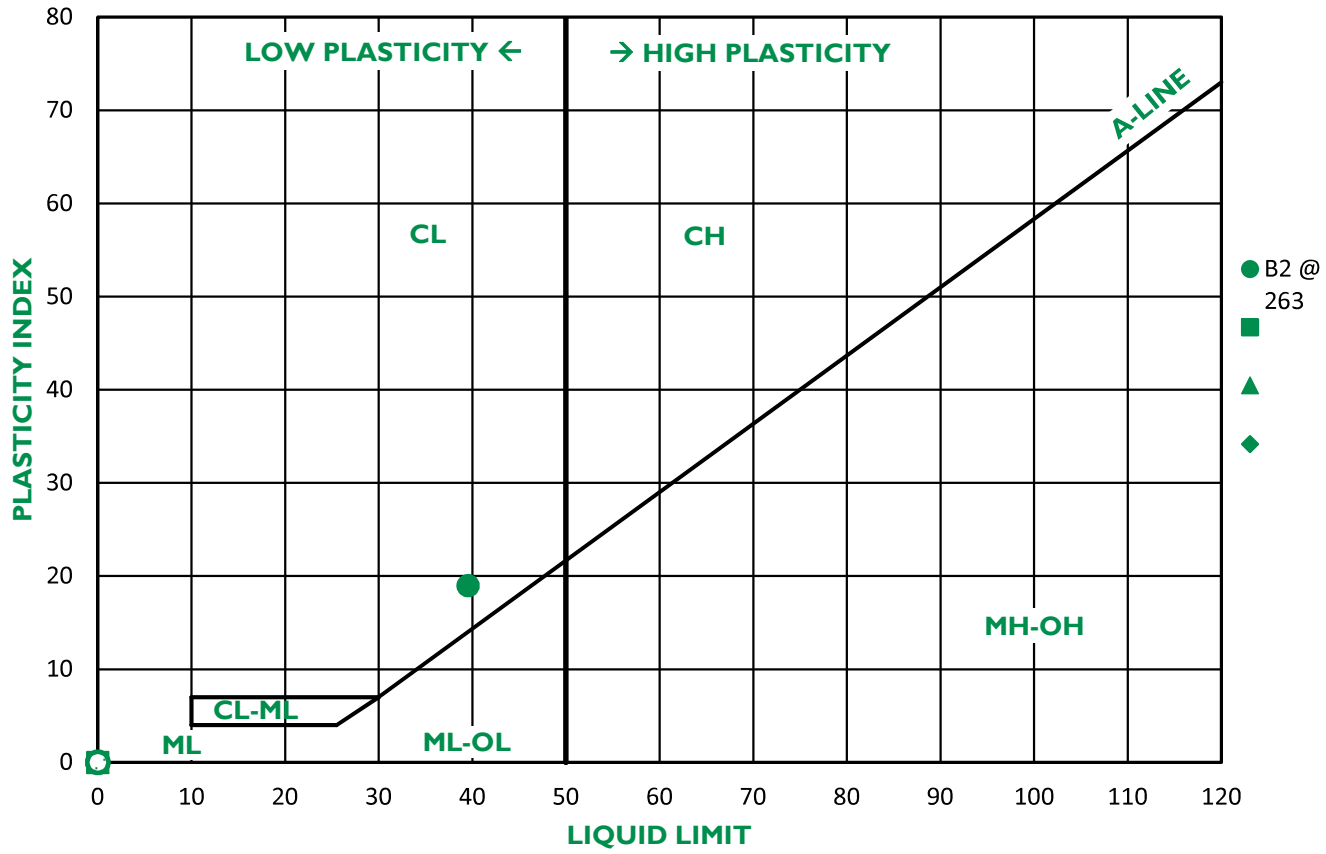
PLASTICITY INDEX - ASTM D 4318

Southwest Village

PROJECT NO.: 06847-42-04

TEST RESULTS					
SAMPLE NO.	GEOLOGIC UNIT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SOIL TYPE
B2 @ 263	Shear Zone	40	21	19	CL



SOIL TYPE DESCRIPTION	
CH	High-Plasticity Clay
CL	Low-Plasticity Clay
ML	Low-Plasticity Silt
CL-ML	Low-Plasticity Clay to Low-Plasticity Silt
MH-OH	High-Plasticity Silt to High-Plasticity, Organic Silt
ML-OL	Low-Plasticity Silt to Low-Plasticity, Organic Silt

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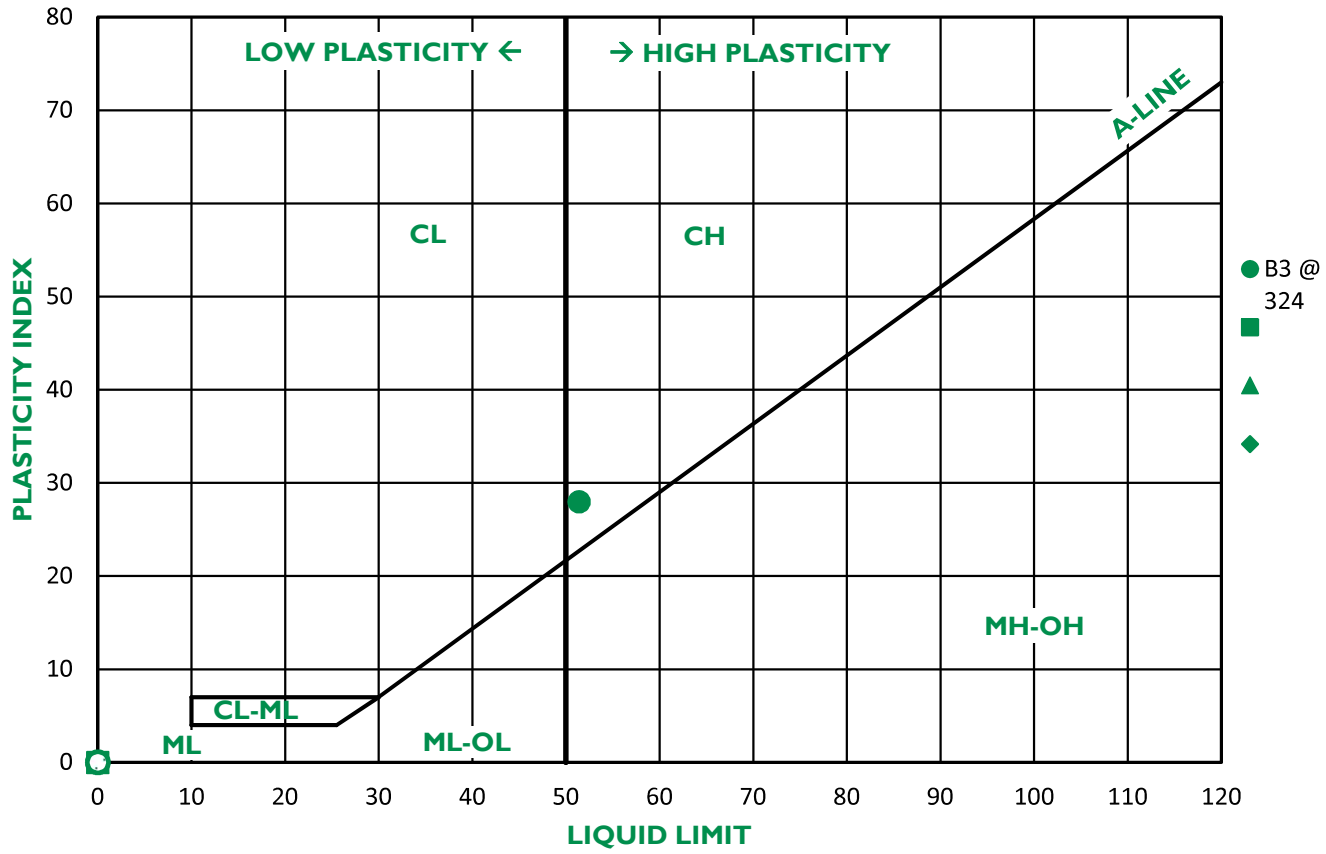
PLASTICITY INDEX - ASTM D 4318

SOUTHWEST VILLAGE

PROJECT NO.: 06847-42-04

TEST RESULTS					
SAMPLE NO.	GEOLOGIC UNIT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SOIL TYPE
B3 @ 324	SHEAR ZONE	51	23	28	CH



SOIL TYPE DESCRIPTION	
CH	High-Plasticity Clay
CL	Low-Plasticity Clay
ML	Low-Plasticity Silt
CL-ML	Low-Plasticity Clay to Low-Plasticity Silt
MH-OH	High-Plasticity Silt to High-Plasticity, Organic Silt
ML-OL	Low-Plasticity Silt to Low-Plasticity, Organic Silt

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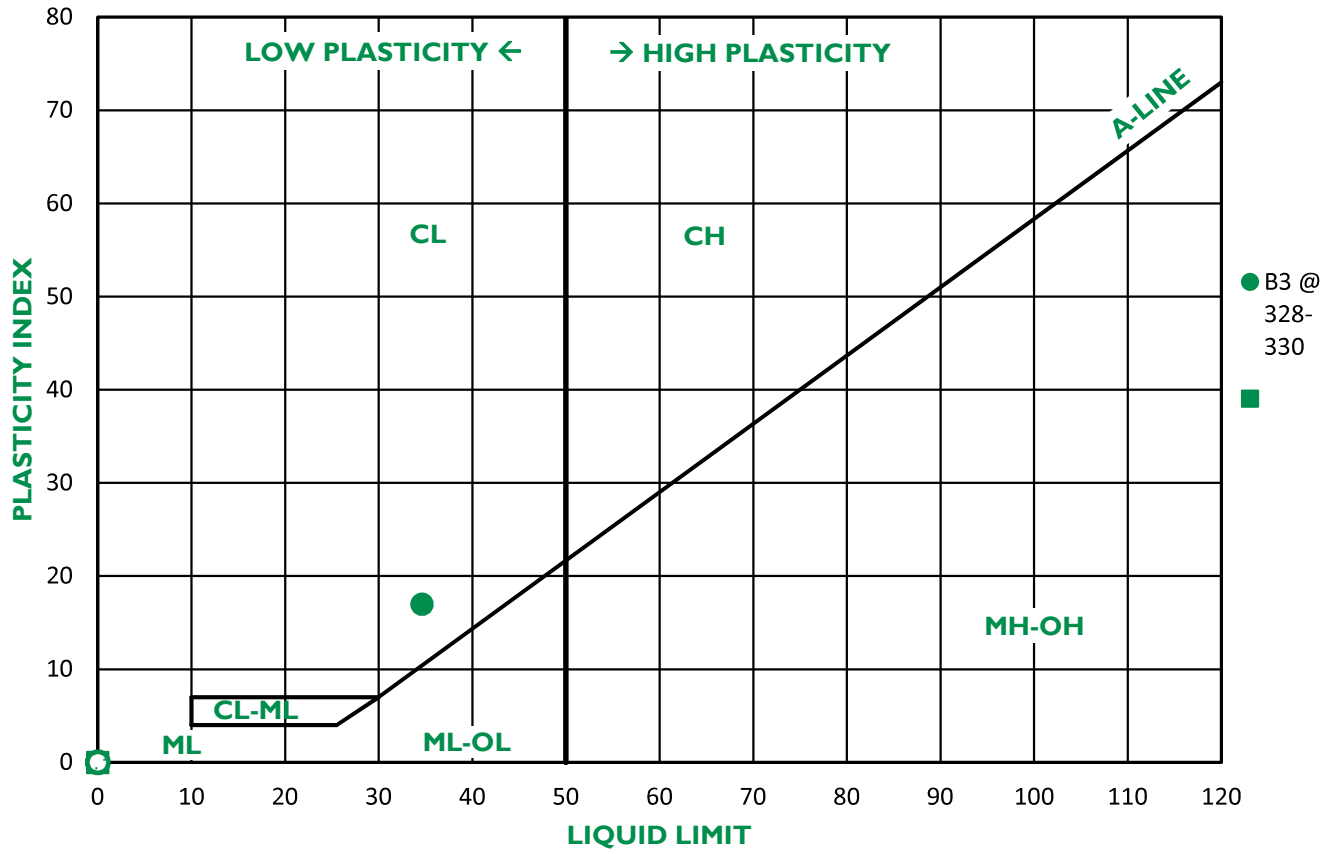
PLASTICITY INDEX - ASTM D 4318

SOUTHWEST VILLAGE

PROJECT NO.: 06847-42-04

TEST RESULTS					
SAMPLE NO.	GEOLOGIC UNIT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SOIL TYPE
B3 @ 328-330	Shear Zone	35	18	17	CL



SOIL TYPE DESCRIPTION	
CH	High-Plasticity Clay
CL	Low-Plasticity Clay
ML	Low-Plasticity Silt
CL-ML	Low-Plasticity Clay to Low-Plasticity Silt
MH-OH	High-Plasticity Silt to High-Plasticity, Organic Silt
ML-OL	Low-Plasticity Silt to Low-Plasticity, Organic Silt

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PLASTICITY INDEX - ASTM D 4318

SOUTHWEST VILLAGE

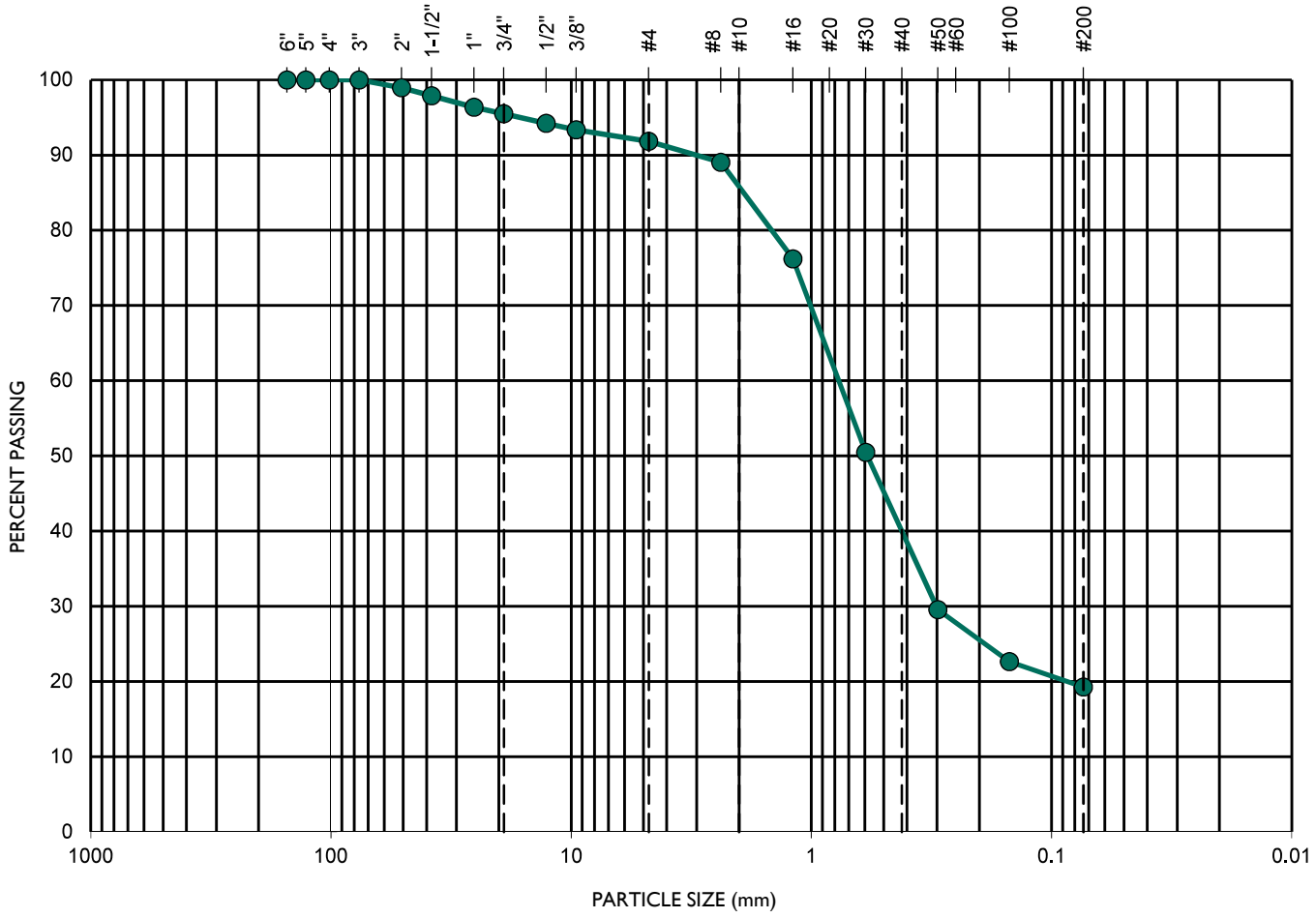
PROJECT NO.: 06847-42-04

SAMPLE NO.: **Perm-1**

SAMPLE DEPTH (FT.): **0**

GEOLOGIC UNIT: **Qt**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.038	0.303	0.816	2.9	21.3	SM - Silty SAND

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SIEVE ANALYSES - ASTM D 135

SOUTHWEST VILLAGE

PROJECT NO.: 06847-42-04

APPENDIX

APPENDIX B

HYDRAULIC CONDUCTIVITY TESTING

We performed hydraulic conductivity testing on the mesa in the development area and at each of the proposed storm water outfalls. The tests were performed in 4- and 6-inch-diameter, drilled boreholes. We also performed a laboratory permeability test on a remolded sample of soil obtained from the mesa. Tables B-1 and B-2 presents the results of the testing. Figure B-1 shows the locations of the tests.

TABLE B-1
HYDRAULIC CONDUCTIVITY TEST RESULTS PERFORMED ON THE MESA

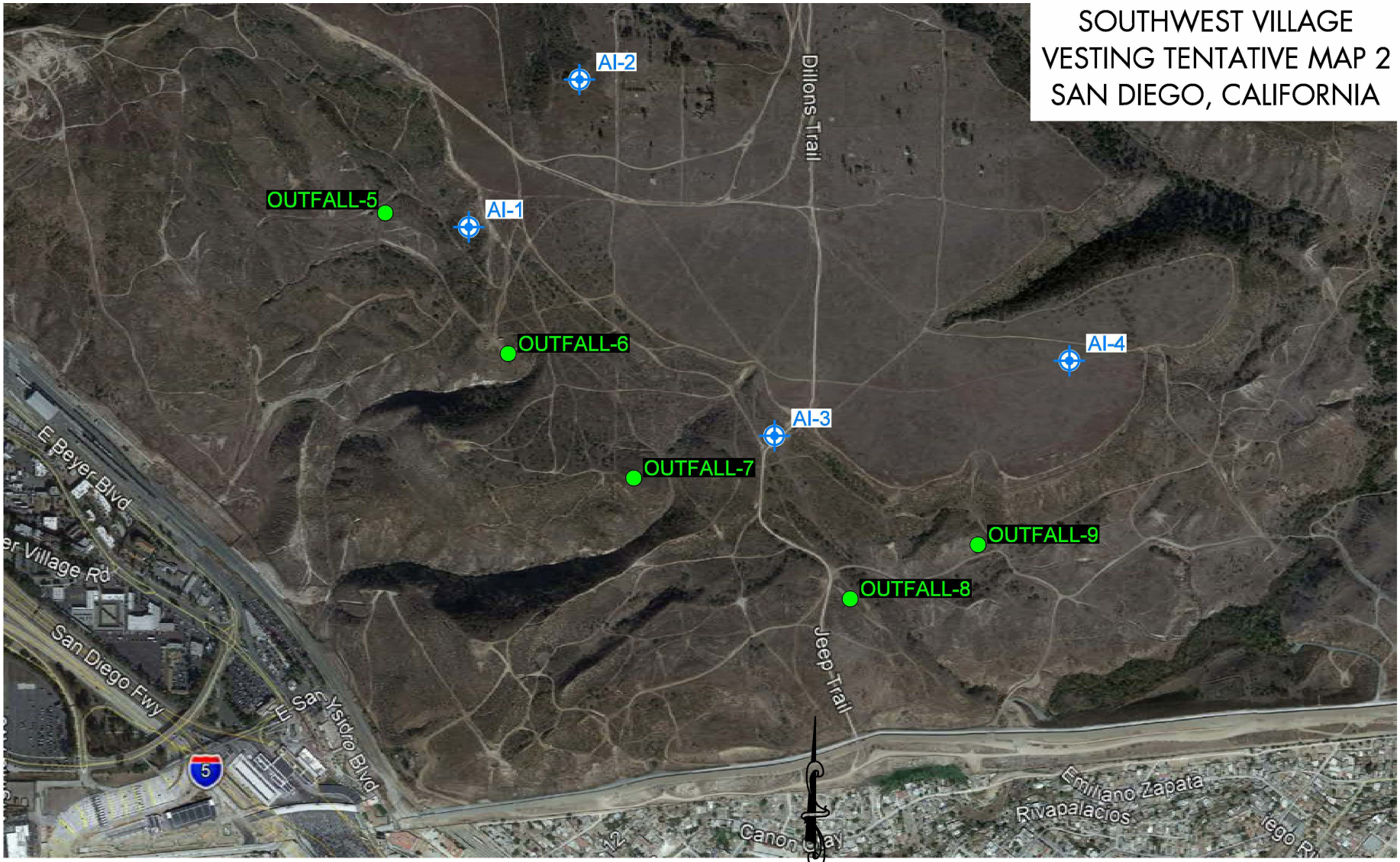
Location	Depth (feet)	Geologic Unit	Hydraulic Conductivity k (in/hr)
A-1	5	Topsoil/Qt	0.007
A-2	5	Qt	0.049
A-3	5	Qt	0.018
A-4	5	Qt	0.004
Lab Permeability	--	Remolded Sample	0.86

TABLE B-2
HYDRAULIC CONDUCTIVITY TEST RESULTS PERFORMED AT OUTFALLS

Location	Depth (feet)	Geologic Unit	Hydraulic Conductivity k (in/hr)
Outfall 5	5	Qls	0.011
Outfall 6	5	Qls	0.0009
Outfall 7*	3.3	Qls	0.0004
Outfall 8	4	Qls	0.008
Outfall 9	4.5	Qls	0.004

* Actual Location Slightly West of Outfall 7

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP 2
SAN DIEGO, CALIFORNIA



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GEOCON LEGEND

AI-4 .....APPROX. LOCATION OF INFILTRATION TEST

0' 1,000' 2,000'

SCALE 1"= 1,000' (On 8.5x11)

INFILTRATION TEST LOCATION MAP

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PROJECT NO. 06847 - 42 - 04
FIGURE B-1
DATE 07 - 02 - 2021

Plotted:07/01/2021 8:27AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\06847-42-04 Southwest Village and Burrow Site\Appendix C\06847-42-04 InfiltrationTestLocationMap.dwg

APPENDIX

APPENDIX C

SLOPE STABILITY ANALYSIS

FOR

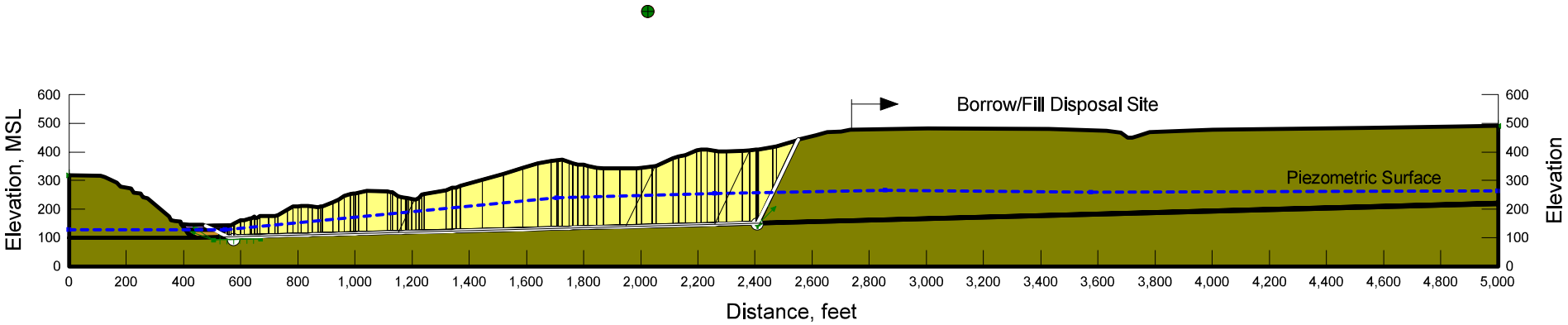
SOUTHWEST VILLAGE VTM-2
SAN DIEGO, CALIFORNIA

PROJECT NO. 06847-42-04

Southwest Village
Project No. 06847-42-04
Cross Section: CC-CC'

Analysis:
– Failure Up Headscarp

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qal	125	100	28	1
	Qcf	130	300	30	1
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To	130	450	34	1
	To (2)				1



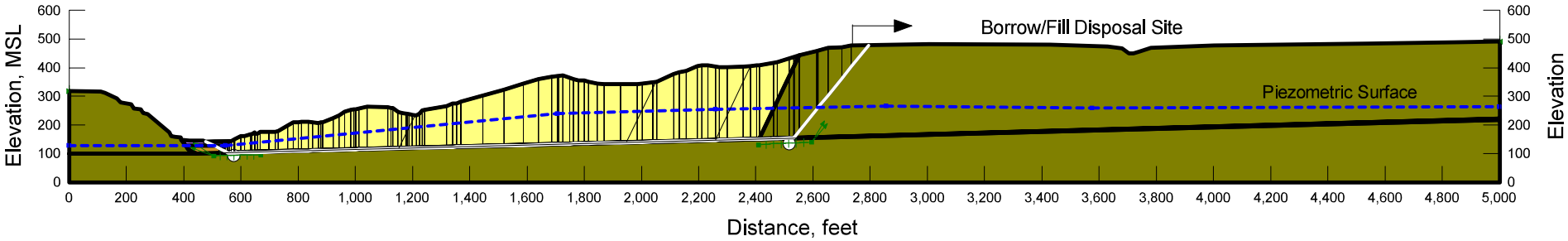
File Name: CC-CC' (headscarp).gsz

Figure C-1

Southwest Village
Project No. 06847-42-04
Cross Section: CC-CC'

Analysis:
– Failure along Extended Shear Plane

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qal	125	100	28	1
	Qcf	130	300	30	1
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To	130	450	34	1
	To (2)				1



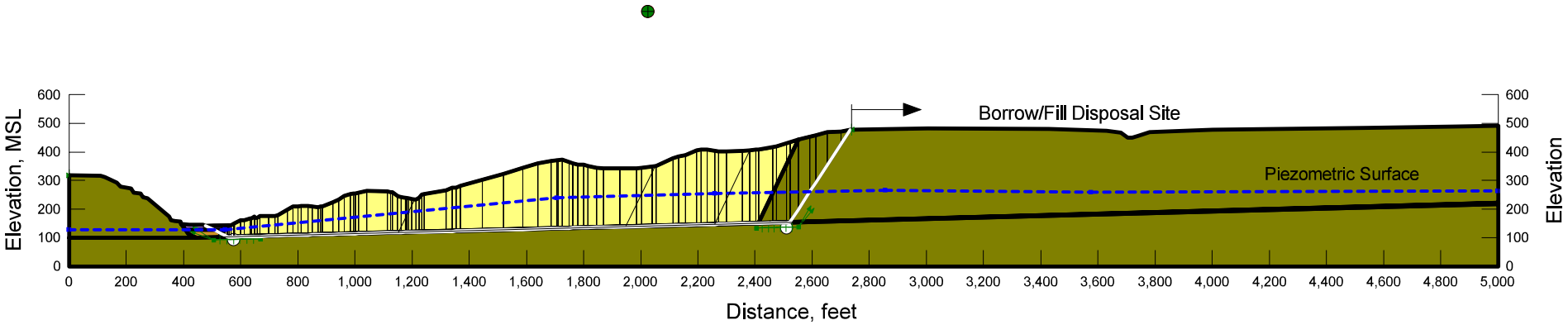
File Name: CC-CC' (Extended Shear Plane).gsz

Figure C-2

Southwest Village
Project No. 06847-42-04
Cross Section: CC-CC'

Analysis:
– Failure at Edge of Borrow/Disposal Site

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qal	125	100	28	1
	Qcf	130	300	30	1
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To	130	450	34	1
	To (2)				1



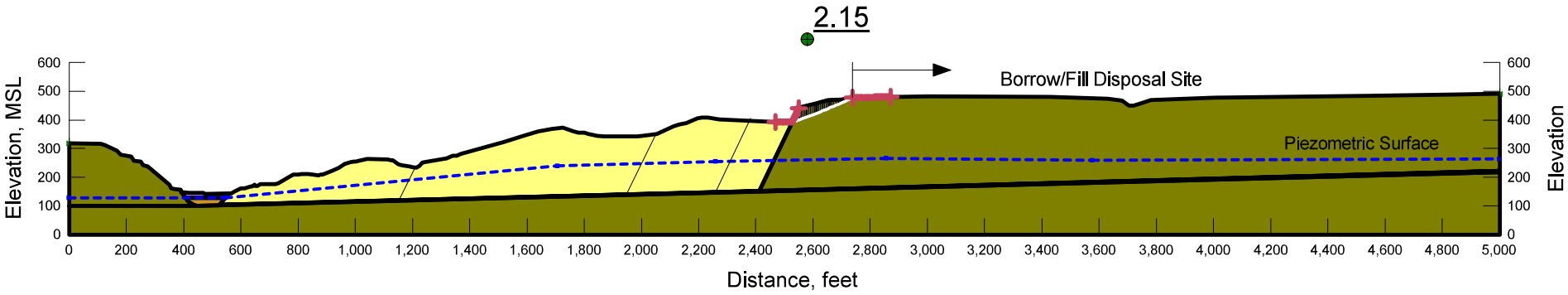
File Name: CC-CC' (edge of borrow site).gsz

Figure C-3

Southwest Village
Project No. 06847-42-04
Cross Section: CC-CC'

Analysis:
– 50 foot drop in landslide

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qal	125	100	28	1
	Qcf	130	300	30	1
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To	130	450	34	1
	To (2)				1



File Name: CC-CC' (50 foot drop in landslide).gsz

Figure C-4

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project Southwest Village **Computed By** RCM
Project Number 06847-42-04
Date 07/02/21

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.21	10% in 50 years
Modal Magnitude, M	6.12	
Modal Distance, r, km	11.5	
Site Condition, S (0 for rock, 1 for soil)	0	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	1500	<--
Max Vertical Distance, H (Feet)	336	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	Y	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	0.8	
Duration, $D_{5-95}\|_{med}$, sec	6.730	
Coefficient, C_1	0.4110	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0021	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.445	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.4811
k_{EQ} = feq(MHA_r)/g	0.101
Factor of Safety in Slope Analysis Using k_{EQ}	0.77

Fails Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	0.896
T_s/T_m	2.01
MHEA/(MHA*NRF)	0.248
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.20
MHEA/g	0.06
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA

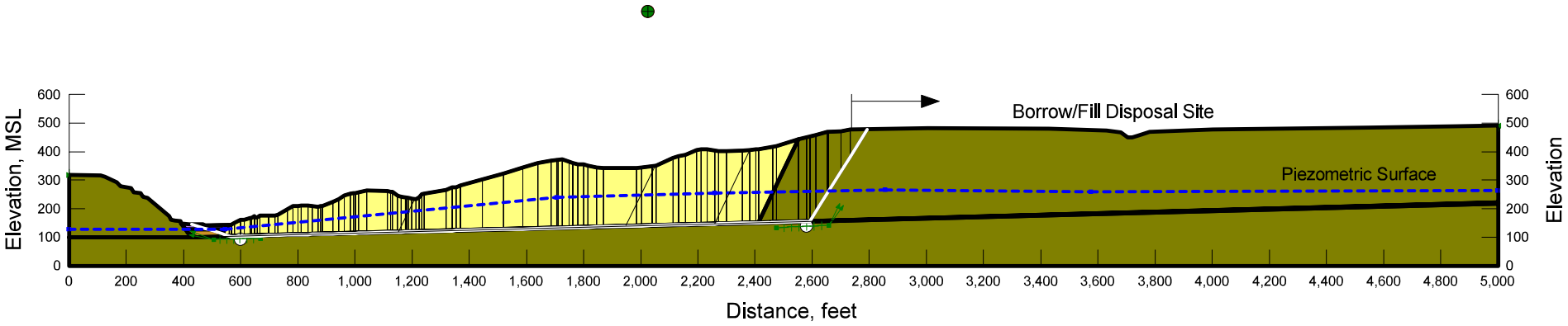
Estimated Displacement, u (cm) NA

FIGURE C-5

Southwest Village
Project No. 06847-42-04
Cross Section: CC-CC'

Analysis:
– Seismic Analysis: Horz Seismic Coef.: 0.101

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qal	125	100	28	1
	Qcf	130	300	30	1
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To	130	450	34	1
	To (2)				1



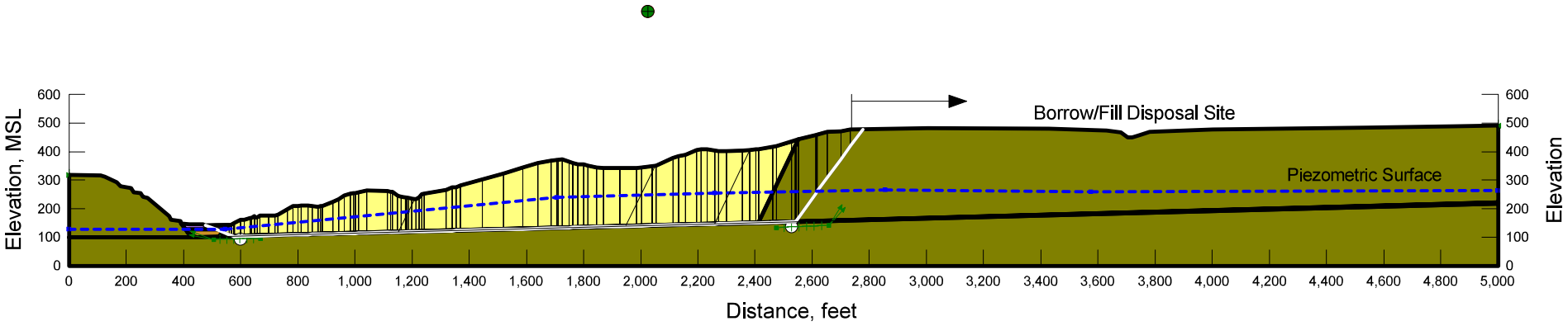
File Name: CC-CC' (Seismic).gsz

Figure C-6

Southwest Village
Project No. 06847-42-04
Cross Section: CC-CC'

Analysis:
- Seismic for FS=1.0
- Horz Seismic Coef.: 0.05

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qal	125	100	28	1
	Qcf	130	300	30	1
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To	130	450	34	1
	To (2)				1



File Name: CC-CC' (Seismic for FS=1).gsz

Figure C-7

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project Southwest Village **Computed By** RCM
Project Number 06847-42-04
Date 07/02/21
Filename Seismic

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.21	10% in 50 years
Modal Magnitude, M	6.12	
Modal Distance, r, km	11.5	
Site Condition, S (0 for rock, 1 for soil)	0	
Yield Acceleration, k_y/g	0.05	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	1500	<--
Max Vertical Distance, H (Feet)	336	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	Y	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	0.8	
Duration, $D_{5-95}\|_{med}$, sec	6.730	
Coefficient, C_1	0.4110	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0021	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.445	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	0.2381
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.4811
k_{EQ} = feq(MHA_r)/g	0.101
Factor of Safety in Slope Analysis Using k_{EQ}	0.77

Fails Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	0.896
T_s/T_m	2.01
MHEA/(MHA*NRF)	0.248
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.20
MHEA/g	0.06
k_y/MHEA = k_y/k_{max}	0.80
Normalized Displacement, Normu	0.1
Estimated Displacement, u (cm)	**0**

FIGURE C-8

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project Southwest Village
Project Number 06847-42-04
Date 07/02/21
Filename Seismic

Computed By RCM

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.21	10% in 50 years
Modal Magnitude, M	6.12	
Modal Distance, r, km	11.5	
Site Condition, S (0 for rock, 1 for soil)	0	
Yield Acceleration, k_y/g	0.05	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	1500	<--
Max Vertical Distance, H (Feet)	80	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	Y	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	0.8	
Duration, $D_{5-95}\|_{med}$, sec	6.730	
Coefficient, C_1	0.4110	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0021	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.445	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	0.2381
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.4811
k_{EQ} = feq(MHA_r)/g	0.101
Factor of Safety in Slope Analysis Using k_{EQ}	0.77

Fails Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	0.213
T_s/T_m	0.48
MHEA/(MHA*NRF)	0.762
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.20
MHEA/g	0.19
k_y/MHEA = k_y/k_{max}	0.26
Normalized Displacement, Normu	9.2
Estimated Displacement, u (cm)	**12**

