Appendix G

2020 Least Bell's Vireo and Yellow Billed Cuckoo Survey Report

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Least Bell's Vireo (*Vireo bellii pusillus*) Surveys and Nest Monitoring at the Otay Ranch Preserve, City of Chula Vista, San Diego County

October 9, 2020

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Introduction

This report presents the results of surveys and nest monitoring conducted for the Least Bell's Vireo (*Vireo bellii pusillus*; vireo) and Yellow-billed Cuckoo (*Coccyzus americanus*; cuckoo) at the southern Salt Creek Parcels of the Otay Ranch Preserve (Preserve), in the city of Chula Vista, San Diego County, California. The Salt Creek Parcels are located in southeastern Chula Vista, California, southwest of

Lower Otay Lake (

FIGURE 1
Regional Location of Salt Creek Parcels
Otay Ranch Preserve

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Figure 1). The survey area includes the southernmost block of the Salt Creek Parcels and is referred to hereafter as the "Project Area (Figure 2)." The Project Area ranges in elevation from approximately 240 to 540 feet above mean sea level (

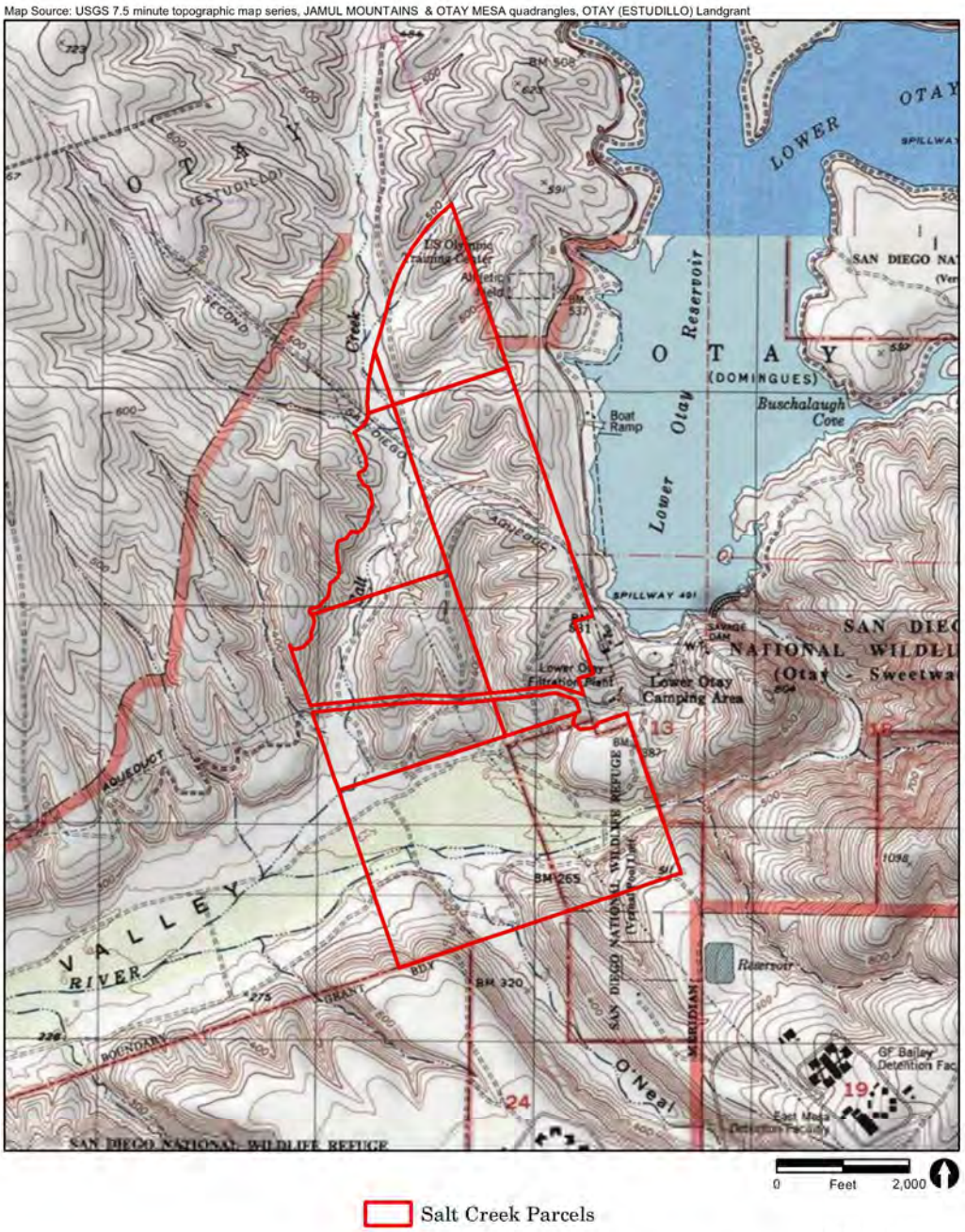

FIGURE 2
Salt Creek Parcels on USGS Map
Otay Ranch Preserve

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Figure 2). The surveys were conducted on all suitable habitat within the Project Area under U.S. Fish and Wildlife Service (USFWS) 10(a)1(A) permit TE-117947 (Kevin Clark and Lea Squires) and TE-122632 (Kimberly Ferree), and a Memorandum of Understanding with the California Department of Fish and Wildlife (CDFW).

Least Bell's Vireo surveys of the Preserve were initiated in 2011. The areas surveyed within the Preserve have changed several times since 2011. To be comparable from year to year, the Project Area has been divided into six survey sites (Table 1, Figure 3). From 2011-2013, the survey sites included the City of Chula Vista (Figure 3; City) site, located in the southern portion of the Salt Creek Parcels; the portion designated as a Formerly Used Defense Site Figure 3; FUDS), located in the southwestern portion of the Salt Creek Parcels; and the Salt Creek site (Figure 3), located north of the City survey site in the northern portion of the Salt Creek Parcels. In 2014, the City and Salt Creek survey sites were surveyed while the FUDS survey site was excluded by request of the City of Chula Vista. No surveys were conducted in 2015. However, due to proposed restoration activities, surveys were resumed in 2016 by ICF and included the City and FUDS survey sites. The San Diego Natural History Museum was contracted separately by ICF and the City of Chula Vista to survey and monitor vireos beginning in 2017 at all three survey sites (City, FUDS, Salt Creek). The survey boundary on the western end of the Preserve was expanded in 2018 to include additional habitat that is under consideration for future restoration by ICF (Figure 3; ICF). In 2019, the Project Area was expanded once more to include all the potential habitat of the Northern Salt Creek Parcel (Figure 3; Northern Salt Creek), south of Olympic Parkway, and the Wolf Canyon Parcel (Figure 3; Wolf Canyon), located north of the Otay River Valley and west of the Salt Creek Parcels. In 2020, the survey effort was reduced to include only the three southern survey sites (ICF, FUDS, and City).

For ease of comparison, results of the Least Bell's Vireo surveys and monitoring (e.g. territory numbers, number of nests) are presented individually by survey site. Reproductive success and productivity statistics are presented for the three contiguous survey sites because sample sizes were too small to present by survey site.

Yellow-billed Cuckoo surveys have been conducted beginning in 2016 as a result of the finding of a Yellow-billed Cuckoo in the Preserve in 2012 (Clark 2012). The areas surveyed for Yellow-billed Cuckoo include the three survey sites located in the Otay River Valley (i.e., City, FUDS, and ICF).

FIGURE 1
Regional Location of Salt Creek Parcels
Otay Ranch Preserve

Figure 1. Regional Location of Salt Creek Parcels, Otay Ranch Preserve, 2020

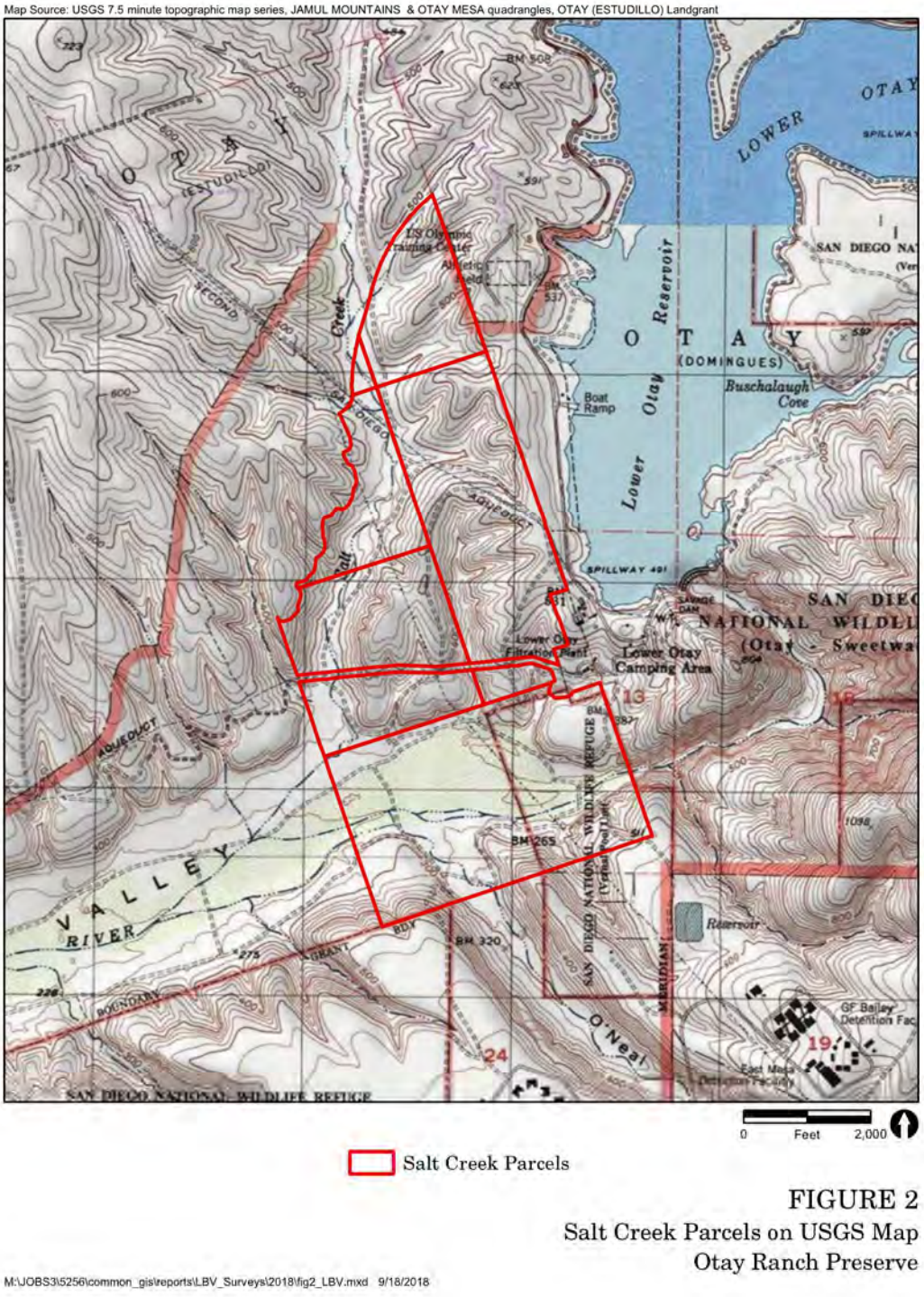


FIGURE 2
Salt Creek Parcels on USGS Map
Otay Ranch Preserve

Figure 2. Salt Creek Parcels on USGS Map, Otay Ranch Preserve. The 2020 Project Area includes the southernmost parcel.

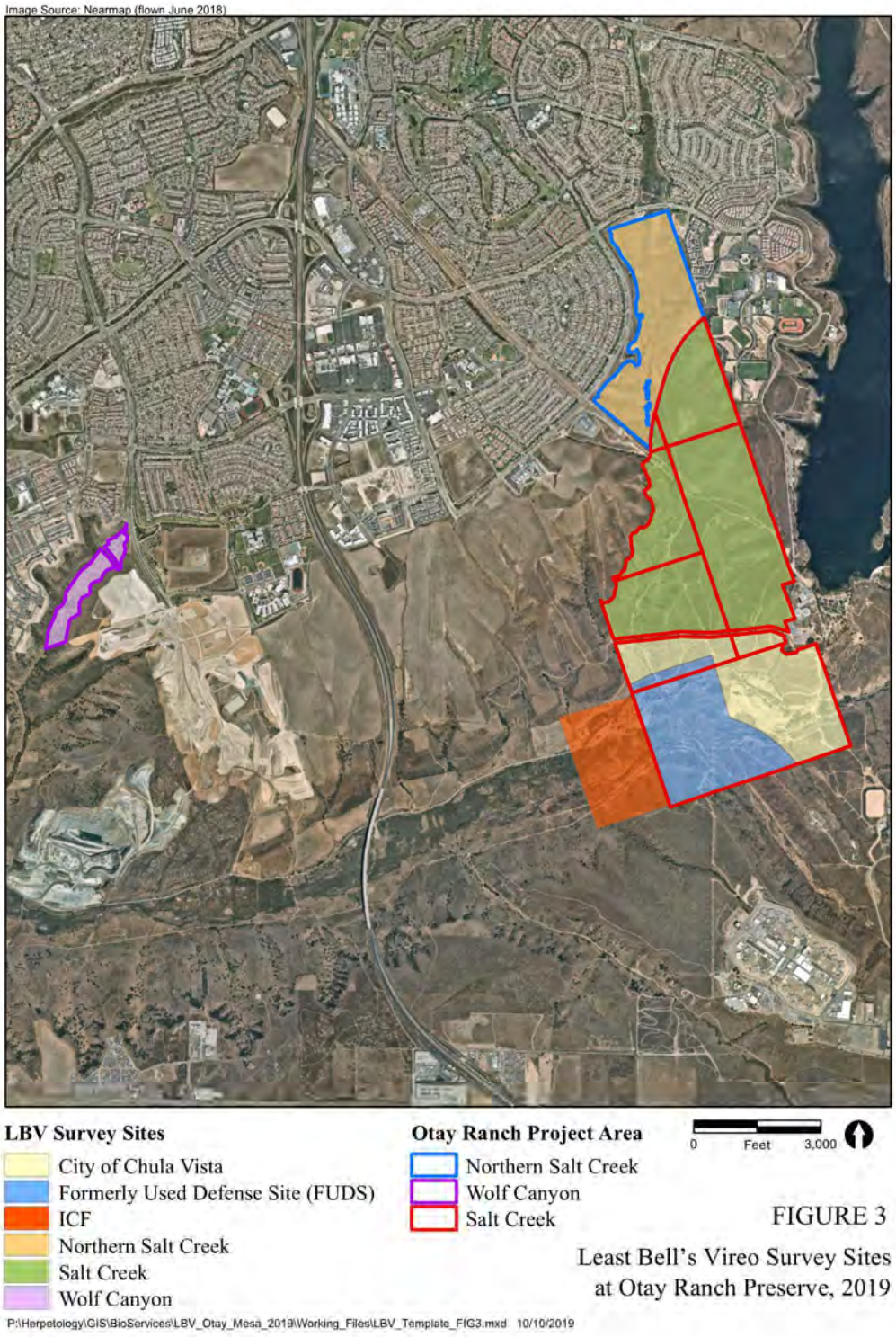


Figure 3. Least Bell's Vireo Survey Sites at Otay Ranch Preserve, 2019-2020

Table 1. Summary of Least Bell's Vireo Surveys and Monitoring in the Otay Ranch Preserve, California, 2011-2020.

Survey Site	Survey Years	Location
City	2011-2014, 2016-2020	Southeastern portion of Salt Creek Parcels in the Otay River Valley.
FUDS	2011[a], 2012-2013, 2016-2020	Southwestern portion of Salt Creek Parcels in the Otay River Valley.
Salt Creek	2011-2014, 2016-2019	Northern portion of the Salt Creek Parcels in Salt Creek.
ICF	2018-2020	West of Salt Creek Parcels in the Otay River Valley.
Northern Salt Creek	2019	Northern Salt Creek Parcels in Salt Creek.
Wolf Canyon	2019	Wolf Canyon Parcel in Wolf Canyon. North of the Otay River Valley. Not contiguous with Salt Creek and Northern Salt Creek Parcels.

[a]Focused surveys and monitoring were not conducted in 2011; however, vireos were noted singing and mapped, but not monitored.

Least Bell's Vireo Biology

The Least Bell's Vireo breeds in southern California and northwestern Baja California, with the majority of the population located in San Diego County (Kus *et al*. 2010). The Least Bell's Vireo is a small, migratory insectivore that prefers dense riparian vegetation for foraging and nesting. The CDFW listed the Least Bell's Vireo as endangered in 1980. The USFWS followed suit in 1986. Critical habitat was designated for this subspecies in 1994 along the southwestern coastline of California below Santa Barbara (USFWS 1994).

Historically, Least Bell's Vireo was a common to locally abundant species found in lowland riparian habitats between northern California and coastal southern California. However, loss of riparian habitats and Brown-Headed Cowbird (*Molothrus ater*) parasitism led to a large population decline. When USFWS first listed the bird in 1986, the population was estimated to be just 300 pairs. The latest Five-Year Review, dated September 2006, reported a 10-fold increase in population size since the time of its listing to an estimated 2,968 territories (USFWS 2006). The vireo population increase is largely attributed to cowbird control and habitat restoration and preservation (Kus 1999, Kus and Whitfield 2005).

Least Bell's Vireos typically begin to arrive on their breeding grounds by mid- to late March. Males tend to arrive first and establish territories; females arrive a few days later. Site fidelity is high among adult Least Bell's Vireo, with many birds returning to the same territory each year and even using the same shrub for nesting as previous years (Salata 1983, Kus 2002). Nests are typically placed within 1 meter of the ground in dense shrubby riparian habitat. A diverse canopy height is required for foraging, with willows often dominating the canopy layer (Salata 1983). Nesting lasts from early April through July, at which time some vireos may begin to depart; however, most adults and juvenile birds remain on the breeding grounds into late September/early October. In southern California, Least Bell's Vireo nest sites are most frequently located in riparian stands between 5 and 10 years old (SANDAG and RECON 1990).

Based on rigorous statistical analysis of Least Bell's Vireo habitat structure and composition, this species appears to preferentially select sites with large amounts of shrub and tree cover, a large degree of vertical stratification, and small amounts of aquatic and herbaceous cover (SANDAG and RECON 1990).

Existing Conditions

The riparian habitats across the Project Area are variable. Dense riparian woodland occurs in the wetter locales dominated by arroyo willow (*Salix lasiolepis*), black willow (*Salix gooddingii*), and Fremont cottonwood (*Populus fremontii*; Appendix A, Photo 6). In more xeric conditions, stands of mule fat (*Baccharis salicifolia*) are present with occasional pockets of arroyo willow and coyote willow (*Salix exigua*) (Appendix A, Photo 7). Dense stands of tamarisk (*Tamarix* sp.) are also present in some locations, being particularly prevalent in the Otay River in the City, FUDS, and ICF survey sites (Appendix A, Photo 8). Upland habitats adjacent to the riparian habitat are dominated by laurel sumac (*Malosma laurina*) and Peruvian pepper trees (*Schinus molle*), with blue elderberry (*Sambucus nigra* subsp. *caerulea*) also prevalent (Appendix A, Photo 9). Laurel sumac and pepper trees are especially common on the upland benches adjacent to the Otay River. The ICF survey site consists of a mix of mule fat, tamarisk, and small stands of arroyo willow.

A habitat restoration project was initiated in the fall of 2018 in the upper portion of the Otay River within the Preserve (City and FUDS). This area was cleared of exotic vegetation and the river bed was recontoured and replanted with native riparian and upland plant species. This restoration area will take several years to mature into native riparian habitat.

Methods

All surveys were led by USFWS section 10(a)(1)(A) permitted biologists, Kevin Clark (TE-117947), Kimberly Ferree (TE-122632) and Lea Squires (TE-117947). A summary of dates, personnel, time, and weather conditions for all survey and monitoring visits is provided in Appendix B.

Least Bell's Vireo Protocol Surveys

Least Bell's Vireo surveys were conducted at the Project Area between 10 April and 31 July 2020 following standard survey techniques recommended by the USFWS Least Bell's Vireo survey guidelines (USFWS 2001). Eight protocol presence/absence surveys were conducted at least 10 days apart (Appendix B).

Observers moved slowly thorough the riparian habitat, stopping frequently to search and listen for vireos. Surveys were conducted between dawn and early afternoon, and did not occur during periods of excessive heat, wind, rain, fog, or other inclement weather. Behavioral observations were used to assist with the determination of breeding status for each individual or pair observed. For each bird encountered, observers recorded age (adult or juvenile), sex, breeding status (paired, single, undetermined, or transient), and whether the bird was banded. Birds were considered transients if they were detected only once during the season. Vireo locations were recorded using a hand-held global positioning system (GPS) unit. In addition, the presence of brown-headed cowbirds within or adjacent to survey sites were noted. All avian species detected during the surveys were recorded. A complete list of avian species detected during surveys is in Appendix C.

Yellow-billed Cuckoo Protocol Surveys

As a result of the finding of a Yellow-billed Cuckoo in the Preserve in 2012 (Clark 2012) and in 2016 (ICF 2017), four cuckoo surveys were conducted in 2019 according to established protocol (Halterman *et al*. 2015) (Appendix B). Taped broadcast calls were played in all suitable habitat in order to solicit a response from any cuckoos present.

Least Bell's Vireo Nest Monitoring

Least Bell's Vireo nests were monitored for nest success and productivity throughout the breeding season from 13 April to 10 July (Appendix B). Vireo territories were visited on a weekly to bi-weekly basis to monitor for evidence of breeding activities. Locations of adults, fledglings, and nests were recorded using a GPS unit or the Collector for ArcGIS (Version 10.4) application on a smart phone (ESRI 2016). In addition, GPS point locations were collected during each visit to estimate territory use and size. Nests were visited every 7 to 10 days, and the contents were recorded, with nest checks as brief as possible. The presence or absence of Brown-headed Cowbird eggs was noted, and if present, cowbird eggs were removed. The presence of fledglings was determined through direct observation of fledglings in the territory. Characteristics of nests, including height, host plant species, and host plant height, were recorded after the young had fledged or the nest had failed.

If a bird was actively foraging, we observed the movements of the species and recorded a GPS point at the limits of its foraging activity. If the bird was not actively foraging, only the initial location was recorded. Observations of aggressive behavior between adjacent individuals was also noted to enable patterns of territory size to be elucidated more clearly. These points were plotted on a map to examine the area used by each individual bird (or pair of birds).

Numbers of vireo territories and nests are presented separately by survey site: City, FUDS, and ICF. Reproductive success and productivity measures are pooled across the three contiguous survey sites

Results

Least Bell's Vireo Protocol Surveys

In 2020, a total of 21 Least Bell's Vireo territories was identified during surveys and monitoring at the Project Area (Table 2**,**

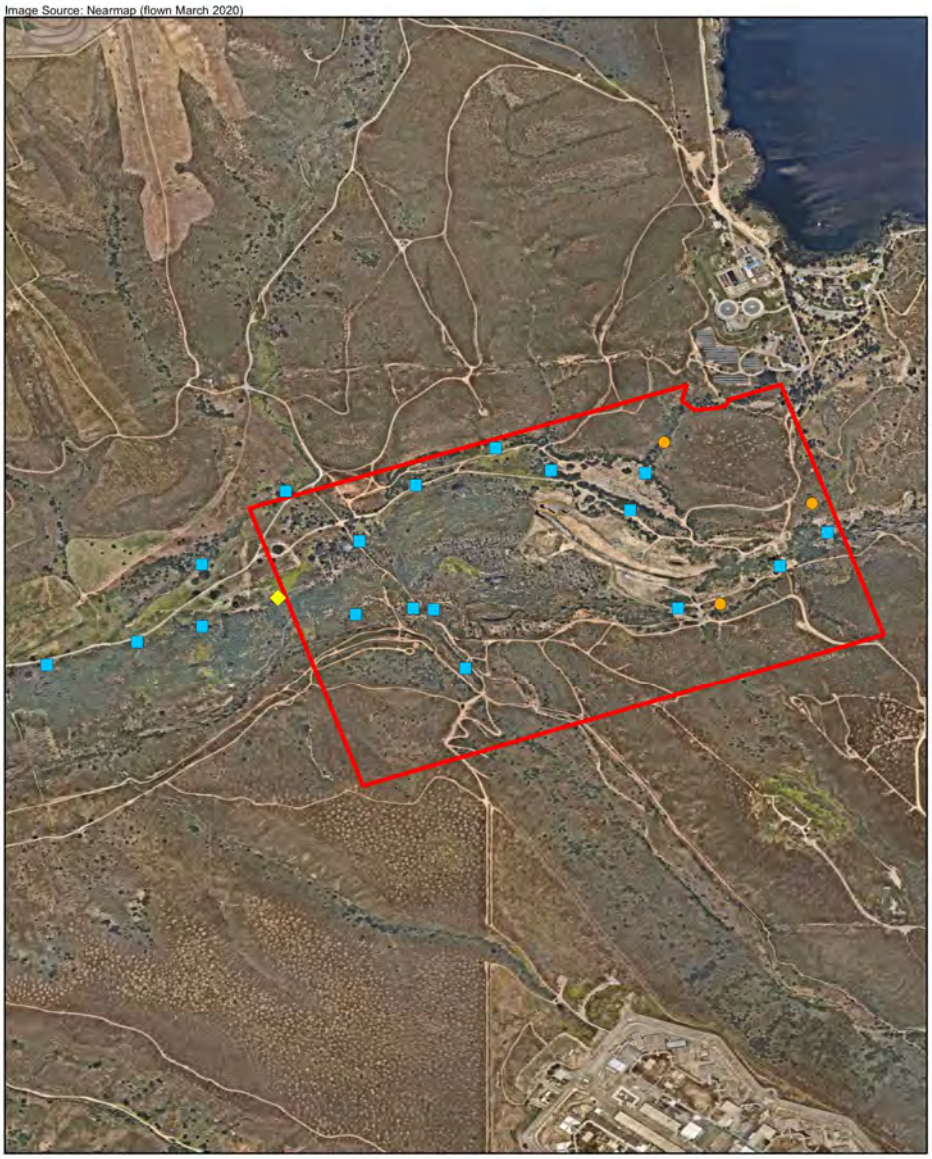


Figure 4). Of the 21 territorial males, 18 were confirmed as paired, and 3 were confirmed as single males. One transient was detected during surveys.