FIGURE C-9

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

32.5545

Time Horizon

Return period in years

475

Longitude

Decimal degrees, negative values for western longitudes

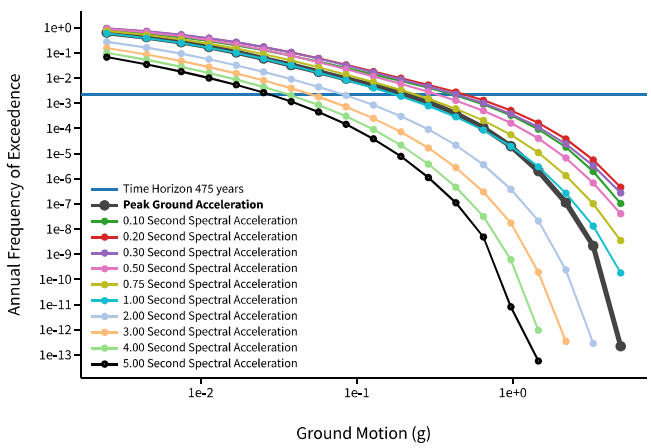
-117.0258

Site Class

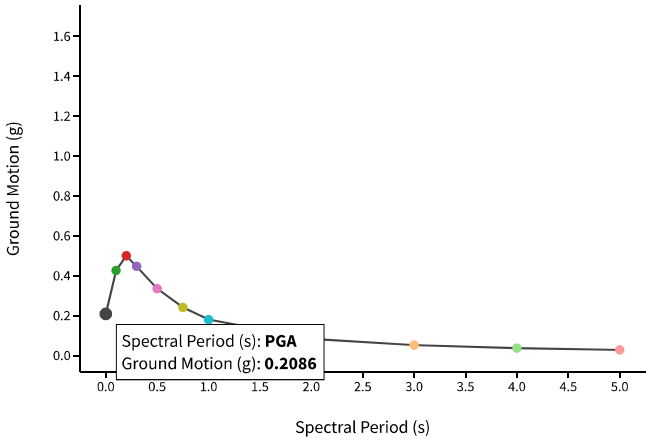
537 m/s (Site class C)

Hazard Curve

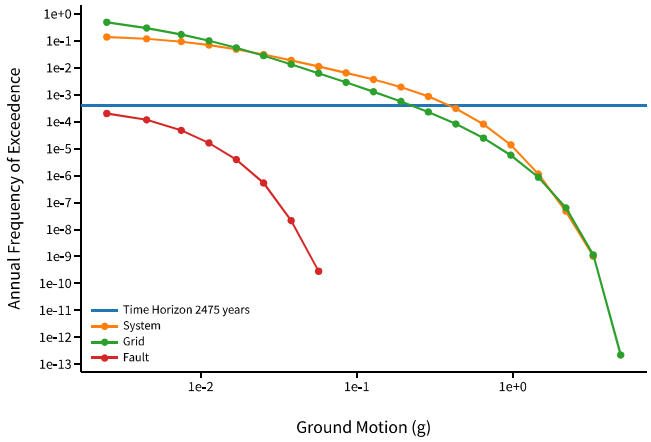
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

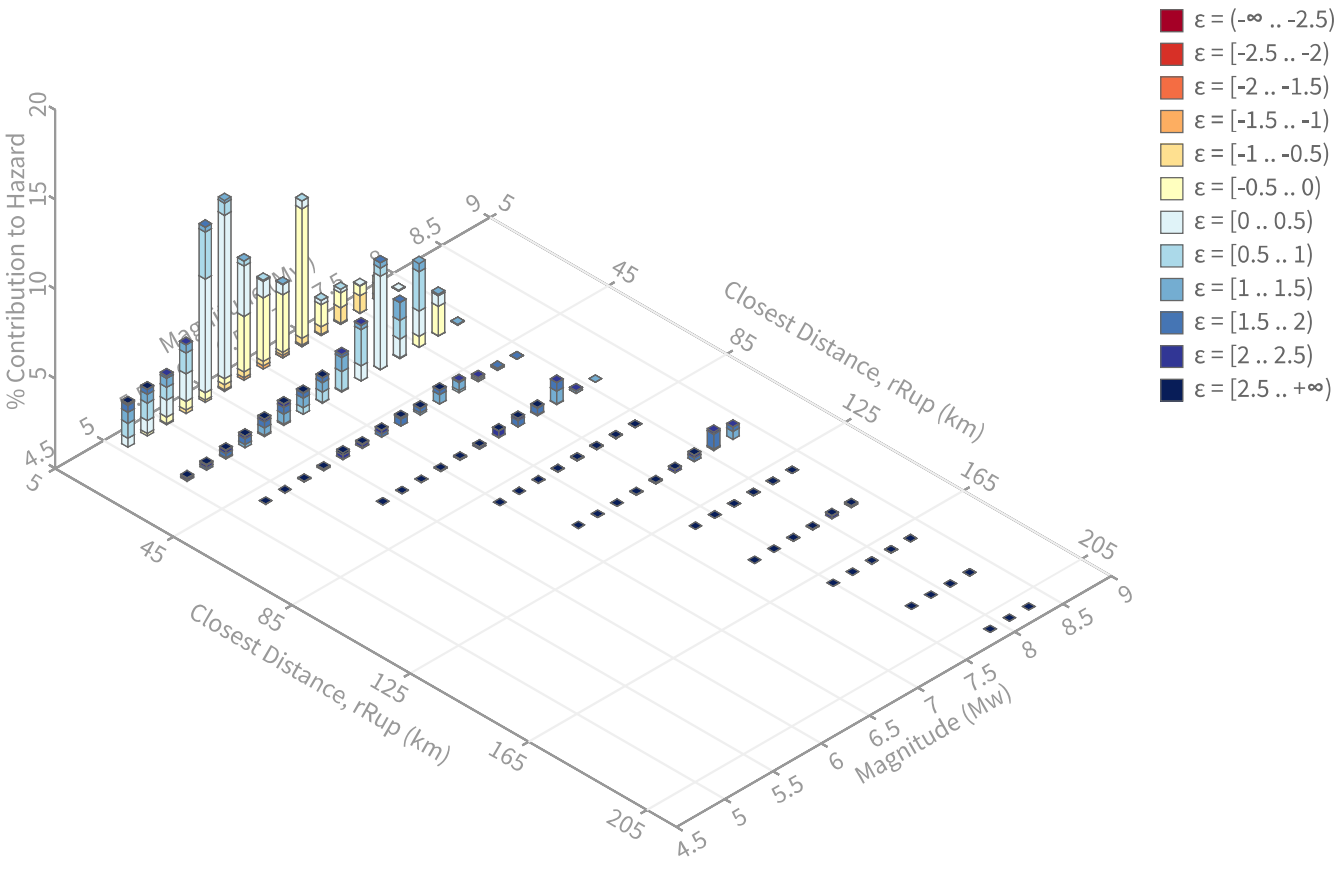


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 475 yrs
Exceedance rate: 0.0021052632 yr^{-1}
PGA ground motion: 0.20861892 g

Recovered targets

Return period: 487.51271 yrs
Exceedance rate: 0.0020512286 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.23 %

Mean (over all sources)

m: 6.58
r: 22.27 km
ε_0: 0.43 σ

Mode (largest m-r bin)

m: 6.12
r: 11.76 km
ε_0: 0.2 σ
Contribution: 10.64 %

Mode (largest m-r-ε_0 bin)

m: 6.12
r: 11.53 km
ε_0: 0.2 σ
Contribution: 9.11 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31	System							39.80
Rose Canyon [0]		11.42	6.36	0.01	117.147°W	32.551°N	267.92	18.70
Coronado Bank alt1 [13]		22.75	7.08	0.41	117.234°W	32.450°N	239.35	6.39
San Diego Trough south [1]		39.15	7.33	0.99	117.397°W	32.395°N	243.08	2.37
Rose Canyon [3]		15.45	6.50	0.33	117.161°W	32.634°N	304.97	1.34
Rose Canyon [1]		11.60	6.97	-0.41	117.148°W	32.568°N	277.27	1.21
Rose Canyon [2]		12.81	6.85	-0.19	117.150°W	32.601°N	294.08	1.01
UC33brAvg_FM32	System							38.23
Rose Canyon [0]		11.42	6.39	-0.02	117.147°W	32.551°N	267.92	17.62
Coronado Bank alt2 [25]		22.75	7.39	0.18	117.233°W	32.448°N	238.72	5.03
San Diego Trough south [1]		39.15	7.33	1.00	117.397°W	32.395°N	243.08	2.33
Oceanside alt2 [0]		19.58	7.39	-0.21	117.357°W	32.560°N	271.13	1.66
Rose Canyon [1]		11.60	6.91	-0.36	117.148°W	32.568°N	277.27	1.25
Rose Canyon [3]		15.45	6.58	0.27	117.161°W	32.634°N	304.97	1.10
UC33brAvg_FM32 (opt)	Grid							10.89
PointSourceFinite: -117.026, 32.604		7.42	5.63	-0.12	117.026°W	32.604°N	0.00	1.15
PointSourceFinite: -117.026, 32.604		7.42	5.63	-0.12	117.026°W	32.604°N	0.00	1.13
UC33brAvg_FM31 (opt)	Grid							10.76
PointSourceFinite: -117.026, 32.604		7.43	5.63	-0.12	117.026°W	32.604°N	0.00	1.16
PointSourceFinite: -117.026, 32.604		7.43	5.63	-0.12	117.026°W	32.604°N	0.00	1.14

APPENDIX

APPENDIX D

GROUNDWATER EVALUATION BY DUDEK & ASSOCIATES

FOR

SOUTHWEST VILLAGE VTM-2
SAN DIEGO, CALIFORNIA

PROJECT NO. 06847-42-04

June 22, 2021 13330

David Evans
Vice President/Senior Geologist
Geocon Incorporated
6990 Flanders Drive
San Diego, CA 92127

Subject: Initial Assessment of Groundwater Conditions at the Southwest Village Site, Otay Mesa and Surrounding Areas, San Diego County

Dear Mr. Evans:

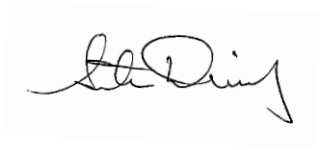
This report is prepared at Geocon's request to address groundwater conditions that relate to slope stability calculations and evaluation of landslide topography for the purposed Southwest Village Project (Project, or VTM-1). The Project site occupies a large mesa situated east of highway 805, south of highway 905, and north of the US-Mexico border (Figure 1). The study area includes the Project site and adjacent slopes southwest, south, and southeast of the mesa. These slopes include a known complex of landslides.

Geocon has conducted, and continues geotechnical investigation including mapping, drilling, trenching, soil sampling, permeameter testing, groundwater measurements, and laboratory soils testing for the project. This includes geotechnical characterization and slope stability assessment for the landslides adjacent to the Project. Figure 1 shows Geocon's delineation of three landslide complex groups adjacent to the proposed development site. These are Landslides A, B, and C. The principal area addressed to date by Geocon's work is Landslide A. The findings of this initial groundwater assessment are summarized as follows:

- Few data points exist at present to characterize Otay Mesa groundwater conditions. The groundwater observations found for this report are summarized in Table 1. These data include a wide time span of observations from 1955 to present, and include some wells which no longer exist. An area with more groundwater level detail is Landslide A, due to Geocon's geotechnical investigations in 2001 and current work of 2020 and 2021.
- Groundwater is present under the Mesa, and as expected is present at shallow depths at the base of slope at the west edge of the Mesa, where the older rocks that form the Mesa contact more porous alluvial deposits of the Tijuana River valley which extend west to the ocean. A profile of three core borings drilled in Landslide A by Geocon documents the groundwater slope in the Otay Formation rising from approximately 40 feet below terrain (elev 52', NAVD88) near base of slope gradually to 193 feet below terrain (elev 170') west of the Landslide A headscarp. Depth to groundwater under the Mesa surface in the Project area is not clearly delineated, but may occur at approximately 300 foot depth (elev 184 ft) based on "first water" encountered when a agricultural well was drilled in the Project area in 1961. This well is presently filled with debris, and because of its 1245 foot depth may blend groundwater pressures from several depth zones.

- The undisturbed sedimentary strata east and north of the landslide masses identified in Figure 1 consist of generally horizontal rocks lying beneath marine terrace deposits and associated well developed soil horizons that cap the Mesa. Beneath the terrace deposits and associated soils are San Diego formation and Otay formation (oldest). The Otay formation rocks, as encountered within Landslide A in Geocon coreholes 1, 2, and 3 are predominantly fractured sandstone, siltstone, and claystone. Where undisturbed outside of the slide complexes, it is expected that the strong horizontal layering inhibits vertical infiltration of groundwater. Such layering can cause development of pockets of groundwater perched above the regional water table.
- At present, there are insufficient monitoring points within and bordering the landslide complexes surrounding the Project to create a groundwater elevation contour map to accurately determine flow directions and groundwater slope, or to determine vertical groundwater pressure gradients which may be important to assessing landslide mass stability.
- A groundwater monitoring well (Corehole 3) which was constructed within Landslide A terminates above the basal shear zone which occurs at Elevation 29-33 (NAVD88). Because of the thickness and apparent continuity of the basal shear as found in Coreholes 1, 2, and 3, and at the Intermodal Transportation Center (Geocon, 2001) it should not be assumed that Corehole 3 is in close continuity with groundwater levels and pressures beneath and upslope of the well, which may respond somewhat differently to seasonal rain than groundwater levels within the landslide masses.
- We recommend additional groundwater monitoring wells to improve characterization and monitoring of groundwater levels within, outside, and under the slide masses adjacent to the proposed development. Determination of the groundwater level response of the landslide affected hillside areas to heavy seasonal rainfall events is recommended as part of the geotechnical assessment. The rate and magnitude of hillside groundwater level changes to seasonal rainfall is of primary importance to causation and/or re-activation of landslide movements.
- Use of the bare soil and rock gullies to conduct stormwater from outfalls 5 through 9 to the base of the slope is not recommended, especially for outfalls 5 and 7. Permeameter tests on the soil in the gully bottoms indicates infiltration through the intact soil of the gully bottoms into the subsurface during moderate storm flow events will not be sufficient to affect stability. However, elevated storm flow velocities such as may occur below outfall 7 during extreme storms within the natural channels could pose the risk of severe soil erosion and expose landslide tension cracks between landslide blocks in the channel bottoms, which could cause rapid stormwater infiltration into deeper levels of the slide masses. Outfall 5 discharges immediately into a closed depression near the headscarp created by previous landslide movements, and is not recommended for direct stormwater disposal.
- The stormwater routing design by Rick Engineering incorporates sufficient retention basin capacity to largely mitigate peak flows and velocities from the proposed Project development areas of the Mesa to pre-project levels or less.
- The process of grading and construction for the Project will reduce vertical infiltration of storm and irrigation water into the subsurface from the Mesa mostly due to the creation of impervious surfaces and to some degree the compaction required to create finished the finished grade and lot pads.

Sincerely,



Steve Dickey
CEG 1070, CHG 386
Senior Hydrogeologist

1 Scope of Work

Dudek has provided the following services under this project:

1. Review of existing geotechnical reports and documents
2. Assist with casing installation, well development, and monitoring of Corehole 3, which was drilled into Landslide A, along with Coreholes 2 and 3.
3. Review of borehole seismic data and report prepared by Geovision, Inc. in the three Geocon coreholes.
4. Review historic documents and air photos to provide groundwater data additional to that developed directly for geotechnical reports for the Southwest Village and Intermodal Transfer Station projects. The largest source of this data is the CA Department of Water Resources Well Driller's Completion Reports, which have recently become publicly available.
5. Review April 21, 2021 Rick Engineering Report, Landslide Hydrology Analysis for Southwest Village, Rick Engineering Job Number 15013-C.
6. Provide field staff to assist Geocon in conducting near surface permeameter measurements of soils at several proposed stormwater outfall sites located within the landslide complex area.
7. Assemble the historic and the recently acquired groundwater information into this assessment of groundwater conditions beneath the mesa and the landslide complexes.

2 Geologic Setting and History

The mesa top is a relatively flat, ancient marine terrace at an elevation of approximately 500 feet. Long term, uniform and continuous uplift of approximately 14-16 cm/1000 years has placed the Mesa at its present elevation (Kern and Rockwell, 1992). The Mesa surface at the Southwest Village site consists of well developed terrace clay surficial soils which overly a thick layer of terrace gravel, cobbles, and boulders. Beneath the Terrace deposits are San Diego formation which overlies Otay formation. Geocon's borings at the mesa top demonstrated erosional contacts between the terrace gravels, San Diego formation, and Otay formation. The Quaternary terrace clay soil and gravel, the San Diego formation and Otay formation rocks are involved in the Landslide A head scarp at the west and beyond to the west of the Mesa.

The appearance of the landslide slope below the Mesa indicates a complex and progressive series of deep seated downslope block movements, which include components of block rotation. A major landslide feature evident in the three deep coreholes drilled by Geocon in the landslide complex west of the mesa top are thick, apparently continuous zones of sheared and deformed bentonite, lying almost horizontal slightly at elevation 29-33 ft (NAVD88) in Corehole 3. The bentonite units occur intermittently and may be an important feature restricting vertical groundwater movement, and could locally cause "perched" conditions, affecting groundwater elevation heads above and/or below the bentonite units.

The deformed bentonite beds found in the Geocon Otay Mesa Landslide A coreholes and in the Intermodal Transportation Center geotechnical borings may be the same or similar as described by Vanderhurst, Hart, and Owen, 2011. Development of the present terrain was influenced by a different Pleistocene climate for extended time with greater precipitation on the order of 30-40 inches annual compared to present day 10 inches average annual for San Ysidro, and a Pleistocene sea level as much as 345 feet below present level starting 20,000 years BP.

The greater precipitation and lower sea levels during the Pleistocene epoch deepened incision of the ravines that are present at the Mesa, and may also have caused larger and more frequent storm flows, resulting in possible meanders of the Tijuana River which undercut the west and southwest edges of Otay Mesa. The greater Pleistocene precipitation during the Younger Dryas period also contributed to the deeply weathered, well-developed soil profiles that cap the Mesa.

Figure 2 provides a cross section constructed from the Mesa and Carvajal driller's logs, along with Geocon boring and corehole logs. The Carvajal well log indicates "pinkish gray mud" from depth 435-460 ft, at elevation slightly higher than the basal shear bentonite bed encountered on the Project side of the Mesa in Geocon Corehole 3.

Figure 3 provides an estimated sea level curve from 20,000 years BP to present, along with a summary graph of ocean core pollen analyses indicating a prolonged wet climate interval during the Pleistocene epoch from 12,000 to 20,000 years BP for the California Borderland at latitude 32.3 degrees north.

3 Groundwater Elevation Data

Plate 1 is a map summarizing the groundwater depth/elevation information that was found for the proposed project the surrounding area. The data are from CA DWR Well Drillers Completion Reports, the CA DWR groundwater information GIS system, wells constructed for groundwater regulatory cleanup investigations such as gas stations, USGS groundwater multi-port monitoring wells, and geotechnical reports generated by Geocon, Inc. This data is summarized in Table 1. The data also includes groundwater levels from three core holes drilled into Landslide A for the current Southwest Village geotechnical investigation. Figure 1 is a map showing Geocon's designation of the landslide areas at the Mesa edges as Landslides "A", "B", and "C", as well as a conceptual footprint of the initial phase of the proposed development.

Because of the scarcity of water well data available for the Mesa area, the Plate 1 includes groundwater observations date from 1955 (Carvajal agricultural well) to the present (depth to groundwater measured in Geocon Corehole 3 and in Mesa agricultural well). Because the available data is very widely spaced and taken over a 66 year time span, Plate 1 should be regarded as reconnaissance level information, especially for the Mesa itself. Several of the groundwater elevations shown in Plate 1 are previous reported levels for wells that no longer exist.

Two deep agricultural wells are located on the Mesa, constructed in 1955 and 1961, which are no longer in service; Attempts to sound the Mesa well, located immediately uphill of the Landslide A complex headscarp were not repeatable because of debris in the well. However, the logs of these wells are included because they were drilled with cable tool equipment, which allows construction of somewhat detailed drilling logs, as well as detailed observations regarding occurrence of first water or perched groundwater.

Plate 2 is a cropped portion of Plate 1, which enlarges the proposed Southwest Village development area. A cross section line through Landslide A is presented in Figure 4. The groundwater depth/elevation cross section shows depth to water and elevation from the three Geocon core holes, the Mesa irrigation well (depth to "first water" in 1960), and Boring SB-3 drilled at the Intermodal Tranportation Center in 2001. Groundwater levels for the Mesa Well and the SB-3 exploration boring have been projected northwest into the Figure 4 cross section.

As part of this investigation, Corehole 3 was equipped with a PVC casing and well screen extending to 270 foot depth, and equipped with a water level recording pressure transducer. The groundwater levels shown in Figure 4 for Coreholes 1 and 2 were measured very shortly after drilling with a borehole seismic survey conducted by Geovision, and the borings have since been abandoned. Boring SB-3 was abandoned in 2001 shortly after logging.

It should not be assumed that the groundwater conditions shown in Figure 4 and Plate 2 are static and invariant with respect to seasonal storms or unusual series of precipitation events, should they occur. Because the core borings indicate the bulk of the Otay formation slide mass is composed of claystone, siltstone, and sandstone, a conservative assumption would be that groundwater flow within Landslide A occurs primarily via fracture flow, and a much lesser degree porous media flow. Therefore groundwater level response of the slope to heavy rainfall could be greater and also more rapid than would occur in more porous, unconsolidated basin aquifer sediments such as sand.

Additional monitor wells with water level recording capability are needed to measure water level and fluctuations uphill of the Landslide A headscarp, and also within the slide mass to measure the groundwater level response to heavy rainfall events. In addition, an observation well should be constructed with a screen isolated beneath the basal shear zone bentonite bed to assess the degree it may function to restrict vertical groundwater flow, and measure the hydraulic pressure acting beneath the basal shear layer.

4 Assessment of Groundwater Conditions

4.1 Groundwater Conditions at Base of Slope, Landslides A and B

Groundwater levels in Geocon boreholes near the base of slope (Plates 1 and 2) in the Landslide A and B area indicate that there is very likely continuous saturation above and beneath the basal slide surface and that these levels are slightly above but on a downwards slope consistent with gas station monitor well groundwater elevations measured recently west of the slide area near the Tijuana River, and northwards adjacent/west of Otay Mesa and northwards to the Otay River area. The groundwater levels within the toe area of Landslides A and B were determined in 2001 by exploration borings advanced for the Intermodal Transfer project area, at the west downhill portion of Landslide A, and adjacent to Landslide B, as shown in the Figure 4 cross section. If property access allows, one or more monitor wells should be re-established at the base of slope, and equipped with a recording groundwater level transducer to determine the groundwater level response, if any of the landslide mass in this area to significant rainfall events.

4.2 Surfacing Groundwater, South Edge of Otay Mesa

Surfacing Groundwater is present in Spring Canyon, at the south edge of Otay Mesa, at the US-Mexico international border. Examination of a multi year sequence of aerial photos as early as November 1981 indicates persistent presence of riparian trees, surface water flow, and riparian vegetation that begins approximately 2800 feet east-northeast and upstream of a newly constructed concrete culvert structure at the International Border that takes the water under the border into Tijuana. The 1981 air photo pre-dates the extensive bulk grading and road construction conducted along this section of the border, which included the construction of a concrete culvert and other works to convey the Spring Canyon surface flow across the border.

Plate 1 and Plate 2 show this location, with a 2014 surface water elevation of 164 feet at the border, located at the southwest corner of Landslide C. This elevation is roughly comparable with nearby groundwater elevations measured in CH-2, CH-3, and the Mesa Well. This location is interpreted as discharging groundwater that has been exposed and released by downcutting of Spring Canyon. The source of the surface water is from older rocks assumed to be Otay Formation, with the groundwater source within the adjacent Otay Mesa hillside, and assumed to be higher than the surface flow at Elevation 164, in order to sustain the flow. A short distance upstream of this location, the canyon bottom surface water ends and the vegetation transitions from riparian to upland species, as visible in aerial mapping photos. Although the relationship of the Spring Canyon perennial surface water to the

regionally extensive bentonite bed at the base of Landslides A, B, and C is unknown, the landslide area core boring logs suggest that this water is perched above the basal shear bentonite bed .

4.3 Groundwater Beneath Top of Mesa, Project Area

The Mesa Well, shown near the west edge of the Mesa in Plates 1 and 2 provides the only data available for groundwater level beneath the Project area, outside of the landslide areas. In 1960 the driller noted "first water" at 298 feet below ground surface (DWR drillers log and completion report provided in Appendix A). The borehole was continued by casing advance to a total depth of 1245 feet. When deep perforations were cut at the completion of the well, the final water level is listed in the report as 565 feet.

While the final water level noted may not have reached equilibrium when measured, it suggests a final water level near or below sea level (ground surface elevation at the Mesa well is 482 feet). This deep level after casing perforation is interpreted to indicate a downwards hydraulic pressure gradient within the Otay Formation with depth.

Although not current or the most reliable data, we regard the "first water" notation on the Mesa Well driller's log as the best available indication of groundwater depth beneath the Project area, subject to verification. The Mesa Well driller's log is presented in the Figure 2 cross section.

5.0 Influence of Proposed Stormwater Outfalls on Groundwater

5.1 Landslide Surface

The project as proposed in includes five outfalls to manage the Project stormwater flows. Figure 5 shows the location of proposed stormwater outlet structures which are intended to convey project stormwater and excess irrigation water to existing bare earth drainages which will then convey the stormwater to the base of the slope and existing San Ysidro stormwater infrastructure. The outfalls are numbered 5, 6, 7, and 8 as indicated in Figure 4.

The existing drainage pathways that traverse from the proposed outfalls through the slide areas are shown in Figure 5 as yellow lines. The drainage pathways were digitized and are graphed as profiles in Figure 6. The cross sections for these bare earth drainages have been unfolded from their curved path routes into the flat plane of Figure6. Thus the true drainage path lengths and slopes are retained in the figure.

The downhill drainage pathway for outfall 5 traverses downslope through Landslide A, while the pathways issuing from outfalls 6 and 7 traverse the slope of Landslide B. The drainage pathways from outfalls 8 and 9 traverse more steeply downhill over the Landslide C slope.

The Figure 6 outfall drainage profiles indicate the channel downhill from Outfall 9 is steepest at 20%, while the drainage gully from Outfall 7 has the least downhill slope at 10%. Outfalls 5, 6, and 8 drop downhill at slopes of 14, 16, and 17% respectively.

None of the current drainage profiles exhibit sharp concave nicks in their profiles indicating excessive “nick point” erosion, such as would indicate wallowing out of a structural weak spots such as tension cracks or soft sedimentary beds. The drainages flowing down from Outfalls 6 and 7 are the most deeply incised into what appears to be a soft, erodible portion the composite landslide slope.

Based on peak stormwater flows calculated by Rick Engineering, the post development flow velocities could be especially elevated in the bare earth channel of Outfall 7, which Rick proposes to substantially mitigate to pre-project levels with retention of stormwater at the Mesa.

The drainage dropping out of Outfall 5 begins almost immediately in a shallow closed depression that occupies a sag immediately beneath the Landslide A headscarp, and is recommended for re-routing or modification to prevent infiltration of stormwater into the Landslide A headscarp.

Based on the stormflow durations calculated by Rick Engineering, and soil permeameter infiltration measurements at each outfall location measured by Geocon, it is calculated that infiltration through the soil bottoms of the existing channels into the slide mass during moderate rainfall events will not be excessive, as it is expected that the soil layer covering the channels will remain intact. After such events it is expected that the infiltrated stormwater will be held in the soils at shallow depth by capillary forces and will come back out as evapotranspiration. Only during extended series of multiple closely spaced rainstorms would infiltration to groundwater be expected to occur, and

it would occur at very slow rates, with of the stormwater continuing downhill as surface flow . The outfall infiltration test results are displayed in Table 2 below.

TABLE 2

Outfall 5	32.55425	-117.027	1.09E-2
Outfall 6	32.55183	-117.0243	9.05E-4
Outfall 7A	32.55078	-117.0229	4.13E-4
Outfall 8	32.54762	-117.0173	8.22E-3
Outfall 9	32.548613	-117.01489	3.92E-3

Notes: Data and calculations for K values provided by Geocon.

However, it is possible that periods of sustained high flow in these drainages, such as might occur during an "atmospheric river" type series of rains could generate erosive stormflows that remove enough soil to expose landslide-generated tension cracks in the channels beneath the soil layer, leading to significant injection of stormwater directly into the subsurface through the cracks in rock, and tension fracture zones between the landslide blocks. Rapid introduction of significant volume stormwater into fractures between slide blocks could raise the water table within portions of the composite slide mass rapidly and sufficiently above the basal shear zone clay surface to affect local slide mass stability.

Analysis of aerial photos and shaded relief topographic images of the landslide complex indicates that such cracks are very likely present. Groups of native palm trees present in catchments within Landslide Component A also suggest that significant trapping of stormwater within the composite landslide surface has occurred in previous rainfall events.

Without detailed knowledge of the slide mass groundwater surface in Landslide A, B, and C, and knowledge of the response of slide mass groundwater levels to significant rain events, it is suggested that routing of stormwater from the proposed development onto the bare earth existing channels on the landslides be avoided.

Draft stormwater calculations by Rick Engineering for proposed flows to Outfalls 1 through 5 indicate that any increase in total volume of stormwater created by development of Southwest Village will be mitigated to pre-project levels by stormwater retention to reduce peak flows leaving the project area through the proposed outfalls 1 through 5. Therefore it can be said that the project, as currently proposed will not cause a change the overall landslide stability situation of the slopes surrounding it to the west, southwest, and south, due to stormwater flows. This is not the same as stating that with the present level of knowledge that Landslide A, B, and C slopes are known to be stable under all future rainfall event sequences.

5.2 Groundwater Infiltration Impact of Developing the Mesa Surface

The existing natural surface of the Mesa is characterized by relatively low infiltration of rainfall, as evidenced by presence of vernal pools. The uppermost natural terrace deposts are predominantly clay soils., classified by USDA as Huerhuero loam (HrC). Compared to the existing natural Mesa surface, the proposed development will reduce the areas open to stormwater infiltration due to the construction of impervious surfaces consisting of streets, sidewalks, roofs, and driveway pavement.

The infiltration capacity of the soil horizons capping the Mesa is limited by the presence of low vertical conductivity layers that restrict downwards water flow. The soil profile of the Mesa top is characterized by USDA as being in runoff class "Very High", and with the infiltration capacity of the limiting soil profile layers as very low to moderately low, with Ksat of 0.00 to .06 inches per hour.

Geocon conducted permeater testing of undisturbed surface soils in the proposed development area of the Mesa, with resulting vertical conductivities as follows:

TABLE 3

GEOCON HYDRAULIC CONDUCTIVITY TEST RESULTS, DEVELOPMENT AREA, MESA SURFACE

Location	Depth, ft	Geologic Unit	Hydraulic Conductivity K (in/hr)
A-1	5	Qt, Topsoil	.007
A-2	5	Qt	.049
A-3	5	Qt	.018
A-4	5	Qt	.004

These results are consistent with the USDA published soil map for the Mesa. Therefore, given the strong layering of horizontal strata under the Mesa surface, the low hydraulic conductivity of the site surface, and the replacement of exposed soil surface with impervious areas by the proposed development plan, we believe the net impact will be a reduction of stormwater infiltration into the Mesa surface. Therefore, the net long term impact of the proposed development of the Mesa surface will be to reduce infiltration of rainwater to groundwater, resulting in a long term, net decrease in groundwater levels beneath the development.

6.0 Conclusions

A thorough search for historic groundwater data was conducted to support this assessment, which is summarized on Table 1 and Plates 1 and 2. The data spans dates from 1955 to the present. In addition measurements of present groundwater levels within Landslide A were conducted. Conclusions are as follows:

1. There is solid evidence that the groundwater surface within the project portion of Otay Mesa rises above the surrounding areas at the flanks and base of the Mesa. The maximum groundwater elevation under the Southwest Village project area of the Mesa could not be determined with available data.

2. The driller's logs from the deep Carvajal and Mesa wells, although very old are detailed and generally meaningful for this initial assessment. They indicate that due to the persistent layering of clay and silt bearing strata, there was perched water within the sedimentary stack, above the main water table when drilled. The perched water occurrences started at approximately 300 foot depth below the Mesa surface when drilled in 1961. It is reasonable to assume that this condition may persist in general today, although exact details may differ.

3. The groundwater depths indicated by Landslide A Coreholes CH-1, CH-2, and CH-3 are considered to be generally representative of groundwater levels for the adjacent portions of the hillside, but specific groundwater depths and elevations in adjacent areas should be confirmed by drilling.

4 Geocon Coreholes 1, 2, and 3 indicate that the aquifer in the landslide area, above the basal shear zone is characterized by fracture flow in claystone, siltstone, and sandstone which probably dominants compared to porous media groundwater flow. The practical impact of this aquifer characteristic is groundwater fluctuations within the slope are likely to be greater and more sudden/abrupt than for a system dominated by porous flow, such as groundwater flow in sand.

5. Given #4 above, we recommend additional monitor wells be installed in the Southwest Village project area, and downslope landslide areas with recording transducers to determine the sensitivity of landslide mass groundwater levels in several locations to seasonal precipitation. Corehole 3 is presently equipped with such a transducer/datalogger.

6. The assumed groundwater elevation above 164 feet that sustains the surface water flow at the south edge of Otay Mesa at the International border (Landslide C area) is generally consistent with the level found in corehole CH-3 to the northwest, and is likely to be approximately representative of groundwater level in the Otay Formation beneath the Mesa north of the scarp above Landslide A. Due to the lack of sufficient wells, the exact shape and elevation contours of the groundwater surface beneath the Mesa is unknown.

7. It is our opinion that a significant cause for development of the extensive landslide apron surrounding the southwest, south, and southeast slopes of Otay Mesa was significantly wetter climate conditions in the late Pleistocene (Younger Dryas event), and also the significantly lower of sea level to minus 345 feet MSL, thus increasing the topographic relief of the Mesa.

8 We recommend the routing of stormwater from the Project outfalls over the bare earth drainages to bottom of slope be re-considered and avoided. Piping the water with storm drains across or around the slide mass is our recommendation.

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TABLE 1 Well Data								
FEATURE	Feature, Short Name	Grd Surf Elev	GW Depth, Ft	GW Elev, Ft	Dec Latitude	Dec Longitude	SP N, US ft	SP E, US ft
				NAVD88			CA Zone 6	CA Zone 6
Corehole 1 Surveyed	CH1	**184**	70	114	32.5515527	-117.0307686	1781361.4	6321066.9
Corehole 2 Surveyed	CH2	**279**	125	154	32.5525594	-117.0291278	1781723.9	6321575.3
Corehole 3 Surveyed	**CH 3**	**360**	189.87	170	32.5534973	-117.0274925	1782061.4	6322081.7
Mesa Well, 1245', 1961	**Mesa**	**482**	385 , 298	97, 184	32.5507160	-117.0187320	1781029.4	6324773.8
Carvajal Well, 1215', 1955	**Carvajal**	507	347	160	32.5655240	-117.0057070	1,786,387.80	6,328,826.54
Spring Canyon Surface Flow At Border	**Spr Cyn Surf**			164	32.5448820	-117.0131950	1,778,894.22	6,326,464.49
Geocon SB-7, Transfer Station	**SB-7**	**101**	54.5	47	32.5444880	-117.0280300	1,778,784.66	6,321,891.64
Geocon SB-3, Transfer Station	**SB-3**	**98**	46	52	32.5460550	-117.0295270	1,779,358.24	6,321,434.56
Geocon SB-1, Transfer Station	SB-1	89	54	35	32.5454390	-117.0293270	1,779,133.65	6,321,494.52
Geocon SB-2, Transfer Station	SB-2	78	47.5	31	32.5442580	-117.0285470	1,778,702.16	6,321,731.69
Otay River Surface Water 1	**OT Riv Surf1**			115	32.5904380	-117.0132720	1,795,469.48	6,326,562.10
Otay Rock Quarry Pit Lake	**OT Pit Lake**			184	32.5925350	-116.9872470	1,796,174.77	6,334,583.63
Mon Well	**Mon Well**			45	32.5854460	-117.0350820	1,793,703.08	6,319,830.59
Otay River Surface Water 2	**OT Riv Surf2**			36	32.5886940	-117.0568320	1,794,935.97	6,313,140.01
Mon Well 314 E San Ysidro	**Mon Well 314 ESY**			40	32.5513010	-117.0397970	1,781,290.76	6,318,284.10
USGS Boundary Waters Mon Well	**USGS Mon Well**			27	32.5536320	-117.0616060	1,782,190.48	6,311,570.21
2004 Dairy Mart Road Mon Well	**2004 Dairy Mart**			31	32.5615550	-117.0627450	1,785,075.91	6,311,241.71
USGS Otay River Mon Well	**SDOR**			45	32.5912140	-117.0539560	1,795,846.00	6,314,032.95
Section 33 Ag Well Deep	**33S1W33 73**	512	440	72	32.5601530	-116.9880660	1,784,394.68	6,334,247.97
SD County Park Well	**SD County**	32	11	21	32.5567410	-117.0757790	1,783,355.95	6,307,211.85
Note: Applied Dave Evans edits to GW Elev, Coreholes 1,2,3.								

APPENDIX A

CA DWR WELL COMPLETION REPORTS

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.____
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

Do Not Fill In
No 12996
State Well No.____
Other Well No.____ PLOTTED

(1) O
Name
Address

(2) LOCATION OF WELL: 16645
County San Diego Owner's number, if any—
R. F. D. or Street No. Otay Mesa

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(3) TYPE OF WORK (*check*):
New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (*check*):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☐
Cable ☒
Dug Well ☐

(6) CASING INSTALLED:
SINGLE ☐ DOUBLE ☐

From	ft. to	Diam.	Gage or Wall
0	849	12-3/4	.250
849	1103	10-3/4	.250

If gravel packed

Diameter of Bore	from ft.	to ft.