Least Bell's Vireos increased from 9 to 16 territories at the City and FUDS survey sites from 2019 to 2020 (Ferree and Clark 2019) (Figure 5). Least Bell's Vireos remained stable at four territories at the ICF survey site in 2019 and 2020. One vireo territory (SAL04) that overlaps the FUDS and Salt Creek survey site (but is counted as a Salt Creek territory) was monitored in 2020. Surveys were not conducted in Salt Creek; thus results from 2020 are not comparable to other survey years.

Table 2. Number and breeding status of Least Bell's Vireo territories at Otay Ranch Preserve, California, in 2020.

Survey Site	Pairs	Single Male	Total Territories
City	7	3	10
FUDS	6	–	6
ICF	4	–	4
Salt Creek[a]	1	–	1
Total	**18**	**3**	**21**

[a]Full surveys were not conducted in Salt Creek in 2020 and are not comparable to other survey years. One territory that overlaps FUDS and Salt Creek survey sites was monitored from this survey site.

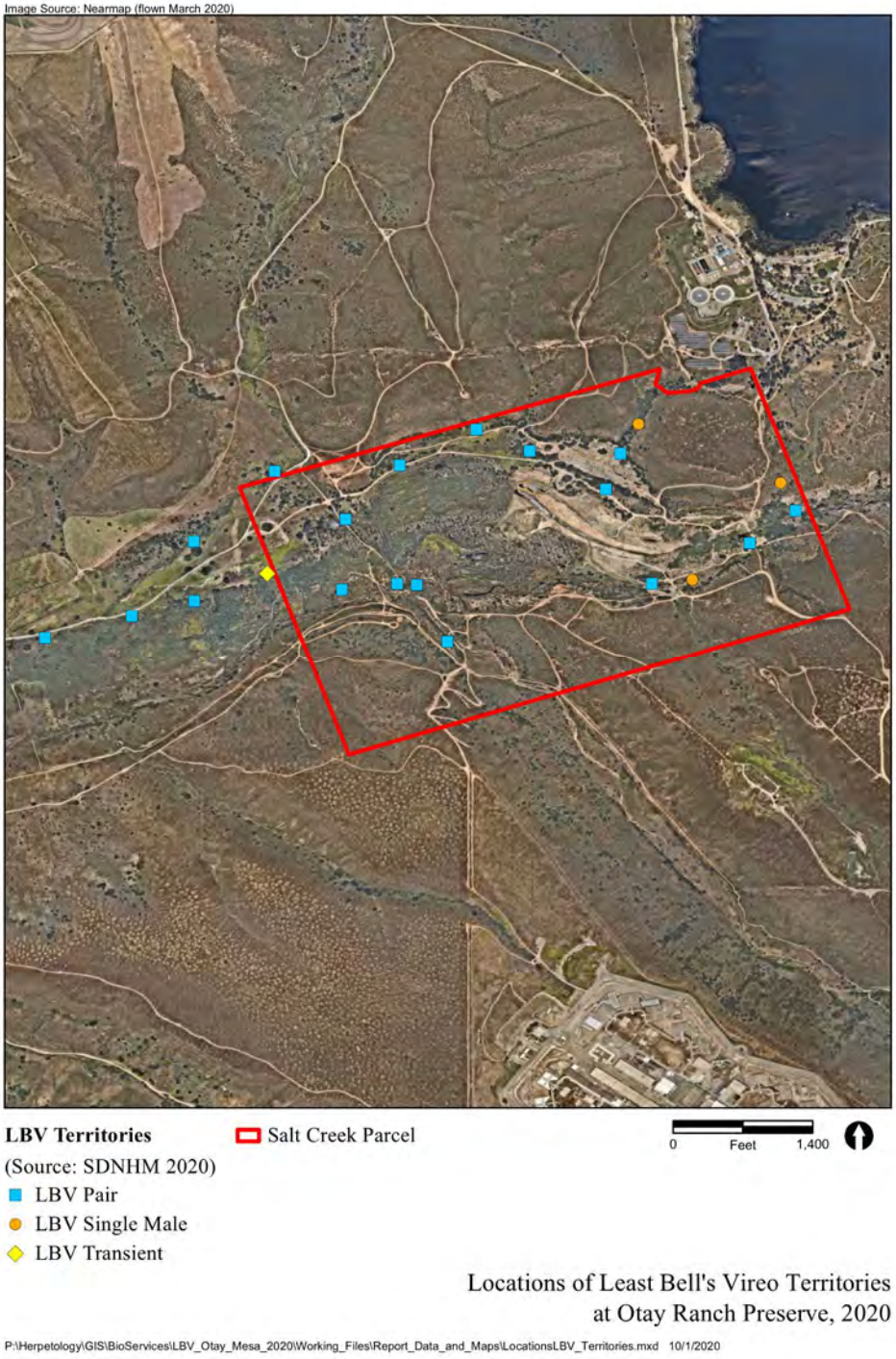


Figure 4. Locations of Least Bell's Vireo Territories at Otay Ranch Preserve, 2020

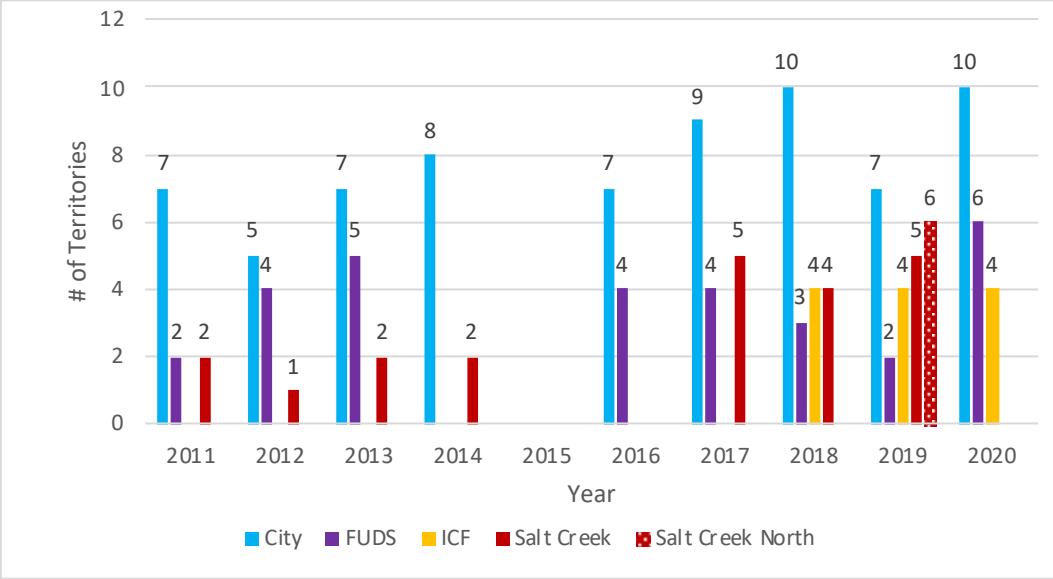


Figure 5. Number of territorial male Least Bell's Vireos by survey site at Otay Ranch Preserve, California, 2011-2019. Missing bar indicates no survey was conducted in that year (FUDS area incidentally monitored in 2011).

Yellow-billed Cuckoo Protocol Surveys

No Yellow-billed Cuckoos were detected during surveys in 2020. Yellow-billed Cuckoo observations from previous years comprised one individual in 2012 (Clark 2012), one individual in 2016 (ICF 2017) and one individual in 2019 (Ferree and Clark 2019) within Otay River.

Least Bell's Vireo Nest Monitoring

Nesting activity was monitored in 17 territories across the three survey sites (Table 3; Appendix D; Appendix E). Of these, 15 were considered "fully monitored," meaning that all nests within the territory were found and monitored during the breeding season. Pairs within the remaining two territories were documented nesting; however, these were "partially monitored," meaning only a subset of nests were monitored. Both partially monitored territories were detected with fledglings, but a nest was never found. Three territories occupied by a single male (one fully monitored and two partially monitored) were excluded from the nesting analysis. A total of 29 nests was monitored during the breeding season. One nest was not completed and subsequently excluded from calculations of nest success and productivity. Two territories were not monitored because they were observed using a large area outside of the Project Area.

Table 3. Number of Least Bell's Vireo territories and nests monitored by survey site at Otay Ranch Preserve, California, in 2020.

	City	FUDS	ICF	Salt Creek	Total
Fully monitored:					
Pair	6	5	3	1[a]	15
Single Male	1				1
Total number of completed nests	12	8	4	4	28
Completed nests/pair (SD)	1.9 ± 1.0				
Total number of nest attempts/pair (SD)	1.9 ± 1.0				
Partially monitored:					
Pair	1[b]	1[b]			2
Single Male	1				1
Total number of completed nests	--	--			0
Total # of nests monitored	**12**	**8**	**4**	**4**	**28**

[a]Territory of this pair overlaps with Salt Creek and FUDS survey sites.
[b]Detected with fledglings, but a nest was never found.
SD = standard deviation.

Nesting Attempts

The average number of nesting attempts over the course of the 2020 breeding season was 1.9 ± 1.0. Over one-half of all vireo pairs re-nested after their initial attempt (60%; 9/15). Three pairs initiated three nesting attempts and one pair initiated four nesting attempts. The majority of first nesting attempts occurred during the last two weeks of April (67%, 10/15). Least Bell's Vireos began building nests more than two weeks later in 2020 compared to 2019 (Figure 6). Patterns of nest initiation in 2020 were similar to 2018 when nest building peaked during the last two weeks of April.

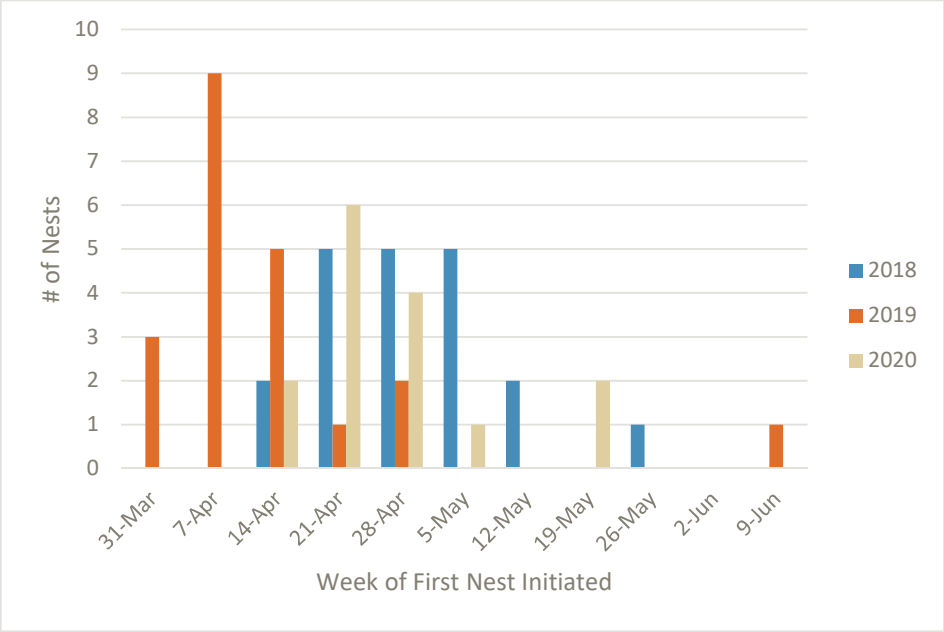


Figure 6. Number of first Least Bell's Vireo nests initiated by week at Otay Ranch Preserve, California, 2018-2020.

Nest Success

Overall, 32% (9/28) of completed nests were successful and fledged young at Otay River (City, FUDS, ICF) in 2020 (Table 4). Predation was believed to be the primary source of nest failure in 2020 (Table 4). Predation accounted for more than half of all nest failures (54%, 15/28). Nest failures were not limited to nest predation. Two nests failed directly as a result of parasitism. One nest was found with a single cowbird egg and the pair abandoned the nest before vireo eggs were laid. The second nest had an 8-day-old cowbird nestling that was being fed by the vireo pair. The cowbird nestling was removed and humanely euthanized. Two nests failed for unknown reasons. Both of these nests were discovered intact and empty and it is unknown whether vireo eggs were laid.

Table 4. Fate of Least Bell's Vireo nests by survey site at Otay Ranch Preserve, California, in 2020. Proportion of total completed nests shown in parentheses.

Nest Fate	City	FUDS	ICF	Salt Creek[a]	Total Number of Nests
Successful	3	2	3	1	9 (0.32)
Failed					
Predation	7	5	1	2	15 (0.54)
Parasitism	1	1			2 (0.07)
Unknown	1			1	2 (0.07)
Failed Total	9	6	1	3	19 (0.68)
Total completed nests	**12**	**8**	**4**	**4**	**28 (1.00)**

[a]Territory of this pair overlaps with FUDS and Salt Creek survey sites.

Brown-headed Cowbird Parasitism

In total, twelve nests were parasitized at the Project Area during the 2020 breeding season (Table 5; 43%, 12/28). Two nests failed directly as a result of cowbird parasitism. Of the remaining ten nests, five nests were parasitized and successful, and five nests were parasitized and subsequently depredated. We removed ten cowbird eggs from ten nests. Cowbird parasitism occurred between 17 May and 12 June. Parasitism was widespread across the Project Area (Appendix E, Figure 10). The highest concentration of cowbird parasitism occurred at the FUDS survey site where four pairs were parasitized (six nests total), of which two had two nests parasitized.

Table 5. Fate of Least Bell's Vireo parasitized nests by survey site at Otay Ranch Preserve, California, in 2020. Proportion of total completed nests shown in parentheses.

Parasitized Nests	City	FUDS	ICF	Salt Creek[a]	Total Number of Nests
Parasitized	1	1			2 (0.17)
Parasitized and depredated	1	4			5 (0.42)
Parasitized and successful		1	3	1	5 (0.42)
Total nests	**2**	**6**	**3**	**1**	**12 (1.00)**

Photo 1. Least Bell's Vireo nest with three vireo eggs and one Brown-headed Cowbird egg at Otay River (OTY19 nest 1). Photo taken on 17 May 2020 by Kimberly Ferree.

Reproductive Success and Productivity

Otay River (City, FUDS, ICF, and one pair from Salt Creek) vireos fledged 1.6 ± 1.5 young per pair (Table 6). Hatching success, fledgling success, and pair success were low; just 60% (9/15) of vireos in fully monitored territories were successful and produced at least one vireo fledgling by the end of the season. Average clutch size was lower in nests that were parasitized compared to nests that were not parasitized (2.9 versus 3.3). Both of the partially monitored pairs fledged young, although no nest was found for either of the pairs. Therefore, overall pair success at Otay River (City, FUDS, ICF) for both fully and partially monitored pairs was 65% (11/17). Unlike previous years, no pairs were observed to double brood in 2020.

Table 6. Reproductive success and productivity of Least Bell's Vireos at Otay Ranch Preserve, California, 2020. Standard deviations presented with means.

Parameter	Number
Completed nests per pair (SD)	2.0 ± 1.0
Average clutch size[a]	3.3 ± 0.5
Average clutch size, parasitized nests[b]	2.9 ± 0.6
Hatching success eggs[c]	43%
Hatching success nests[d]	74%
Fledgling success hatchlings[e]	63%
Fledgling success nests[f]	47%
Fledglings per nest[g]	0.8
Average number of young fledged per pair[h]	1.6 ± 1.5
Pairs fledging ≥ one young[h]	9 (60%)
Pairs fledging two broods[h]	0

[a] Based on 12 unparasitized nests with a full clutch.

[b] Based on 10 parasitized nests.

[c] Percent of all eggs that hatched (30/70).

[d] Percent of all nests with eggs in which at least one egg hatched (17/23).

[e] Percent of all nestlings that fledged (19/30).

[f] Percent of all nests with nestlings in which at least one young fledged (8/17).

[g] Number of fledglings per nest (19/23).

[h] Based on 15 pairs whose territories were fully monitored.

Host Plant Species

Least Bell's Vireos used seven different host plant species at Otay River in 2020 (Table 7, Photos 2-5). Half of all nests were placed in laurel sumac (13/26). Mule fat and elderberry were the next most commonly used substrates representing 31%. Tamarisk, fennel, tecate cypress, and toyon were used once or twice.

Photos 2-5. Least Bell's Vireo nests placed in laurel sumac (*Malosma laurina*, top left), Mexican elderberry (*Sambucus nigra* subsp. *Caerulea*, top right), Tecate cypress (*Hesperocyparis forbesii*, bottom left), and Mule fat (*Baccharis salicifolia*, bottom right) at Otay River. Photos taken in May-July 2020 by Kimberly Ferree.

Table 7. Host plant species used by Least Bell's Vireos, by survey site, Otay Ranch Preserve, California, 2020. Proportion of total nests shown in parentheses.

Host Species	City	FUDS	ICF	Salt Creek	Total
Laurel sumac (*Malosma laurina*)	10	2		1	13 (0.50)
Mule fat (*Baccharis salicifolia*)		2	2	1	5 (0.19)
Mexican elderberry (*Sambucus nigra* subsp. *caerulea*)			1	2	3 (0.12)
Tamarisk (*Tamarix sp.*)		2			2 (0.08)
Fennel (*Foeniculum vulgare*)		1			1 (0.04)
Tecate Cypress (*Hesperocyparis forbesii*)		1			1 (0.04)
Toyon (*Heteromeles arbutifolia*)			1		1 (0.04)
Total	10	8	4	4	26 (1.00)

Avian Species Detected

We detected 91 bird species during Least Bell's Vireo and Yellow-billed Cuckoo surveys and monitoring (Appendix C) from 13 April to 6 August 2020 within or in close proximity to the Project Area. Notable breeding species from the California Bird Species of Special Concern (Shuford and Gardali 2008) include Northern Harrier (*Circus hudsonius*), Cactus Wren (*Campylorhynchus brunneicapillus*), Yellow Warbler (*Setophaga petechia*), Yellow-breasted Chat (*Icteria virens*), and the federally listed California Gnatcatcher (*Polioptila californica*).

Discussion

Least Bell's Vireo territories increased from 9 to 16 territories (78% increase) at the City and FUDS survey sites from 2019 to 2020. Both sites have been surveyed 8 of the last 10 years and vireo numbers have fluctuated from a low of 9 territories in 2011 and 2012 to the current high of 16 territories (Figure 5; Clark 2012; Clark 2013; Clark 2014b; ICF 2017; Ferree and Clark 2017, 2018, 2019). The ICF survey site which has been surveyed the past 3 years has remained stable at 4 territories.

Least Bell's Vireos occupied the same territories from 2019 to 2020 except for one territory that was located on the north edge of the restoration area (between OTY12 and OTY05, Figure 9). For the additional 2020 territories, vireos used areas that are not consistently occupied including sections of the FUDS survey site and two small side canyons (OTY16, OTY17, OTY20, OTY21, OTY22, OTY23, Figures 8-9). They also squeezed in between other vireos in the laurel sumac/peppertree stands along the north side of the channel (OTY10, OTY18, Figures 8-9). Interestingly, the side canyon territories were held by single males. In years with high vireo numbers, it is not uncommon to have unpaired males, particularly first-year males using areas that are not typically occupied. In a banded population of Least Bell's Vireo on the San Luis Rey River, first-year single males and first-year pairs were more likely to hold territories in areas less favorable as indicated by lower vegetation cover, lower occupancy rates, and smaller territory sizes compared to older, more experienced birds (Ferree et al. 2010). The population of Least Bell's Vireos increased by 26-58% across San Diego County including the populations at Camp Pendleton

Marine Corps Base (39% Suellen Lynn, personal comm.), Marine Corps Air Station Camp Pendleton (58% increase, Ferree and Clark 2020), and the San Luis Rey River (26% Alexandra Houston, personal comm.) likely in response to the high productivity observed regionwide in 2019 (Lynn et al. 2019, Houston et al. 2019, Ferree and Clark 2019).

Vireo productivity at Otay River (City, FUDS, ICF survey sites) declined dramatically from 2019 to 2020. Vireos fledged just 0.8 fledglings per pair in 2020 compared to 4.1 fledglings per pair in 2019. Productivity has not been this low since the extreme drought year of 2014 when vireos also fledged 0.8 young per pair. Vireo productivity has fluctuated widely at Otay River since nest monitoring was initiated in 2011. Between 2.0 and 2.7 fledglings per pair were produced from 2011 to 2013, many from nests rescued from parasitism, but this productivity dropped to 0.8 fledglings per pair in 2014. From 2017 to 2018, vireo productivity declined steeply from a high of 4.2 fledglings per pair to 1.2 fledglings, but then rebounded in 2019. Several factors likely contributed to low productivity in 2020 including delayed nest initiation (almost two weeks later than in 2019), low rates of re-nesting (three pairs did not renest after their first nest failed), no double-brooding, and high nest parasitism. While the number of nests completed per pair was similar between 2019 and 2020 (2.0 nests/pair), other reproductive measures such as clutch size and hatching success (43% versus 67%) were lower in 2020 compared to 2019. Notably, clutch size in parasitized nests was reduced to 2.9 eggs per pair compared to unparasitized nests that averaged 3.3 eggs per pair in 2020. Like the Otay River vireos, productivity declined from 2019 to 2020 for the Camp Pendleton and San Luis Rey River vireo populations, but not as steeply, likely because parasitism is mostly absent at these sites. Vireos produced 3.1 and 2.1 fledglings per pair at Camp Pendleton and the San Luis Rey River, respectively (Suellen Lynn and Alexandra Houston, personal comm.).

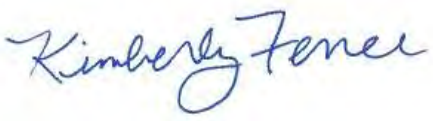
Cowbird parasitism was recorded in 12 nests, totaling 43% of all nests monitored. Cowbird trapping did not occur in 2020 and this rate is comparable to initial monitoring in 2011 which revealed a 45% nest parasitism rate (no trapping). After the initiation of a trapping program in 2012, the parasitism rate dropped to 36% in 2012 and then to zero in 2013-2014 (Clark 2011, 2012, 2013, 2014a, Sexton 2012). Cowbird trapping was resumed after three years of no trapping in 2018-2019 with rates of 7-8% (Clark 2018, 2019). The spatial distribution of vireo territories might help explain the high parasitism rate in 2020. Territories located in and near the FUDS survey site, particularly in the channel, typically experience high levels of parasitism likely as a result of the high number of tall trees and snags with perch sites that cowbirds use for nest searching. The number of vireo territories in the FUDS survey site went up from 2-3 territories in 2018-2019 to 6 territories in 2020. All but one parasitized nest was located in the FUDS and adjacent ICF survey sites (Figure 10).

Certification Statement

I certify that the information in this survey report fully and accurately represents my work.

October 9, 2020

Kevin Clark (TE-117947)



October 9, 2020

Kimberly Ferree (TE-122632)

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Appendix A. Photos of Least Bell's Vireo Habitat

Photo 6. Least Bell's Vireo territory located in riparian woodland with arroyo willow (*Salix lasiolepis*), black willow (*Salix gooddingii*), and mule fat (*Baccharis salicifolia*) at eastern end of Otay River (OTY03). Photo taken 24 May 2020 by Kimberly Ferree.

Photo 7. Least Bell's Vireo territory dominated by arroyo willow (*Salix lasiolepis*) and black willow (*Salix gooddingii*), at upper Otay River (OTY05). Photo taken 8 May 2020 by Kimberly Ferree.

Photo 8. Least Bell's Vireo nest patch dominated by tamarisk (*Tamarix* sp.), located in the channel of the Otay River (OTY17 Nest 1, ICF survey site). Photo taken 30 July 2019 by Kimberly Ferree.

Photo 9. Least Bell's Vireo pairs nested and foraged in laurel sumac (*Malosma laurina*) located on the upland benches of the Otay River (OTY18, City survey site). Photo taken 21 July 2020 by Kimberly Ferree.

Appendix B. Survey Summary

Least Bell's Vireo (LBVI) Monitoring and Yellow-billed Cuckoo (YBCU) Survey Schedule, Otay Ranch Preserve, 2020.

Date	Personnel[a]	Time	Weather	Task
April 13	LS	0700 - 1230	start: 100% cloud cover, 1-3 mph WSW, 56°F; end: 100% cloud cover; light to heavy mist all morning, some rain in morning	LBVI survey #1 and monitoring
April 16	KC	0700 - 1330	start: 5% cloud cover, calm, 65°F; end: 65% cloud cover, light breeze, 80°	LBVI survey #1 and monitoring
April 20	LS	0615 – 1215	start: 100% cloud cover, calm, 59°F; end: 80% cloud cover, light breeze, 66°	LBVI monitoring
April 26	KF	0630 - 1330	start: clear, calm, 55°F; end: 75% cloud cover, wind 2-5 mph, 75°	LBVI survey #2 monitoring
April 27	LS	0630 – 1230	start: 100% cloud cover, calm, 60°F; end: 60% cloud cover, calm, 67°	LBVI survey #2 monitoring
April 29	KC	0645 - 1330	start: 100% cloud cover, calm, 50°F; end: 100% cloud cover, calm, 70°	LBVI monitoring
May 4	LS	0630 - 1230	start: clear, calm, 60°F; end: clear, calm, 70°	LBVI monitoring
May 8	KF	0730 - 1200	start weather: clear, light breeze, 70°F; end: clear, breeze 4-12 mph, 72°	LBVI survey #3 and monitoring
May 11	LS	0615 – 1300	start weather: 25% cloud cover, calm, 57°F; end: clear, light breeze, 67°	LBVI survey #3 and monitoring
May 17	KF	0600 – 1300	start weather: 100% cloud cover, 60°F; end: 100%, breeze 5 mph, 68°	LBVI monitoring
May 18	LS	0605 – 1300	start weather: 90% cloud cover, calm, 61°F; end: clear, breeze 5 mph, 72°	LBVI monitoring
May 24	KF	0600 - 1215	start weather: 100% cloud cover, 60°F; end: 100%, breeze 5 mph, 68°	LBVI monitoring
May 25	LS	0600 – 1230	start weather: 100% cloud cover, calm, 62°F	LBVI survey #4 and LBVI monitoring
May 29	KF	0615 - 1215	start weather: 100% cloud cover, calm, 60°F; end: 95% cloud cover, breeze 1-3 mph, 68°	LBVI survey #4 and LBVI monitoring
June 1	LS	0600 - 1215	start: 100% cloud cover, calm, 61°F; end: clear, w 1-3 mph breeze, 74°	LBVI monitoring
June 8	KF	0715 - 1230	start: 100% cloud cover, calm, 60°F; end: clear, breeze 5 mph, 71°	LBVI monitoring