Type and size of shoe or well ring 10" & 12" Baker
Size of gravel:
Describe joint Welded

(7) PERFORATIONS:
Type of perforator used Mills
Size of perforations 5/8 in., length, by 5/8 in.

From	ft. to	ft.	Perf. per row	Rows per ft.
540	615	8	1	
760	840	8	1	

(8) CONSTRUCTION:
Was a surface sanitary seal provided? ☐ Yes ☒ No To what depth ft.
Were any strata sealed against pollution? ☐ Yes ☒ No If yes, note depth of strata

From	ft. to	ft.

Method of Sealing

(9) WATER LEVELS:
Depth at which water was first found 347 ft.
Standing level before perforating 472 ft.
Standing level after perforating 470 ft.

(10) WELL TESTS:
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. draw down after hrs.
Temperature of water Was a chemical analysis made? ☒ Yes ☐ No
Was electric log made of well? ☐ Yes ☐ No

(11) WELL LOG:
Total depth 1210 ft. Depth of completed well 1210 ft.
Formation: *Describe by color, character, size of material, and structure.*

ft. to	ft.	Formation
0	4	Surface formation
4	7	Hard Pan
7	9	Clay & sand
9	65	Clay & large boulders
65	135	Yellow sandy silt
135	210	Yellow sandy clay
210	250	Grey " "
250	255	Hard sandstone ledge
255	280	Gray sandy clay
280	285	Hard sandstone ledge
285	290	Gray sandy clay
290	295	Yellow sandy clay
295	300	Yellow sandstone clay
300	304	Sandstone ledge
304	305	Hard rock ledge
305	310	Yellow sandy clay
310	315	Hard sandy ledge
315	320	Grey sandstone & clay
320	330	Dry hard sand
330	332	Yellow clay & sand
332	337	Yellow sandstone & sand
337	345	Yellow clay & hard sand
345	347	Soft yellow clay & water
347	350	Hard rocky ledge
350	355	Gray sandy clay & water
355	365	Gray sandy clay
365	375	Soft muddy clay
375	405	Fine sand
405	420	Gray clay & boulders
420	430	Hard sand, rock & clay
430	435	Yellow sandy clay
435	460	Pinkish gray mud
460	490	Yellow sandy clay
490	492	Hard rocky ledge
492	500	Fine sand & clay
500	510	Sandstone
510	517	Fine gray sand & clay
517	525	Gray clay & sand
525	543	Yellow mud, some clay
543	544	Black sandy silt
544	547	Brown sandy silt
547	553	Black sandy silt
553	563	Gray sandstone

Work started 1/28/55 19 , Completed 6/2/55 19

WELL DRILLER'S STATEMENT: MICROFILMED
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME San Diego Pump & Well Drillers
(Person, firm, or corporation) (*Typed or printed*)
Address P.O.Box 428 Imola Napa, Calif.

[SIGNED] [signature]
Well Driller
License No. 83485 Dated 6/29, 1955

95689 3-54 50M QUIN ® SPO

DWR FORM NO. 246 (REV. 3-54)

QUINTUPLICATE
Retain This Copy
DIVISION OF WATER RESOURCES
P. O. BOX 1079
SACRAMENTO, CALIFORNIA

SUPPLEMENTAL SHEET

Do Not Fill In
State Well No.
Other Well No.
Region

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

(5) **Well log** (continued):
Total depth of well .... ft.

Give details of formations penetrated, such as silt, peat, muck, sand, gravel, clay, shale, sandstone, hardpan, rock. Include size of gravel (diameter) and sand (fine, medium, coarse), color of material, structure (loose, packed, cemented, soft, hard, brittle).

Depth From Ground Surface	
ft. to ft.	

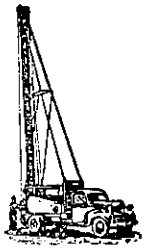
[illegible]

CONFIDENTIAL - NOT FOR PUBLIC RELEASE

MICROFILMED

If additional space is required continue on DWR Form No. 246—Supplement, and attach to respective report copies.

23973 3-50 20M QUIN SPO



TELEPHONE:
GArfield 2-3778

SAN DIEGO PUMP & WELL DRILLERS

STATE LICENSED DRILLING CONTRACTORS

PUMP SALES AND SERVICE

POST OFFICE BOX 438

CHULA VISTA, CALIFORNIA

Water test on Ray Carvajal well Otay Mesa

505'	865	PPM
597	650	"
660	1058	"
710	935	"
771	605	"
830	715	"
875	1255	"
1014	1320	"
1085	1640	"
1180	1380	"
1200	1010	"

FIELD CHECK OF WELL LOCATION

DRILLER Son Diego Water Well Drillers CHECKED BY H. Cortez.

OWNER ___. DATE 5-5, 1978.

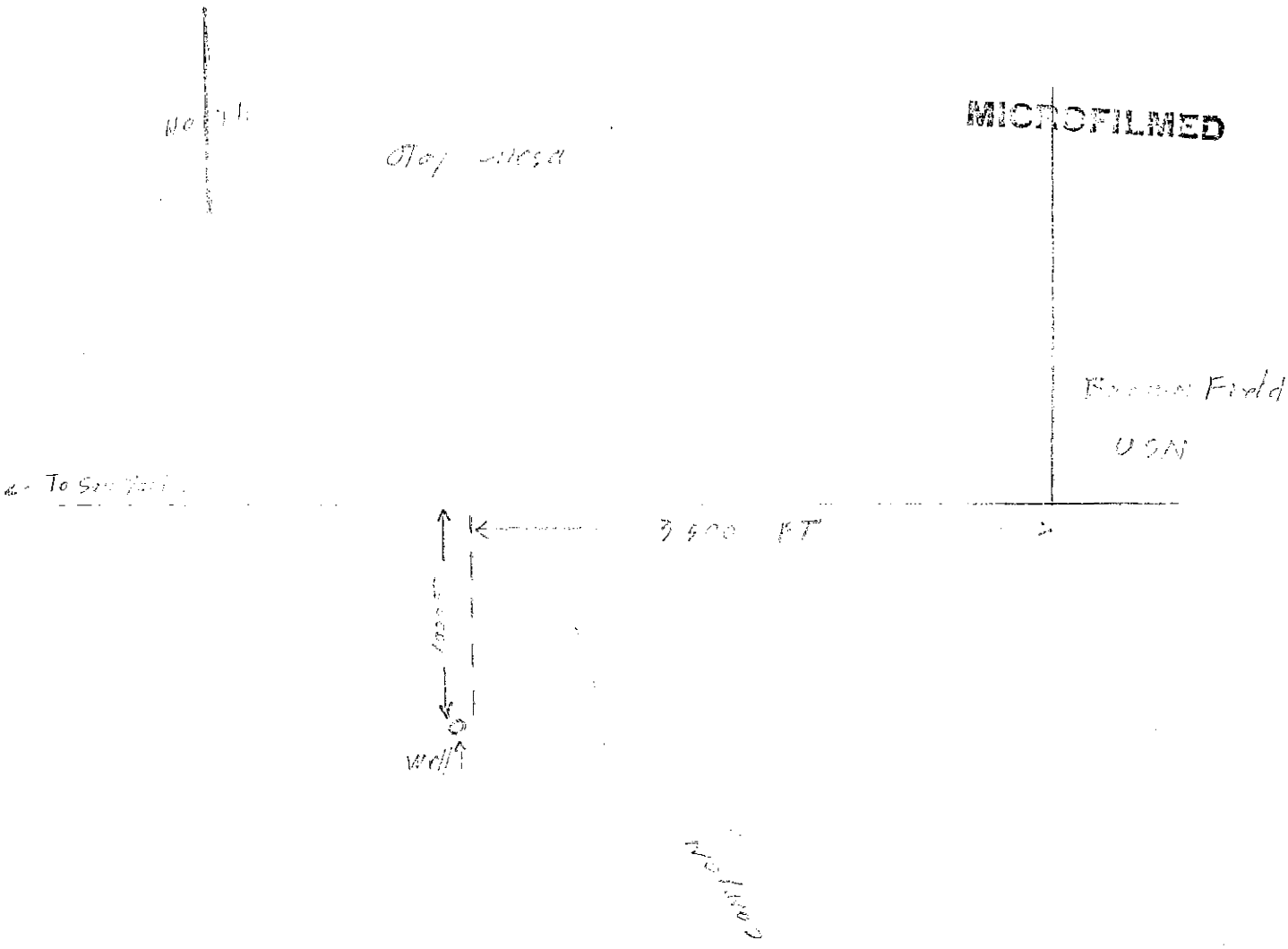
PUMP: MAKE Byron Jackson; SERIAL NO. 312312

MOTOR: MAKE Byron Jackson; NO. Submersible HP 75

METER NO. 222981.

STATE WELL NO. 18S/1W-33K1.

LOCATE WELL WITH REFERENCE TO ROADS AND ROAD INTERSECTIONS: ALSO INDICATE DISTANCES AND DIRECTIONS TO NEARBY CITIES OR TOWNS.



32 32 58.322, -117 1 16.439 MVR 12/23/11

DUPLICATE
File Original, Duplicate and Triplicate with the REGIONAL WATER POLLUTION CONTROL BOARD No.
(Insert appropriate number)

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

Do Not Fill In
No. 28842
State Well No. 19S/1W-6G001S
Other Well No.

[redacted]

(2) LOCATION OF WELL:

County Owner's number, if any—

R. F. D. or Street No.

SE cor W½, NE¼, Sec 6, T 19S/1W

(3) TYPE OF WORK (check):

New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☐
Cable ☒
Dug Well ☐

(6) CASING INSTALLED:

SINGLE ☒ DOUBLE ☐

From ft.	to ft.	Diam.	Gage or Wall
0	1245	12	1/4

Type and size of shoe or well ring

Describe joint

If gravel packed

Diameter of Bore	from ft.	to ft.

Size of gravel:

(7) PERFORATIONS:

Type of perforator used Mill

Size of perforations in., length, by in.

From ft.	to ft.	Perf. per row	Rows per ft.
820	830	6	2
885	900	6	1 3"
980	1124	6	1 3"

(8) CONSTRUCTION:

Was a surface sanitary seal provided? ☐ Yes ☒ No To what depth ft.

Were any strata sealed against pollution? ☐ Yes ☒ No If yes, note depth of strata

From ft.	to ft.

Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found 298 ft.
Standing level before perforating 565 ft.
Standing level after perforating 565 ft.

(10) WELL TESTS:

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. draw down after hrs.

Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

Was electric log made of well? ☐ Yes ☐ No

(11) WELL LOG:

Total depth 1245 ft. Depth of completed well 1245 ft.

Formation: *Describe by color, character, size of material, and structure.*

ft. to	ft.	
0	11	Grey sticky clay & rocks
11	32	Brown sandy clay & lg. rocks
32	49	Grey sandy clay & " "
49	105	Grey sticky sandy clay
105	252	Grey sandstone
252	257	Sandstone & bentonite
257	295	Grey sandstone
295	298	Sand & gravel
298	351	Brown sandstone
351	400	Hard brown sandstone
400	452	Brown clay & rocks
452	470	Brown clay
470	481	Brown clay & rocks
481	490	Soft brown sandstone
490	494	Brown sticky clay
494	567	Brown sandstone
567	701	Grey sandstone
701	727	Brown shale
727	798	Brown sandstone
798	810	Brown shale
810	825	Grey sandstone
825	830	Grey sandstone & small gravel
830	880	Light grey sandstone
880	898	Dark grey sandstone (soft)
898	1042	Dark grey sandstone (hard)
1042	1141	Dark grey shale
1141	1164	Grey sandstone (hard)
1164	1245	Black shale
		ALLISITOS Fm ??
		ROSARIO Fm ??

MICROFILMED

CONFIDENTIAL - NOT FOR PUBLIC RELEASE

Work started 5/23/60 19 , Completed 1/25 19 61

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME San Diego Pump & Well Drillers (Type or printed)

Address 1410 Hwy 101 Alt., Imperial Beach, Calif.

[SIGNED] Jack Hamilton (Well Driller)

License No. 160313 Dated 4/13

95689 3-54 50M QUIN (R) SPO

DWR FORM NO. 246 (R:

ORIGINAL
File with DWR
Page 1 of 6

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 447315

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. _____
Date Work Began 13 July 95, Ended 5 August 95
Local Permit Agency County of San Diego, Dept. of Health Services
Permit No. _____ Permit Date _____

WELL OWNER _____

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER _____ (Ft.) BELOW SURFACE

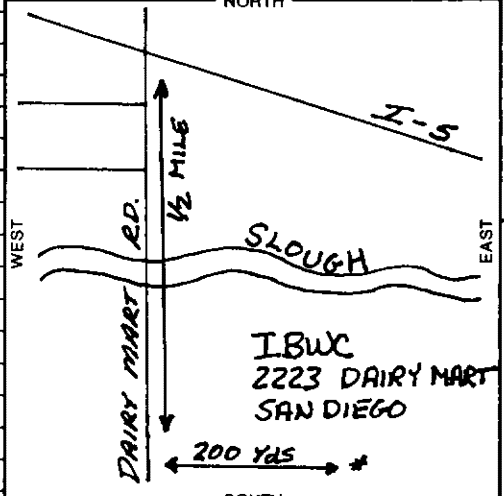
DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	20	Sand, fine to medium
20	60	Sand, fine to very coarse, poorly sorted shell fragments
60	150	Sandy gravel, medium to very
150	190	Sand, fine
190	310	Silty sand, very fine sand to medium
310	650	Clayey sand with very fine to fine sand
650	670	Sandy clay
670	710	Sandy silt, very fine sand to medium
710	770	Clayey silt, some fine sands
770	830	Sandy clay
830	950	Clayey silt, some very fine to fine sands
950	970	Sandy silt
970	990	Silty sand
990	1030	Sand very fine to very coarse
1030	1050	Silty sand
1050	1430	Sand, very fine sand to medium sand
		Geologic log for well 1 through 5 (completed in the same hole)

TOTAL DEPTH OF BORING 1430 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1360 (Feet)

WELL LOCATION

Address 2223 Dairy Mart Rd
City San Diego
County San Diego
APN Book 760 Page 107 Parcel 60
Township 19S Range 2W Section 2C
Latitude 32 DEG. 33 MIN. 13 SEC. NORTH Longitude 117 DEG. 03 MIN. 39 SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)
X MONITORING
WATER SUPPLY
___ Domestic
___ Public
___ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Hydraulic Rotary FLUID Bentonite Mud

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 50.56 (Ft.) & DATE MEASURED 7/25/95
ESTIMATED YIELD* _____ (GPM) & TEST TYPE _____
TEST LENGTH _____ (Hrs.) TOTAL DRAWDOWN _____ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	5				X		Steel	10		
	1340		X				Sch 80 pvc	2		
1340	1360			X			Sch 80 pvc	2		0.020
Well construction for well 1										

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	25	X			
25	225		X		
225	283			X	#3 sand
283	532		X		
532	613			X	#3 sand
613	898		X		

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
X Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other _____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME JOHN IZBICKI U.S. GEOLOGICAL SURVEY
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

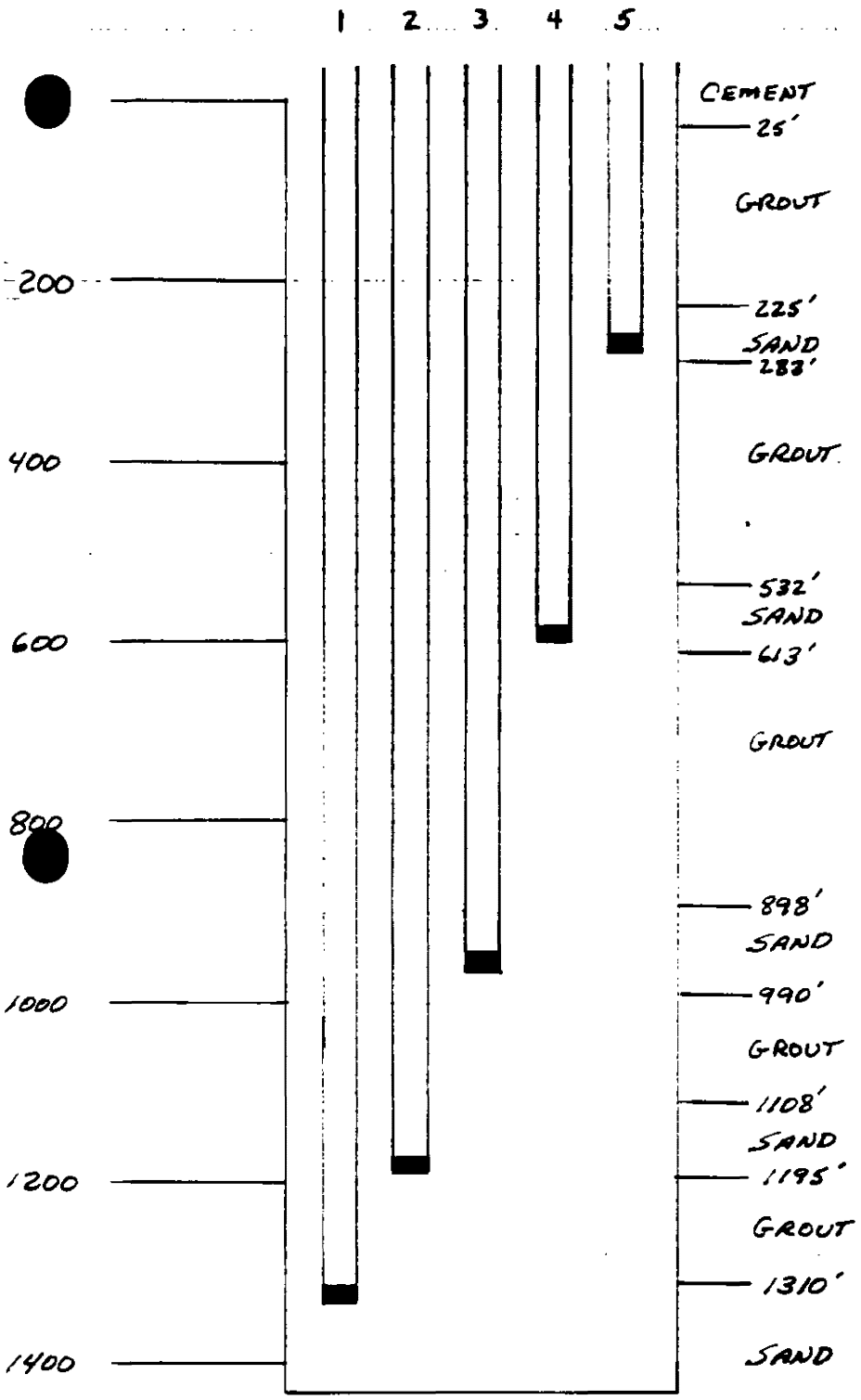
5735 KEARNY VILLA RD, STE O San Diego, CA 92123-1135
ADDRESS CITY STATE ZIP

Signed _____ 9/8/95 NA
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

447315



WELL #		
1	1340	- 1360
2	1170	- 1190
3	945	- 965
4	580	- 600
5	260	- 280

COUNTY OF SAN DIEGO
DEPARTMENT OF HEALTH SERVICES

WELL PERMIT APPLICATION 447315

APN 760 107 60
Control # W30485

TYPE OF WORK (Check)		USE (Check)		EQUIPMENT (Check)	
New Well	☒	Individual Domestic	☐	Rotary	☐
Repair or Modification	☐	Agricultural	☐ Community ☐	Cable Tool	☐
Time Extension	☐	Industrial	☐ (Other) Observation	Other	☐
Destruction	☐				

PROPOSED WELL DEPTH
Max. 1400 Min. >200 (Feet)

PROPOSED CASING
Type PVC Depth 1400' Diameter 2" Wall or Gage Sched. 80

PROPOSED SEALING ZONE(S)
From (see Attached) Feet
From ____ to ____ Feet
From ____ to ____ Feet

PROPOSED PERFORATIONS OR SCREEN
From ____ to ____ Feet
From ____ to ____ Feet
From ____ to ____ Feet
From ____ to ____ Feet

SEALING MATERIAL (Check)
Neat Cement Grout ☐ Bentonite Clay ☐
Sand Cement Grout ☐ Concrete ☒
Other-Specify: ____

DATE OF WORK
Start 6/13/95
Completion 6/22/95

NAME OF WELL OWNER

NAME OF WELL DRILLER
U.S. Geological Survey

LOCATION OF WELL Inter. Bound. & Wat. Comm.
2223 Dairy Mart Rd San Diego

COMPANY
U.S. Geological Survey

BUSINESS ADDRESS
San Diego, Ca. 92173
5735 Kearny Villa Rd, Suite O

LICENSE NUMBER
WA

Cash Deposit ☐ NA
Bond Posted ☐ Waived

$150 (Hazmat Fee) Fee paid on 4/26/95

DISPOSITION OF APPLICATION
(FOR HEALTH OFFICERS USE ONLY)

☒ APPROVED ☐ DENIED

☐ APPROVED WITH CONDITIONS

Report Reason(s) for Denial or Necessary Conditions Here:

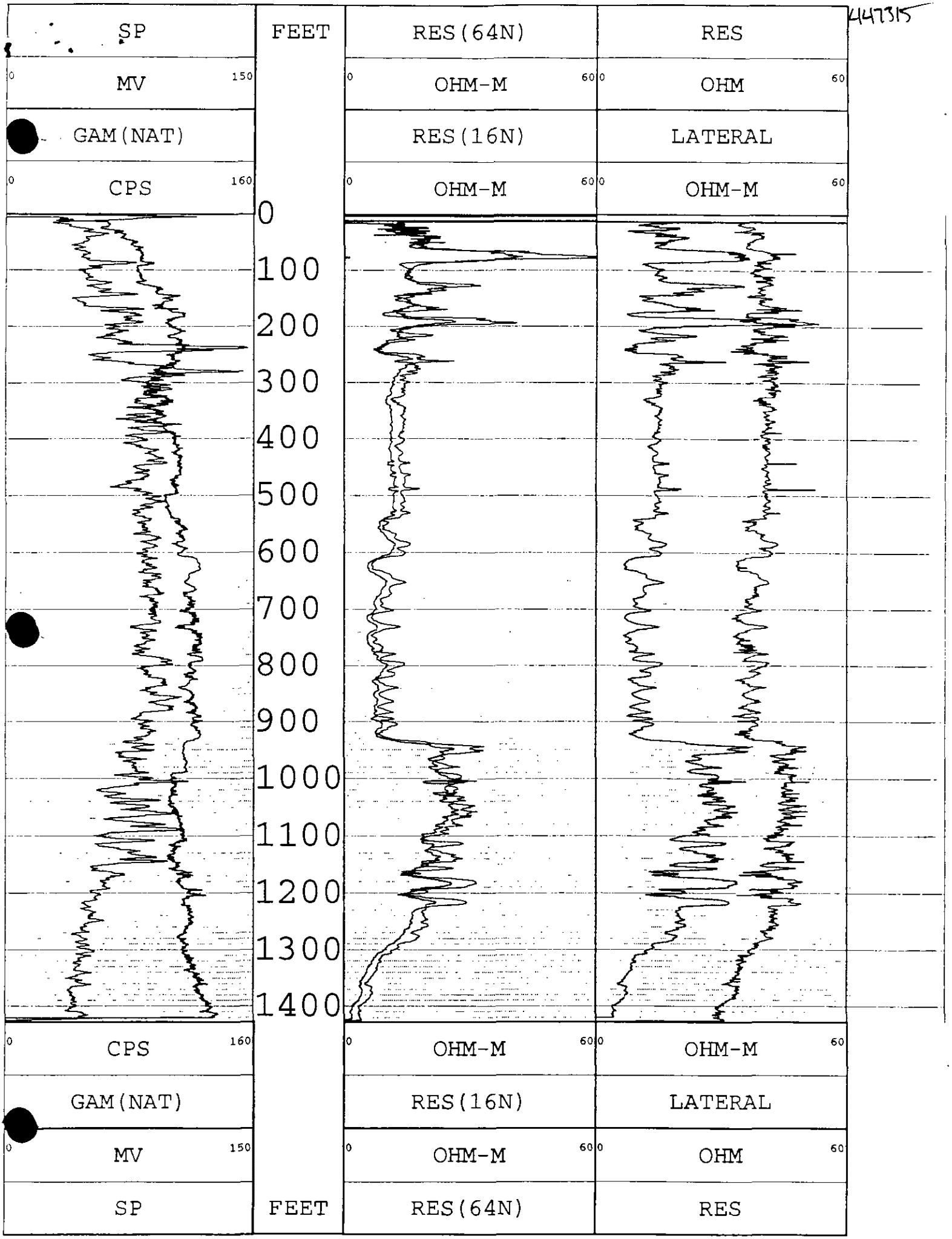
I hereby agree to comply with all regulations of the Department of Health Services and with all ordinances and laws of the County of San Diego and of the State of California pertaining to well construction, repair, modification and destruction. Immediately upon completion of work I will furnish the Department of Health Services with a complete and accurate log of the well.

HEALTH OFFICER

4-26-95
DATE

APPLICANT'S SIGNATURE

4/26/95
DATE


447315
SP
MV
0
150
GAM(NAT)
CPS
0
160
FEET
RES(64N)
OHM-M
0
60
RES(16N)
OHM-M
0
60
RES
OHM
0
60
LATERAL
OHM-M
0
60
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
CPS
0
160
GAM(NAT)
MV
0
150
SP
FEET
OHM-M
0
60
RES(16N)
OHM-M
0
60
RES(64N)
OHM-M
0
60
LATERAL
OHM
0
60
RES

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0084925

Page 1 of 5

Owner's Well Number SDOR #1

Date Work Began 11/06/2008 Date Work Ended 12/13/2008

Local Permit Agency County of San Diego Department of Environmental Health

Permit Number LMON T106077 Permit Date 10/31/08

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 18S02W23G002S

Latitude N / Longitude W

APN/TRS/Other

Geologic Log

Orientation: ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description: Describe material, grain size, color, etc
0	10	Gravelly sand; m-vc sand w/ granules-sm pebbles; olive gray (5Y 5/2)
10	20	Gravelly sand; m-vc sand w/ granules; grayish brown (2.5Y 5/2)
20	30	Gravelly sand; m-vc sand w/ granules; lt olive brown (2.5Y 5/4)
30	40	Gravelly sand; m-vc sand w/ granules; dk yellowish brown (10YR 4/6)
40	60	Gravel; granules-med pebbles; various colors
60	70	Clayey silt; silt w/ clay; olive (5Y 4/3)
70	80	Silty sandy gravel; granules-med pebbles w/ vf-vc sand and silt; olive gray (5Y 4/2)
80	200	Clayey silt; silt w/ clay and shell fragments; v dk gray (5Y 3/1)
200	240	Clayey silt; silt w/ clay and minor shell fragments; v dk gray (5Y 3/1)
240	320	Silt; silt; dk gray (5Y 4/1)
320	550	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
550	560	Sand; vf-coarse sand w/ shell fragments; dk gray (5Y 4/1)
560	570	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
570	580	Sandy clay; clay w/ med-coarse sand; greenish gray (10Y 5/1)
580	610	Clay; clay; grayish brown (2.5Y 5/2)
610	630	Clay; clay; grayish brown (10YR 5/2)
630	650	Clay; clay; lt brownish gray (2.5Y 6/2)
650	750	Clay; clay; grayish brown (2.5Y 5/2)
750	880	Sandy clayey silt; silt w/ clay & vf-med sand; grayish brown (2.5Y 5/2)
880	910	Clayey silty sand; vf-coarse sand w/ silt & clay; grayish brown (2.5Y 5/2)
910	920	Clay; clay; brown (10YR 5/3)
920	940	Gravelly sand; med-vc sand w/ granules-sm pebbles; grayish brown (2.5Y 5/2)
940	1,030	Clayey silty gravelly sand; vf-vc sand w/ granules, silt & clay; lt olive brown (2.5Y 5/3)
1030	1,120	Silty gravelly sand; vf-vc sand w/ granules & silt; grayish brown (2.5Y 5/2)
1120	1,140	Sandy clay; clay w/ med-vc sand; lt brownish gray (2.5Y 6/2)
1140	1,472	Clayey silty sand; vf-vc sand w/ silt & clay; grayish brown (2.5Y 5/2)
		SWN's 18S02W23G002S'
		Through 23G006S

Total Depth of Boring 1472 Feet

Total Depth of Completed Well 1460 Feet

Well Owner

Well Location

Address 276 Mace Street

City Chula Vista, CA 91911 County San Diego

Latitude 32 Deg. 35 Min. 28.45 Sec. N Longitude 117 Deg. 03 Min. 14.06 Sec. W

Datum NAD83 Decimal Lat. Decimal Long.

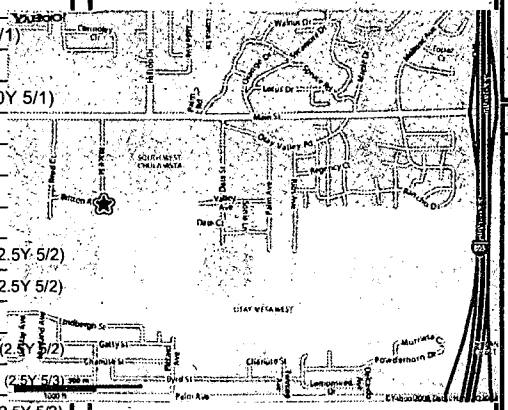
APN Book Page Parcel

Township 18S Range 02W Section 23G2

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	60	22.00	Conductor	PVC Sch. 80				
60	100	13.00						
100	460	12.00						
460/1000	1000/1472	10.00/8.00						
0	1420		Blank	PVC Sch. 80	0.30	3.5		
1,420	1,460		Screen	PVC Sch. 80	0.30	3.5	Milled Slots	0.020

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
51	97	Filter Pack	RMC #3 Sand
194	266	Filter Pack	RMC #3 Sand
530	584	Filter Pack	RMC #3 Sand
926	985	Filter Pack	RMC #3 Sand
1399	1472	Filter Pack	RMC #3 Sand
		Bentonite	All other depths

Attachments

- ☑ Geologic Log
- ☑ Well Construction Diagram
- ☑ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☑ Other On file @ USGS- San Diego

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Anthony Brown, Hydrologic Technician, U.S. Geological Survey

Person, Firm or Corporation

4165 Spruance Road Suite 200 San Diego CA 92101

Address City State Zip

Signed 02/10/2009 Exempt- Federal Government

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

B 0084925

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0084925

Page 2 of 5

Owner's Well Number SDOR #2

Date Work Began 11/06/2008 Date Work Ended 12/13/2008

Local Permit Agency County of San Diego Department of Environmental Health

Permit Number LMON T106077 Permit Date 10/31/08

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 18S 02W 23 G 003 S

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description: Describe material, grain size, color, etc
0	10	Gravelly sand; m-vc sand w/ granules-sm pebbles; olive gray (5Y 5/2)
10	20	Gravelly sand; m-vc sand w/ granules; grayish brown (2.5Y 5/2)
20	30	Gravelly sand; m-vc sand w/ granules; lt olive brown (2.5Y 5/4)
30	40	Gravelly sand; m-vc sand w/ granules; dk yellowish brown (10YR 4/6)
40	60	Gravel; granules-med pebbles; various colors
60	70	Clayey silt; silt w/ clay; olive (5Y 4/3)
70	80	Silty sandy gravel; granules-med pebbles w/ vf-vc sand and silt; olive gray (5Y 4/2)
80	200	Clayey silt; silt w/ clay and shell fragments; v dk gray (5Y 3/1)
200	240	Clayey silt; silt w/ clay and minor shell fragments; v dk gray (5Y 3/1)
240	320	Silt; silt; dk gray (5Y 4/1)
320	550	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
550	560	Sand; vf-coarse sand w/ shell fragments; dk gray (5Y 4/1)
560	570	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
570	580	Sandy clay; clay w/ med-coarse sand; greenish gray (10Y 5/1)
580	610	Clay; clay; grayish brown (2.5Y 5/2)
610	630	Clay; clay; grayish brown (10YR 5/2)
630	650	Clay; clay; lt brownish gray (2.5Y 6/2)
650	750	Clay; clay; grayish brown (2.5Y 5/2)
750	880	Sandy clayey silt; silt w/ clay & vf-med sand; grayish brown (2.5Y 5/2)
880	910	Clayey silty sand; vf-coarse sand w/ silt & clay; grayish brown (2.5Y 5/2)
910	920	Clay; clay; brown (10YR 5/3)
920	940	Gravelly sand; med-vc sand w/ granules-sm pebbles; grayish brown (2.5Y 5/2)
940	1,030	Clayey silty gravelly sand; vf-vc sand w/ granules, silt & clay; lt olive brown (2.5Y 5/3)
1030	1,120	Silty gravelly sand; vf-vc sand w/ granules & silt; grayish brown (2.5Y 5/2)
1120	1,140	Sandy clay; clay w/ med-vc sand; lt brownish gray (2.5Y 6/2)
1140	1,472	Clayey silty sand; vf-vc sand w/ silt & clay; grayish brown (2.5Y 5/2)

Total Depth of Boring 1472 Feet

Total Depth of Completed Well 970 Feet

Well Owner

Well Location

Address 276 Mace Street

City Chula Vista, CA 91911 County San Diego

Latitude 32 Deg. 35 Min. 28.45 Sec. N Longitude 117 Deg. 03 Min. 14.06 Sec. W

Datum NAD83 Decimal Lat. Decimal Long.

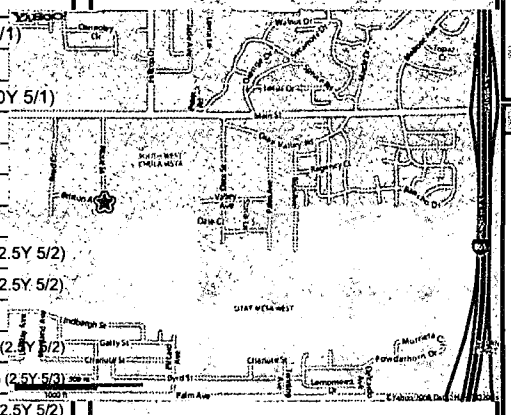
APN Book Page Parcel

Township 18S Range 02W Section 23G3

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

◉ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
◉ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	60	22.00	Conductor	PVC Sch. 80				
60	100	13.00						
100	460	12.00						
460/1000	1000/1472	10.00/8.00						
0	950		Blank	PVC Sch. 80	0.218	2.375		
950	970		Screen	PVC Sch. 80	0.218	2.375	Milled Slots	0.020

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
51	97	Filter Pack	RMC #3 Sand
194	266	Filter Pack	RMC #3 Sand
530	584	Filter Pack	RMC #3 Sand
926	985	Filter Pack	RMC #3 Sand
1399	1472	Filter Pack	RMC #3 Sand
		Bentonite	All other depths

Attachments

☑ Geologic Log
☑ Well Construction Diagram
☑ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other On file @ USGS- San Diego

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Anthony Brown, Hydrologic Technician, U.S. Geological Survey
Person, Firm or Corporation

4165 Spruance Road Suite 200 San Diego CA 92101
Address City State Zip

Signed
C-57 Licensed Water Well Contractor

02/10/2009
Date Signed

Exempt- Federal Government
C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0084925

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0084925

Page 3 of 5

Owner's Well Number SDOR #3

Date Work Began 11/06/2008 Date Work Ended 12/13/2008

Local Permit Agency County of San Diego Department of Environmental Health

Permit Number LMON T106077 Permit Date 10/31/08

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 18S02W23G004S

Latitude N / Longitude W

APN/TRS/Other

Geologic Log

Orientation: (•) Vertical ( ) Horizontal ( ) Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	10	Gravelly sand; m-vc sand w/ granules-sm pebbles; olive gray (5Y 5/2)
10	20	Gravelly sand; m-vc sand w/ granules; grayish brown (2.5Y 5/2)
20	30	Gravelly sand; m-vc sand w/ granules; lt olive brown (2.5Y 5/4)
30	40	Gravelly sand; m-vc sand w/ granules; dk yellowish brown (10YR 4/6)
40	60	Gravel; granules-med pebbles; various colors
60	70	Clayey silt; silt w/ clay; olive (5Y 4/3)
70	80	Silty sandy gravel; granules-med pebbles w/ vf-vc sand and silt; olive gray (5Y 4/2)
80	200	Clayey silt; silt w/ clay and shell fragments; v dk gray (5Y 3/1)
200	240	Clayey silt; silt w/ clay and minor shell fragments; v dk gray (5Y 3/1)
240	320	Silt; silt; dk gray (5Y 4/1)
320	550	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
550	560	Sand; vf-coarse sand w/ shell fragments; dk gray (5Y 4/1)
560	570	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
570	580	Sandy clay; clay w/ med-coarse sand; greenish gray (10Y 5/1)
580	610	Clay; clay; grayish brown (2.5Y 5/2)
610	630	Clay; clay; grayish brown (10YR 5/2)
630	650	Clay; clay; lt brownish gray (2.5Y 6/2)
650	750	Clay; clay; grayish brown (2.5Y 5/2)
750	880	Sandy clayey silt; silt w/ clay & vf-med sand; grayish brown (2.5Y 5/2)
880	910	Clayey silty sand; vf-coarse sand w/ silt & clay; grayish brown (2.5Y 5/2)
910	920	Clay; clay; brown (10YR 5/3)
920	940	Gravelly sand; med-vc sand w/ granules-sm pebbles; grayish brown (2.5Y 5/2)
940	1,030	Clayey silty gravelly sand; vf-vc sand w/ granules, silt & clay; lt olive brown (2.5Y 5/3)
1030	1,120	Silty gravelly sand; vf-vc sand w/ granules & silt; grayish brown (2.5Y 5/2)
1120	1,140	Sandy clay; clay w/ med-vc sand; lt brownish gray (2.5Y 6/2)
1140	1,472	Clayey silty sand; vf-vc sand w/ silt & clay; grayish brown (2.5Y 5/2)

Total Depth of Boring 1472 Feet

Total Depth of Completed Well 570 Feet

Well Owner

Well Location

Address 276 Mace Street

City Chula Vista, CA 91911 County San Diego

Latitude 32 Deg. 35 Min. 28.45 Sec. N Longitude 117 Deg. 03 Min. 14.06 Sec. W

Datum NAD83 Decimal Lat. Decimal Long.