June 12	LS	0600 - 1230	start weather: clear, calm, 60°F; end: 20% cloud cover, 4-12 mph breeze, 70°	LBVI survey #5 and LBVI monitoring
June 19	LS	0600 - 1230	start weather: 100% cloud cover, calm, 50°F; end: 100%, breeze 4-12 mph, 55°, showers on and off	LBVI monitoring
June 20	KF	0630 - 1230	start: 100% cloud cover, calm, 55°F; end: clear, breeze 0-1 mph, 55°, rainy as leaving site	LBVI survey #6 and LBVI monitoring
June 26	LS	0600 - 1250	start: 100% cloud cover, calm, 50°F; end: 75% cloud cover, breeze 2-5 mph, 68°	LBVI monitoring
June 28	KF	0615 – 1130	start: 100% cloud cover, calm, 65°F; end: clear, breeze 5 mph, 70°	LBVI monitoring
July 1	KF	0620 - 1130	start: 100% cloud cover, breeze 0-1 mph, 64°F; end: clear, breeze 1-5 mph, 72°	YBCU survey #1 and LBVI survey #7 and monitoring
July 3	LS	6:00 - 1200	start: clear, calm, 54; end: clear, light breeze, 76	LBVI monitoring
July 8	KF	0630 - 1230	start weather: 100% cloud cover, light breeze, 64°F; end: clear, breeze 2-5 mph, 72°	LBVI monitoring
July 10	LS	0600 - 1215	start: clear, calm, 65°F; end: clear, calm, 77°	LBVI monitoring
July 16	KF	0630 - 1245	start: 100% cloud cover, calm, 64°F; end: clear, breeze 1-5 mph, 80°	YBCU survey #2 and monitoring
July 28	KF	0600 - 1000	start: 100% cloud, breeze 0-1 mph, 64°F; end: clear, breeze 1-2 mph, 70°	YBCU survey #3
August 6	KF	0625 - 1030	start: 100% cloud cover, calm, 65°F; end: clear, breeze 5-10 mph, 80°	YBCU survey #4

[a]Personnel: LS=Lea Squires (SDNHM), KC=Kevin Clark (SDNHM), KF=Kimberly Ferree (SDNHM)

Appendix C. Avian Species

Avian species detected during Otay Ranch Preserve Least Bell's Vireo and Yellow-billed Cuckoo surveys, 13 April – 6 August 2020.

Common Name	Scientific Name
Mallard	*Anas platyrhynchos*
California Quail	*Callipepla californica*
Common Ground Dove	*Columbina passerina*
Mourning Dove	*Zenaida macroura*
Greater Roadrunner	*Geococcyx californianus*
Lesser Nighthawk	*Chordeiles acutipennis*
White-throated Swift	*Aeronautes saxatalis*
Black-chinned Hummingbird	*Archilochus alexandri*
Anna's Hummingbird	*Archilochus anna*
Costa's Hummingbird	*Archilochus costae*
Rufous Hummingbird	*Selasphorus rufus*
Allen's Humingbird	*Selasphorus sasin*
Selasphorus spp.	*Selasophorus spp.*
Virginia Rail	*Rallus limicola*
American Coot	*Fulica americana*
Killdeer	*Charadrius vociferus*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Snowy Egret	*Egretta thula*
Green Heron	*Butorides striatus*
Black-crowned Night-Heron	*Nycticorax nycticorax*
Turkey Vulture	*Cathartes aura*
White-tailed Kite	*Elanus leucurus*
Northern Harrier	*Circus hudsonius*
Cooper's Hawk	*Accipiter cooperii*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk	*Buteo jamaicensis*
Barn Owl	*Tyto alba*
Great Horned Owl	*Bubo virginianus*
Nuttall's Woodpecker	*Picoides nuttallii*
Northern Flicker	*Colaptes auratus*
American Kestrel	*Falco sparverius*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Cassin's Kingbird	*Tyrannus vociferans*
Western Kingbird	*Tyrannus verticalis*
Hammond's Flycatcher	*Empidonax hammondii*
Pacific-slope Flycatcher	*Empidonax difficilis*
Cordilleran Flycatcher	*Empidonax occidentalis*
Black Phoebe	*Sayornis nigricans*

Avian species detected during Otay Ranch Preserve Least Bell's Vireo and Yellow-billed Cuckoo surveys, 13 April – 6 August 2020.	
Common Name	**Scientific Name**
Say's Phoebe	*Sayornis saya*
Bell's Vireo	*Vireo bellii*
Hutton's Vireo	*Vireo huttoni*
Warbling Vireo	*Vireo gilvus*
California Scrub-Jay	*Aphelocoma californica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Horned Lark	*Eremophila alpestris*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Cliff Swallow	*Petrochelidon pyrrhonota*
Bushtit	*Aegithalos minimus*
Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
House Wren	*Troglodytes aedon*
Marsh Wren	*Cistothorus palustris*
Bewick's Wren	*Troglodytes bewickii*
Cactus Wren	*Campylorhynchus brunneicapillus*
Blue-gray Gnatcatcher	*Polioptila caerulea*
California Gnatcatcher	*Polioptila californica*
Wrentit	*Chamaea fasciata*
Hermit Thrush	*Catharus guttatus*
California Thrasher	*Toxostoma redivivum*
Northern Mockingbird	*Mimus polyglottos*
European Starling	*Sturnus vulgaris*
Phainopepla	*Phainopepla nitens*
House Finch	*Haemorhous mexicanus*
Lesser Goldfinch	*Spinus psaltria*
Lawrence's Goldfinch	*Spinus lawrencei*
American Goldfinch	*Spinus tristis*
Grasshopper Sparrow	*Ammodramus savannarum*
White-crowned Sparrow	*Zonotrichia leucophrys*
Song Sparrow	*Melospiza melodia*
California Towhee	*Melozone crissalis*
Rufous-crowned Sparrow	*Aimophila ruficeps*
Spotted Towhee	*Pipilo maculatus*
Yellow-breasted Chat	*Icteria virens*
Hooded Oriole	*Icterus cucullatus*
Bullock's Oriole	*Icterus bullockii*
Red-winged Blackbird	*Agelaius phoeniceus*
Brown-headed Cowbird	*Molothrus ater*
Brewer's Blackbird	*Euphagus cyanocephalus*

Avian species detected during Otay Ranch Preserve Least Bell's Vireo and Yellow-billed Cuckoo surveys, 13 April – 6 August 2020.	
Common Name	**Scientific Name**
Orange-crowned Warbler	*Oreothlypis celata*
Nashville Warbler	*Leiothlypis ruficapilla*
Common Yellowthroat	*Geothlypis trichas*
Yellow Warbler	*Setophaga petechia*
Yellow-rumped Warbler	*Setophaga coronata*
Black-throated Gray Warbler	*Paruline grise*
Townsend's Warbler	*Setophaga townsendi*
Wilson's Warbler	*Cardellina pusilla*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Passerina caerulea*
Lazuli Bunting	*Passerina amoena*

Appendix D. Nesting Activities of Least Bell's Vireos

Nesting Activities of Least Bell's Vireo at Otay Ranch Preserve, California, 2020.

Survey Site[a]	Monitoring Type[b]	Pair	Nest Label	Nest #	# Fledged	Nest Outcome[c]	Comments
City	fully	OTY02	--	--	3	SUC	Observed with fledglings on 10 July.
City	fully	OTY02	OTY02N1	1	--	PRE	Nest depredated, unknown whether eggs were laid.
City	fully	OTY02	OTY02N2	2		PRE	Nest depredated, large hole on side, contents empty. Some eggshell fragments below nest, otherwise intact.
City	fully	OTY03	OTY03N1	1	3	SUC	Observed with fledglings on 24 May.
City	fully	OTY03	OTY03N2	2		PAR	Removed 1 7-8 day old BHCO nestling from nest. Nest failed as a result of parasitism
City	fully	OTY06	OTY06N1	1	4	SUC	Fledged on 27 May.
City	fully	OTY10	OTY10N1	1		PRE	Nest depredated, nest empty, intact.
City	fully	OTY10	OTY10N2	2		PRE	Nest depredated, nest empty, intact. Removed one cowbird egg.
City	fully	OTY10	OTY10N3	3		PRE	Nest depredated, nest pulled down on one side, lining pulled up.
City	fully	OTY12	OTY12N1	1		PRE	Nest depredated, empty, intact. Skeleton covered in ants below nest, approximately 4-5 days old.
City	fully	OTY12	OTY12N2	2		UNK	Nest found, intact. Built before nest 3, unknown cause of failure.
City	fully	OTY12	OTY12N3	3	3	SUC	Fledged on 26 May.
City	fully	OTY18	OTY18N1	1		PRE	Nest depredated, 1 egg in nest, 1 egg below nest with holes at either end.
City	fully	OTY18	OTY18N2	2		INC	Male observed building beginning of nest, 1% complete. Bachelor nest. Female from

Nesting Activities of Least Bell's Vireo at Otay Ranch Preserve, California, 2020.							
Survey Site[a]	**Monitoring Type[b]**	**Pair**	**Nest Label**	**Nest #**	**# Fledged**	**Nest Outcome[c]**	**Comments**
							earlier in season was not detected during this time.
City	partially	OTY04	--	--	3	SUC	Observed with fledglings on 8 June.
FUDS	fully	OTY14	OTY14N1	1		SUC	1 nestling fledged on 29 May.
FUDS	fully	OTY17	OTY17N1	1		PRE	Nest depredated, empty, intact. Removed one cowbird egg.
FUDS	fully	OTY17	OTY17N2	2		PRE	Nest depredated, empty, intact. Removed one cowbird egg.
FUDS	fully	OTY17	OTY17N3	3		PRE	Nest depredated, empty, intact.
FUDS	fully	OTY19	OTY19N1	1		PRE	Nest depredated, lining messing, no fledglings detected. Removed one cowbird egg.
FUDS	fully	OTY20	OTY20N1	1		PRE	Nest appears depredated, pulled down slightly from where anchored to branch. Removed one cowbird egg.
FUDS	fully	OTY22	--	--	3	SUC	Pair observed with fledglings in juniper stand on 8 July.
FUDS	fully	OTY22	OTY22N1	1		PAR	Nest abandoned with 1 BHCO egg.
FUDS	partially	OTY23	--	--	2	SUC	Pair observed with 2 fledglings between OTY20 and OTY19 on 8 June.
FUDS	partially	OTY20	OTY20N2	2	3	SUC	Fledged on 9 July. Removed one cowbird egg
ICF	fully	ICF20	ICF20N1	1	2	SUC	Fledged on 30 May. Removed one cowbird egg.
ICF	fully	ICF22	ICF22N1	1		SUC	Fledged on 30 May. Removed one cowbird egg.
ICF	fully	ICF23	ICF23N1	1		PRE	Nest depredated, nest empty, intact. Two egg shell fragments below nest.

Nesting Activities of Least Bell's Vireo at Otay Ranch Preserve, California, 2020.							
Survey Site[a]	**Monitoring Type[b]**	**Pair**	**Nest Label**	**Nest #**	**# Fledged**	**Nest Outcome[c]**	**Comments**
ICF	fully	ICF23	ICF23N2	2	3	SUC	Fledged on 16 June. Removed one cowbird egg.
Salt Creek	fully	SAL04	SALO4N1	1		PRE	Nest depredated, nest empty, at least one cracked egg below nest.
Salt Creek	fully	SAL04	SALO4N2	2		UNK	Nest failed. Unknown if there were eggs or abandoned before eggs were laid.
Salt Creek	fully	SAL04	SALO4N3	3		PRE	Nest failed as a result of predation. Nest lining pulled up slightly, otherwise intact.
Salt Creek	fully	SAL04	SALO4N4	4	1	SUC	One nestling fledged on 8 July. Removed one cowbird egg.

[a]FUDS = FUDS portion of the southern Salt Creek Parcel, City = area within the southern Salt Creek Parcel that does not contain FUDS, ICF = section west of southern Salt Creek Parcel along Otay River, Salt Creek = area in northern Salt Creek Parcel (southern section), Northern Salt Creek = area in northern Salt Creek Parcel (northern section). See Figure 3.

[b] fully = territory was fully monitored, all nests were located and monitored throughout the breeding season.
partially = territory was monitored weekly, but not nests were located;

[c]Nest fate: INC = nest partially built, but never completed, PAR = nest failed directly as a result of Brown-headed Cowbird parasitism; PRE = nest failure caused by predation event; SUC = fledged at least 1 Least Bell's Vireo young, UNK = unknown cause of nest failure.

Appendix E. Figures 7-10: Least Bell's Vireo Territories and Nests

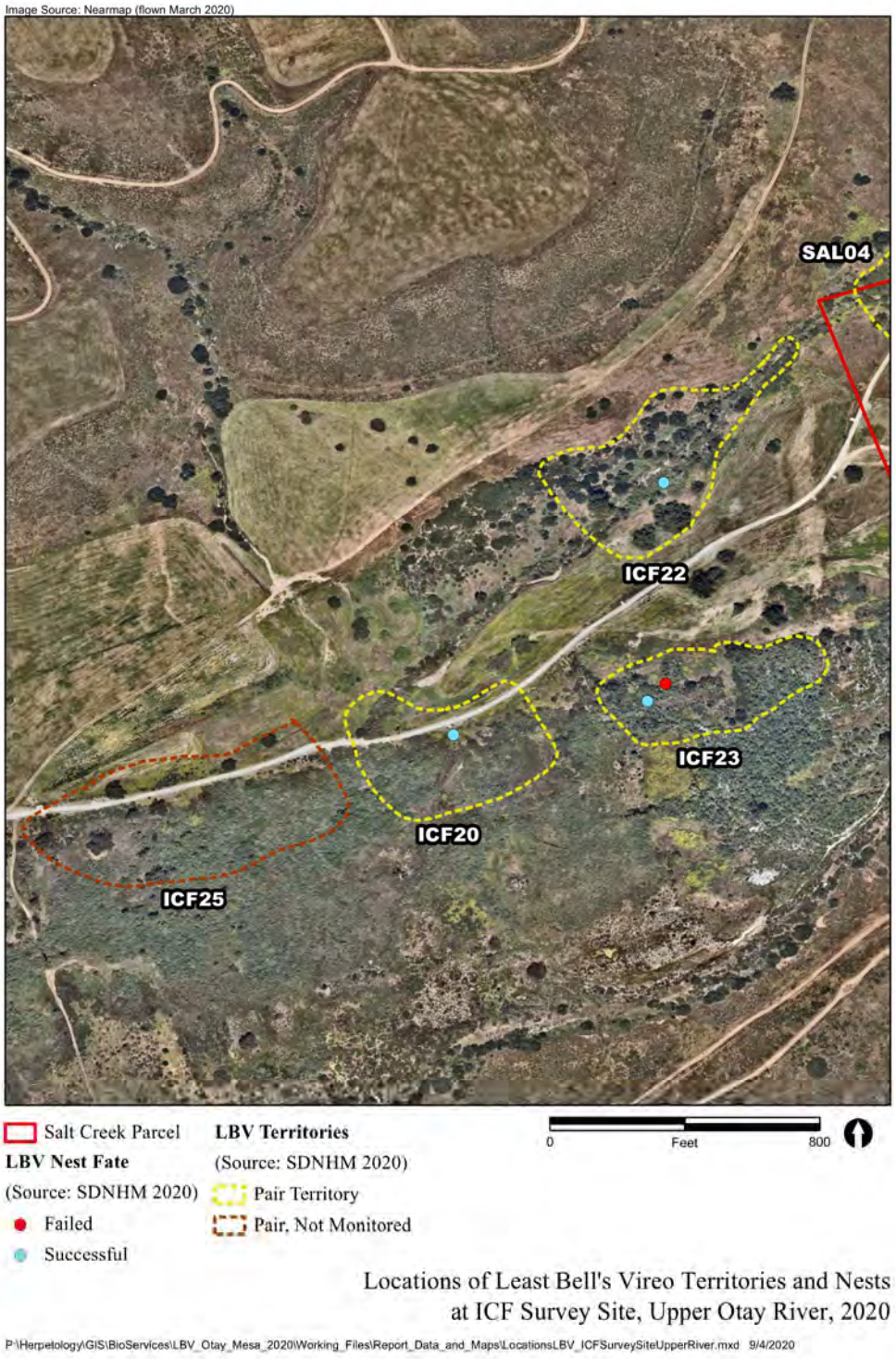

Figure 7. Locations of Least Bell's Vireo Territories and Nests at ICF Survey Site, Upper Otay River, 2020

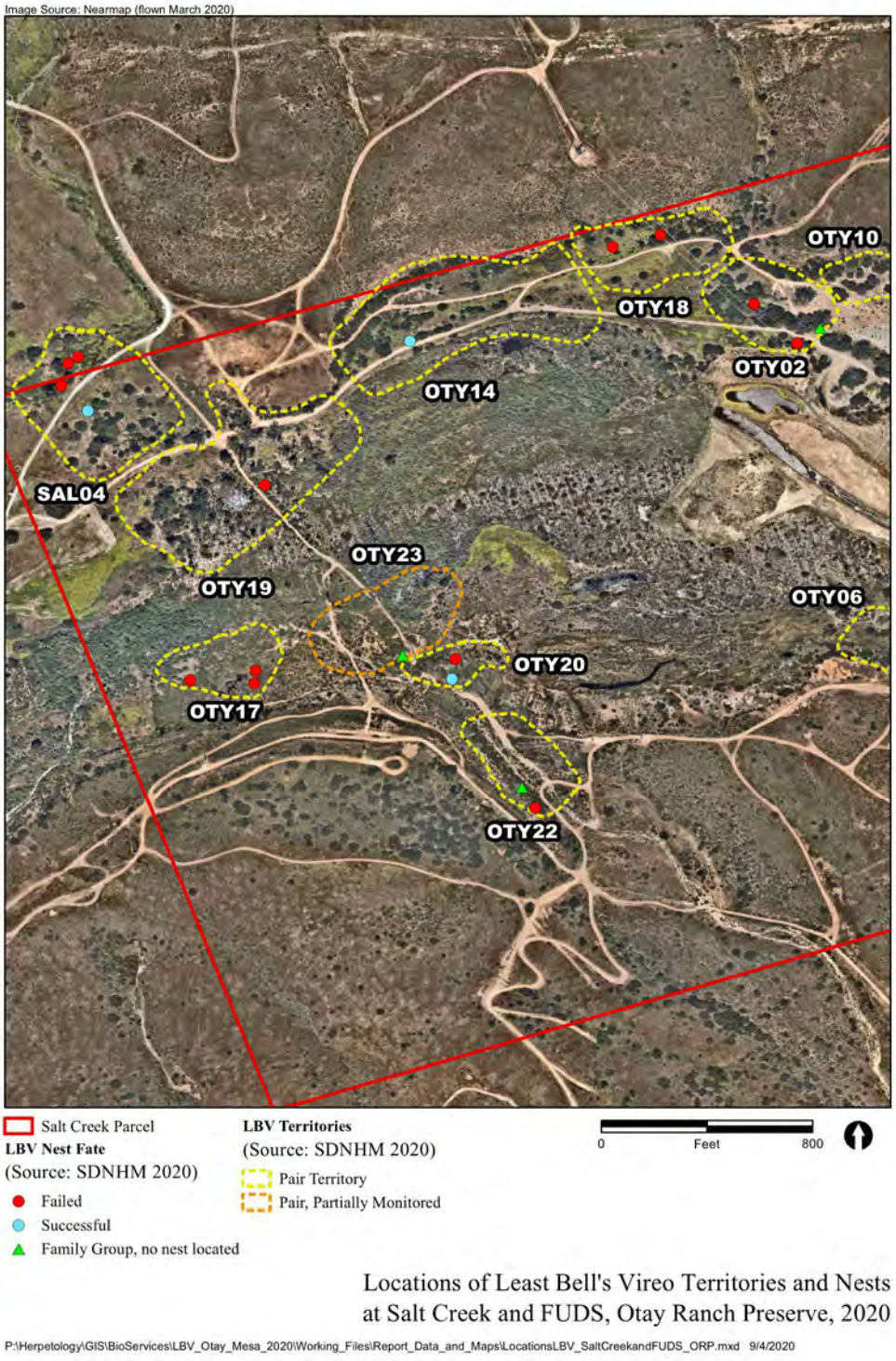

Figure 8. Locations of Least Bell's Vireo Territories and Nests at Salt Creek and FUDS, Otay Ranch Preserve, 2020

Figure 9. Locations of Least Bell's Vireo Territories and Nests at City Survey Site, Otay Ranch Preserve, 2020

Figure 10. Locations of Least Bell's Vireo Territories and Parasitized Nests at Salt Creek and Northern Salt Creek Survey Sites, 2020

Appendix H

2018 California Gnatcatcher Survey Report for Expansion

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August 10, 2018

Stacey Love
Recovery Permit Coordinator
Carlsbad Fish and Wildlife Office
U.S. Fish and Wildlife Service
2177 Salk Avenue, Suite 250
Carlsbad, CA 92008

Subject: 45-Day Report – Coastal California Gnatcatcher Presence/Absence Survey Results for the Otay Mitigation Bank Expansion (Phase 2) Project, San Diego County, CA

Dear Ms. Love:

This report documents the results of protocol coastal California gnatcatcher (*Polioptila californica californica*) (CAGN) presence/absence surveys conducted by ICF in 2018 for the Otay Mitigation Bank Expansion (Phase 2) Project (Project) located in the City of Chula Vista, San Diego County, California.

Location

The Project site is located in the southeast corner of the City of Chula Vista in the south end of San Diego County, California (Figure 1). The Project site is located within the Otay Mesa River Valley approximately 2 miles downstream from Lower Otay Lake dam and approximately 1 mile upstream from the SR-125 South Bay Expressway overcrossing. The Project site is found within Township 18 South, Range 1 West of the Otay Mesa, California, U.S. Geological Survey 7.5-minute quadrangle map (USGS 1975) (Figure 2). The elevation ranges from approximately 230 feet above mean sea level (msl) within the floodplain to approximately 300 feet above msl along the southern end of the Project site.

Project Description

The Project site is part of a larger mitigation bank and habitat restoration project. Specifically, the Project site is designated as Phase 2 of a proposed plan to expand habitat restoration activities on-going upstream. In addition, the Project site is located within the City of Chula Vista's planned trail enhancement project. The proposed Project will include habitat restoration and enhancement activities that may include grading, temporary irrigation, and native vegetation planting.

Survey Area

The survey area for CAGN includes the approximate 61-acre Project footprint plus a 300-ft buffer (Figure 3). The total acreage associated with the survey area is approximately 120 acres; however, potentially suitable habitat for CAGN is mostly found along the southern half of the survey area. A relatively flat, densely vegetated floodplain associated with the Otay River intersects the center of the survey area and raised terraces are located to the north and south. The center of the survey area, within the Otay River floodplain, supports a mix of vegetation communities including Southern Willow Scrub, Southern

Cottonwood Willow Riparian Forest, Tamarix Scrub, Freshwater Marsh, and Diegan Coastal Sage Scrub. The north terrace is dominated by Non-native Grassland, but also includes Eucalyptus Woodland and a narrow channel supporting Southern Willow Scrub. The southern terrace is dominated by Diegan Coastal Sage Scrub, Disturbed Diegan Coastal Sage Scrub, and Non-native Grassland.

The potentially suitable habitat for CAGN within the survey area included Diegan Coastal Sage Scrub and Disturbed Coastal Sage Scrub vegetation communities supporting the following vegetation species: California sagebrush (*Artemesia californica*), California buckwheat (*Eriogonum fasciculatum*), black sage (*Salvia mellifera*), coyote brush (*Baccharis pilularis*), lemonade berry (*Rhus integrifolia*), California encelia (*Encelia californica*), mule fat (*Baccharis salicifolia*), deerweed (*Acmispon glaber*), white sage (*Salvia apiana*), and laurel sumac (*Malosma laurina*).

Representative photographs of the survey area are provided in Appendix A.

Species Background

California Gnatcatcher

The CAGN is a small resident insectivorous bird whose occurrence is strongly associated with sage scrub habitat found throughout southern California into northern Baja California, Mexico. The USFWS listed this species as threatened in 1993. It is also considered a California Department of Fish and Game Species of Special Concern.

Historically, CAGN's range extended from southern Ventura County southward through Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties, and into Baja California, Mexico, to approximately 30 degrees north latitude near El Rosario (Atwood 1990). Although CAGN have a close association with sage scrub, this species has also been documented using coastal sage-chaparral scrub, chamise chaparral, and other habitat types (Campbell et al. 1998; Bontrager 1991). Habitat destruction, fragmentation, and modification have led to this species' decline (USFWS 1993). Loss of habitat to agriculture and urban development were leading challenges to conserving the species until the interval between 2003 and 2007 when widespread fires consumed one-third of the habitat in the U.S range of the species that the USFWS believed to be suitable for the coastal CAGN (USFWS 2010).

Territory size varies and is influenced by season and locale (Preston et al. 1998). During the breeding season, territories in coastal areas range from approximately 2.5 to 5.7 acres (Atwood et al. 1998). Territories in more inland regions are slightly larger with areas averaging approximately 8.4 acres (Braden et al. 1997). During the nonbreeding season, wandering into adjacent territories or unoccupied habitat may result in up to 80% increase in home range size relative to area used during nesting (Bontrager 1991, Preston et al. 1998).

The breeding season of CAGN extends from mid-February through mid-August, although earlier starts and later seasons have been observed (USFWS 1993). During the breeding season, the male CAGN select a nest site and for approximately 4 to 10 days both sexes build a cup-shaped nest located approximately 1 meter (3 feet) off the ground (Atwood and Bontrager 2001; USFWS 2003). Clutch size is typically four eggs but can range from three to five eggs (Atwood and Bontrager 2001). Both sexes incubate eggs for approximately 14 days and, after the eggs hatch, chicks fledge from the nest around Day 14 (Atwood and Bontrager 2001). Juveniles will stay with adults from 2 to 5 weeks (Atwood and Bontrager 2001).

Survey Methods

The survey protocol to determine presence/absence of CAGN requires a federal 10(A)1(a) permit. From May 24 through June 22, 2018, permitted ICF biologist Phillip Richards (permit # TE-095896) performed three focused surveys for CAGN in all potentially suitable habitat within the Project limits plus a 300-ft buffer (Figure 3). Additional ICF staff participated during each of the visits; however, their involvement was for training purposes (Table 1). The survey effort followed the published survey methodology for CAGN (USFWS 1997) during the breeding season inside a Natural Community Conservation Plan area.

Three surveys were conducted at least one week apart between 6:00 A.M. and 12:00 P.M. Surveys were not conducted during periods of excessive or abnormal heat, wind, rain, fog, or other inclement weather. The rate of coverage during each survey visit was approximately 3 to 4 hectares (8 to 10 acres) per hour. Methods included slowly walking through the vegetation with frequent stops to listen and play taped CAGN vocalizations. During each visit, a taped vocalization was broadcast at least once in all potential habitat at distance intervals of approximately 23 to 30 meters (75 to 100 feet). All vertebrate species detected were recorded (Appendix B). CAGN survey dates, times, weather conditions, and personnel are summarized in Table 1.