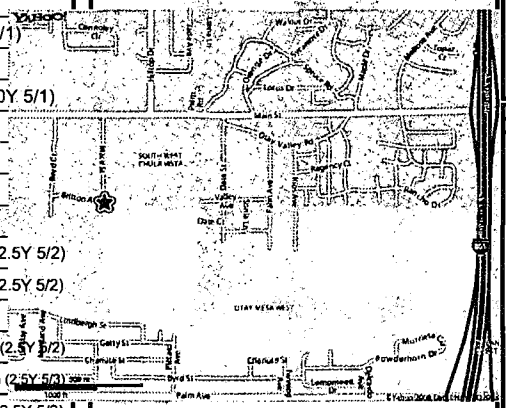
APN Book Page Parcel

Township 18S Range 02W Section 23G4

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

(•) New Well
( ) Modification/Repair
( ) Deepen
( ) Other
( ) Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

( ) Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
( ) Cathodic Protection
( ) Dewatering
( ) Heat Exchange
( ) Injection
(•) Monitoring
( ) Remediation
( ) Sparging
( ) Test Well
( ) Vapor Extraction
( ) Other

Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	60	22.00	Conductor	PVC Sch. 80				
60	100	13.00						
100	460	12.00						
460/1000	1000/1472	10.00/8.00						
0	550		Blank	PVC Sch. 80	0.218	2.375		
550	570		Screen	PVC Sch. 80	0.218	2.375	Milled Slots	0.020

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
51	97	Filter Pack	RMC #3 Sand
194	266	Filter Pack	RMC #3 Sand
530	584	Filter Pack	RMC #3 Sand
926	985	Filter Pack	RMC #3 Sand
1399	1472	Filter Pack	RMC #3 Sand
		Bentonite	All other depths

Attachments

☑ Geologic Log
☑ Well Construction Diagram
☑ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other On file @ USGS- San Diego

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Anthony Brown, Hydrologic Technician, U.S. Geological Survey
Person, Firm or Corporation

4165 Spruance Road Suite 200 San Diego CA 92101
Address City State Zip

Signed
C-57 Licensed Water Well Contractor

02/10/2009
Date Signed

Exempt- Federal Government
C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0084925

Page 4 of 5

Owner's Well Number SDOR #4

Date Work Began 11/06/2008 Date Work Ended 12/13/2008

Local Permit Agency County of San Diego Department of Environmental Health

Permit Number LMON T106077 Permit Date 10/31/08

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 18S 02W 23 G 005 S

Latitude N / Longitude W

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description: Describe material, grain size, color, etc
0	10	Gravelly sand; m-vc sand w/ granules-sm pebbles; olive gray (5Y 5/2)
10	20	Gravelly sand; m-vc sand w/ granules; grayish brown (2.5Y 5/2)
20	30	Gravelly sand; m-vc sand w/ granules; lt olive brown (2.5Y 5/4)
30	40	Gravelly sand; m-vc sand w/ granules; dk yellowish brown (10YR 4/6)
40	60	Gravel; granules-med pebbles; various colors
60	70	Clayey silt; silt w/ clay; olive (5Y 4/3)
70	80	Silty sandy gravel; granules-med pebbles w/ vf-vc sand and silt; olive gray (5Y 4/2)
80	200	Clayey silt; silt w/ clay and shell fragments; v dk gray (5Y 3/1)
200	240	Clayey silt; silt w/ clay and minor shell fragments; v dk gray (5Y 3/1)
240	320	Silt; silt; dk gray (5Y 4/1)
320	550	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
550	560	Sand; vf-coarse sand w/ shell fragments; dk gray (5Y 4/1)
560	570	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
570	580	Sandy clay; clay w/ med-coarse sand; greenish gray (10Y 5/1)
580	610	Clay; clay; grayish brown (2.5Y 5/2)
610	630	Clay; clay; grayish brown (10YR 5/2)
630	650	Clay; clay; lt brownish gray (2.5Y 6/2)
650	750	Clay; clay; grayish brown (2.5Y 5/2)
750	880	Sandy clayey silt; silt w/ clay & vf-med sand; grayish brown (2.5Y 5/2)
880	910	Clayey silty sand; vf-coarse sand w/ silt & clay; grayish brown (2.5Y 5/2)
910	920	Clay; clay; brown (10YR 5/3)
920	940	Gravelly sand; med-vc sand w/ granules-sm pebbles; grayish brown (2.5Y 5/2)
940	1,030	Clayey silty gravelly sand; vf-vc sand w/ granules, silt & clay; lt olive brown (2.5Y 5/3)
1030	1,120	Silty gravelly sand; vf-vc sand w/ granules & silt; grayish brown (2.5Y 5/2)
1120	1,140	Sandy clay; clay w/ med-vc sand; lt brownish gray (2.5Y 6/2)
1140	1,472	Clayey silty sand; vf-vc sand w/ silt & clay; grayish brown (2.5Y 5/2)

Total Depth of Boring 1472 Feet

Total Depth of Completed Well 240 Feet

Well Owner

Well Location

Address 276 Mace Street

City Chula Vista, CA 91911 County San Diego

Latitude 32 Deg. 35 Min. 28.45 Sec. N Longitude 117 Deg. 03 Min. 14.06 Sec. W

Datum NAD83 Decimal Lat. Decimal Long.

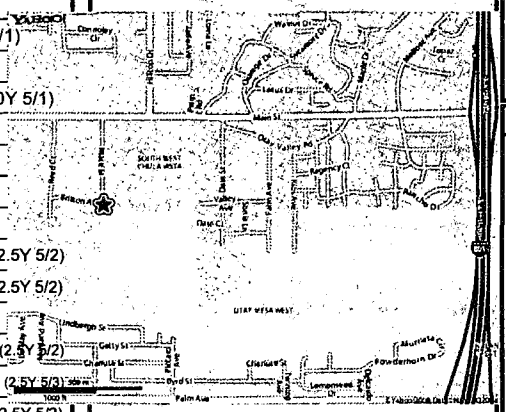
APN Book Page Parcel

Township 18S Range 02W Section 23G5

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

◉ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
◉ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	60	22.00	Conductor	PVC Sch. 80				
60	100	13.00						
100	460	12.00						
460/1000	1000/1472	10.00/8.00						
0	220		Blank	PVC Sch. 80	0.218	2.375		
220	240		Screen	PVC Sch. 80	0.218	2.375	Milled Slots	0.020

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
51	97	Filter Pack	RMC #3 Sand
194	266	Filter Pack	RMC #3 Sand
530	584	Filter Pack	RMC #3 Sand
926	985	Filter Pack	RMC #3 Sand
1399	1472	Filter Pack	RMC #3 Sand
		Bentonite	All other depths

Attachments

☑ Geologic Log
☑ Well Construction Diagram
☑ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other On file @ USGS- San Diego

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Anthony Brown, Hydrologic Technician, U.S. Geological Survey

Person, Firm or Corporation

4165 Spruance Road Suite 200 San Diego CA 92101

Address City State Zip

Signed 02/10/2009 Exempt- Federal Government

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0084925

Page 5 of 5

Owner's Well Number SDOR #5

Date Work Began 11/06/2008 Date Work Ended 12/13/2008

Local Permit Agency County of San Diego Department of Environmental Health

Permit Number LMON T106077 Permit Date 10/31/08

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 18S02W23G006S

Latitude ___ N Longitude ___ W

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify ___

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	10	Gravelly sand; m-vc sand w/ granules-sm pebbles; olive gray (5Y 5/2)
10	20	Gravelly sand; m-vc sand w/ granules; grayish brown (2.5Y 5/2)
20	30	Gravelly sand; m-vc sand w/ granules; lt olive brown (2.5Y 5/4)
30	40	Gravelly sand; m-vc sand w/ granules; dk yellowish brown (10YR 4/6)
40	60	Gravel; granules-med pebbles; various colors
60	70	Clayey silt; silt w/ clay; olive (5Y 4/3)
70	80	Silty sandy gravel; granules-med pebbles w/ vf-vc sand and silt; olive gray (5Y 4/2)
80	200	Clayey silt; silt w/ clay and shell fragments; v dk gray (5Y 3/1)
200	240	Clayey silt; silt w/ clay and minor shell fragments; v dk gray (5Y 3/1)
240	320	Silt; silt; dk gray (5Y 4/1)
320	550	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
550	560	Sand; vf-coarse sand w/ shell fragments; dk gray (5Y 4/1)
560	570	Clayey silt; silt w/ clay; v dk gray (5Y 3/1)
570	580	Sandy clay; clay w/ med-coarse sand; greenish gray (10Y 5/1)
580	610	Clay; clay; grayish brown (2.5Y 5/2)
610	630	Clay; clay; grayish brown (10YR 5/2)
630	650	Clay; clay; lt brownish gray (2.5Y 6/2)
650	750	Clay; clay; grayish brown (2.5Y 5/2)
750	880	Sandy clayey silt; silt w/ clay & vf-med sand; grayish brown (2.5Y 5/2)
880	910	Clayey silty sand; vf-coarse sand w/ silt & clay; grayish brown (2.5Y 5/2)
910	920	Clay; clay; brown (10YR 5/3)
920	940	Gravelly sand; med-vc sand w/ granules-sm pebbles; grayish brown (2.5Y 5/2)
940	1,030	Clayey silty gravelly sand; vf-vc sand w/ granules, silt & clay; lt olive brown (2.5Y 5/3)
1030	1,120	Silty gravelly sand; vf-vc sand w/ granules & silt; grayish brown (2.5Y 5/2)
1120	1,140	Sandy clay; clay w/ med-vc sand; lt brownish gray (2.5Y 6/2)
1140	1,472	Clayey silty sand; vf-vc sand w/ silt & clay; grayish brown (2.5Y 5/2)

Total Depth of Boring 1472 Feet

Total Depth of Completed Well 90 Feet

Well Owner

Well Location

Address 276 Mace Street

City Chula Vista, CA 91911 County San Diego

Latitude 32 Deg. 35 Min. 28.45 Sec. N Longitude 117 Deg. 03 Min. 14.06 Sec. W

Datum NAD83 Decimal Lat. ___ Decimal Long. ___

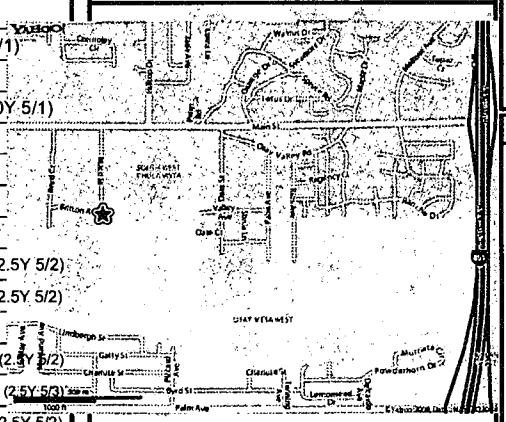
APN Book ___ Page ___ Parcel ___

Township 18S Range 02W Section 23G6

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

◉ New Well
○ Modification/Repair
○ Deepen
○ Other ___
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
◉ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other ___

Water Level and Yield of Completed Well

Depth to first water ___ (Feet below surface)

Depth to Static Water Level ___ (Feet) Date Measured ___

Estimated Yield * ___ (GPM) Test Type ___

Test Length ___ (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	60	22.00	Conductor	PVC Sch. 80				
60	100	13.00						
100	460	12.00						
460/1000	1000/1472	10.00/8.00						
0	70		Blank	PVC Sch. 80	0.218	2.375		
70	90		Screen	PVC Sch. 80	0.218	2.375	Milled Slots	0.020

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
51	97	Filter Pack	RMC #3 Sand
194	266	Filter Pack	RMC #3 Sand
530	584	Filter Pack	RMC #3 Sand
926	985	Filter Pack	RMC #3 Sand
1399	1472	Filter Pack	RMC #3 Sand
		Bentonite	All other depths

Attachments

☑ Geologic Log
☑ Well Construction Diagram
☑ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other On file @ USGS- San Diego

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Anthony Brown, Hydrologic Technician, U.S. Geological Survey

Person, Firm or Corporation

4165 Spruance Road Suite 200 San Diego CA 92101

Address City State Zip

Signed ___ 02/10/2009

C-57 Licensed Water Well Contractor Date Signed

Exempt- Federal Government

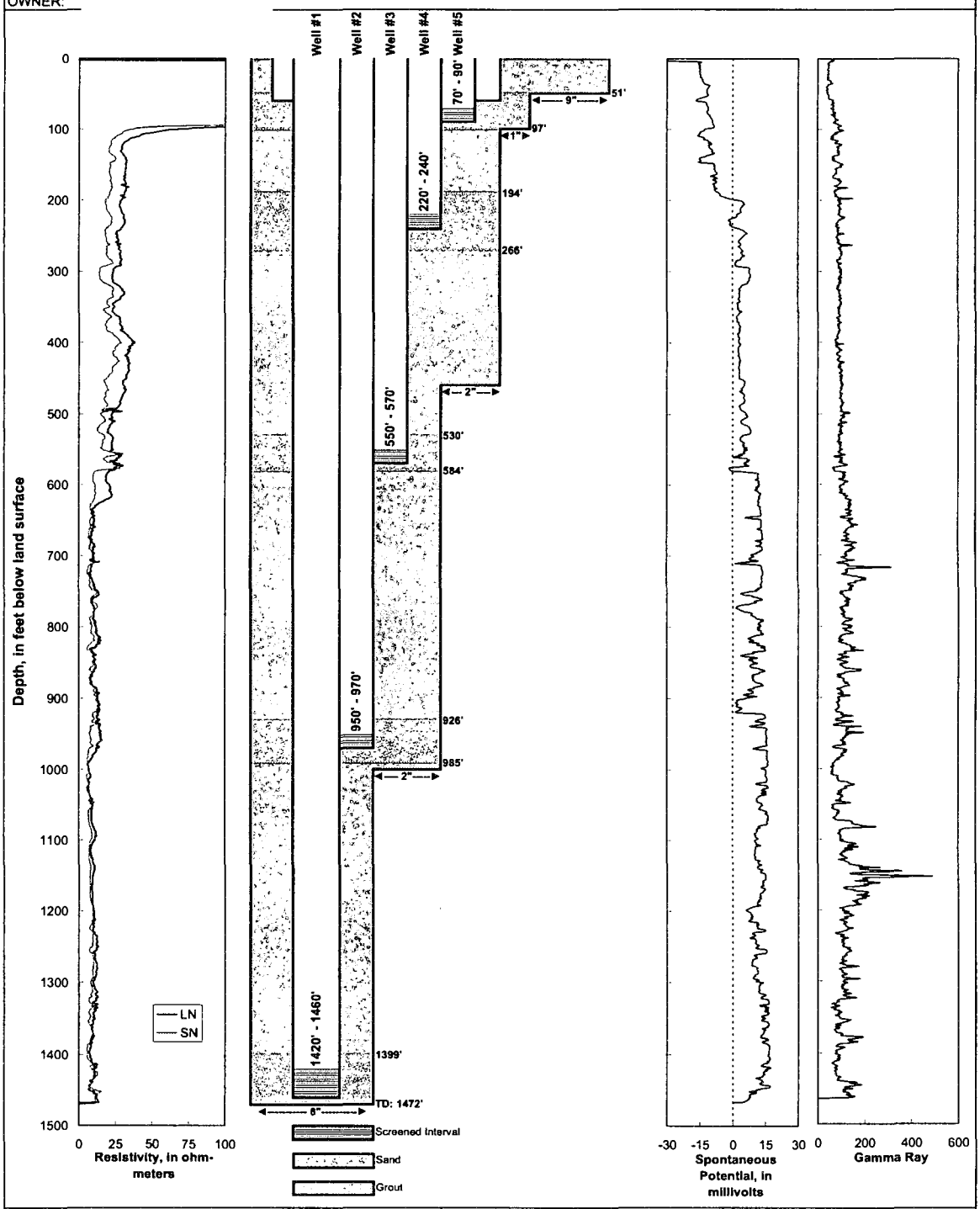
C-57 License Number

DWR 188 REV. 1/2006

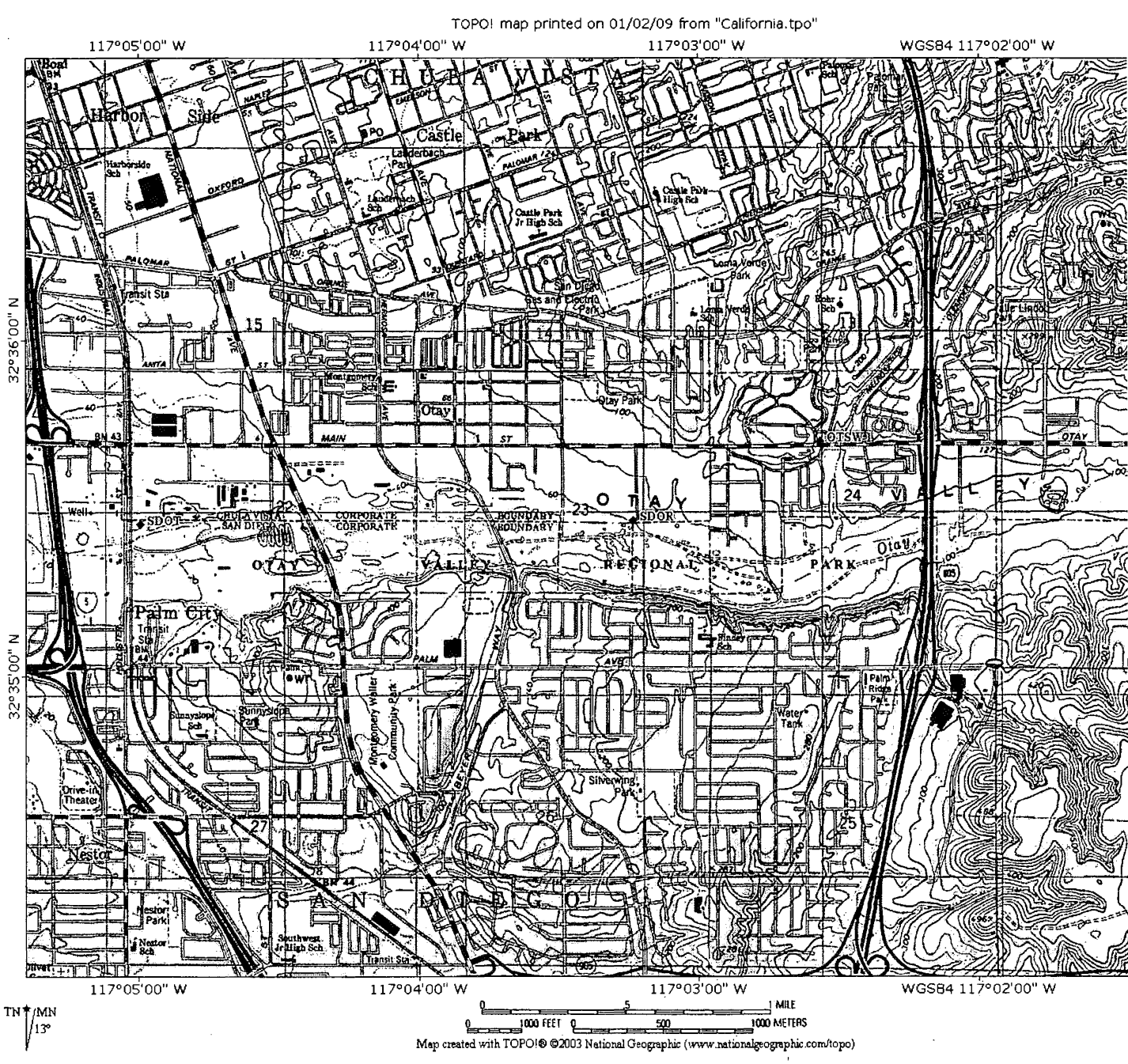
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

600084925

SITE I.D:	323528117031401-05	COMPLETION DATE:	12/13/2008
STATION NAME:	0018S002W32G002-06s	TOTAL DEPTH:	1472'
USGS SITE:	San Diego Otay River (SDOR)	WELL FINISH:	VAULT
OWNER:			



DRILL TYPE:	HYDRAULIC MUD ROTARY	DRILLER:	USGS WESTERN REGION RESEARCH DRILLING UNIT
CASING TYPE:	SCHD. 80 PVC 20' SEC (#1: 3", #2-5: 2")	SCREEN TYPE:	SCHD. 80 1.5"x0.02" SLOTS (Except #1: 2.0"X0.02")
GROUT:	PUREGOLD GROUT @ 30% SOLIDS	SAND:	RMC #3
BOREHOLE DIA:	22": 0' - 60'; 13": 60' - 100'; 12": 100' - 460'; 10": 460' - 1000'; 8": 1000' - 1472'		
SURFACE/CONDUCTOR CASING:	15": 0' - 60' PVC BELL-END SDR35		



0 25 50 75 100 Resistivity, in ohm-meters	Sand / Grout	-30 -15 0 15 30 Spontaneous Potential, in millivolts	0 200 400 600 Gamma Ray

DRILL TYPE: HYDRAULIC MUD ROTARY	DRILLER: USGS WESTERN REGION RESEARCH DRILLING UNIT
CASING TYPE: SCHD. 80 PVC 20' SEC (#1: 3", #2-5: 2")	SCREEN TYPE: SCHD. 80 1.5"x0.02" SLOTS (Except #1: 2.0"X0.02")
GROUT: PUREGOLD GROUT @ 30% SOLIDS	SAND: RMC #3
BOREHOLE DIA: 22": 0' - 60'; 13": 60' - 100'; 12": 100' - 460'; 10": 460' - 1000'; 8": 1000' - 1472'	
SURFACE/CONDUCTOR CASING: 15": 0' - 60' PVC BELL-END SDR35	


Main St
Britton Ave
Reed St
Mace St
SDOR
© USFWS
© 2008 Tele Atlas
©2008 Google
32°35'32.81" N 117°03'12.31" W
elev 80 ft
Feb 2008
Eye alt 1987 ft

C0084925

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

19S/2W-00

Do Not Fill In

No. 28827

State Well No. 19S/2W

Other Well No.

(1) OWNER:

(2) LOCATION OF WELL:

County San Diego Owner's number, if any Bay Farms

R. F. D. or Street No. 1000' South on Dairy Mart Rd.

From 101 Freeway & 1000' West

(3) TYPE OF WORK (*check*):

New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (*check*):

Domestic ☐ Industrial ☐ Municipal ☐

Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☐

Cable ☐

Dug Well ☒

(6) CASING INSTALLED:

SINGLE ☐ DOUBLE ☐

From ft.	to ft.	Diam.	Gage or Wall
0	88'	6" or 12" O.D.	3/4 By 1/4" Wall.

Type and size of shoe or well ring 1-12"

Describe joint Welding

If gravel packed

Diameter of Bore	from ft.	to ft.

Size of gravel:

(7) PERFORATIONS:

Type of perforator used

Size of perforations 2½" X 1/4" in., length, by 128 in.

From ft.	to ft.	Perf. per row	Rows per ft.
70	88		

(8) CONSTRUCTION:

Was a surface sanitary seal provided? ☐ Yes ☐ No To what depth ft.

Were any strata sealed against pollution? ☐ Yes ☐ No If yes, note depth of strata

From ft.	to ft.

Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found ft.

Standing level before perforating ft.

Standing level after perforating 32' ft.

(10) WELL TESTS:

Was a pump test made? ☐ Yes ☐ No If yes, by whom?

Yield: gal./min. with ft. draw down after hrs.

Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

Was electric log made of well? ☐ Yes ☐ No

(11) WELL LOG:

Total depth ft. Depth of completed well ft.

Formation: *Describe by color, character, size of material, and structure.*

ft. to	ft.	
0	25	Sand
25	30	Sand & Sand Gravel
30	53	Sandy Mud
53	67	Sand & Gravel
67	70	Sand, Gravel & Large Rock
70	85	Sand & Gravel

CONFIDENTIAL - NOT FOR PUBLIC RELEASE

MICROFILMED

Work started 5/5/ 19 59 , Completed 5/30/59 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME San Diego Pump & Well Drillers

(Person, firm or corporation) (Type or print)

Address P.O. Box 996 Chula Vista, Calif.

[SIGNED] J. Hamilton 996

(Well Driller)

License No. No. 160313 Dated 6/30/59, 19

95689 3-54 50M QUIN ® SPO

DWR FORM No. 246 (REV. 3-54)

ORIGINAL
File with DWR

Page 1 of 3

STATE OF CALIFORNIA
WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. e010426

Owner's Well No. B-20

Date Work Began 11-4-03 Ended 11-4-03

Local Permit Agency San Diego County

Permit No. _____ Permit Date _____

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD HSA FLUID _____

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
	SEE ATTACHED LOG

TOTAL DEPTH OF BORING 30 (Feet)

TOTAL DEPTH OF COMPLETED WELL 30 (Feet)

WELL OWNER

WELL LOCATION

Address 314 E. San Ysidro Blvd

City San Diego

County San Diego

APN Book ___ Page ___ Parcel ___

Township 19S Range 2W Section 1

Latitude 32 DEG. 33 MIN. 8 SEC. NORTH Longitude 117 DEG. 2 MIN. 18 SEC. WEST

LOCATION SKETCH

NORTH

SEE ATTACHED MAP

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 15 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 to 10	10	✓				PVC	4	SCH 40	—
10 to 30	10		✓			PVC	4	SCH 40	.020

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 to 4	✓			
4 to 7		✓		chips
7 to 30			✓	#3

ATTACHMENTS (✓)

✓ Geologic Log
✓ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
✓ Other Site Map

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME BC² ENVIRONMENTAL CORP. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 1212 EAST ASH AVE. CITY FULLERTON STATE CA ZIP 92831

Signed M DeRose WELL DRILLER/AUTHORIZED REPRESENTATIVE

DATE SIGNED 2-11-04

C-57 LICENSE NUMBER 686255

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

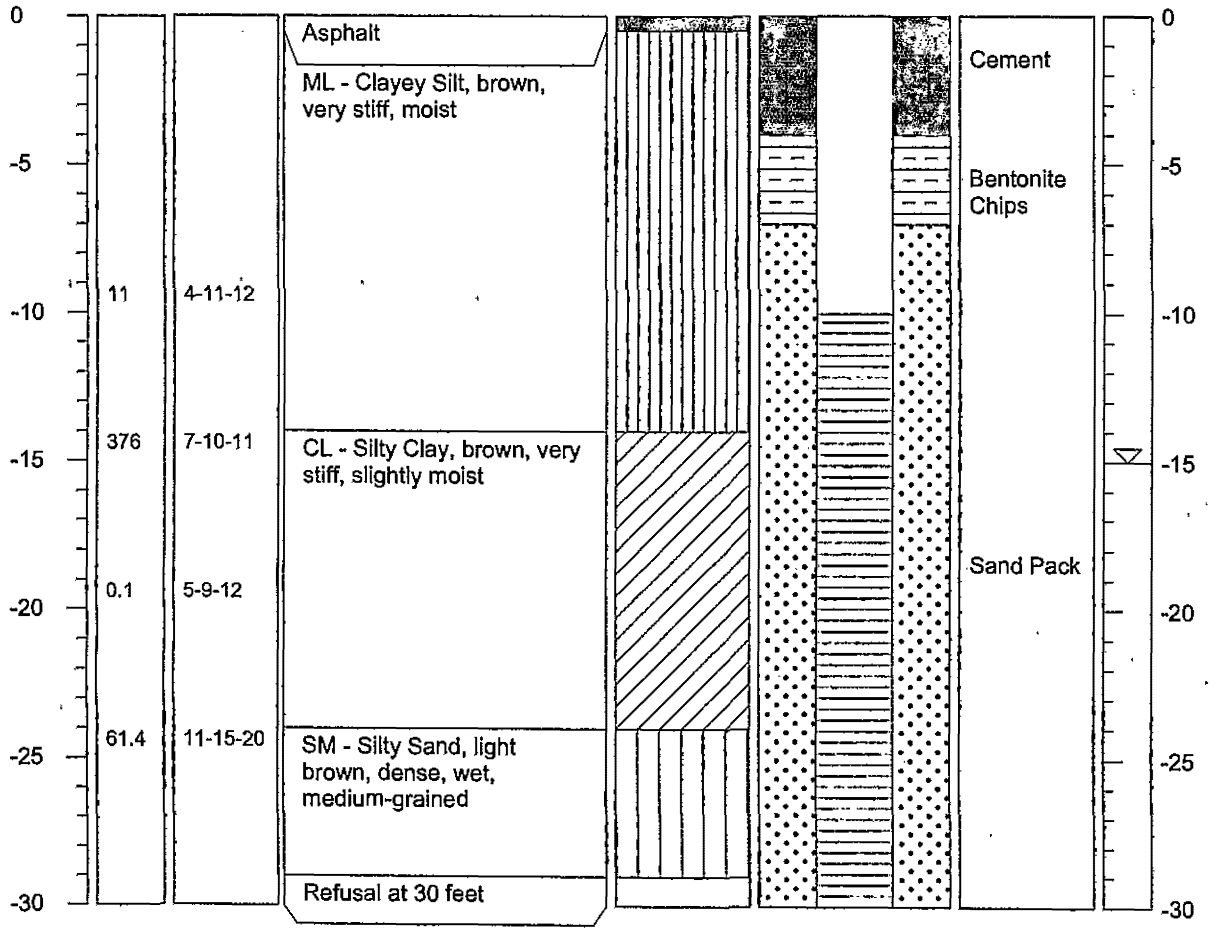
NorthShore Engineering, Inc.

e010426

Logged by: Aaron Hill
Location: 314 East San Ysidro Blvd.
Project No.: NS-02-1100
Date Drilled: November 4, 2003

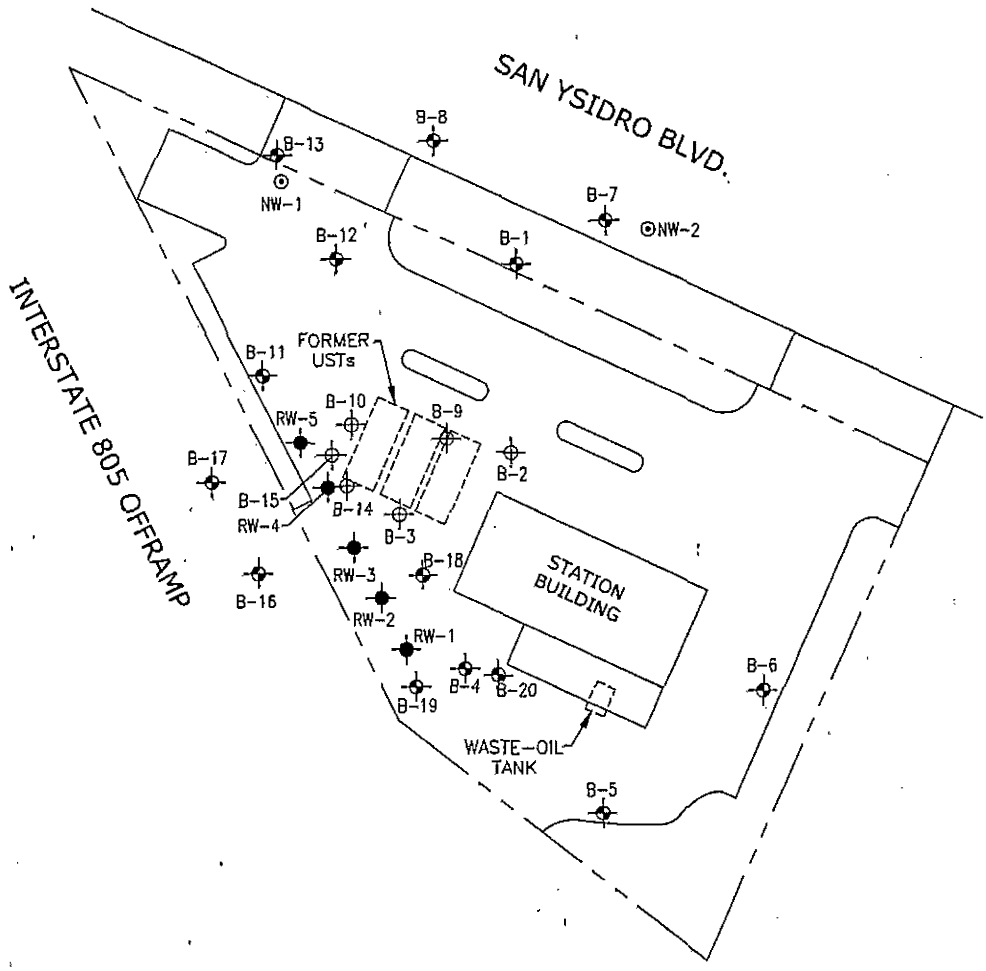
Drilling Co.: BC2
Drilling Method: Hollow Stem Auger
Depth to First Saturation: 15 feet
Total Depth: 30 feet

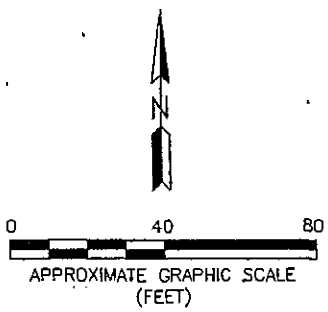
Well No.: B-20
Well Casing Dimension: 10-ft of 4" SCH 40 PVC
Well Screen: 20-ft of 4" SCH 40 Slotted PVC Casing
Boring Dimension: 10" O.D.



Approved by Charlie Wyatt, P.E.

e010426





LEGEND:

- B-1 ⊕ EXISTING GROUNDWATER MONITORING WELL
- B-2 ⊕ ABANDONED GROUNDWATER WELL
- RW-1 ● ABANDONED GROUNDWATER RECOVERY WELL
- NW-1 ⊙ NESTED WELL LOCATION

NorthShore Engineering, Inc. 2551 STATE STREET, SUITE 226 CARLSBAD, CA 92008 TEL: (760) 729-9425 FAX: (760) 729-9425	SITE PLAN	
CLIENT:	PROJECT MANAGER: BILL LANTZ	PROJECT NUMBER: NS-D2-1100
LOCATION: 314 EAST SAN YSIDRO BLVD. SAN DIEGO, CALIFORNIA	DATE: FEBRUARY 2004	FIGURE: 2

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

ORIGINAL
File with DWR

Do not fill in

No. 336128

Notice of Intent No 250338
Local Permit No or Date W91968

State Well No
Other Well No MW1

(2) LOCATION OF WELL (See instructions):
County SAN DIEGO Owner's Well Number
Well address if different from above
Township 18S Range 2W Section 24
Distance from cities, roads, railroads, fences, etc APPROXIMATELY 400 FEET EAST OF INTERSTATE 805.