Table 1. CAGN Survey Dates, Times, and Weather Conditions

Visit	Date	Start–End Time	Temperature (°F)	Wind Speed (mph)	Skies	Surveyor
1	5/24/2018	0710-1120	58-61	0-3	cloudy	Phil Richards* Ryan Layden Will Kohn Marty Lewis
2	6/13/2018	0700-1150	60-80	0-5	cloudy to sunny	Phil Richards* Ryan Winkleman Ryan Layden Marty Lewis Will Kohn Ford Bendell Courtney Casey
3	6/22/2018	0715-1200	66-77	1-5	cloudy to sunny	Phil Richards* Ryan Layden Marty Lewis Shawn Johnston

* Permit No. TE-095896

Results

CAGN were detected during each of the three focused CAGN surveys. Table 2 summarizes the CAGN observations for each visit. Figure 4 shows the location of CAGN observations. The territory boundaries presented on Figure 4 are approximations based on CAGN activities observed during three visits to the survey area.

Table 3. CAGN Survey Results

Visit	Date	Observations	Territories with Observed Activity
1	5/24/2018	1 pair feeding at least 1 fledgling (Territory 1) 1 pair nest building (Territory 2) 1 pair incubating (Territory 3) 1 males foraging (Territory 5)	4 of 6
2	6/13/2018	3 males foraging (Territories 1, 2, 5) 1 pair feeding nestlings (Territory 3)	4 of 6
3	6/22/2018	2 pairs feeding at least on fledgling (Territory 1, 6) 1 pair feeding nestlings (Territory 2) 1 pair nest building (suspect previous nest failed) (Territory 3) 1 pair feeding at least 3 fledglings (Territory 4) 1 male foraging (Territory 5) 1 dispersing juvenile	6 of 6

Based on the combined observations from each visit to the survey area, three territories are located within the south boundary of the Project limits (Figure 4, Territories 1-3). Breeding was confirmed at all three territories. An additional three territories are located within 300 feet from the southern Project limits (Figure 4, Territories 4-6). Breeding was confirmed at two of the three adjacent territories.

If you have questions or need clarifications regarding this report, please contact me at (949) 333-6643 or Phillip.Richards@icfi.com.

Sincerely,

Phillip Richards
ICF Biologist

Enclosed:
Figure 1: Regional Location
Figure 2: Project Vicinity
Figure 3: Vegetation Communities
Figure 4: Results

Appendix A: Site Photographs
Appendix B: Wildlife Species Detected
Appendix C: Certification Statement

Literature Cited

Atwood, J. L. 1990, Status review if the California Gnatcatcher (*Polioptila californica*). Unpublished Report, Manomet Bird Observatory, Manomet, Massachusettes. 79 pp.

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Bontrager, D. R. 1991. Habitat requirements, home range and breeding biology of the California gnatcatcher (*Polioptila californica*) in South Orange County, California. Prepared for Santa Margarita Company, Rancho Santa Margarita, California.

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Figures

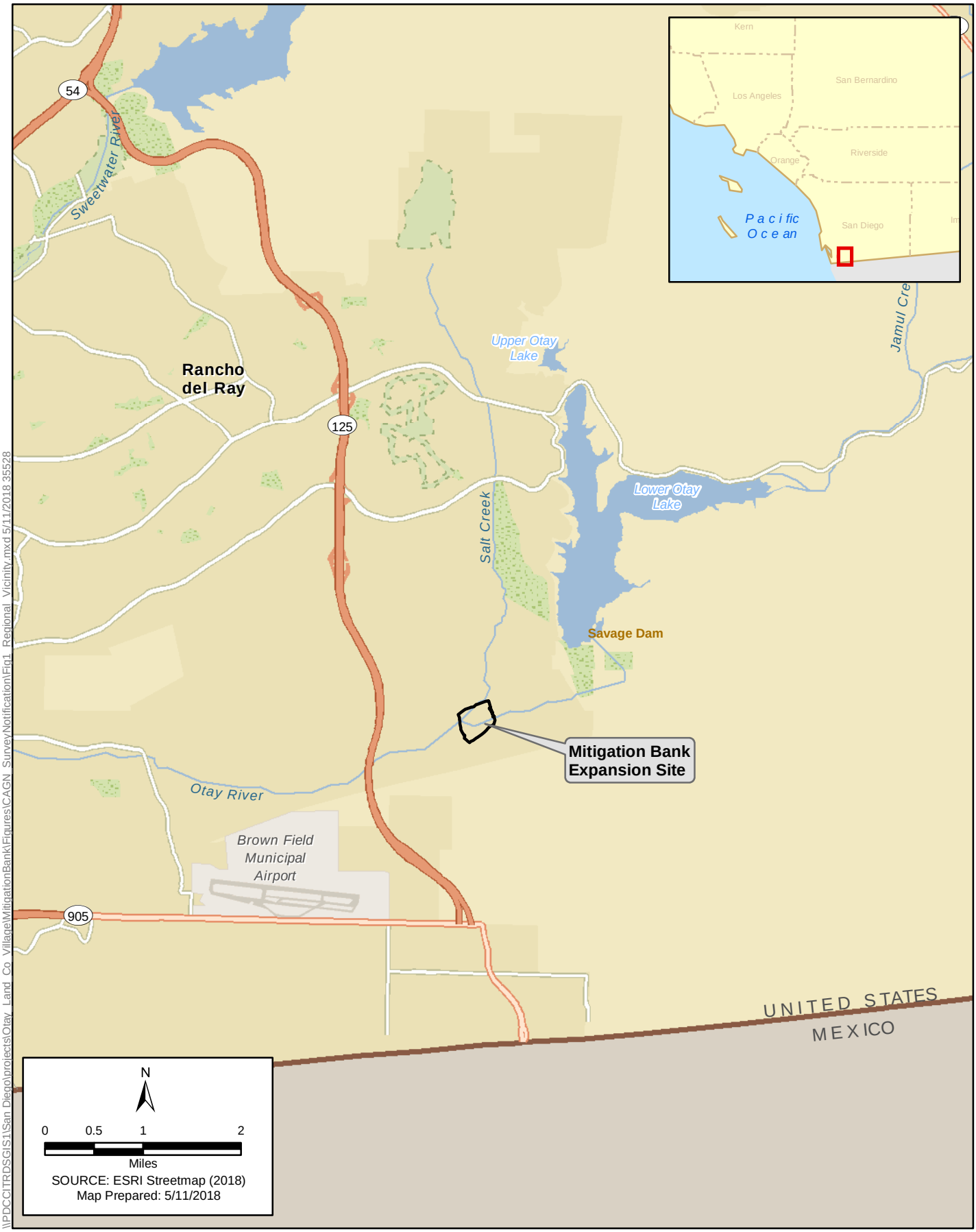

Figure 1
Regional Location
Otay River Mitigation Bank Expansion

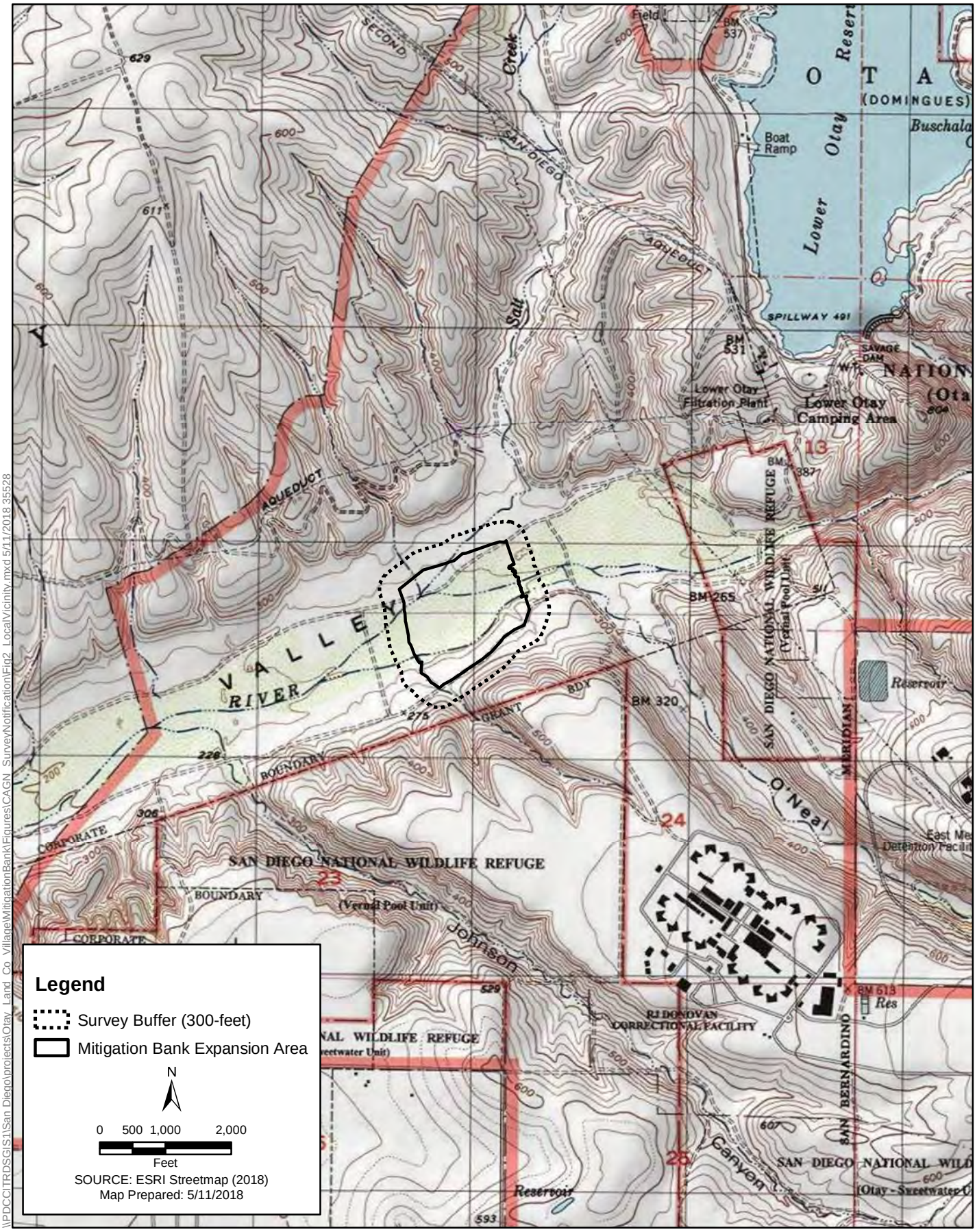

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Figure 2
Project Vicinity
Otay River Mitigation Bank Expansion