SEE ATTACHED

WELL LOCATION SKETCH

(3) TYPE OF WORK
New Well X Deepening
Reconstruction
Reconditioning
Horizontal Well
Destruction (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE
Domestic
Irrigation
Industrial
Test Well
Municipal
Other GROUNDWATER MONITOR X (Describe)

(5) EQUIPMENT
Rotary X Reverse
Cable Air X
Other X Bucket
AUGER

(6) GRAVEL PACK
Yes X No Size
Diameter of bore 8 INCH
Packed from 265 ft to 218 ft

(7) CASING INSTALLED
Steel Plastic X Concrete

(8) PERFORATIONS SLOTTED
Type of perforation or size of screen .020

From ft.	To ft	Dia in	Gage or Wall	From ft	To ft	Slot size
0.5	250	2"		220	250	0.020"

(9) WELL SEAL:
Was surface sanitary seal provided? Yes X No If yes, to depth 218 ft
Were strata sealed against pollution? Yes X No Interval ft
Method of sealing BENTONITE/CEMENT

(10) WATER LEVELS:
Depth of first water, if known NOTKNOWN ft
Standing level after well completion 210 ft

(11) WELL TESTS:
Was well test made? Yes No X If yes, by whom?
Type of test Pump Bailer Air lift
Depth to water at start of test ft At end of test ft
Discharge gal/min after hours Water temperature
Chemical analysis made? Yes X No If yes, by whom?
Was electric log made Yes No X If yes, attach copy to this report

(12) WELL LOG. Total depth 265 ft Completed depth 250 ft

from ft	to ft	Formation (Describe by color, character, size or material)
0	-80	MODERATE, YELLOWISH BROWN (10YR 5/4), DRY, MEDIUM TO COARSE SAND (SP) WITH COBBLES
80	-85	BECOMES MOIST, FINE SILTY SAND (SM)
85	-110	BECOMES CLAYEY SAND (SC)
110	-237	DARK YELLOWISH ORANGE (10YR 6/6), MOIST, FINE SAND (SP)
237	-265	GRAY, VERY MOIST, SILT (ML)

Work started 24 MAY 1991 Completed 26 JUNE 1991

WELL DRILLER'S STATEMENT

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief

Signed (Well Driller)

NAME A & R DRILLING, INC. (Person, firm, or corporation) (Typed or printed)

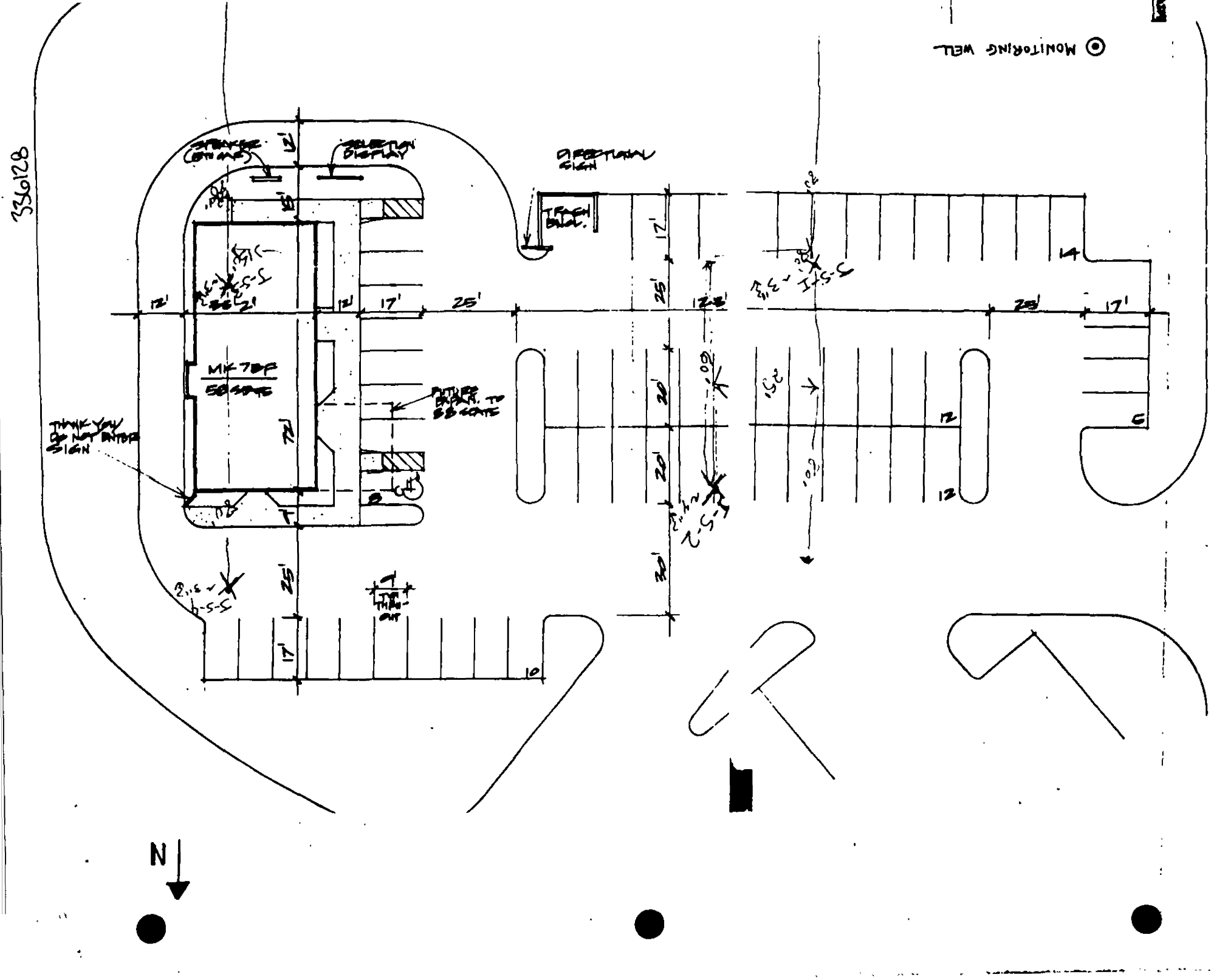
Address 1210 EAST 223RD STREET, SUITE 319

City CARSON ZIP 90745

License No 492082 Date of this report 5 AUGUST 1991

CONFIDENTIAL NOT FOR PUBLIC USE WATER CODE SEC. 13752

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 86 96355


MONITORING WELL
DIRECTIONAL SIGN
MK-7BF
58 SPACES
FUTURE BREAK. TV
58 SPACES
THANK YOU
DO NOT ENTER
SIGN
ONE THRU-OUT
N

336128

PROJECT ▷ JACK 3014	APPLIED GEOSCIENCES INC.	PROJECT NUMBER ▷ A901924A
LOGGED BY ▷ C. HILL/P. ROBERTS		START DATE ▷ 24 May 1991
CHECKED BY ▷		COMPLETION DATE ▷ 26 June 1991
GROUND SURFACE ELEVATION DATUM (FT-MSL) ▷		DRILLING COMPANY ▷ LAYNE/A & R DRILLING
DRILLING EQUIPMENT ▷ FAILING F-10 W/8-INCH HOLLOW STEM AUGERS/CME 75 ROTARY RIG		
BORING DEPTH (FT) ▷ 265.0	WELL DEPTH (FT) ▷ 250	WATER DEPTH (FT)-Initial: Completion: 210.0
WELL MATERIALS ▷ SCHEDULE 80 PVC W/0.02 SLOT		WELL SCREEN INTERVAL (FT) ▷ 220 TO 250
WELL CASING ELEVATION (FT-MSL) ▷ N/A		OVM/OVA ▷ N/A
BACKFILL MATERIAL ▷ #3 SAND, BENTONITE, AND CEMENT		

DEPTH (FT)	LITHOLOGY DESCRIPTION	GRAPHIC	WELL	BLOW COUNT	OVM/OVA (PPM)	SAMPLE RECOVERY X	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS
0	Moderate yellowish brown (10 YR 5/4), dry, medium to coarse SAND (SP) with cobbles.								
5									
10									
15									
20									
25									
30									

BORING DESIGNATION	BORING LOG	PAGE NUMBER	FIGURE NUMBER
MW1		1 OF 7	a

336128

PROJECT ▷ JACK 3014 | PROJECT NUMBER ▷ A901924A

DEPTH (FT)	LITHOLOGY: DESCRIPTION	LITHOLOGY: GRAPHIC	WELL	BLOW COUNT	OVM/OVA (PPM)	SAMPLE: RECOVERY %	SAMPLE: TYPE	SAMPLE: NUMBER	COMMENTS
30									
35									
40									
45									
50									
55									
60									
65									
70									

BORING DESIGNATION: MW1 | BORING LOG | PAGE NUMBER: 2 OF 7 | FIGURE NUMBER: b

336128

PROJECT ▷ JACK 3014 | PROJECT NUMBER ▷ A901924A

DEPTH (FT)	LITHOLOGY: DESCRIPTION	GRAPHIC	WELL	BLOW COUNT	OVM/OVA (PPM)	SAMPLE: RECOVERY %	SAMPLE: TYPE	SAMPLE: NUMBER	COMMENTS
70	Soil becomes moist, more clayey, fewer cobbles								
75									
80	Became moist, fine silty SAND (SM)								
85	Became clayey SAND (SC)								
90									
95									
100									
105									
110									

BORING DESIGNATION	BORING LOG	PAGE NUMBER	FIGURE NUMBER
MW1		3 OF 7	c

336029

PROJECT ▷ JACK 3014 | PROJECT NUMBER ▷ A901924A

DEPTH (FT)	LITHOLOGY: DESCRIPTION	LITHOLOGY: GRAPHIC	WELL	BLOW COUNT	OVM/OVA (PPM)	SAMPLE: RECOVERY %	SAMPLE: TYPE	SAMPLE: NUMBER	COMMENTS
110	Dark yellowish orange, moist, fine SAND (SP) Became cobbly								
115									
120									
125									
130									
135									
140									
145									
150									

BORING DESIGNATION: MW1 | BORING LOG | PAGE NUMBER: 4 OF 7 | FIGURE NUMBER: d

336128

PROJECT ▷ JACK 3014 | PROJECT NUMBER ▷ A901924A

DEPTH (FT)	LITHOLOGY. DESCRIPTION	GRAPHIC	WELL	BLOW COUNT	OVM/OVA (PPM)	SAMPLE RECOVERY %	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS
150									
155									
160									
165									
170									
175									
180									
185	Became gravelly								
190									

BORING DESIGNATION: MW1 | BORING LOG | PAGE NUMBER: 5 OF 7 | FIGURE NUMBER: e

336128

PROJECT ▷ JACK 3014 | PROJECT NUMBER ▷ A901924A

DEPTH (FT)	LITHOLOGY: DESCRIPTION	LITHOLOGY: GRAPHIC	WELL	BLOW COUNT	OVM/OVA (PPM)	SAMPLE: RECOVERY %	SAMPLE: TYPE	SAMPLE: NUMBER	COMMENTS
190									
195									
200									
205									
210									
215									
220									
225									
230									

BORING DESIGNATION	BORING LOG	PAGE NUMBER	FIGURE NUMBER
MW1		6 OF 7	f

336128

PROJECT ▷ JACK 3014 | PROJECT NUMBER ▷ A901924A

DEPTH (FT)	LITHOLOGY: DESCRIPTION	GRAPHIC	WELL	BLOW COUNT	OVM/OVA (PPM)	SAMPLE: RECOVERY %	SAMPLE: TYPE	SAMPLE: NUMBER	COMMENTS
230									
235									
	Gray, very moist, SILT (ML)								
240									
245									
250									
255									
260									
265	Boring terminated at approximately 265 feet								

BORING DESIGNATION	BORING LOG	PAGE NUMBER	FIGURE NUMBER
MW1		7 OF 7	g

18 S/2W/24

336128

APPLIED GEOSCIENCES INC.

5505 Morehouse Drive, Suite 230
South Sorrento Plaza
San Diego, CA 92121
(619) 558-0600
FAX (619) 558-7180

8 August 1991
A901924A

Site Assessment and Mitigation
Environmental Health Services (HMMD)
P.O. Box 85261
San Diego, California 92138-5261

Attn:

SUBJECT: 30 DAY REPORT CONCERNING DRILLING AND CONSTRUCTION OF WELLS AT THE NORTHEAST CORNER OF INTERSTATE 805 AND PALM AVENUE, CHULA VISTA, CALIFORNIA

Dear :

Enclosed please find a copy of the Department of Water Resources Water Well Drillers Report. This information is requested as conditions of the well permit issued for the installation of one groundwater monitoring well at the site. Also enclosed are the boring log and site plot plan with the well location. A water sample has not been collected as of the date of this report. Laboratory results for the water sample will be forwarded at a later date.

If further information is needed, please feel free to contact me at (619) 558-0600.

Sincerely,
APPLIED GEOSCIENCES INC.

Craig L. Carlisle
Senior Project Hydrogeologist

CC: File A901924A

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR 19S02W01

Page 1 of 1

Owner's Well Number URS-MW07

Date Work Began 03/02/2010 Date Work Ended 3/3/2010

Local Permit Agency San Diego County Department of Environmental Health

Permit Number LMON106922 Permit Date 2/2/10

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0108070

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow Stem Auger Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	7	Yellowish brown, Silt with fine Sand (ML), moist
7	33	Gray, fine to coarse Sand (SW), moist

Total Depth of Boring 33 Feet

Total Depth of Completed Well 30 Feet

Well Owner

Well Location

Address 245 Calle Primera

City San Diego County San Diego

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum NAD83 Decimal Lat. 32.5514239 Decimal Long. -117.0469

APN Book Page Parcel 666-371-07-00

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED SITE PLAN FOR WELL LOCATIONS

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

◉ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
◉ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 15 (Feet below surface)

Depth to Static Water Level 15 (Feet) Date Measured 03/09/2010

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	10	10	Blank	PVC Sch. 40	0.25	4.5		
10	30	10	Screen	PVC Sch. 40	0.25	4.5	Milled Slots	0.010

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	3	Cement	Concrete
3	5	Bentonite	Cement/Bentonite
5	8	Bentonite	Chips
8	30	Filter Pack	#2/12 Sand
30	33	Fill	Native Soil

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other Well Location Site Plan

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name WDE EXPLORATION & WELLS
Person, Firm or Corporation

5866 ARROW HIGHWAY Address MONTCLAIR City CA State 91763 Zip

Signed C-57 Licensed Water Well Contractor

3/31/10 Date Signed

283326 C-57 License Number

DWR 188 REV. 1/2006

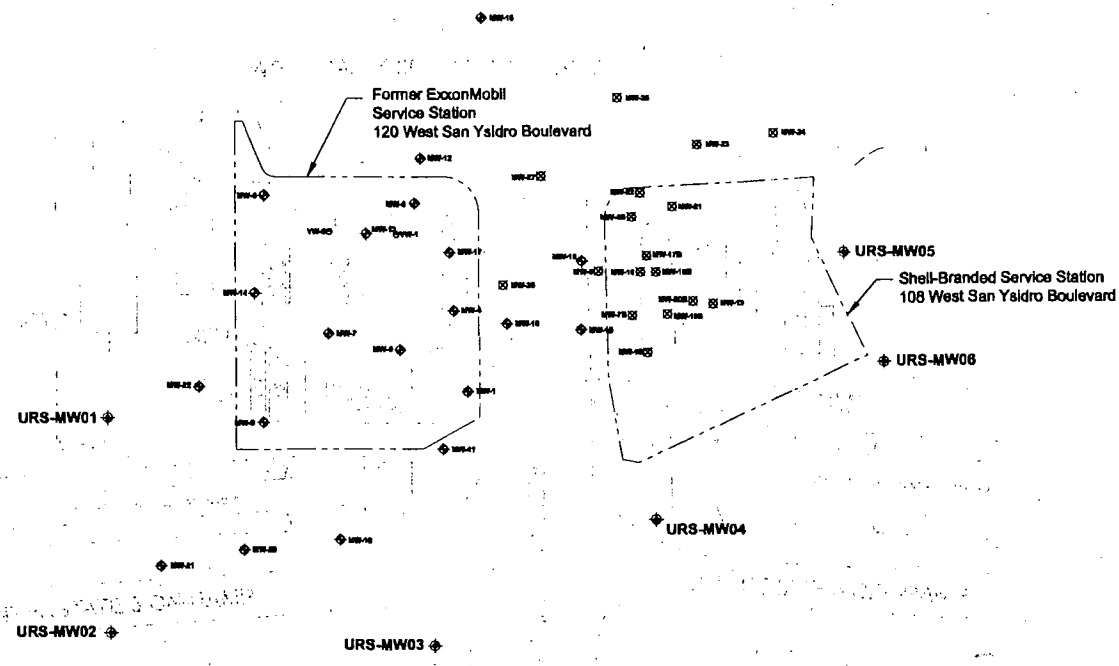
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

04/05/10

e0108070

LEGEND

- Shell-Branded Service Station Groundwater Monitoring Well
- Former ExxonMobil Service Station Groundwater Monitoring Well
- Former ExxonMobil Service Station Vapor Extraction Well
- RELLC Groundwater Monitoring Well



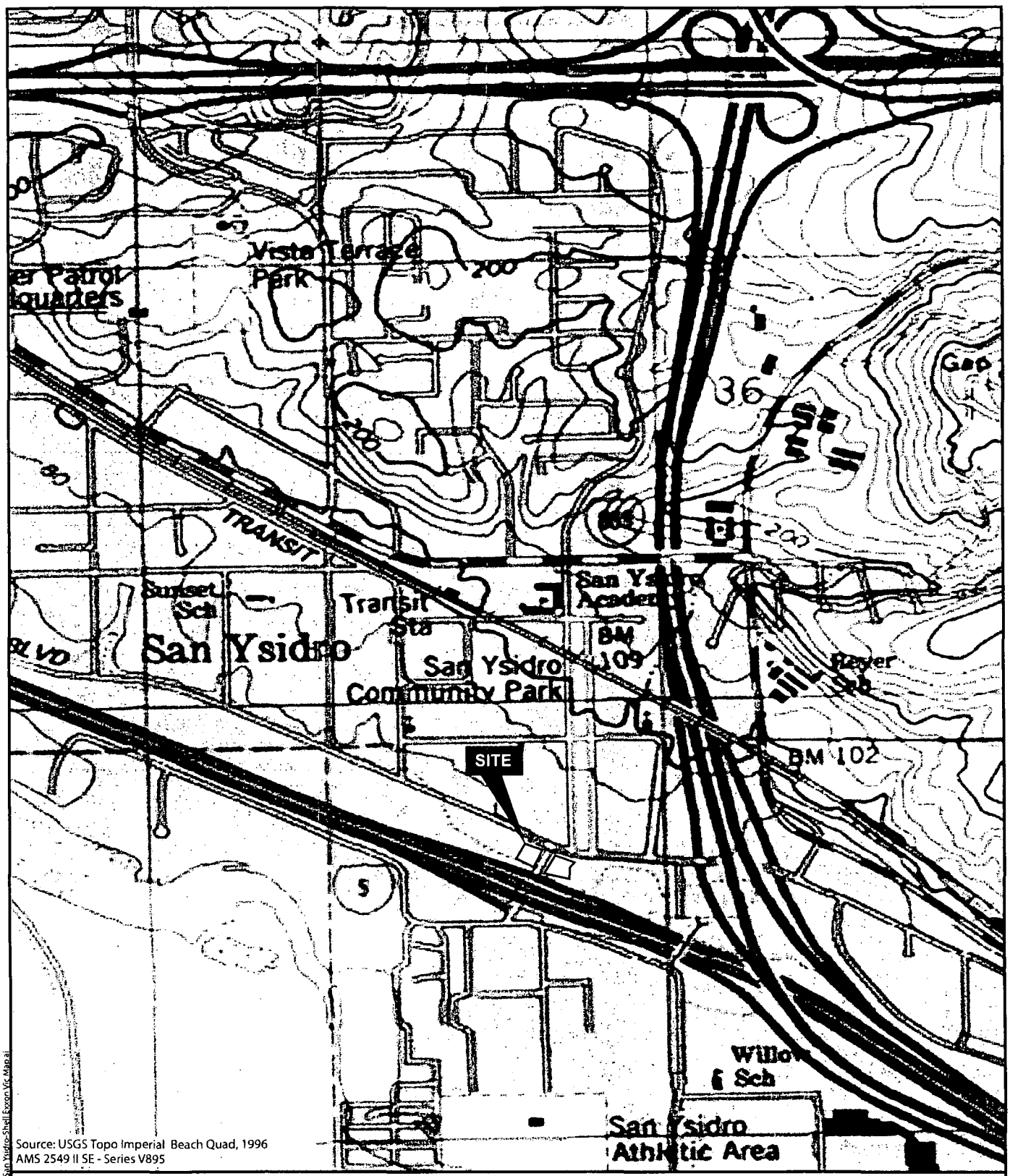
URS-MW07

0 50 100

SCALE IN FEET

URS	SITE PLAN Shell-Branded Service Station and Former ExxonMobil Service Station 108 and 120 West San Ysidro Boulevard San Diego, California	Figure 2

e0108070



VICINITY MAP

URS	Project No.: 15301786	Date: MAY 2009	Project: RELLC - SAN YSIDRO	Figure 1

T:\2006\RELLC\San Ysidro\12 Maps\Vicinity Maps\San Ysidro-Shell Exxon Vic Map.ai

State of California

Well Completion Report

Form DWR 188 Auto-Completed 2/25/2019

WCR2018-011811

Owner's Well Number: RC-18-001 | Date Work Began: 11/27/2018 | Date Work Ended: 11/28/2018

Local Permit Agency: County of San Diego DEH/LWQD Land Water and Quality Division, Monitoring Well Program

Secondary Permit Agency: | Permit Number: LMWP-003639 | Permit Date: 09/20/2018

Name: XXXXXXXXXXXXXXXXXXX

Mailing Address: XXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXX

City: XXXXXXXXXXXXXXXXXXX | State: XX | Zip: XXXXX

Activity: Drill and Destroy

Planned Use: Destruction

Address:

City: | Zip: | County: San Diego

Latitude: 32 Deg. 33 Min. 54.5219 Sec. N | Longitude: -116 Deg. 57 Min. 1.6776 Sec. W

Dec. Lat.: 32.565145 | Dec. Long.: -116.950466

Vertical Datum: | Horizontal Datum: WGS84

Location Accuracy: | Location Determination Method:

APN: 646-121-2900

Township: 18 S

Range: 01 W

Section: 35

Baseline Meridian: San Bernardino

Ground Surface Elevation:

Elevation Accuracy:

Elevation Determination Method:

Orientation: Vertical | Specify:

Drilling Method: Direct Rotary | Drilling Fluid: Bentonite

Total Depth of Boring: 120.5 Feet

Total Depth of Completed Well: Feet

Depth to first water: (Feet below surface)

Depth to Static Water Level: (Feet) | Date Measured:

Estimated Yield*: (GPM) | Test Type:

Test Length: (Hours) | Total Drawdown: (feet)

*May not be representative of a well's long term yield.

Depth from Surface Feet to Feet		Description
0	1	SILTY SAND (SM), brown, dry, fine
1	10	SEDIMENTARY ROCK (POORLY INDURATED CLAYSTONE), laminated, brown, slightly weathered, soft, unfractured, LEAN CLAY (CL), hard, brown, moist, medium plasticity, PP>4.0 tsf
10	17.5	SEDIMENTARY ROCK (POORLY INDURATED CLAYSTONE), fine-grained, massive, brown, soft, unfractured, SILTY SAND (SM) very dense, brown, moist, fine
17.5	28.5	SEDIMENTARY ROCK (SANDSTONE), moderately interbedded with CLAYSTONE; SANDSTONE: fine-grained, brown, moderately weathered, unfractured, CLAYSTONE: very thinly bedded, reddish brown, moderately weathered, moderately hard, slightly fractured
28.5	40	SEDIMENTARY ROCK (SANDSTONE), fine-grained, thickly bedded, brown, sightly weathered, moderately hard, unfractured, locally moderate cementation, locally thickly interbedded with moderate interbeds of CLAYSTONE, laminated, reddish brown, slightly weathered, moderately soft, unfractured.
40	45	SEDIMENTARY ROCK (CLAYSTONE), laminated, reddish brown, slightly weathered, moderately soft, unfractured
45	50	SEDIMENTARY ROCK (SILTSTONE), thickly bedded, brown, slightly weathered, moderately soft, unfractured
50	55	SEDIMENTARY ROCK (SANDSTONE), fine-grained, massive, brown, soft, slightly fractured.
55	68	SEDIMENTARY ROCK (CLAYSTONE), laminated, brown, slightly weathered, moderately hard, unfractured
68	74	SEDIMENTARY ROCK (SANDSTONE), fine-grained, very thickly bedded, reddish brown, soft, slightly fractured.
74	82	SEDIMENTARY ROCK (CLAYSTONE), laminated, reddish brown, slightly weathered, hard, slightly fractured
82	86	SEDIMENTARY ROCK (SANDSTONE), fine-grained, massive, brown, slightly weathered, soft, slightly fractured.

86	90	SEDIMENTARY ROCK (CLAYSTONE), laminated, brown, slightly weathered, moderately soft, unfractured
90	100	SEDIMENTARY ROCK (SANDSTONE), thickly interbedded with CLAYSTONE; SANDSTONE: fine-grained, brown, moderately weathered, unfractured, CLAYSTONE: very thinly bedded, reddish brown, moderately weathered, moderately soft, unfractured
100	106	SEDIMENTARY ROCK (CLAYSTONE), laminated, reddish brown, slightly weathered, hard, moderately fractured
106	111	SEDIMENTARY ROCK (SILTSTONE), moderately bedded, brown, slightly weathered, soft, unfractured
111	120.5	SEDIMENTARY ROCK (CLAYSTONE), laminated, reddish brown, slightly weathered, hard, slightly fractured

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description

Destruction Details:
Boring backfilled using 80 gallons of grout using proportions of 6 gallons of water each #94 sack of cement.

Other Observations:

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	120.5	4

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name: FUGRO USA LAND INC
Person, Firm or Corporation

6100 HILLCROFT ST (Address) | HOUSTON (City) | TX (State) | 77081 (Zip)

Signed: *electronic signature received* (C-57 Licensed Water Well Contractor) | 12/26/2018 (Date Signed) | 909719 (C-57 License Number)

CSG #	State Well Number	Site Code	Local Well Number

						N							W

Latitude Deg/Min/Sec **Longitude Deg/Min/Sec**

TRS:

APN:

DUPLICATE
File Original, Duplicate and Triplicate with the
DIVISION OF W[illegible] RESOURCES
P. O. BOX 1079
SACRAMENTO 5, CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

DIVISION OF WATER RESOURCES

37-2510

SHEET 1

Do Not Fill In
State Well No. 18S/1W 33K1
Other Well No.
Region 9

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

441

(1) **Driller:**
Name San Diego Pump & Well Drillers
Address 145 Brightwood St.
Chula Vista, Calif.
License No. 85485 Classification C 57

Owner 16467
Na
Ad

(2) **Proposed use or uses** *(check)*:
Domestic ☐ Municipal ☐
Irrigation ☒ Industrial ☐
2 Domestic and Irrigation ☐ Test well ☐
Other

(3) **Equipment used** *(check)*:
Rotary ☐
Cable ☒
2 Dug well ☐
Other

(4) **Type of work** *(check)*:
New well ☒ Reconditioning of well ☐
Deepening existing well ☒

(5) **Well log:**
Total depth of well 870 ft.

Depth From Ground Surface

660 ft. to 870 ft. Clay, gray

Give details of formations penetrated, such as silt, peat, muck, sand, gravel, clay, shale, sandstone, hardpan, rock. Include size of gravel (diameter) and sand (fine, medium, coarse), color of material, structure (loose, packed, cemented, soft, hard, brittle).

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MICROFILMED

If additional space is required, continue on DWR Form No. 246—Supplement, and attach to respective report copies.

(6) **Casing left in well:**

LENGTH FT.	DIAMETER INCHES	SINGLE, DOUBLE, WELDED, OTHER	LBS. PER FOOT OR GAGE OF CASING	SEATING BELOW GROUND SURFACE, FT.
133	8x 6"	Welded	12 lbs.	787

Type and size of shoe or well ring 6" x 8" x 3/4" Welded joints—☒ Yes ☐ No

1-75-6 /

D.W.R. FORM NO. 246

23971 3-50 40M QUIN SPO

DUPLICATE
File Original, Duplicate and Triplicate with the
DIVISION OF WATER RESOURCES
P. O. BOX 1079
SACRAMENTO 5, CALIFORNIA

SHEET 2

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code) 37-2510

Do Not Fill In
State Well No. 18S/1W 33K1
Other Well No.
Region 9

(7) Perforations:

Type of perforator used mills 2 38-2 0

Perforated 660 ft. to 780 ft. Hole size 3/8" x 2" No. of holes 180

" " " " " " " " " " " " 2

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CONFIDENTIAL - NOT FOR PUBLIC RELEASE

(8) Water levels:

Depth at which water first encountered ft.

Depth to water before perforating 440 ft.

Depth to water after perforating 440 ft.

Note any change in water level while drilling
no

(9) Well pumping test:

Date of test By whom

Depth to water when test started ft.

G.P.M. at beginning of test

Drawdown from standing level ft.

G.P.M. at completion of test

Drawdown at completion of test ft.

Length of time tested

Temperature of water

Was gas present in water? ☐ Yes ☐ No

MICROFILMED

(10) General:

Was well gravel packed? no 2 Size of rock Thickness of pack

Was a surface sanitary seal provided? no 2

Were any strata sealed against pollution? ☐ Yes ☒ No If yes, attach detailed description. 2

Strata sealed

Was analysis made of water? ☐ Yes ☒ No If yes, attach copy.

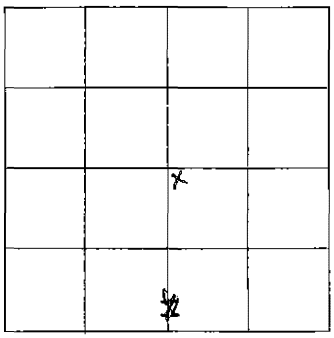
Was electric log made of well? ☐ Yes ☒ No If yes, attach copy.

If well abandoned, was it plugged and sealed?

Method of plugging and sealing

(11) Location:

North



1 MILE

Section No. 33

Township 18S

Range 1W

Base & Meridian SB

Show location of well in Section, thus (×)

Distances to section lines from well, N or S 2650 ft. and E or W 2500 ft.

Show location of nearest known well, thus (O)

Distance to nearest known well 2½ Mi. East, Approx.

(12) Time of work:

Work started date 3-26-51 Completed date 6-2-51

Date of this report July 3, 1951

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[SIGNED] San Diego Pump & Well Drillers
Well Driller

By

License No. 88485 Classification C 57

Dated July 3, 1951, 19

D.W.R. FORM NO. 246

23972 3-50 40M QUIN SPO

37-2510

FIELD CHECK OF WELL LOCATION

BRILLER S.D. Hopkins Pump Co. CHECKED BY D J. Leve.

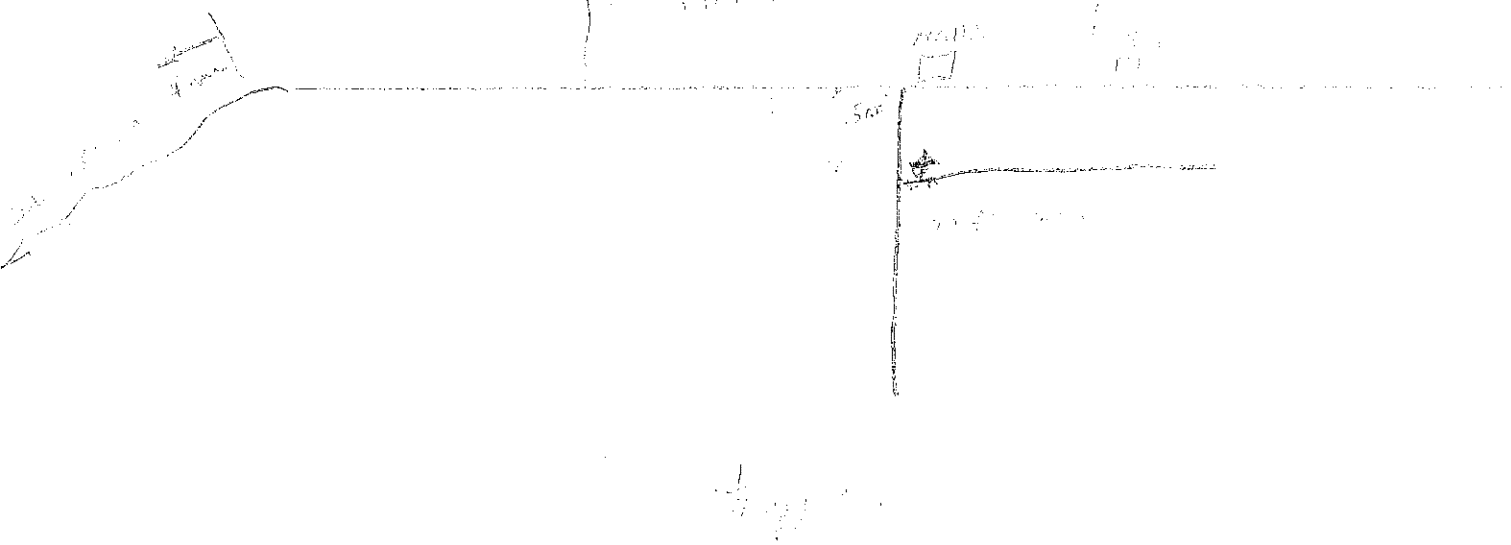
OWNER ___. DATE _____ 19___.

PUMP NO._____.

METER NO._____.

STATE WELL NO. 18S/1W-33K1

LOCATE WELL WITH REFERENCE TO ROADS AND ROAD INTERSECTIONS: ALSO INDICATE DISTANCES AND DIRECTIONS TO NEARBY CITIES OR TOWNS.



*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR 18S 01W 33

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0201989

Page 1 of 1

Owner's Well Number MW-7

Date Work Began 01/13/2014 Date Work Ended 1/18/2014

Local Permit Agency County of San Diego

Permit Number LMWP 000820 Permit Date 1/6/14

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow Stem Auger Drilling Fluid

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
		WELL DESTRUCTION
		Drill out 4" well to 31' and backfill with cement -
		bentonite grout.

Total Depth of Boring Feet

Total Depth of Completed Well Feet

Well Owner

N

M

C

Well Location

Address 1902 Cactus Road Landfill

City Otay Mesa County San Diego

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum Dec. Lat. Dec. Long.

APN Book 646 Page 100 Parcel 75-76

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

○ New Well
○ Modification/Repair
○ Deepen
○ Other
◉ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	31	Bentonite	

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other Site Map

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name National EWP, Inc (Person, Firm or Corporation)

5566 Arrow Highway (Address) Montclair (City) CA (State) 91763 (Zip)

Signed for National EWP (C-57 Licensed Water Well Contractor) 2/18/14 (Date Signed) 953646 (C-57 License Number)

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

RECEIVED

APR 25 2014

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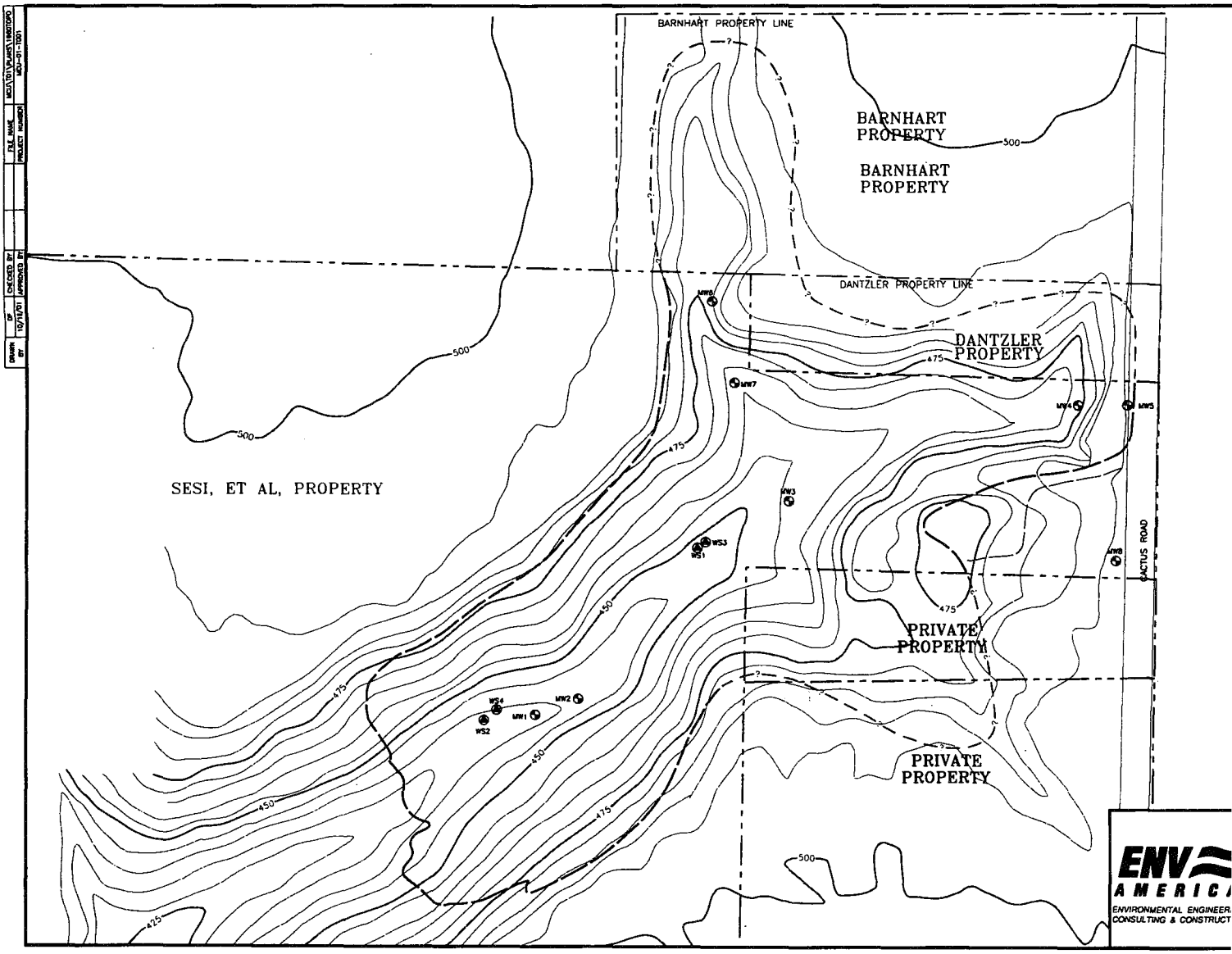


Attachments	Certification Statement
☐ Geologic Log ☐ Well Construction Diagram ☐ Geophysical Log(s) ☐ Soil/Water Chemical Analyses ☑ Other Site Map Attach additional information, if it exists.	I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief Name National EWP, Inc (Person, Firm or Corporation) 5566 Arrow Highway (Address) Montclair (City) CA (State) 91763 (Zip) Signed for National EWP (C-57 Licensed Water Well Contractor) 2/18/14 (Date Signed) 953646 (C-57 License Number)

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

RECEIVED

A0003.567 OTAYMESA

APR 25 2014

ORIGINAL

File with DWR

SEP 30 1977

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 00929

Notice of Intent No. XXXXXX 97018

Local Permit No. or Date

State Well No. 18S/2W-33N04

Other Well No.

(1) OWNER:

Name [redacted]

Address

City

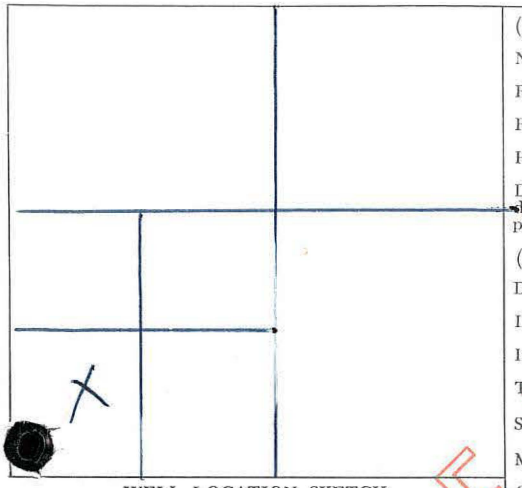
(2) LOCATION OF WELL (See instructions):

County San Diego Owner's Well Number

Well address if different from above San Ysidro

Township 18 Range 2W Section 33

Distance from cities, roads, railroads, fences, etc. San Ysidro, Ca.



WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic [X]
Irrigation [ ]
Industrial [ ]
Test Well [ ]
Stock [ ]
Municipal [ ]
Other [ ]

(5) EQUIPMENT:

Rotary [X] Reverse [ ]
Cable [ ] Air [X]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:

Yes [X] No [ ] Size #4 x #7
Diameter of bore 8-3/4"
Packed from to ft.

(7) CASING INSTALLED:

Steel [X] Plastic [X] Concrete [ ]

From ft.	To ft.	Dia. in.	Gage or Wall
0	20	8-5/8	od .188
0	150	5"	liner

(8) PERFORATIONS: 60 ft.

Type of perforation or size of screen

From ft.	To ft.	Slot size
35	55	
110	150	

(9) WELL SEAL:

Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 20 ft.
Were strata sealed against pollution? Yes [ ] No [X] Interval ft.
Method of sealing cement grout

(10) WATER LEVELS:

Depth of first water, if known ft.
Standing level after well completion 40 ft.

(11) WELL TESTS:

Was well test made? Yes [X] No [ ] If yes, by whom? Rex Anderson
Type of test Pump [ ] Bailer [ ] Air lift [X]
Depth to water at start of test ft. At end of test ft
Discharge 75 gal/min after hours Water temperature unk
Chemical analysis made? Yes [ ] No [X] If yes, by whom?
Electric log made? Yes [ ] No [X] If yes, attach copy to this report

(12) WELL LOG:

Total depth 150 ft. Depth of completed well 150 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	14	Cobble stone
14	19	Silt and sand
19	48	Sand
48	68	Gravel
68	69	Cobble stone
69	80	Gravel
80	85	Sand
85	140	Gravel
140	150	Gravel and clay

CONFIDENTIAL NOT FOR PUBLIC USE WATER CODE SEC. 13752

Work started June 15, 1977 Completed June 29, 1977

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED Rex C. Anderson (Well Driller)

NAME REX ANDERSON CORP. (Person, firm, or corporation) (Typed or printed)

Address 10303 Channel Rd.

City Lakeside, Ca. Zip 92040

License No. A 305739 Date of this report July 19, 1977

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 43816-950 7-76 50M QUAD ①T OSP

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR 19502W01

Page 1 of 1

Owner's Well Number URS-MW08

Date Work Began 05/11/2011 Date Work Ended 5/11/2011

Local Permit Agency San Diego County Department of Environmental Health

Permit Number LMON107780 Permit Date 5/3/11

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0131746

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow Stem Auger Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	1	Asphalt
1	4	Brown, Silty fine SAND (SM), moist, trace gravel
		clay
4	11	Light olive brown, fine to medium SAND (SP)
		medium dense, moist, trace coarse sand, trace silt
11	15	Dark yellowish brown, SILT (ML), very stiff, moist
		trace fine sand, trace fine to coarse gravel
15	20	Becomes very dark grayish brown, hard,
		trace clay, trace mica
20	21	Becomes dark grayish brown, silt with fine sand,
		very stiff, abundant mica
21	24	Dark grayish brown, Lean CLAY (CL), very stiff,
		moist, trace silt, trace mica
24	26	Grayish brown, fine to medium SAND (SP), dense
		moist, trace coarse sand, trace silt
26	29	Light brownish gray, SAND (SW), dense, moist
		trace silt
29	31	Grayish brown, medium SAND (SP), dense, wet,
		trace fine sand, trace silt
31	38	Dark grayish brown, Fat CLAY (CH), hard, wet,
		trace mica, trace cobbles
38	40	Dark grayish brown, Silty fine SAND (SM), dense
		wet, trace medium sand, abundant mica
40	42	Light yellowish brown, SAND (SW), dense, wet
		trace silt, trace fine and coarse gravel

Total Depth of Boring 42 Feet

Total Depth of Completed Well 39 Feet

Well Owner

Well Location

Address 104 W. San Ysidro Blvd.

City San Diego County San Diego

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum NAD83 Decimal Lat. 32.5520237 Decimal Long. -117.0439

APN Book ___ Page ___ Parcel 666-380-28-00

Township ___ Range ___ Section ___

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED SITE PLAN FOR WELL LOCATIONS

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

◉ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
◉ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 30 (Feet below surface)

Depth to Static Water Level 26 (Feet) Date Measured 05/23/2011

Estimated Yield * ___ (GPM) Test Type ___

Test Length ___ (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	19	10	Blank	PVC Sch. 40	0.25	4.5		
19	39	10	Screen	PVC Sch. 40	0.25	4.5	Milled Slots	0.010

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	3	Cement	Concrete
3	14	Bentonite	Bentonite Grout
14	17	Bentonite	Chips
17	42	Filter Pack	#2/12 Sand

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other Well Location Site Plan

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name WDC Exploration & Wells
Person, Firm or Corporation

5566 ARROW HWY. MONTCLAIR CA 91763
Address City State Zip

Signed for WDC 6/17/11 283326
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

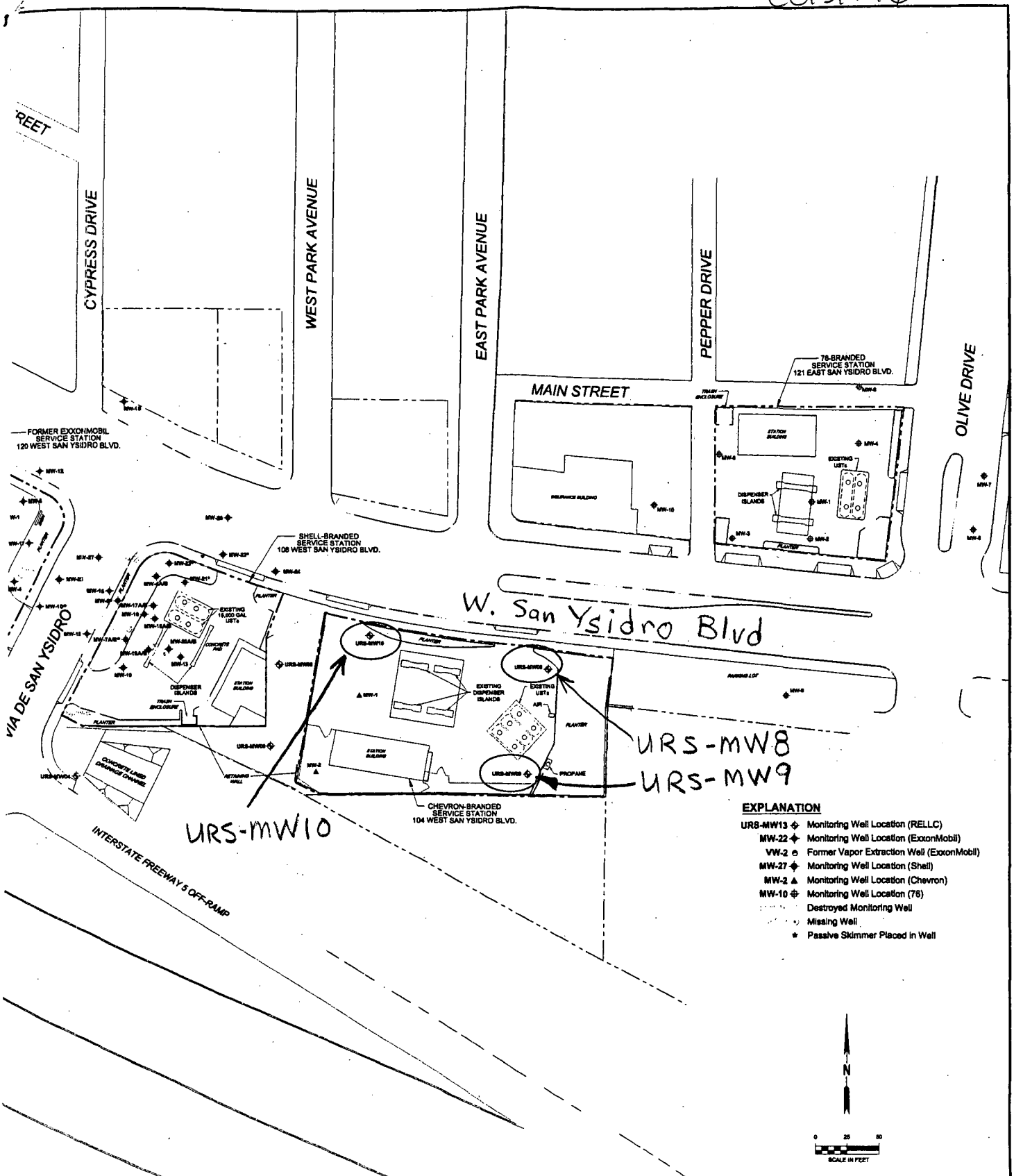
DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

231353U SAN YSIDRO

06/27/11

e0131746



EXPLANATION

- URS-MW13 ⊕ Monitoring Well Location (RELLC)
- MW-22 ✦ Monitoring Well Location (ExxonMobil)
- VW-2 ⊖ Former Vapor Extraction Well (ExxonMobil)
- MW-27 ✦ Monitoring Well Location (Shell)
- MW-2 ▲ Monitoring Well Location (Chevron)
- MW-10 ⊕ Monitoring Well Location (76)
- Destroyed Monitoring Well
- Missing Well
- ★ Passive Skimmer Placed in Well

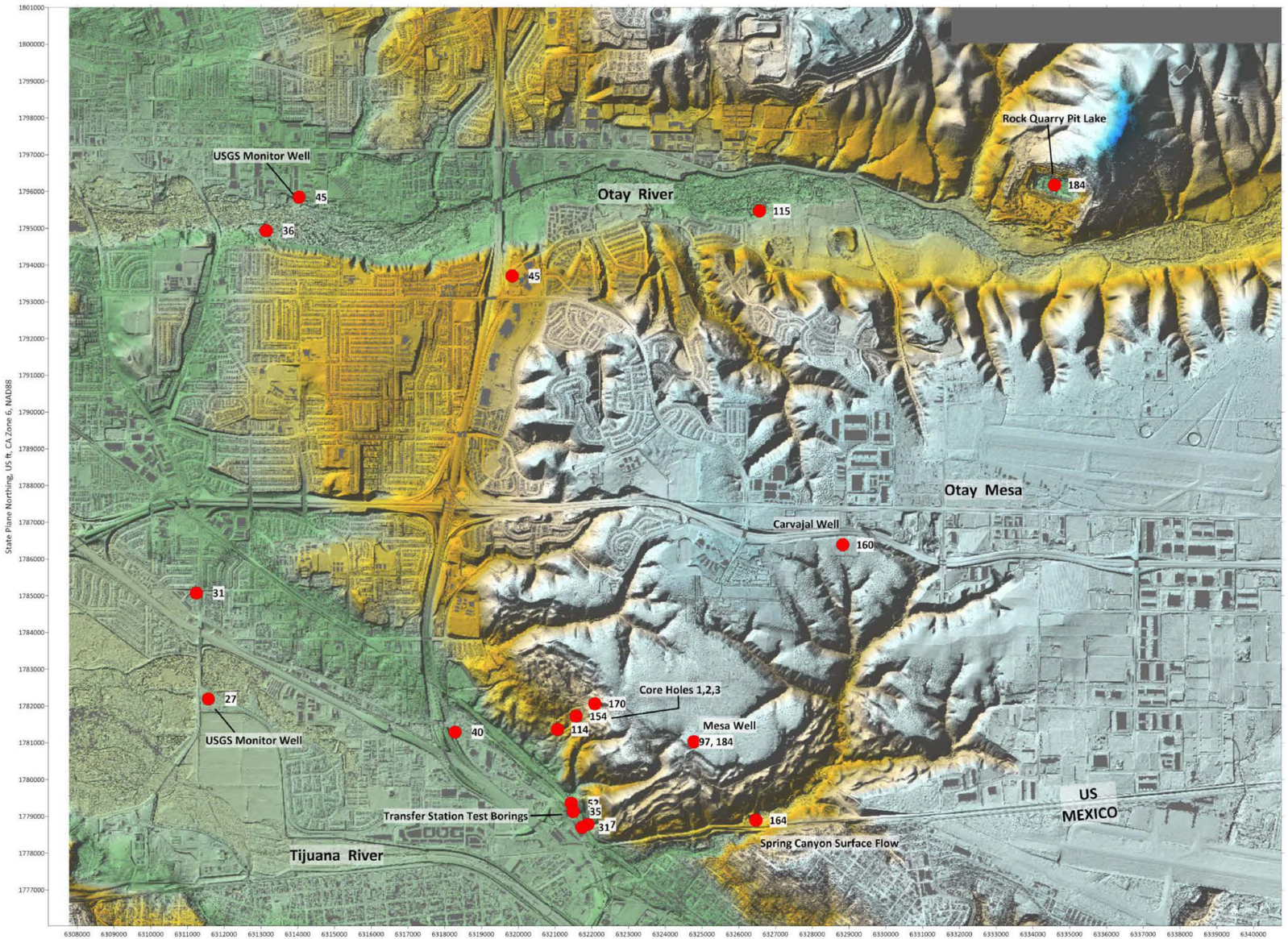
N

0 25 50
SCALE IN FEET

URS

SITE PLAN

Proj. No.: 15302641	Date: JUNE 2011
Project: - SAN YSIDRO EGO, CALIFORNIA	Figure: 2



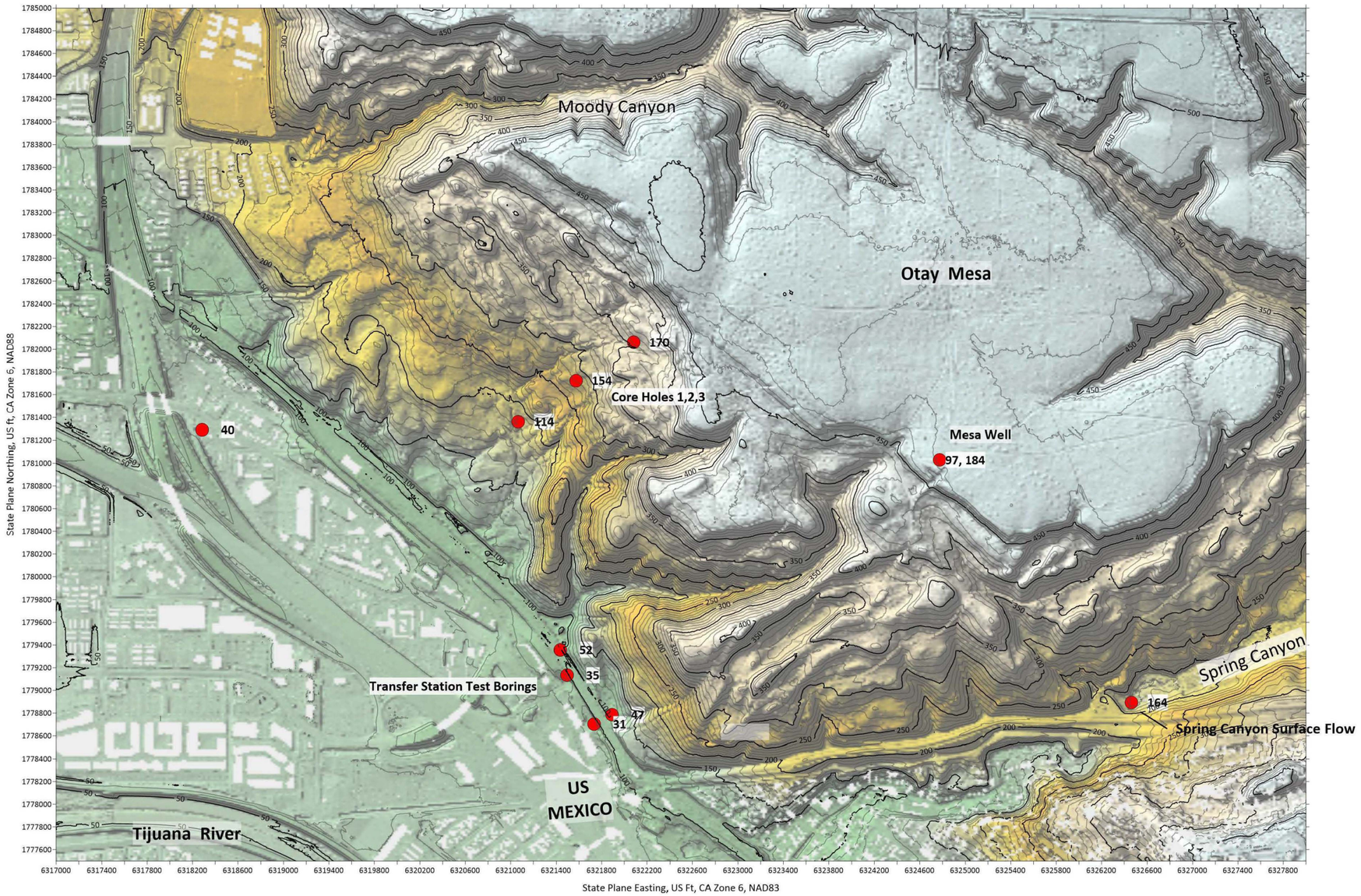
Base Map Image is USGS 2014 Lidar, Ground Return, Obtained from NOAA Digital Coast

42 Groundwater Observation Point, Consisting of Wells and Surface Water Exposures. Approximate Groundwater Elevation, NAVD88 Shown at Right.

Data Sources:

- CA DWR Well Completion Reports, 1951 - Present
- Examination of Historical and Current Aerial Photography
- USGS Multiple Completion Monitor Wells at Boundary Waters and Otay River
- Geocon, Inc. 2000 Geotechnical Report for Intermodal Transfer Station
- Geocon, Inc. Boring Logs and Test Data for Southwest Village Investigation

PLATE 1
Map Summarizing Groundwater Observation Points for Estimating Groundwater Conditions Affecting Southwest Village Area, Otay Mesa



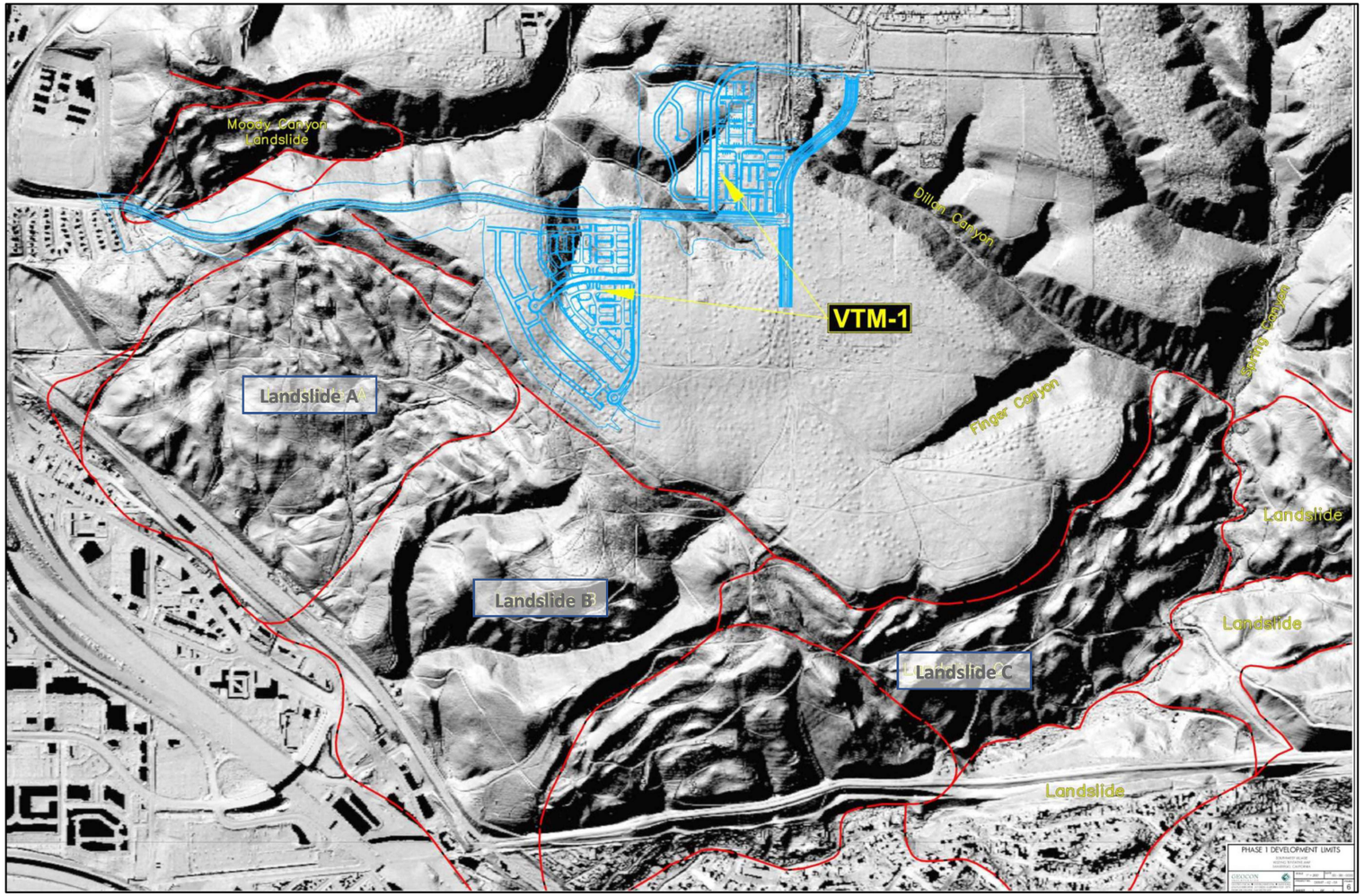
42 Groundwater Observation Point, Consisting of Wells and Surface Water Exposures. Approximate Groundwater Elevation, NAVD88 Shown at Right.

Base Map Image is USGS 2014 Lidar, Ground Return, Obtained from NOAA Digital Coast. Elevations are NAVD88

Data Sources:

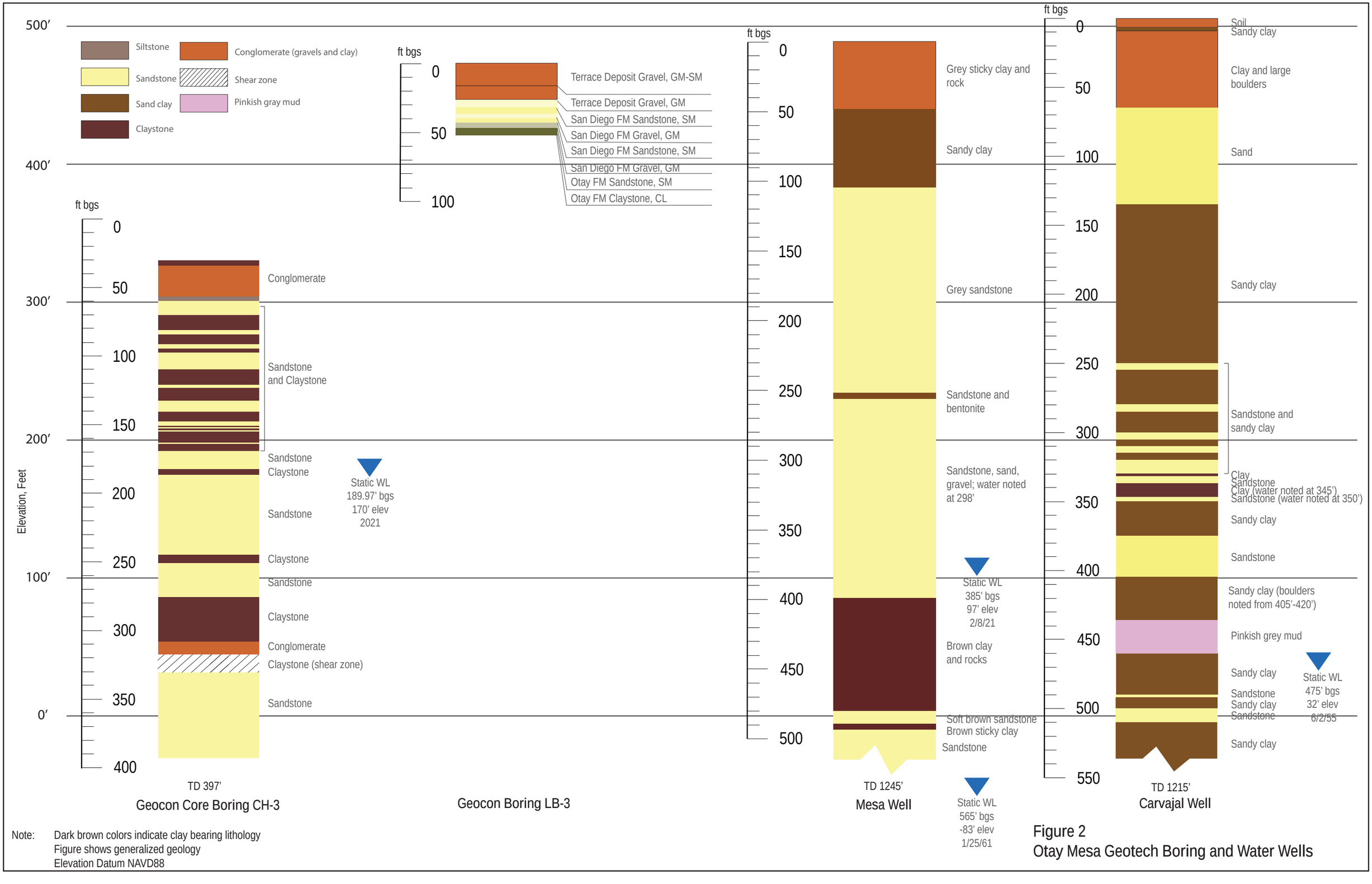
- CA DWR Well Completion Reports, 1951 - Present
- Examination of Historical and Current Aerial Photography
- USGS Multiple Completion Monitor Wells at Boundary Waters and Otay River
- Geocon, Inc. 2000 Geotechnical Report for Intermodal Transfer Station
- Geocon, Inc. Boring Logs and Test Data for Southwest Village Investigation

PLATE 2
Map Summarizing Available Groundwater Observation Points Within and Closest To Landslide Areas for Estimating Groundwater Conditions Affecting Slope Stability, Southwest Village Area, Otay Mesa



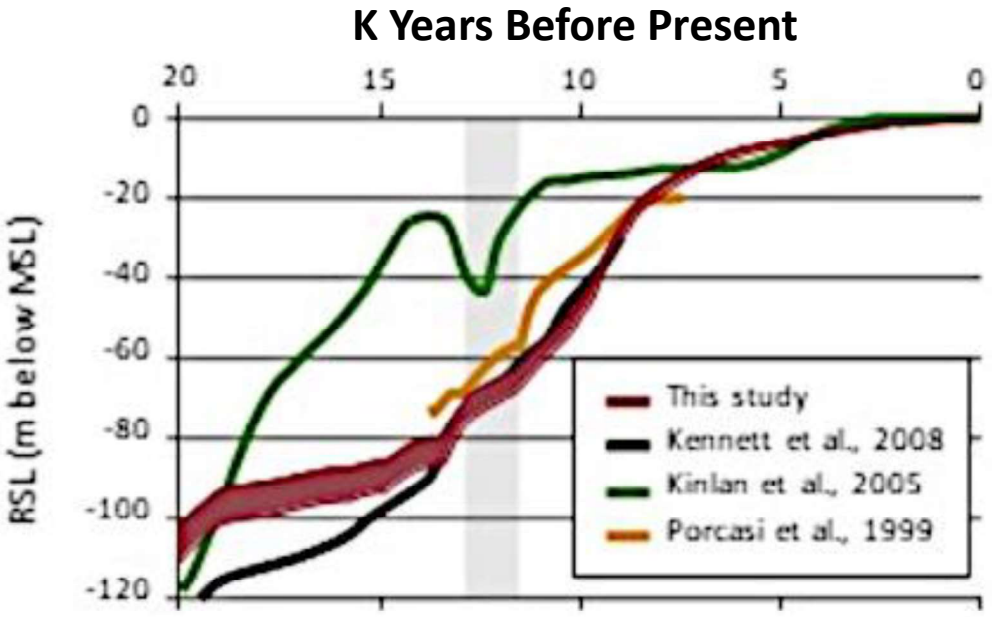
NOTE:
Figure adapted from Geocon Inc Illustration
Blue artwork is proposed village development
And access road.

FIGURE 1
Location Map
Southwest Village

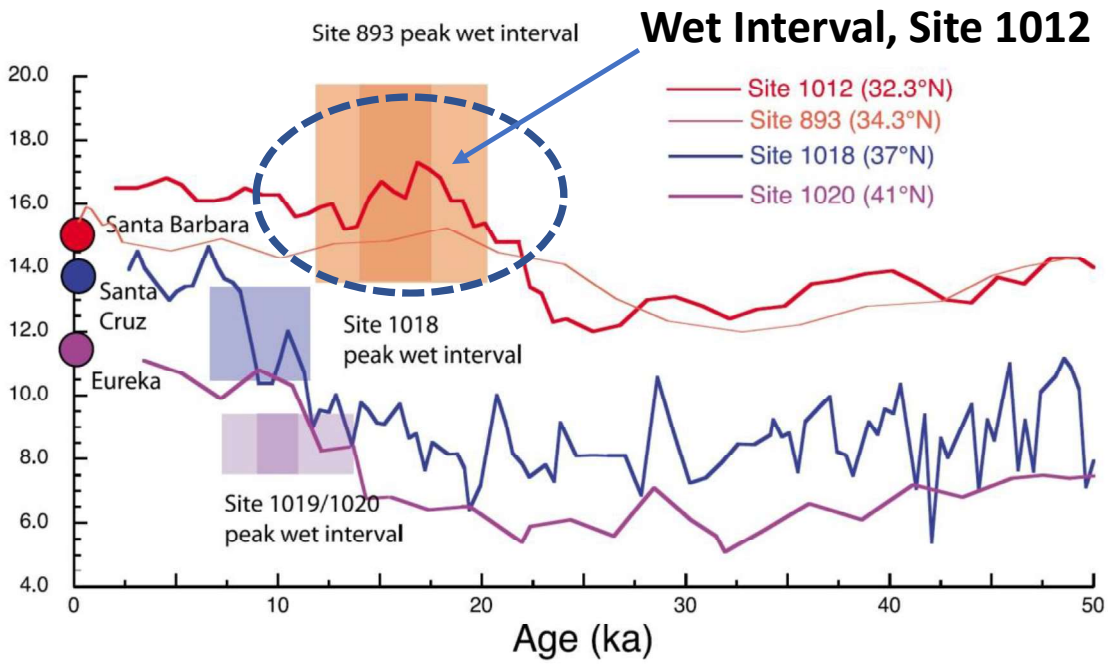


Note: Dark brown colors indicate clay bearing lithology
Figure shows generalized geology
Elevation Datum NAVD88

Figure 2
Otay Mesa Geotech Boring and Water Wells



Sea Level Curve, reproduced from Reeder, et al, 2015



Wet Climate Interval, inferred from pollen analysis
Of ocean bottom sediment cores, CA Borderland.
Reproduced from Lyle, et al, 2010

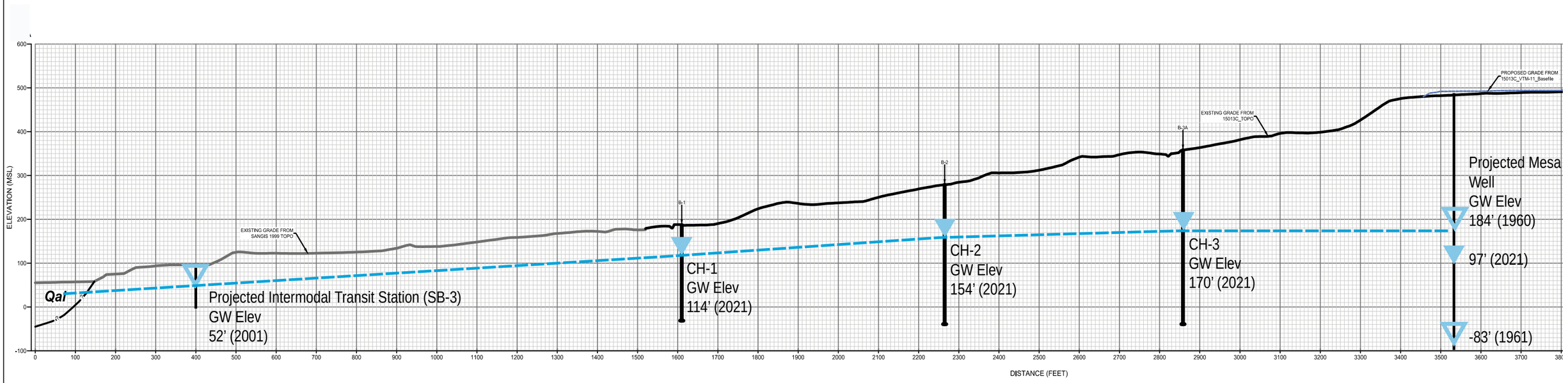
FIGURE 3
Pleistocene Sea Level Curve
And Ocean Core Paleo
Environment Analysis

Recent Groundwater Elevation

Historical Groundwater Elevation

Estimated Groundwater Elevation

Corehole or Groundwater Wells



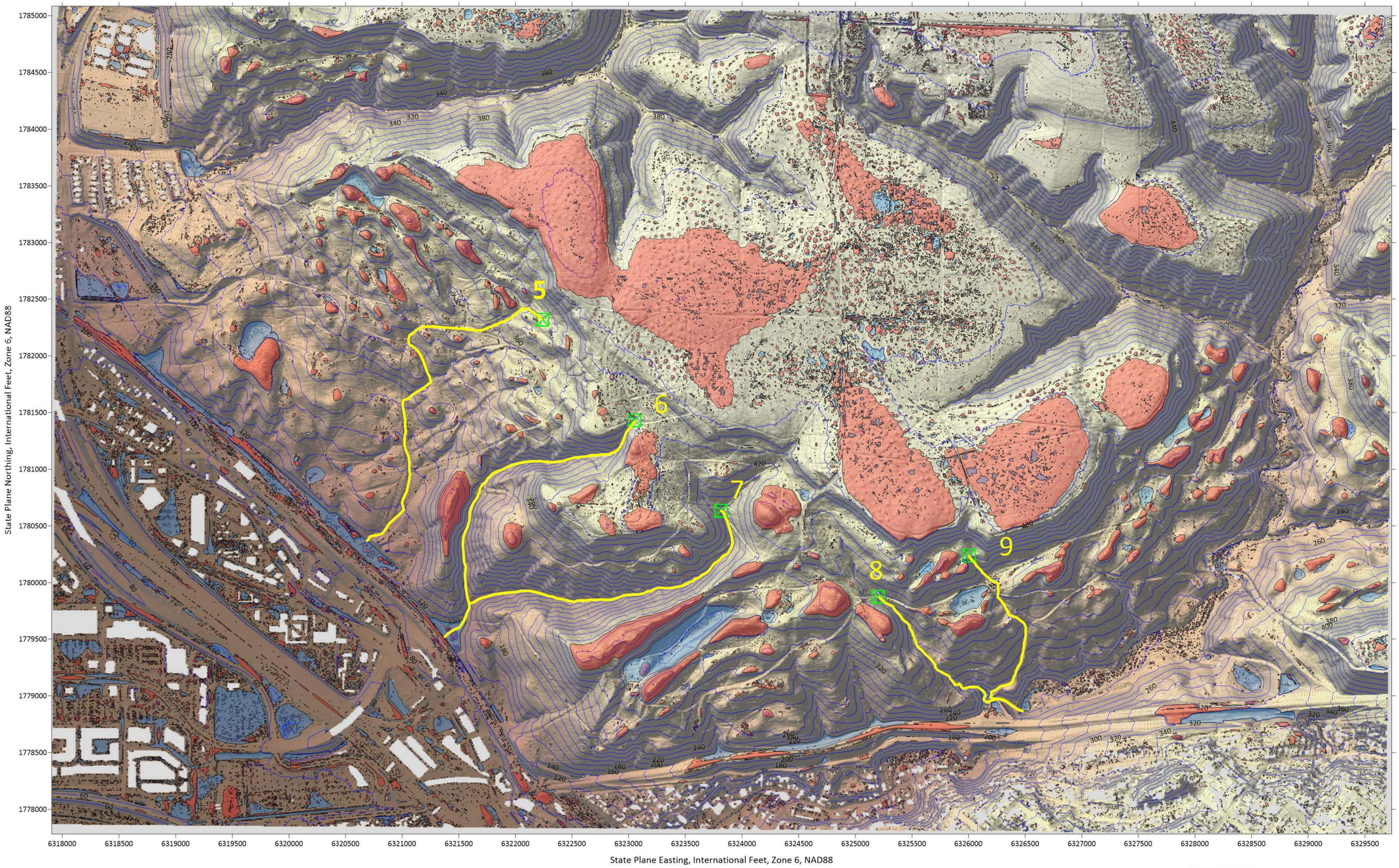
Groundwater cross section through Geocon Landslide A
Figure adapted from Draft Geocon cross section
Groundwater elevations shown for borings are NAVD88

SOURCE: Geocon

FIGURE 4

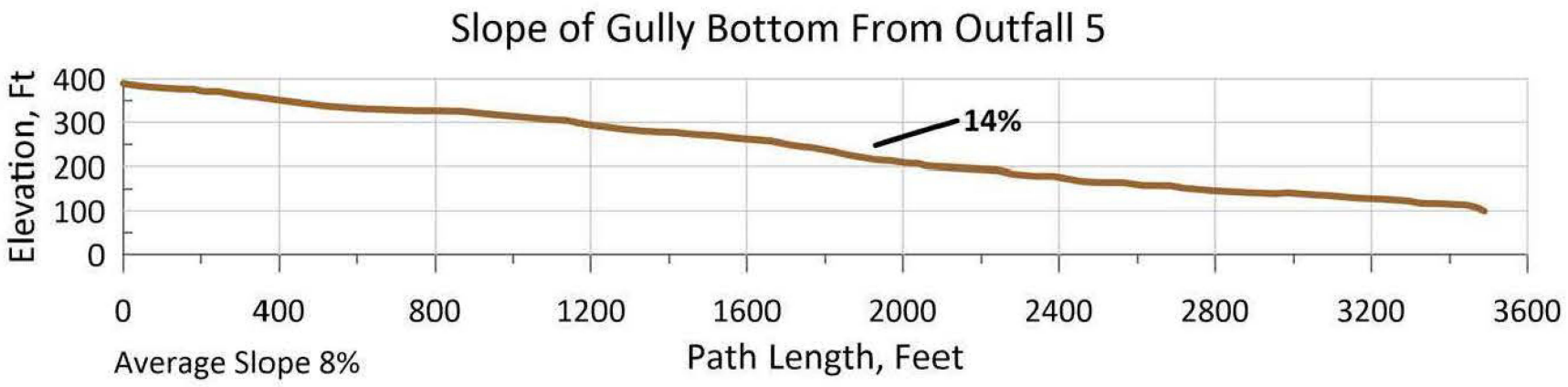
Groundwater Elevation Cross Section

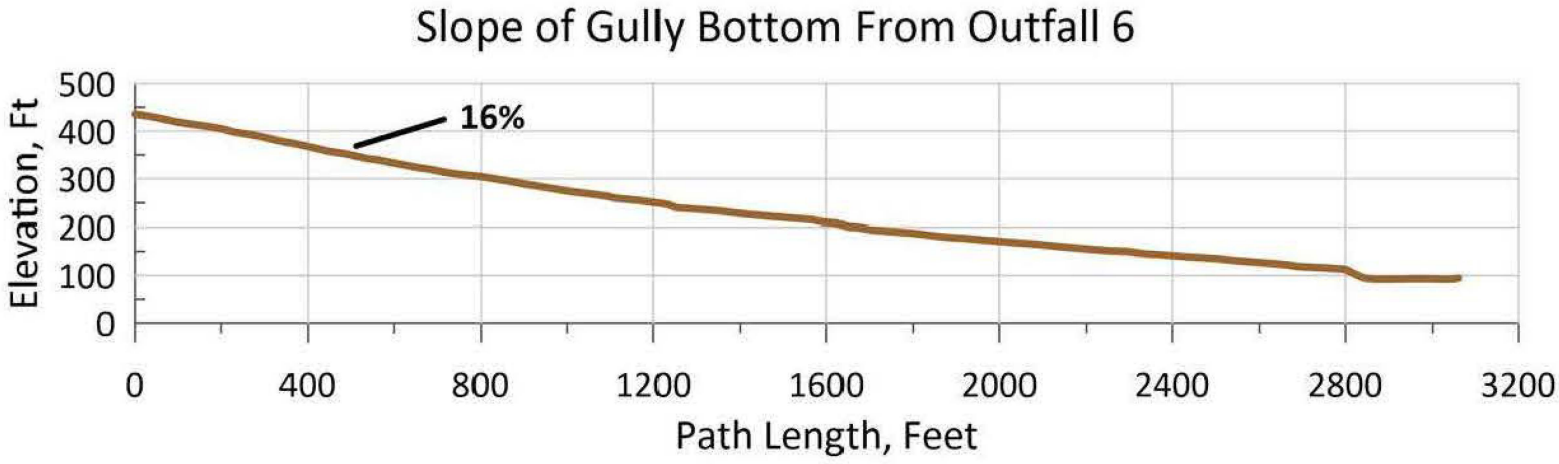
USGS 2014 Lidar, 2 Foot Contours

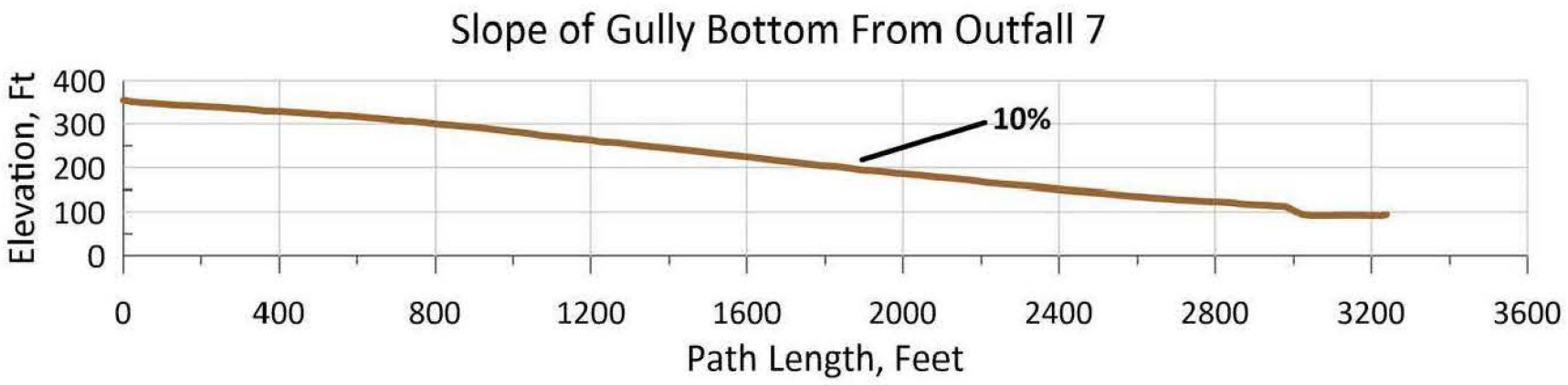


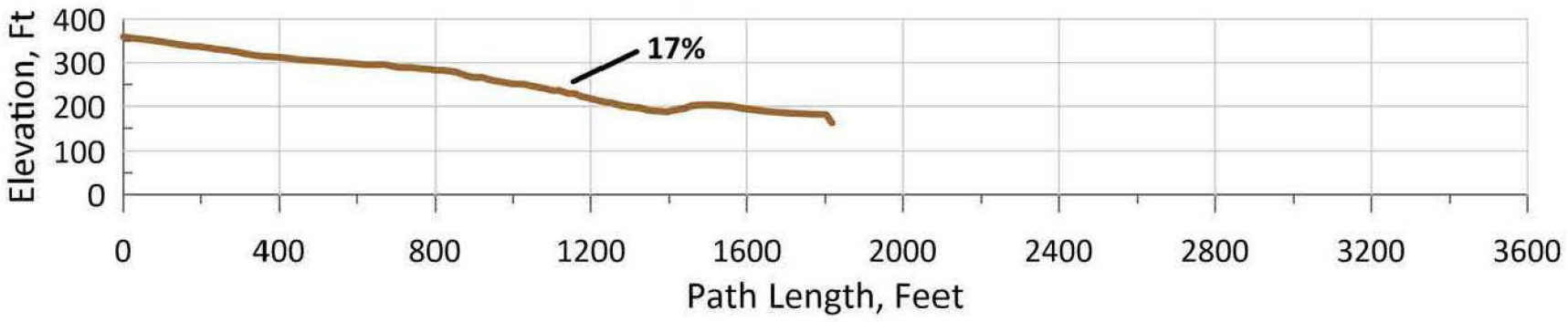
NOTES: Blue Topo Shading Indicates Closed Contour Depression
Salmon Topo Shading Indicates Closed Contour Hilltops
Yellow Lines are Outfall Flowpaths

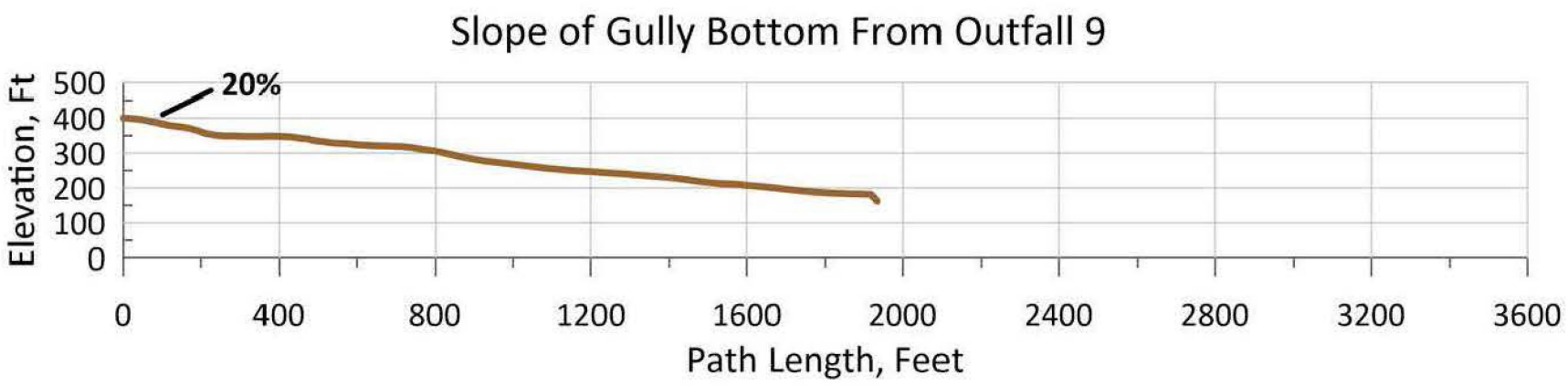
FIGURE 5
Stormwater Outfalls and
Outfall Flow Paths











NOTES:
Elevation profiles digitized from 2 foot contour map of USGS/San Diego County 2014 Lidar data downloaded from NOAA Digital Coast access server.

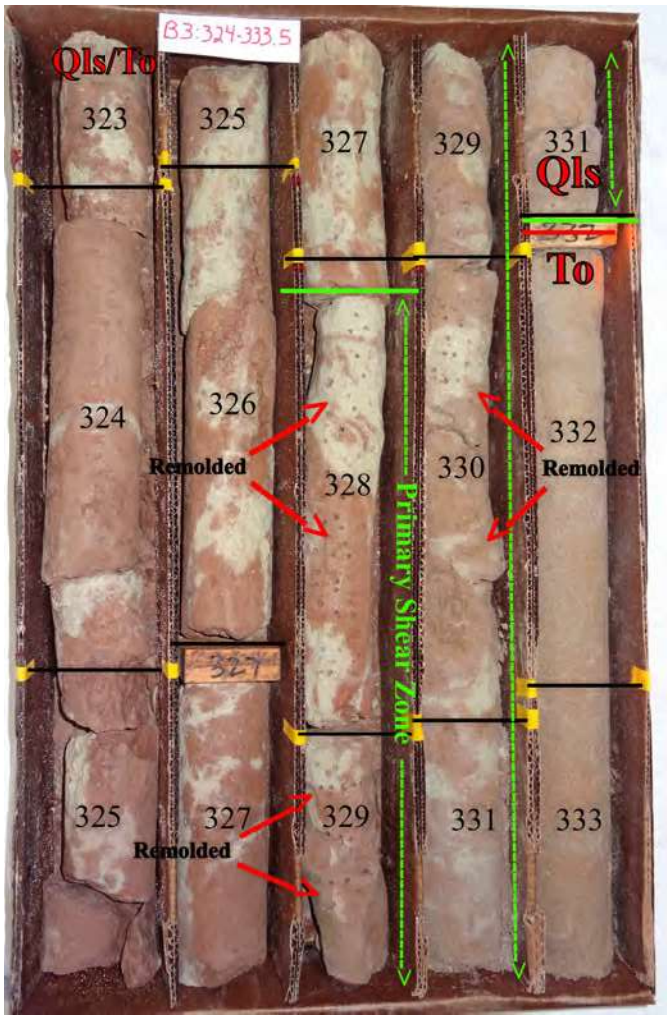
Gully plan view shapes meander; section data shown is calculated path length unfolded into plane. Steepest portion of each outfall gully slope identified.

FIGURE 6
Drainage Bottom Profiles Leaving Proposed Outfalls 5,6,7,8,9
Southwest Village

Claystone (282’ - 396’ bgs)

Sandstone (324’ - 333.5’ bgs)

Sandstone (382’ - 392’ bgs)



Note: Photographs by Geocon

Figure 7
Lithology photographs of Borehole CB-3

APPENDIX

RICK™
ENGINEERING COMPANY

April 16, 2021

City of San Diego
Development Services
101 Ash Street
San Diego, California 92101

SUBJECT: LANDSLIDE HYDROLOGY ANALYSIS FOR SOUTWEST VILLAGE
(RICK ENGINEERING COMPANY JOB NUMBER 15013-C)

1. Introduction

This letter report presents the existing and proposed hydrology associated with the landslide area adjacent to the Otay Mesa Southwest Village project area. The Southwest Village project is a smaller portion of the overall community of Otay Mesa. Specifically, the project boundary is generally located south of State Route 905, east of Interstate 805, north of US-Mexico border, and immediately west of the northerly branch of Spring Canyon Creek. Refer to the Vicinity Map in Attachment 1 as well as the drainage study maps included in Map Pockets 1 and 2 for the limits of the area analyzed.

2. Drainage Characteristics

In the existing condition, Basins 400, flows in a westerly direction to a collection point east of the existing railroad. Basin 500 and 700, drain in a southwesterly direction where they confluence before flowing to a collection point along the eastern edge of the existing railroad. From these locations, runoff is conveyed in an existing storm drain system (pipes and channels) to the Tijuana River by the border line with Mexico. Runoff from Basins 800 and 900 drain to the south and confluence in Spring Canyon Creek. Runoff is conveyed south within Spring Canyon Creek towards an existing culvert at the Spring Canyon concentration point along the border with Mexico. Based upon the available information, it is assumed that the runoff is conveyed via a system of storm drain and open channels to a concrete lined reach of the Tijuana River on the Mexican side of the border.

Throughout the landslide area there are several existing sump locations where it is anticipated that storm water will collect and infiltrate into the native soil or evaporate over time. The area analyzed also includes existing shallow sump locations, notably in Basins 800 and 900, where it is anticipated that in larger storm events, storm water will weir over the edge of the low point

and flow out to collection points along the border with Mexico by Spring Canyon Creek. Please refer to Map Pocket 1 for the existing condition drainage map.

The post-project drainage conditions will remain largely similar to those in the existing condition. However, drainage improvements are being proposed throughout the development area. Storm drain outfalls will be extended as far as practicable towards the bottom of mesa and located adjacent to established existing channels. Underground storage is proposed to detain peak flow rates back to existing conditions for the 50 and 100-year storm event. Additionally, the drainage area flowing into Mexico at the Spring Canyon concentration point and will need to comply with the US/Mexico International flood control detention requirements (i.e. – 5, 10, 25, 50, & 100-year storm events). Please refer to Map Pocket 2 for the proposed condition drainage map.

3. Hydrology Methodology and Results

This study considers peak flow rates in the existing and proposed project condition and a summary is provided in Table 1 below. Weighted Runoff Coefficients and Time of Concentration were calculated based on guidance from the City of San Diego Drainage Design Manual, dated January 2017. The Rational Method computer program developed by Advanced Engineering Software (AES 2014) was used for this study.

Table 1: Existing and Proposed Hydrology (AES)

Drainage Basin #	Drainage Node # at Point of Interest	Project Condition	Tributary Area, A (acres)	Time of Concentration, T_c (minutes)	100-year Flow Rates, Q_{100} (cfs [1])	Change in Area (ac)	% Change in Peak Discharge (Pre to Post Detained)
400	499	Pre-project	188.9	15.4	244.1	-8.7	-32%
	499	Post-project	180.2	14.9	243.8		
	499	Post-Detained	180.2	27.8	165.1		
500 & 700	799	Pre-project	176.3	22.9	184.5	-3.9	-1%
	799	Post-project	172.4	10.9	312.4		
	799	Post-Detained	172.4	22.2[2]	181.9[3]		
800 & 900	999	Pre-project	83.5	16.7	103.8	+1.4	-16%
	999	Post-project	84.9	12.0	141.4		
	999	Post-Detained	84.9	22.9[2]	86.8[3]		

Notes:

1. Rainfall intensities for AES Rational Method analysis were calculated using the City of San Diego's 2017 Drainage Design Manual
2. Detailed detention analysis for basins that are not a part of the Vesting Tentative Map (VTM) (Basin 700, 800, & 900) has yet to be completed. For the purpose of this analysis the Time of Concertation was approximated by using detention analysis done on the adjacent Basins within the VTM (Basin 400 & 500). Peak flow rate for detention was based on the pre-project peak flow rates for the 100-year event.
3. For basins not a part of the VTM ((Basin 700, 800, & 900) percent imperviousness was conservatively assumed to be 85% impervious based on the proposed land use in the Specific Plan.

A summary of the average annual volume at key locations throughout the landslide area has also been quantified. The locations analyzed are at the upstream edge of the landslide buffer, the proposed storm drain outfall locations, and at the collection point either adjacent to the railroad for Basins 400, 500, and 700 or adjacent to the border with Mexico for Basins 800 and 900. A continuous simulation model using EPA SWMM v5 for each of the basins has been completed to determine the average annual volume of precipitation, runoff, and infiltration. Due to potential issues with the Lower Otay Reservoir rain gauge, the Lindberg Field rain gauge was used for this analysis. The time series for the rain gauges dates from October 17, 1948 to December 31, 2005. Parameters used within the EPA SWMM models will be consistent with guidance provided in the October 2018 City of San Diego Storm Water Standards Manual Appendix G. Please refer to Table 2 for a summary of precipitation, runoff, and infiltration.

Table 2: Existing and Proposed Average Annual Volume (SWMM)

Drainage Basin #	Drainage Node # at Point of Interest	Project Condition	Precipitation (ac-ft)	Runoff (ac-ft)	Infiltration (ac-ft)	% Change in Runoff	% Change in Infiltration
400	499	Pre-project	149.9	30.7	120.5	0.4%	-7%
	499	Post-project	144.4	30.8	111.6		
500 & 700	799	Pre-project	139.9	25.6	113.7	60%	-22%
	799	Post-project	136.9	40.9	88.4		
800 & 900	999	Pre-project	66.3	13.3	53.4	30%	-14%
	999	Post-project	67.4	17.3	45.9		

Notes:

1. The average annual rain fall was calculated to be 9.53-inches based on annual averages calculated in EPA SWMM using the Lindberg Field rain gauge
2. The Lindberg Field rain gauge was used for this analysis. The time series for this rain gauges dates from October 17, 1948 to December 31, 2005.

Table 2 shows that in the post project condition, average annual runoff volumes have increased. This is due to the development associated with the Southwest Village project site and the addition of impervious area. The increased impervious area and compacted fill soils with reduced conductivity result in a high runoff volume. This increase in runoff volume makes sense as flows are conveyed through the landslide area and are collected at points adjacent to the railroad or next to the border with Mexico. Because of the increase in impervious area due to the development of the project site and the decrease in conductivity of the compacted fill, Table 2 also shows a decrease in the average annual infiltration. The increase in runoff and the decrease in infiltration overall results in less storm water being infiltrated into the landslide area.

4. Irrigation – Estimate Total Water Use

Review was limited to the estimated landscape irrigation water use (potable water systems) as they relate to portions of irrigation to be utilized by residential and common area landscapes areas within the basin area footprint(s). Evaluation utilized a standard in the industry formula associated with this type of analysis, that being the Estimated Total Water Use (ETWU) found in the City of San Diego Landscape Standards of the Development Manual (Section 2.6) and City of San Diego Municipal code, Chapter 14, Division 4: Landscape Regulations 142.0413(d)(2). Assessment will be based on typical landscape irrigation requirements

associated with various plant types, Evapotranspiration (ETo), irrigation system, and component efficiency and standard irrigation scheduling practices.

Assessment of landscape area to be irrigated is based on a typical lot footprint of building architecture and layout of hardscape (driveways, patios, and walks). In the absence of typical building footprints and associated hardscape, assumptions were made as to percentage of lot coverage for non-irrigated areas.

Without a fit lot plan, architectural footprints were placed based on setback requirements. Based on this preliminary plan, a set number of each plan was determined for Basins 400 & 500. Each plan has a set area for the residence, driveway, walkway and rear patio. This area was subtracted from the overall lot area, to produce the total landscape area. Of this total landscape area, 5% was assumed to be turf. Based on the ratio of each plan found in Basin 500, a number of each plan was assumed for Basins 700, 800 & 900. Landscape areas for parks and recreational spaces were determined directly from the approved overall Conceptual Landscape Plan. For the park located in Basin 700, turf was assumed to be 85% of the landscape area.

An Estimated Total Water Use calculation was conducted for each basin footprint area and can be found below in Table 3. Turf was set at high water use, to be irrigated by rotors. Trees were to be moderate water use, irrigated by bubblers. Shrub and groundcover areas were assumed to be low water use, irrigated by drip. The results were then combined and illustrated in the summary table. Assumptions are listed below the summary.

Table 3: Average Annual Estimated Total Water Use for Irrigation

Basin ID	Average Annual Estimated Total Water Use for Irrigation (ac-ft)	Average Annual Volume Evapotranspired (ac-ft)	Average Annual Volume Infiltrated (ac-ft)
400	4.4	4.4	0.0
500	7.9	7.9	0.0
700	6.1	6.1	0.0
800	0.8	0.8	0.0
900	2.0	2.0	0.0

Notes:

1. Evaluation utilized a standard in the industry formula for Estimated Total Water Use (ETWU) found in the City of San Diego Landscape Standards of the Development Manual (Section 2.6) and City of San Diego Municipal code, Chapter 14, Division 4: Landscape Regulations 142.0413(d)(2)

5. Infiltration Summary

Table 4 below provides a summary of the change in storm water infiltration at the upstream edge of the land slide area. It is anticipated that the average annual water use for irrigation will be entirely used by the plants, stored in the top six to twelve inches of the soil, and evapotranspired. Resulting in no additional infiltration due to irrigation. However, considering the possibility that mismanagement of irrigation in the post-project condition could result in over application and increase infiltration, a factor of safety (FOS) was determined. Table 4 provides a factor of safety for over irrigation within the post-project drainage basins.

Table 4: Infiltration Summary and Factor of Safety (FOS) for Over Irrigation

Basin ID	Node #	Average Annual Volume Storm Water Infiltrated Pre-Project (ac-ft)	Average Annual Volume Storm Water Infiltrated Post-Project (ac-ft)	Change in Average Annual Volume of Storm Water Infiltration (ac-ft)	Average Annual Estimated Total Water Use for Irrigation (ac-ft)	Average Annual Volume of Irrigation Infiltrated (ac-ft)	Factor of Safety for Over Irrigation
400	417	4.6	1.7	-2.9	4.4	0.0	166%
500	545	9.1	2.4	-6.7	7.9	0.0	185%
700	780	23.6	4.7	-18.9	6.1	0.0	409%
800	860	2.7	0.4	-2.3	0.8	0.0	386%
900	980	4.3	0.7	-3.7	2.0	0.0	284%

6. Conclusion

This letter report presents the existing and proposed hydrology and proposed irrigation associated with the landslide area adjacent to the Otay Mesa Southwest Village project area. Peak flow rates for the 100-year storm event were determined using the Rational Method computer program developed by Advanced Engineering Software (AES 2014) in conformance with the City of San Diego Drainage Design Manual, dated 2017. It is anticipated that peak flow rates will be detained back to pre-project levels as shown in Table 1. Average annual volume of precipitation, runoff, and infiltration were determined through continuous simulation modeling using EPA SWMM v5. Average annual runoff volume has increased while the average annual infiltration has decreased resulting in less storm water being infiltrated into the landslide area as shown in Table 2. The average annual Estimated Total Water Use for irrigation will be entirely used by the plants and evapotranspired based on City of San Diego Landscape Standards of the Development Manual as show in Table 3. Table 4 shows the factor of safety for over irrigation in the event that the water use for irrigation is mismanaged. Considering both the infiltration of

storm water and the application of irrigation, the average annual infiltration volume has decreased in the post-project condition as compared to the pre-project condition.

Reference and supporting documents are included in the Attachments of this letter. A list discussing the Attachments and Exhibits may be found below.

Please feel free to contact Eric Hengesbaugh or myself if you have any questions and/or concerns at (619) 291-0707.

Sincerely,

RICK ENGINEERING COMPANY

Brendan Hastie, P.E.
R.C.E. #65809, Exp. 9/21
Principal

BH:EGH:vs/files/Report/15013-C.016

Attachments

1. Vicinity Map
2. Landslide Hydrology Table
3. Preliminary Water Budget Summary for Landscape Areas

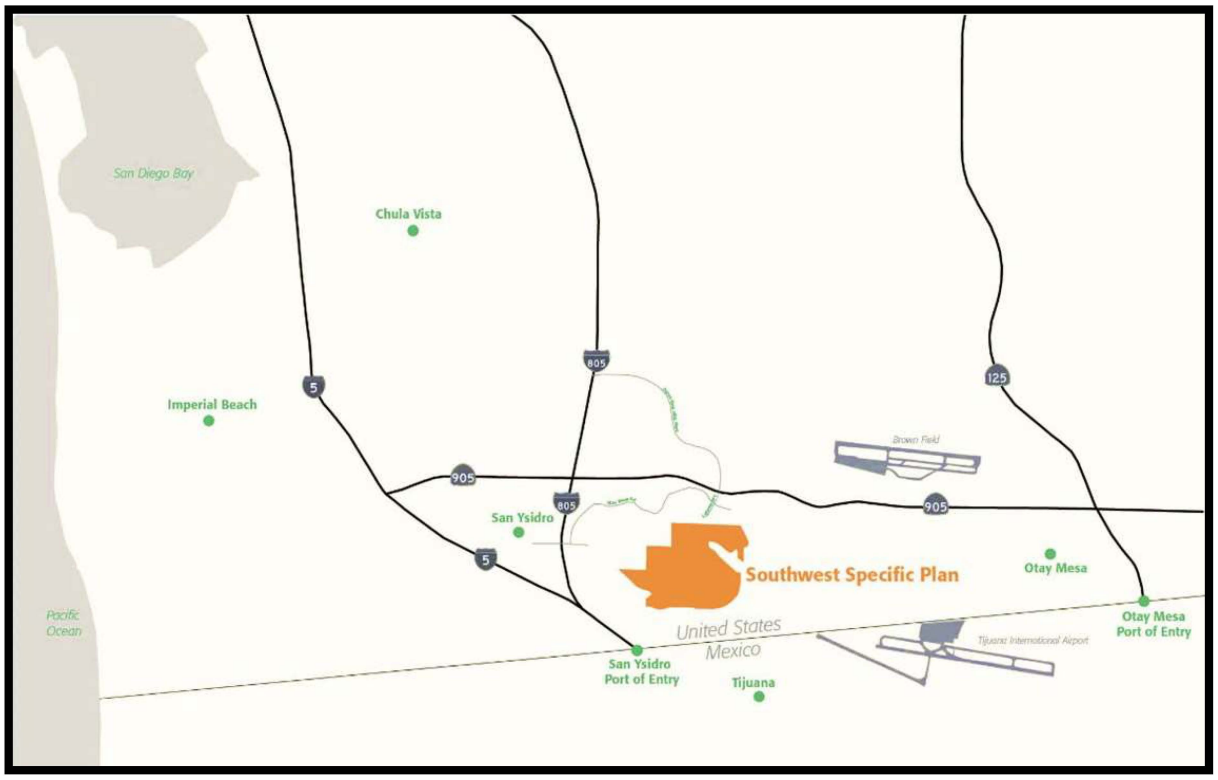
Map Pockets

1. Landslide Hydrology Pre-Project Exhibit
2. Landslide Hydrology Post-Project Exhibit

Attachments

Vicinity Map

Vicinity Map



Landslide Hydrology Table

15013C: Southwest Village Landslide Hydrology and Irrigation Summary Table

9.53in = average annual precip.

Southwest Village Landslide Hydrology Summary (AES)													Southwest Village Landslide Volume Summary (SWMM)											Southwest Village Landslide Irrigation Volume Summary							
															Precipitation		Runoff		Infiltration													
		Pre-Project			Post-Project (Unmitigated)			Post-Project (Mitigated)			Change in Area	% Change Peak Discharge			Pre-Project	Post-Project	Pre-Project	Post-Project	Pre-Project	Post-Project	% Change Runoff	% Change Infiltration	Change in Infiltration			Pre-Project	Post-Project	Post-Project	Post-Project	Change in Total Infiltration	
Node	Description	Area (ac)	Tc (min)	Q100 (cfs)	Area (ac)	Tc (min)	Q100 (cfs)	Area (ac)	Tc (min)	Q100 (cfs)	(ac)	(Post-Project Mitigated - Pre-Project)	Node	Description	Avg. Annual Precipitation Volumes (ac-ft)	Avg. Annual Precipitation Volumes (ac-ft)	Avg. Annual Runoff Volume (ac-ft)	Avg. Annual Runoff Volume (ac-ft)	Avg. Annual Infiltration Volume (ac-ft)	Avg. Annual Infiltration Volume (ac-ft)			Avg. Annual Volume (ac-ft)	Node	Description	Avg. Annual Volume (ac-ft)	Avg. Annual Volume Applied (ac-ft)	Avg. Annual Volume Evapotranspired (ac-ft)	Avg. Annual Volume Infiltrated (ac-ft)	Avg. Annual Volume (ac-ft)	Available FOS for Over Irrigation
Westerly Drainge toward Railroad Collection Points													**Westerly Drainge toward Railroad Collection Points**											**Westerly Drainge toward Railroad Collection Points**						
417	Upstream Edge of Landslide	7.4	10.2	10.8	8.8	10.3	23.0	8.8	22.1	4.5	1.4	-58%	417	Upstream Edge of Landslide	6.0	7.2	1.3	4.1	4.6	1.7	220%	-64%	-2.9	417	Upstream Edge of Landslide	-	4.4	4.4	0.0	-2.9	166%
430	Outfall	15.2	11.5	20.7	17.0	11.2	34.6	17.0	23.5	12.9	1.8	-38%	430	Outfall	12.3	13.6	2.6	4.2	9.4	6.5	63%	-31%	-2.9	430	Outfall	-					
499	Downstream Collection Point near Railroad	188.9	15.4	244.1	180.2	14.9	243.8	180.2	27.8	165.1	-8.7	-32%	499	Downstream Collection Point near Railroad	149.9	144.4	30.7	30.8	120.5	111.6	0.4%	-7%	-8.8	499	Downstream Collection Point near Railroad	-					
545	Upstream Edge of Landslide	14.3	12.7	20.3	12.9	9.6	36.4	12.9	19.7	9.8	-1.4	-52%	545	Upstream Edge of Landslide	11.4	10.2	2.2	6.5	9.1	2.4	202%	-74%	-6.7	545	Upstream Edge of Landslide	-	7.9	7.9	0.0	-6.7	185%
550	Outfall	21.6	13.5	29.8	21.6	10.0	49.2	21.6	20.2	19.4	0.0	-35%	550	Outfall	17.1	17.1	3.5	7.0	13.6	7.6	102%	-44%	-5.9	550	Outfall	-					
780	Upstream Edge of Landslide	36.4	16.1	46.1	32.5	6.0	107.9	32.5	15.0	40.0	-3.9	-13%	780	Upstream Edge of Landslide	28.9	25.8	4.7	17.4	23.6	4.7	266%	-80%	-18.9	780	Upstream Edge of Landslide	-	6.1	6.1	0.0	-18.9	409%
782	Outfall	58.8	17.4	71.6	54.9	6.5	147.0	54.9	15.6	68.0	-3.9	-5%	782	Outfall	46.7	43.6	8.5	20.9	37.5	18.6	146%	-50%	-18.9	782	Outfall	-					
799	Downstream Collection Point near Railroad	176.3	22.9	184.5	172.4	10.9	312.4	172.4	22.2	181.9	-3.9	-1%	799	Downstream Collection Point near Railroad	139.9	136.9	25.6	40.9	113.7	88.4	60%	-22%	-25.4	799	Downstream Collection Point near Railroad	-					
Total		365.2			352.6			352.6			-12.6				**289.8**	**281.2**	**56.3**	**71.8**	**234.2**	**200.0**	**28%**	**-15%**	**-34.2**				18.4	18.4	0.0	-34.2	286%
Southerly Drainage towards Spring Canyon at Border													**Southerly Drainage towards Spring Canyon at Border**											**Southerly Drainage towards Spring Canyon at Border**						
860	Upstream Edge of Landslide	4.3	11.5	6.4	5.3	9.6	15.7	5.3	20.0	6.0	1.0	-6%	860	Upstream Edge of Landslide	3.4	4.2	0.7	3.2	2.7	0.4	329%	-85%	-2.3	860	Upstream Edge of Landslide	-	0.8	0.8	0.0	-2.3	386%
870	Outfall	20.6	12.2	29.8	19.8	10.0	37.8	19.8	20.6	21.0	-0.8	-30%	870	Outfall	12.9	11.5	3.1	3.5	10.3	9.0	10%	-13%	-1.3	870	Outfall	-					
980	Upstream Edge of Landslide	6.9	14.1	9.3	9.1	6.9	30.9	9.1	20.0	8.0	2.2	-14%	980	Upstream Edge of Landslide	5.5	7.2	1.1	5.7	4.3	0.7	421%	-85%	-3.7	980	Upstream Edge of Landslide	-	2.0	2.0	0.0	-3.7	284%
981	Outfall	8.5	14.4	11.4	10.7	7.1	33.5	10.7	20.2	9.8	2.2	-14%	981	Outfall	6.7	8.5	1.4	5.8	5.3	1.6	324%	-69%	-3.7	981	Outfall	-					
999	Downstream Collection Point near Border	83.5	16.7	103.8	84.9	12.0	141.4	84.9	22.9	86.8	1.4	-16%	999	Downstream Collection Point near Border	66.3	67.4	13.3	17.3	53.4	45.9	30%	-14%	-7.5	999	Downstream Collection Point near Border	-					
Total		83.5			84.9			84.9			**1.4**				**66.3**	**67.4**	**13.3**	**17.3**	**53.4**	**45.9**	**30%**	**-14%**	**-7.5**				2.8	2.8	0.0	-7.5	367%

Notes:

1. Rainfall intensities for AES Rational Method analysis were calculated using the City of San Diego's 2017 Drainage Design Manual
2. Detailed detention analysis for basins that are not a part of the Vesting Tentative Map (VTM) (Basin 700, 800, & 900) has yet to be completed. For the purpose of this analysis the Time of Concertation was approximated by using detention analysis done on the adjacent Basins within the VTM (Basin 400 & 500). Peak flow rate for detention was based on the pre-project peak flow rates for the 100-year event.

3. For basins not apart of the VTM ((Basin 700, 800, & 900) percent imperviousness was conservatively assumed to be 85% impervious based on the proposed land use in the Specific Plan.
4. The average annual rain fall was calculated to be 9.53-inches based on annual averages calculated in EPA SWMM using the Lindberg Field rain gauge
5. The Lindberg Field rain gauge was used for this analysis. The time series for this rain gauges dates from October 17, 1948 to December 31, 2005.
6. Irrigation Assumptions:
   - Residential lots have 5% turf
   - Plan ratio (ie Plan 1, Plan 2, Plan 3..) for Basins 700, 800 and 800 follows ratios from Basin 500
   - Basin 500, buildings 74, 75, 76 & 78 have no trees
   - One (1) tree per residential lot
   - Turf will be irrigated by rotors
   - Shrub and groundcover area will be irrigated by drip
   - Standard in the industry formula for Estimated Total Water Use (ETWU) found in the City of San Diego Landscape Standards of the Development Manual (Section 2.6) and City of San Diego Municipal code, Chapter 14, Division 4: Landscape Regulations 142.0413(d)(2)

Preliminary Water Budget Summary for Landscape Areas

SOUTHWEST VILLAGE

PRELIMINARY WATER BUDGET SUMMARY FOR LANDSCAPE AREAS

4/6/2021 - r2

OVERALL TOTALS		
1,072,837	sf	Total Area of Site (sq. ft.):
695,943	sf	Landscape Area (sq. ft.):
38,971	sf	Special Landscape Area
56,869	sf	Toal Area Landscaped in Turf (sq. ft.):
8%	sf	Turf to Landscape Area Ratio:
533,732	sf	Drip
10,892	sf	Bubbler
0	sf	Spray
87,230	sf	Rotor
631,854	TOTAL SF	
3,750,354	gpy	Drip
202,591	gpy	Bubbler
0	gpy	Spray
2,942,109	gpy	Rotor
6,895,054	TOTAL GPY	
21.16	TOTAL AC/FT	

	Basin 400				Basin 500				Basin 700				Basin 800				Basin 900			
	269,714	SF			337,049	SF			181,001	SF			88,427	SF			196,645	SF		
	137,549	SF			232,646	SF			184,893	SF			52,944	SF			87,910	SF		
	11,325	SF			27,646	SF			0	SF			0	SF			0	SF		
	16,729	SF			31,088	SF			3,812	SF			1,429	SF			3,812	SF		
	12%	SF			13%	SF			2%	SF			3%	SF			4%	SF		
	118,132	SF	830,077.00	GPY	206,149	SF	1,448,541.71	GPY	112,221	SF	788,542.33	GPY	26,512	SF	186,291.83	GPY	70,717	SF	496,901.58	GPY
	2,688	SF	49,996.80	GPY	3,164	SF	58,850.40	GPY	2,688	SF	49,996.80	GPY	644	SF	11,978.40	GPY	1,708	SF	31,768.80	GPY
	0	SF	0.00	GPY	0	SF	0.00	GPY	0	SF	0.00	GPY	0	SF	0.00	GPY	0	SF	0.00	GPY
	16,729	SF	564,222	GPY	31,496	SF	1,062,290	GPY	33,765	SF	1,138,825	GPY	1,429	SF	48,206	GPY	3,812	SF	128,565	GPY
Totals	137,549	SF	1,444,296.02	GPY	240,809	SF	2,569,682.45	GPY	148,674	SF	1,977,363.97	GPY	28,585	SF	246,476.63	GPY	76,236	SF	657,235.38	GPY
			4.4	AC/FT			7.9	AC/FT			6.1	AC/FT			0.8	AC/FT			2.0	AC/FT

Assumptions:

1. Residential lots have 5% turf
2. Plan ratio (ie Plan 1, Plan 2, Plan 3..) for Basins 700, 800 and 800 follows ratios from Basin 500
3. Basin 500, buildings 74, 75, 76 & 78 have no trees
4. (1) tree per residential lot
5. Turf will be irrigated by rotors
6. Shrub and groundcover area will be irrigated by drip

Map Pocket 1

Landslide Hydrology Pre-Project Exhibit

RICK™
ENGINEERING COMPANY

April 16, 2021

City of San Diego
Development Services
101 Ash Street
San Diego, California 92101

SUBJECT: LANDSLIDE HYDROLOGY ANALYSIS FOR SOUTWEST VILLAGE
(RICK ENGINEERING COMPANY JOB NUMBER 15013-C)

1. Introduction

This letter report presents the existing and proposed hydrology associated with the landslide area adjacent to the Otay Mesa Southwest Village project area. The Southwest Village project is a smaller portion of the overall community of Otay Mesa. Specifically, the project boundary is generally located south of State Route 905, east of Interstate 805, north of US-Mexico border, and immediately west of the northerly branch of Spring Canyon Creek. Refer to the Vicinity Map in Attachment 1 as well as the drainage study maps included in Map Pockets 1 and 2 for the limits of the area analyzed.

2. Drainage Characteristics

In the existing condition, Basins 400, flows in a westerly direction to a collection point east of the existing railroad. Basin 500 and 700, drain in a southwesterly direction where they confluence before flowing to a collection point along the eastern edge of the existing railroad. From these locations, runoff is conveyed in an existing storm drain system (pipes and channels) to the Tijuana River by the border line with Mexico. Runoff from Basins 800 and 900 drain to the south and confluence in Spring Canyon Creek. Runoff is conveyed south within Spring Canyon Creek towards an existing culvert at the Spring Canyon concentration point along the border with Mexico. Based upon the available information, it is assumed that the runoff is conveyed via a system of storm drain and open channels to a concrete lined reach of the Tijuana River on the Mexican side of the border.

Throughout the landslide area there are several existing sump locations where it is anticipated that storm water will collect and infiltrate into the native soil or evaporate over time. The area analyzed also includes existing shallow sump locations, notably in Basins 800 and 900, where it is anticipated that in larger storm events, storm water will weir over the edge of the low point

and flow out to collection points along the border with Mexico by Spring Canyon Creek. Please refer to Map Pocket 1 for the existing condition drainage map.

The post-project drainage conditions will remain largely similar to those in the existing condition. However, drainage improvements are being proposed throughout the development area. Storm drain outfalls will be extended as far as practicable towards the bottom of mesa and located adjacent to established existing channels. Underground storage is proposed to detain peak flow rates back to existing conditions for the 50 and 100-year storm event. Additionally, the drainage area flowing into Mexico at the Spring Canyon concentration point and will need to comply with the US/Mexico International flood control detention requirements (i.e. – 5, 10, 25, 50, & 100-year storm events). Please refer to Map Pocket 2 for the proposed condition drainage map.

3. Hydrology Methodology and Results

This study considers peak flow rates in the existing and proposed project condition and a summary is provided in Table 1 below. Weighted Runoff Coefficients and Time of Concentration were calculated based on guidance from the City of San Diego Drainage Design Manual, dated January 2017. The Rational Method computer program developed by Advanced Engineering Software (AES 2014) was used for this study.

Table 1: Existing and Proposed Hydrology (AES)

Drainage Basin #	Drainage Node # at Point of Interest	Project Condition	Tributary Area, A (acres)	Time of Concentration, T_c (minutes)	100-year Flow Rates, Q_{100} (cfs [1])	Change in Area (ac)	% Change in Peak Discharge (Pre to Post Detained)
400	499	Pre-project	188.9	15.4	244.1	-8.7	-32%
	499	Post-project	180.2	14.9	243.8		
	499	Post-Detained	180.2	27.8	165.1		
500 & 700	799	Pre-project	176.3	22.9	184.5	-3.9	-1%
	799	Post-project	172.4	10.9	312.4		
	799	Post-Detained	172.4	22.2[2]	181.9[3]		
800 & 900	999	Pre-project	83.5	16.7	103.8	+1.4	-16%
	999	Post-project	84.9	12.0	141.4		
	999	Post-Detained	84.9	22.9[2]	86.8[3]		

Notes:

1. Rainfall intensities for AES Rational Method analysis were calculated using the City of San Diego's 2017 Drainage Design Manual
2. Detailed detention analysis for basins that are not a part of the Vesting Tentative Map (VTM) (Basin 700, 800, & 900) has yet to be completed. For the purpose of this analysis the Time of Concertation was approximated by using detention analysis done on the adjacent Basins within the VTM (Basin 400 & 500). Peak flow rate for detention was based on the pre-project peak flow rates for the 100-year event.
3. For basins not a part of the VTM ((Basin 700, 800, & 900) percent imperviousness was conservatively assumed to be 85% impervious based on the proposed land use in the Specific Plan.

A summary of the average annual volume at key locations throughout the landslide area has also been quantified. The locations analyzed are at the upstream edge of the landslide buffer, the proposed storm drain outfall locations, and at the collection point either adjacent to the railroad for Basins 400, 500, and 700 or adjacent to the border with Mexico for Basins 800 and 900. A continuous simulation model using EPA SWMM v5 for each of the basins has been completed to determine the average annual volume of precipitation, runoff, and infiltration. Due to potential issues with the Lower Otay Reservoir rain gauge, the Lindberg Field rain gauge was used for this analysis. The time series for the rain gauges dates from October 17, 1948 to December 31, 2005. Parameters used within the EPA SWMM models will be consistent with guidance provided in the October 2018 City of San Diego Storm Water Standards Manual Appendix G. Please refer to Table 2 for a summary of precipitation, runoff, and infiltration.

Table 2: Existing and Proposed Average Annual Volume (SWMM)

Drainage Basin #	Drainage Node # at Point of Interest	Project Condition	Precipitation (ac-ft)	Runoff (ac-ft)	Infiltration (ac-ft)	% Change in Runoff	% Change in Infiltration
400	499	Pre-project	149.9	30.7	120.5	0.4%	-7%
	499	Post-project	144.4	30.8	111.6		
500 & 700	799	Pre-project	139.9	25.6	113.7	60%	-22%
	799	Post-project	136.9	40.9	88.4		
800 & 900	999	Pre-project	66.3	13.3	53.4	30%	-14%
	999	Post-project	67.4	17.3	45.9		

Notes:

1. The average annual rain fall was calculated to be 9.53-inches based on annual averages calculated in EPA SWMM using the Lindberg Field rain gauge
2. The Lindberg Field rain gauge was used for this analysis. The time series for this rain gauges dates from October 17, 1948 to December 31, 2005.

Table 2 shows that in the post project condition, average annual runoff volumes have increased. This is due to the development associated with the Southwest Village project site and the addition of impervious area. The increased impervious area and compacted fill soils with reduced conductivity result in a high runoff volume. This increase in runoff volume makes sense as flows are conveyed through the landslide area and are collected at points adjacent to the railroad or next to the border with Mexico. Because of the increase in impervious area due to the development of the project site and the decrease in conductivity of the compacted fill, Table 2 also shows a decrease in the average annual infiltration. The increase in runoff and the decrease in infiltration overall results in less storm water being infiltrated into the landslide area.

4. Irrigation – Estimate Total Water Use

Review was limited to the estimated landscape irrigation water use (potable water systems) as they relate to portions of irrigation to be utilized by residential and common area landscapes areas within the basin area footprint(s). Evaluation utilized a standard in the industry formula associated with this type of analysis, that being the Estimated Total Water Use (ETWU) found in the City of San Diego Landscape Standards of the Development Manual (Section 2.6) and City of San Diego Municipal code, Chapter 14, Division 4: Landscape Regulations 142.0413(d)(2). Assessment will be based on typical landscape irrigation requirements

associated with various plant types, Evapotranspiration (ETo), irrigation system, and component efficiency and standard irrigation scheduling practices.

Assessment of landscape area to be irrigated is based on a typical lot footprint of building architecture and layout of hardscape (driveways, patios, and walks). In the absence of typical building footprints and associated hardscape, assumptions were made as to percentage of lot coverage for non-irrigated areas.

Without a fit lot plan, architectural footprints were placed based on setback requirements. Based on this preliminary plan, a set number of each plan was determined for Basins 400 & 500. Each plan has a set area for the residence, driveway, walkway and rear patio. This area was subtracted from the overall lot area, to produce the total landscape area. Of this total landscape area, 5% was assumed to be turf. Based on the ratio of each plan found in Basin 500, a number of each plan was assumed for Basins 700, 800 & 900. Landscape areas for parks and recreational spaces were determined directly from the approved overall Conceptual Landscape Plan. For the park located in Basin 700, turf was assumed to be 85% of the landscape area.

An Estimated Total Water Use calculation was conducted for each basin footprint area and can be found below in Table 3. Turf was set at high water use, to be irrigated by rotors. Trees were to be moderate water use, irrigated by bubblers. Shrub and groundcover areas were assumed to be low water use, irrigated by drip. The results were then combined and illustrated in the summary table. Assumptions are listed below the summary.

Table 3: Average Annual Estimated Total Water Use for Irrigation

Basin ID	Average Annual Estimated Total Water Use for Irrigation (ac-ft)	Average Annual Volume Evapotranspired (ac-ft)	Average Annual Volume Infiltrated (ac-ft)
400	4.4	4.4	0.0
500	7.9	7.9	0.0
700	6.1	6.1	0.0
800	0.8	0.8	0.0
900	2.0	2.0	0.0

Notes:

1. Evaluation utilized a standard in the industry formula for Estimated Total Water Use (ETWU) found in the City of San Diego Landscape Standards of the Development Manual (Section 2.6) and City of San Diego Municipal code, Chapter 14, Division 4: Landscape Regulations 142.0413(d)(2)

5. Infiltration Summary

Table 4 below provides a summary of the change in storm water infiltration at the upstream edge of the land slide area. It is anticipated that the average annual water use for irrigation will be entirely used by the plants, stored in the top six to twelve inches of the soil, and evapotranspired. Resulting in no additional infiltration due to irrigation. However, considering the possibility that mismanagement of irrigation in the post-project condition could result in over application and increase infiltration, a factor of safety (FOS) was determined. Table 4 provides a factor of safety for over irrigation within the post-project drainage basins.

Table 4: Infiltration Summary and Factor of Safety (FOS) for Over Irrigation

Basin ID	Node #	Average Annual Volume Storm Water Infiltrated Pre-Project (ac-ft)	Average Annual Volume Storm Water Infiltrated Post-Project (ac-ft)	Change in Average Annual Volume of Storm Water Infiltration (ac-ft)	Average Annual Estimated Total Water Use for Irrigation (ac-ft)	Average Annual Volume of Irrigation Infiltrated (ac-ft)	Factor of Safety for Over Irrigation
400	417	4.6	1.7	-2.9	4.4	0.0	166%
500	545	9.1	2.4	-6.7	7.9	0.0	185%
700	780	23.6	4.7	-18.9	6.1	0.0	409%
800	860	2.7	0.4	-2.3	0.8	0.0	386%
900	980	4.3	0.7	-3.7	2.0	0.0	284%

6. Conclusion

This letter report presents the existing and proposed hydrology and proposed irrigation associated with the landslide area adjacent to the Otay Mesa Southwest Village project area. Peak flow rates for the 100-year storm event were determined using the Rational Method computer program developed by Advanced Engineering Software (AES 2014) in conformance with the City of San Diego Drainage Design Manual, dated 2017. It is anticipated that peak flow rates will be detained back to pre-project levels as shown in Table 1. Average annual volume of precipitation, runoff, and infiltration were determined through continuous simulation modeling using EPA SWMM v5. Average annual runoff volume has increased while the average annual infiltration has decreased resulting in less storm water being infiltrated into the landslide area as shown in Table 2. The average annual Estimated Total Water Use for irrigation will be entirely used by the plants and evapotranspired based on City of San Diego Landscape Standards of the Development Manual as show in Table 3. Table 4 shows the factor of safety for over irrigation in the event that the water use for irrigation is mismanaged. Considering both the infiltration of

storm water and the application of irrigation, the average annual infiltration volume has decreased in the post-project condition as compared to the pre-project condition.

Reference and supporting documents are included in the Attachments of this letter. A list discussing the Attachments and Exhibits may be found below.

Please feel free to contact Eric Hengesbaugh or myself if you have any questions and/or concerns at (619) 291-0707.

Sincerely,

RICK ENGINEERING COMPANY

Brendan Hastie, P.E.
R.C.E. #65809, Exp. 9/21
Principal

BH:EGH:vs/files/Report/15013-C.016

Attachments

1. Vicinity Map
2. Landslide Hydrology Table
3. Preliminary Water Budget Summary for Landscape Areas

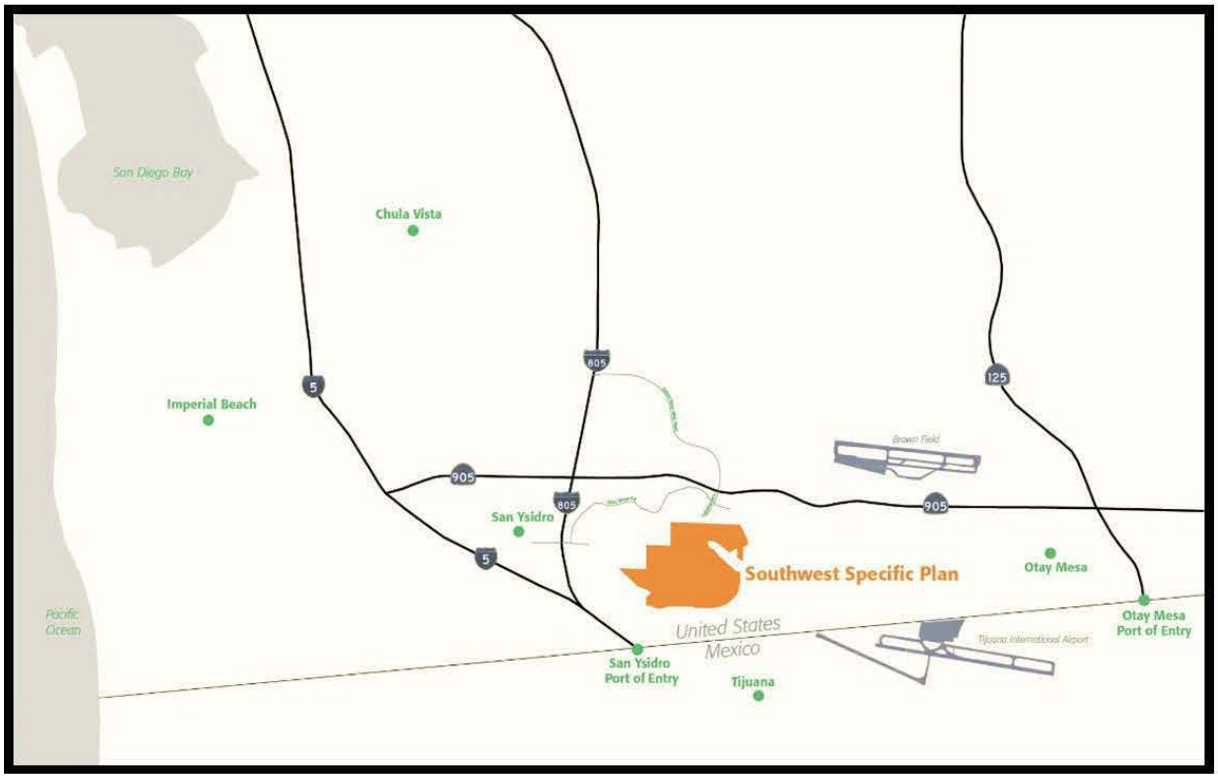
Map Pockets

1. Landslide Hydrology Pre-Project Exhibit
2. Landslide Hydrology Post-Project Exhibit

Attachments

Vicinity Map

Vicinity Map



Landslide Hydrology Table

15013C: Southwest Village Landslide Hydrology and Irrigation Summary Table

9.53in = average annual precip.

Southwest Village Landslide Hydrology Summary (AES)													Southwest Village Landslide Volume Summary (SWMM)											Southwest Village Landslide Irrigation Volume Summary							
															Precipitation		Runoff		Infiltration													
		Pre-Project			Post-Project (Unmitigated)			Post-Project (Mitigated)			Change in Area	% Change Peak Discharge			Pre-Project	Post-Project	Pre-Project	Post-Project	Pre-Project	Post-Project	% Change Runoff	% Change Infiltration	Change in Infiltration			Pre-Project	Post-Project	Post-Project	Post-Project	Change in Total Infiltration	
Node	Description	Area (ac)	Tc (min)	Q100 (cfs)	Area (ac)	Tc (min)	Q100 (cfs)	Area (ac)	Tc (min)	Q100 (cfs)	(ac)	(Post-Project Mitigated - Pre-Project)	Node	Description	Avg. Annual Precipitation Volumes (ac-ft)	Avg. Annual Precipitation Volumes (ac-ft)	Avg. Annual Runoff Volume (ac-ft)	Avg. Annual Runoff Volume (ac-ft)	Avg. Annual Infiltration Volume (ac-ft)	Avg. Annual Infiltration Volume (ac-ft)			Avg. Annual Volume (ac-ft)	Node	Description	Avg. Annual Volume (ac-ft)	Avg. Annual Volume Applied (ac-ft)	Avg. Annual Volume Evapotranspired (ac-ft)	Avg. Annual Volume Infiltrated (ac-ft)	Avg. Annual Volume (ac-ft)	Available FOS for Over Irrigation
Westerly Drainge toward Railroad Collection Points													**Westerly Drainge toward Railroad Collection Points**											**Westerly Drainge toward Railroad Collection Points**						
417	Upstream Edge of Landslide	7.4	10.2	10.8	8.8	10.3	23.0	8.8	22.1	4.5	1.4	-58%	417	Upstream Edge of Landslide	6.0	7.2	1.3	4.1	4.6	1.7	220%	-64%	-2.9	417	Upstream Edge of Landslide	-	4.4	4.4	0.0	-2.9	166%
430	Outfall	15.2	11.5	20.7	17.0	11.2	34.6	17.0	23.5	12.9	1.8	-38%	430	Outfall	12.3	13.6	2.6	4.2	9.4	6.5	63%	-31%	-2.9	430	Outfall	-					
499	Downstream Collection Point near Railroad	188.9	15.4	244.1	180.2	14.9	243.8	180.2	27.8	165.1	-8.7	-32%	499	Downstream Collection Point near Railroad	149.9	144.4	30.7	30.8	120.5	111.6	0.4%	-7%	-8.8	499	Downstream Collection Point near Railroad	-					
545	Upstream Edge of Landslide	14.3	12.7	20.3	12.9	9.6	36.4	12.9	19.7	9.8	-1.4	-52%	545	Upstream Edge of Landslide	11.4	10.2	2.2	6.5	9.1	2.4	202%	-74%	-6.7	545	Upstream Edge of Landslide	-	7.9	7.9	0.0	-6.7	185%
550	Outfall	21.6	13.5	29.8	21.6	10.0	49.2	21.6	20.2	19.4	0.0	-35%	550	Outfall	17.1	17.1	3.5	7.0	13.6	7.6	102%	-44%	-5.9	550	Outfall	-					
780	Upstream Edge of Landslide	36.4	16.1	46.1	32.5	6.0	107.9	32.5	15.0	40.0	-3.9	-13%	780	Upstream Edge of Landslide	28.9	25.8	4.7	17.4	23.6	4.7	266%	-80%	-18.9	780	Upstream Edge of Landslide	-	6.1	6.1	0.0	-18.9	409%
782	Outfall	58.8	17.4	71.6	54.9	6.5	147.0	54.9	15.6	68.0	-3.9	-5%	782	Outfall	46.7	43.6	8.5	20.9	37.5	18.6	146%	-50%	-18.9	782	Outfall	-					
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Total		365.2			352.6			352.6			-12.6				**289.8**	**281.2**	**56.3**	**71.8**	**234.2**	**200.0**	**28%**	**-15%**	**-34.2**				18.4	18.4	0.0	-34.2	286%
Southerly Drainage towards Spring Canyon at Border													**Southerly Drainage towards Spring Canyon at Border**											**Southerly Drainage towards Spring Canyon at Border**						
860	Upstream Edge of Landslide	4.3	11.5	6.4	5.3	9.6	15.7	5.3	20.0	6.0	1.0	-6%	860	Upstream Edge of Landslide	3.4	4.2	0.7	3.2	2.7	0.4	329%	-85%	-2.3	860	Upstream Edge of Landslide	-	0.8	0.8	0.0	-2.3	386%
870	Outfall	20.6	12.2	29.8	19.8	10.0	37.8	19.8	20.6	21.0	-0.8	-30%	870	Outfall	12.9	11.5	3.1	3.5	10.3	9.0	10%	-13%	-1.3	870	Outfall	-					
980	Upstream Edge of Landslide	6.9	14.1	9.3	9.1	6.9	30.9	9.1	20.0	8.0	2.2	-14%	980	Upstream Edge of Landslide	5.5	7.2	1.1	5.7	4.3	0.7	421%	-85%	-3.7	980	Upstream Edge of Landslide	-	2.0	2.0	0.0	-3.7	284%
981	Outfall	8.5	14.4	11.4	10.7	7.1	33.5	10.7	20.2	9.8	2.2	-14%	981	Outfall	6.7	8.5	1.4	5.8	5.3	1.6	324%	-69%	-3.7	981	Outfall	-					
999	Downstream Collection Point near Border	83.5	16.7	103.8	84.9	12.0	141.4	84.9	22.9	86.8	1.4	-16%	999	Downstream Collection Point near Border	66.3	67.4	13.3	17.3	53.4	45.9	30%	-14%	-7.5	999	Downstream Collection Point near Border	-					
Total		83.5			84.9			84.9			**1.4**				**66.3**	**67.4**	**13.3**	**17.3**	**53.4**	**45.9**	**30%**	**-14%**	**-7.5**				2.8	2.8	0.0	-7.5	367%

Notes:

1. Rainfall intensities for AES Rational Method analysis were calculated using the City of San Diego's 2017 Drainage Design Manual
2. Detailed detention analysis for basins that are not a part of the Vesting Tentative Map (VTM) (Basin 700, 800, & 900) has yet to be completed. For the purpose of this analysis the Time of Concertation was approximated by using detention analysis done on the adjacent Basins within the VTM (Basin 400 & 500). Peak flow rate for detention was based on the pre-project peak flow rates for the 100-year event.

3. For basins not apart of the VTM ((Basin 700, 800, & 900) percent imperviousness was conservatively assumed to be 85% impervious based on the proposed land use in the Specific Plan.
4. The average annual rain fall was calculated to be 9.53-inches based on annual averages calculated in EPA SWMM using the Lindberg Field rain gauge
5. The Lindberg Field rain gauge was used for this analysis. The time series for this rain gauges dates from October 17, 1948 to December 31, 2005.
6. Irrigation Assumptions:
   - Residential lots have 5% turf
   - Plan ratio (ie Plan 1, Plan 2, Plan 3..) for Basins 700, 800 and 800 follows ratios from Basin 500
   - Basin 500, buildings 74, 75, 76 & 78 have no trees
   - One (1) tree per residential lot
   - Turf will be irrigated by rotors
   - Shrub and groundcover area will be irrigated by drip
   - Standard in the industry formula for Estimated Total Water Use (ETWU) found in the City of San Diego Landscape Standards of the Development Manual (Section 2.6) and City of San Diego Municipal code, Chapter 14, Division 4: Landscape Regulations 142.0413(d)(2)

Preliminary Water Budget Summary for Landscape Areas

SOUTHWEST VILLAGE

PRELIMINARY WATER BUDGET SUMMARY FOR LANDSCAPE AREAS

4/6/2021 - r2

OVERALL TOTALS		
1,072,837	sf	Total Area of Site (sq. ft.):
695,943	sf	Landscape Area (sq. ft.):
38,971	sf	Special Landscape Area
56,869	sf	Toal Area Landscaped in Turf (sq. ft.):
8%	sf	Turf to Landscape Area Ratio:
533,732	sf	Drip
10,892	sf	Bubbler
0	sf	Spray
87,230	sf	Rotor
631,854	TOTAL SF	
3,750,354	gpy	Drip
202,591	gpy	Bubbler
0	gpy	Spray
2,942,109	gpy	Rotor
6,895,054	TOTAL GPY	
21.16	TOTAL AC/FT	

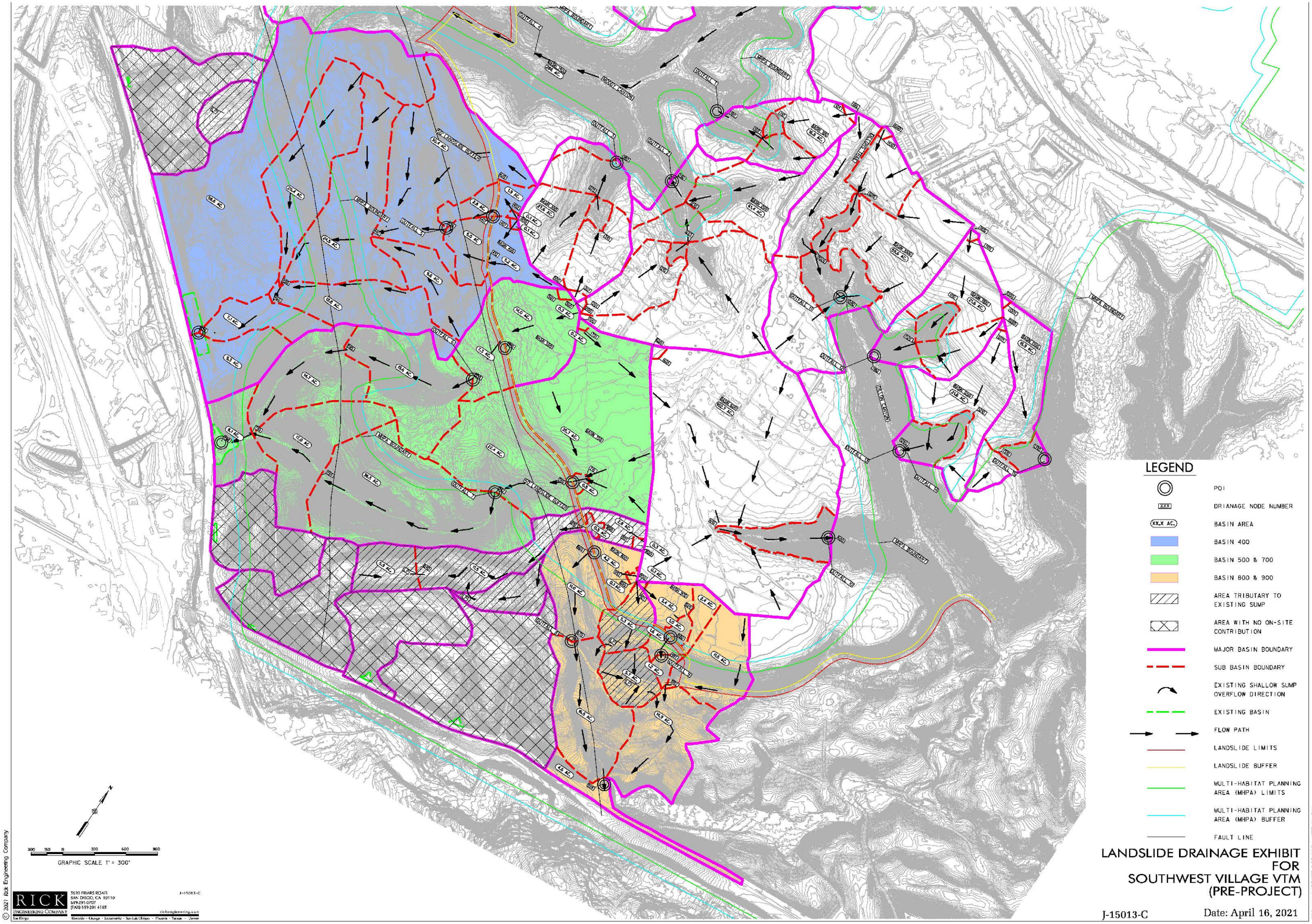
	Basin 400				Basin 500				Basin 700				Basin 800				Basin 900			
	269,714	SF			337,049	SF			181,001	SF			88,427	SF			196,645	SF		
	137,549	SF			232,646	SF			184,893	SF			52,944	SF			87,910	SF		
	11,325	SF			27,646	SF			0	SF			0	SF			0	SF		
	16,729	SF			31,088	SF			3,812	SF			1,429	SF			3,812	SF		
	12%	SF			13%	SF			2%	SF			3%	SF			4%	SF		
	118,132	SF	830,077.00	GPY	206,149	SF	1,448,541.71	GPY	112,221	SF	788,542.33	GPY	26,512	SF	186,291.83	GPY	70,717	SF	496,901.58	GPY
	2,688	SF	49,996.80	GPY	3,164	SF	58,850.40	GPY	2,688	SF	49,996.80	GPY	644	SF	11,978.40	GPY	1,708	SF	31,768.80	GPY
	0	SF	0.00	GPY	0	SF	0.00	GPY	0	SF	0.00	GPY	0	SF	0.00	GPY	0	SF	0.00	GPY
	16,729	SF	564,222	GPY	31,496	SF	1,062,290	GPY	33,765	SF	1,138,825	GPY	1,429	SF	48,206	GPY	3,812	SF	128,565	GPY
Totals	137,549	SF	1,444,296.02	GPY	240,809	SF	2,569,682.45	GPY	148,674	SF	1,977,363.97	GPY	28,585	SF	246,476.63	GPY	76,236	SF	657,235.38	GPY
			4.4	AC/FT			7.9	AC/FT			6.1	AC/FT			0.8	AC/FT			2.0	AC/FT

Assumptions:

1. Residential lots have 5% turf
2. Plan ratio (ie Plan 1, Plan 2, Plan 3..) for Basins 700, 800 and 800 follows ratios from Basin 500
3. Basin 500, buildings 74, 75, 76 & 78 have no trees
4. (1) tree per residential lot
5. Turf will be irrigated by rotors
6. Shrub and groundcover area will be irrigated by drip

Map Pocket 1

Landslide Hydrology Pre-Project Exhibit



LANDSLIDE DRAINAGE EXHIBIT FOR SOUTHWEST VILLAGE VTM (PRE-PROJECT)

J-15013-C

Date: April 16, 2021

RICK ENGINEERING COMPANY
San Diego
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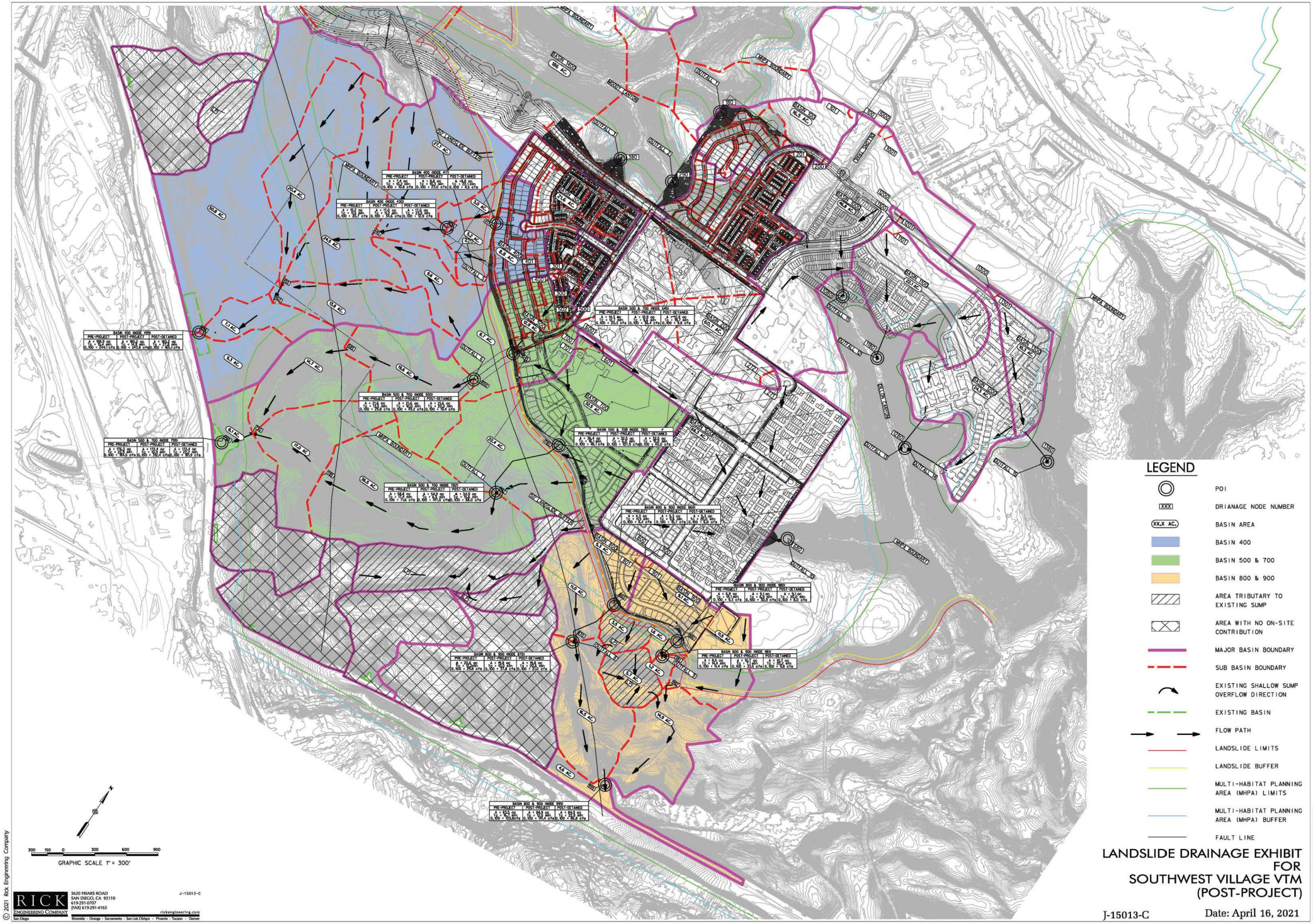
rickengineering.com
Riverside - Orange - Sacramento - San Luis Obispo - Phoenix - Tucson - Denver

NOT FOR CONSTRUCTION - EXHIBIT FOR DRAINAGE STUDY ONLY

Map Pocket 2

Landslide Hydrology Post-Project Exhibit



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