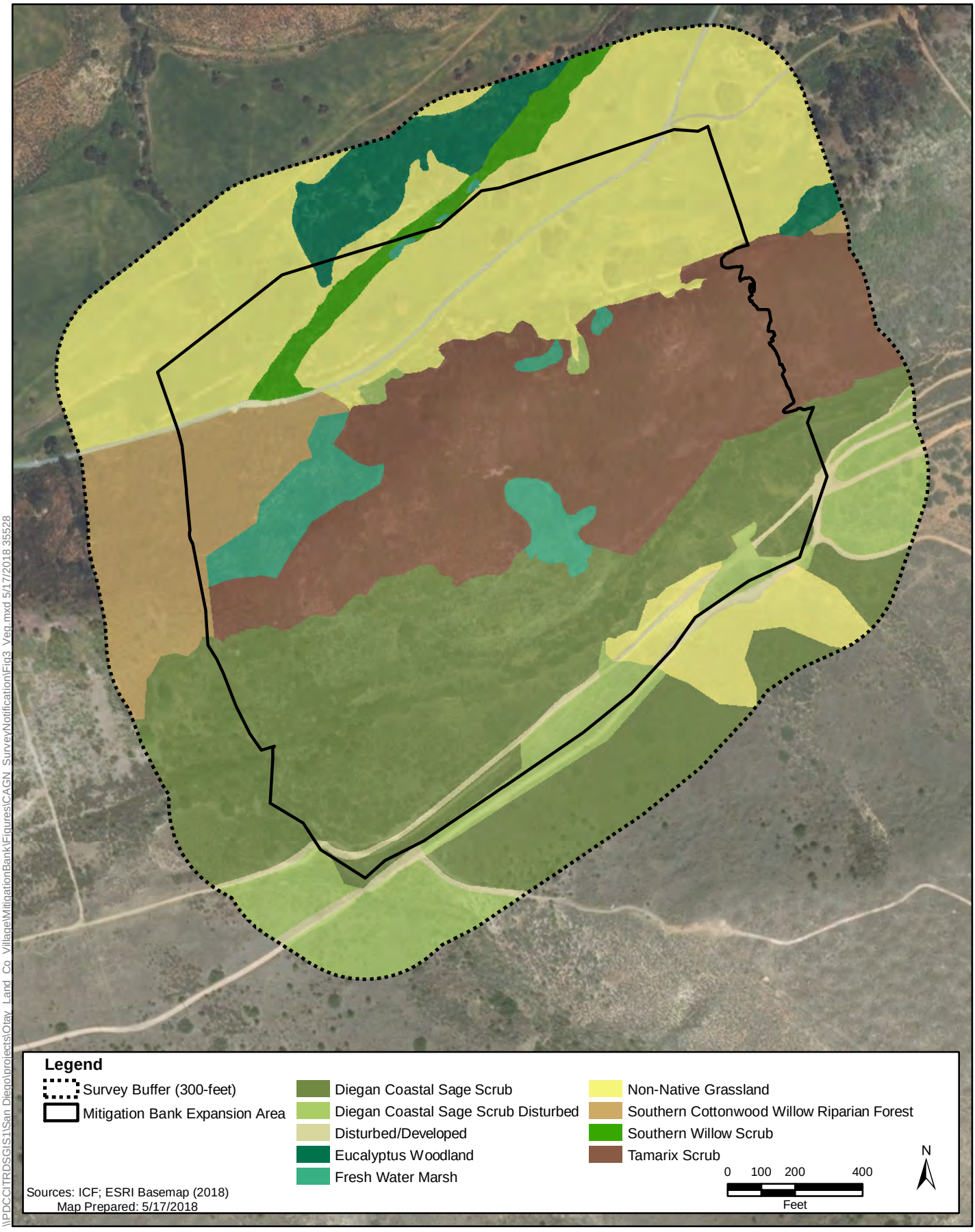

Figure 3
Vegetation Communities
Otay River Mitigation Bank Expansion

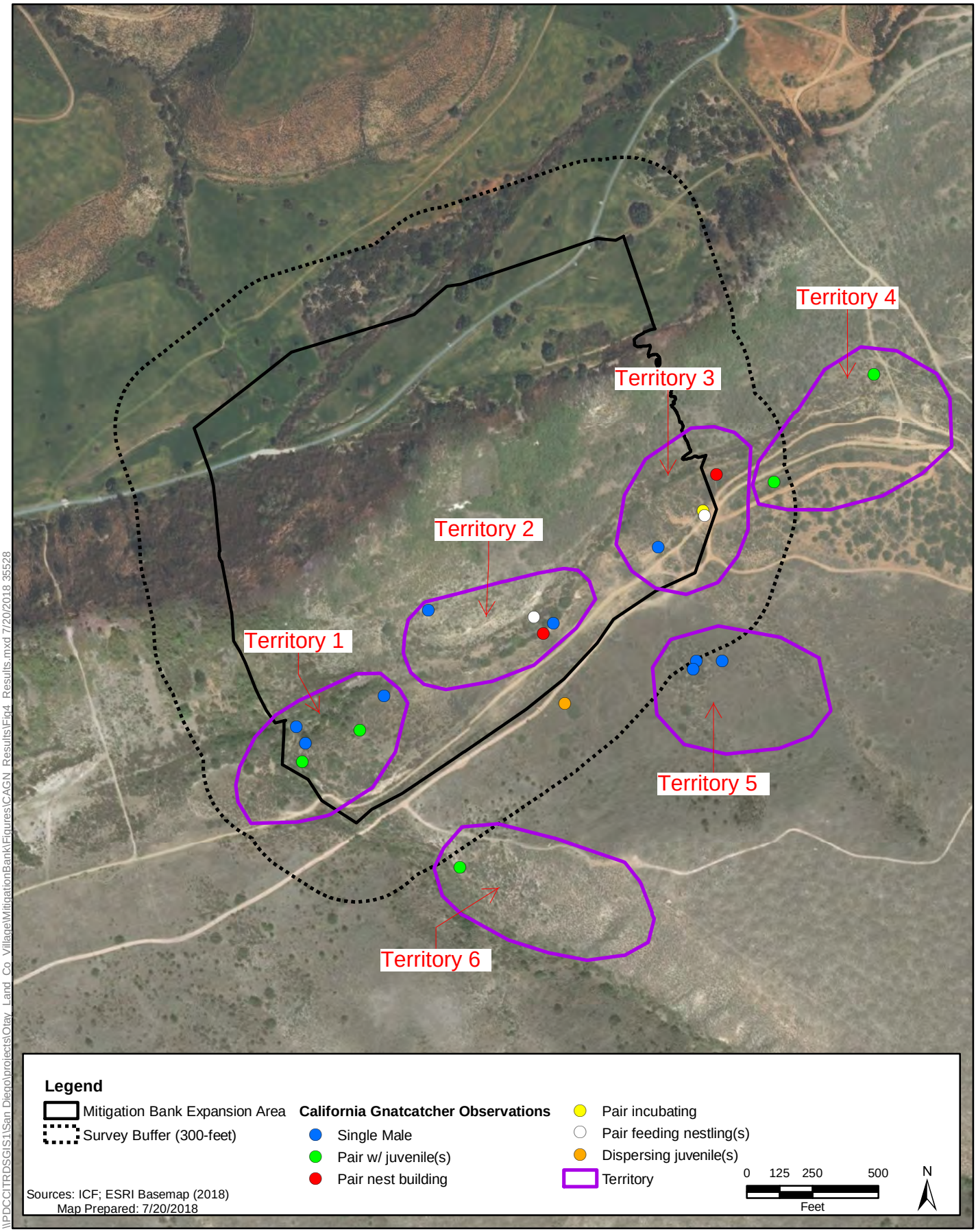

Figure 4
Gnatcatcher Survey Results
Otay River Mitigation Bank Expansion

Appendix A

Site Photographs

Photograph: 1

Photo Date: June 13, 2018

Location: Southeast corner of survey area.

Direction: View facing northeast.

Comment: Photo depicts upland vegetation on terrace south of Otay River supporting coastal sage scrub.

Photograph: 2

Photo Date: June 13, 2018

Location: Center of survey area along southern boundary.

Direction: View facing north.

Comment: Photo depicts upland habitat above Otay River floodplain.

Photograph: 3

Photo Date: May 24, 2018

Location: Center of survey area along southern boundary.

Direction: View facing west.

Comment: Photo depicts upland habitat above Otay River floodplain.

Photograph: 4

Photo Date: June 13, 2018

Location: Center of survey area along southern boundary.

Direction: View facing southwest.

Comment: Photo depicts upland habitat on terrace south of Otay River supporting coastal sage scrub.

Photograph: 5

Photo Date: May 24, 2018

Location: Southwest corner of survey area.

Direction: View facing northeast.

Comment: Photo depicts upland habitat on terrace south of Otay River supporting coastal sage scrub.

Photograph: 6

Photo Date: April 17, 2018

Location: Southwest corner of survey area.

Direction: View facing west.

Comment: Photo depicts upland habitat on terrace south of Otay River supporting coastal sage scrub.

Appendix B

Wildlife Species Detected

Appendix B. Wildlife Species Detected

Scientific Name	Common Name	Special Status	
VERTEBRATES			
Reptiles			
Sceloporus occidentalis	Western Fence Lizard		
Uta stansburiana elegans	Western Side-blotched Lizard		
Birds			
Callipepla californica	California Quail		
Elanus leucurus	White-tailed Kite	CFP	SDC Group I
Buteo jamaicensis	Red-tailed Hawk		
Zenaida macroura	Mourning Dove		
Chordeiles acutipennis	Lesser Nighthawk		
Aeronautes saxatalis	White-throated Swift		
Archilochus alexandri	Black-chinned Hummingbird		
Calypte anna	Anna's Hummingbird		
Picoides nuttallii	Nuttall's Woodpecker		
Empidonax difficilis	Pacific-slope Flycatcher		
Sayornis nigricans	Black Phoebe		
Sayornis saya	Say's Phoebe		
Myiarchus cinerascens	Ash-throated Flycatcher		
Tyrannus vociferans	Cassin's Kingbird		
Vireo bellii pusillus	Least Bell's Vireo	FE, SE	SDC Group I, MSCP
Vireo huttoni	Hutton's Vireo		
Vireo gilvus	Warbling Vireo		
Corvus brachyrhynchos	American Crow		
Corvus corax	Common Raven		
Tachycineta bicolor	Tree Swallow		
Stelgidopteryx serripennis	Northern Rough-winged Swallow		
Petrochelidon pyrrhonota	Cliff Swallow		
Psaltriparus minimus	Bushtit		
Troglodytes aedon	House Wren		
Cistothorus palustris	Marsh Wren		
Thryomanes bewickii	Bewick's Wren		
Campylorhynchus brunneicapillus	Cactus Wren		

Scientific Name	Common Name	Special Status	
Polioptila caerulea	Blue-gray Gnatcatcher		
Polioptila californica californica	Coastal California Gnatcatcher	FT, CSC	SDC Group I, MSCP
Chamaea fasciata	Wrentit		
Toxostoma redivivum	California Thrasher		
Mimus polyglottos	Northern Mockingbird		
**Sturnus vulgaris*	European Starling		
Phainopepla nitens	Phainopepla		
Oreothypis celata	Orange-crowned Warbler		
Geothlypis trichas	Common Yellowthroat		
Setophaga petechia	Yellow Warbler	CSC	SDC Group II
Icteria virens	Yellow-breasted Chat	CSC	SDC Group I
Pipilo maculatus	Spotted Towhee		
Aimophila ruficeps canescens	Southern California Rufous-crowned Sparrow		SDC Group I, MSCP
Melozone crissalis	California Towhee		
Melospiza melodia	Song Sparrow		
Pheucticus melanocephalus	Black-headed Grosbeak		
Passerina caerulea	Blue Grosbeak		
Sturnella neglecta	Western Meadowlark		
**Molothrus ater*	Brown-headed Cowbird		
Icterus cucullatus	Hooded Oriole		
Icterus bullockii	Bullock's Oriole		
Haemorhous mexicanus	House Finch		
Carduelis psaltria	Lesser Goldfinch		
Carduelis lawrencei	Lawrence's Goldfinch		
Carduelis tristis	American Goldfinch		
Mammals			
Sylvilagus audubonii	Desert Cottontail		
Canis latrans	Coyote		

Scientific Name	Common Name	Special Status

Legend

*= Non-native or invasive species

Special Status:

Federal:
FE = Endangered
FT = Threatened

State:
SE = Endangered
ST =Threatened
CSC = California Species of Special Concern
CFP = California Fully Protected Species

County:
SDC Group I = includes animal species that have a very high level of sensitivity, either because they are listed as threatened or endangered or because they have very specific natural history requirements that must be met.
SDC Group II - includes animal species that are becoming less common, but are not yet so rare that extirpation or extinction is imminent without immediate action. These species tend to be prolific within their suitable habitat types.

MSCP = Multiple Species Conservation Program Covered Species

Appendix C

Certification Statement

I certify that the information contained in this survey report and attached exhibits fully and accurately represents my work. Should you have any questions regarding the methodology or findings in this report, please do not hesitate to contact Phillip C. Richards by email (Phillip.Richards@icfi.com) or call (949) 333-6643.

Sincerely,

Phillip C. Richards
Permit# TE-095896

Appendix I

GEOCON Infiltration Report for Vernal Pool Creation Area

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INFILTRATION REPORT

OTAY VALLEY
CHULA VISTA, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ICF

JULY 29, 2020
PROJECT NO. 06930-52-13A

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Geocon Project No. 06930-52-13A
July 29, 2020

ICF
3665 JFK Parkway, Building 1, Suite 300
Fort Collins, Colorado 80525

Attention: Ms. Lindsay Teunis

Subject: INFILTRATION REPORT
OTAY VALLEY
CHULA VISTA, CALIFORNIA

Dear Ms. Teunis:

In accordance with your authorization and our proposal LG-20242, dated June 9, 2020, we prepared this infiltration testing report for the subject project. The accompanying report presents our findings of the underlying soil permeability rates for the proposed evaluation to transplant or allow vernal pools along the northern banks of the Otay River Valley. The study also includes an evaluation of the geologic units and results of geotechnical laboratory testing.

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

Very truly yours,

GEOCON INCORPORATED

Shawn Foy Weedon
GE 2714

Michael C. Ertwine
CEG 2659

SFW:MCE:arm

(e-mail) Addressee

TABLE OF CONTENTS

INFILTRATION REPORT

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical study for the infiltration testing in the Otay Valley area in the City of Chula Vista, California and shown on the Vicinity Map. The subject site is located south of the Otay Ranch Village 8 area and southwest of the Otay Reservoir.

Vicinity Map

The scope of this investigation included reviewing readily available published and unpublished geologic literature (see List of References), performing field infiltration tests, performing laboratory tests and preparing this report. We also advanced 15 exploratory borings to a maximum depth of about 5 feet, performed 15 infiltration tests, sampled soil and performed laboratory testing. Appendix A presents the exploratory boring logs and details of the field investigation. The details of the field and laboratory tests and a summary of the test results are shown in Appendix B and on the boring logs in Appendix A.

2. SITE AND PROJECT DESCRIPTION

The site is currently an open space area located within the Otay Valley which is covered in natural grasses and vegetation. Several biking and hiking trails exist around the subject area. The existing grades range from about 250 feet above mean sea level (MSL) at the west end of the site to about 270 feet MSL at the northeast area. The site is accessed from Main Street and Heritage Road along the Vulcan Quarry Road. The Existing Site Map shows the current conditions of the study area.

Existing Site Map

We understand the area is being evaluated to transplant or allow vernal pools to be placed along northern banks of the Otay Valley. Additionally, we provided infiltration tests to evaluate the ability of the underlying soil to permeate and provided logs of the soil and geologic units encountered. During our field investigation, we were consulted and directed by a soil scientist from ICF during our field investigation on sample locations and depths for infiltration testing. Table 2 below lists the infiltration test identification number and their approximate coordinates.

TABLE 2
SUMMARY OF INFILTRATION TESTING LOCATION

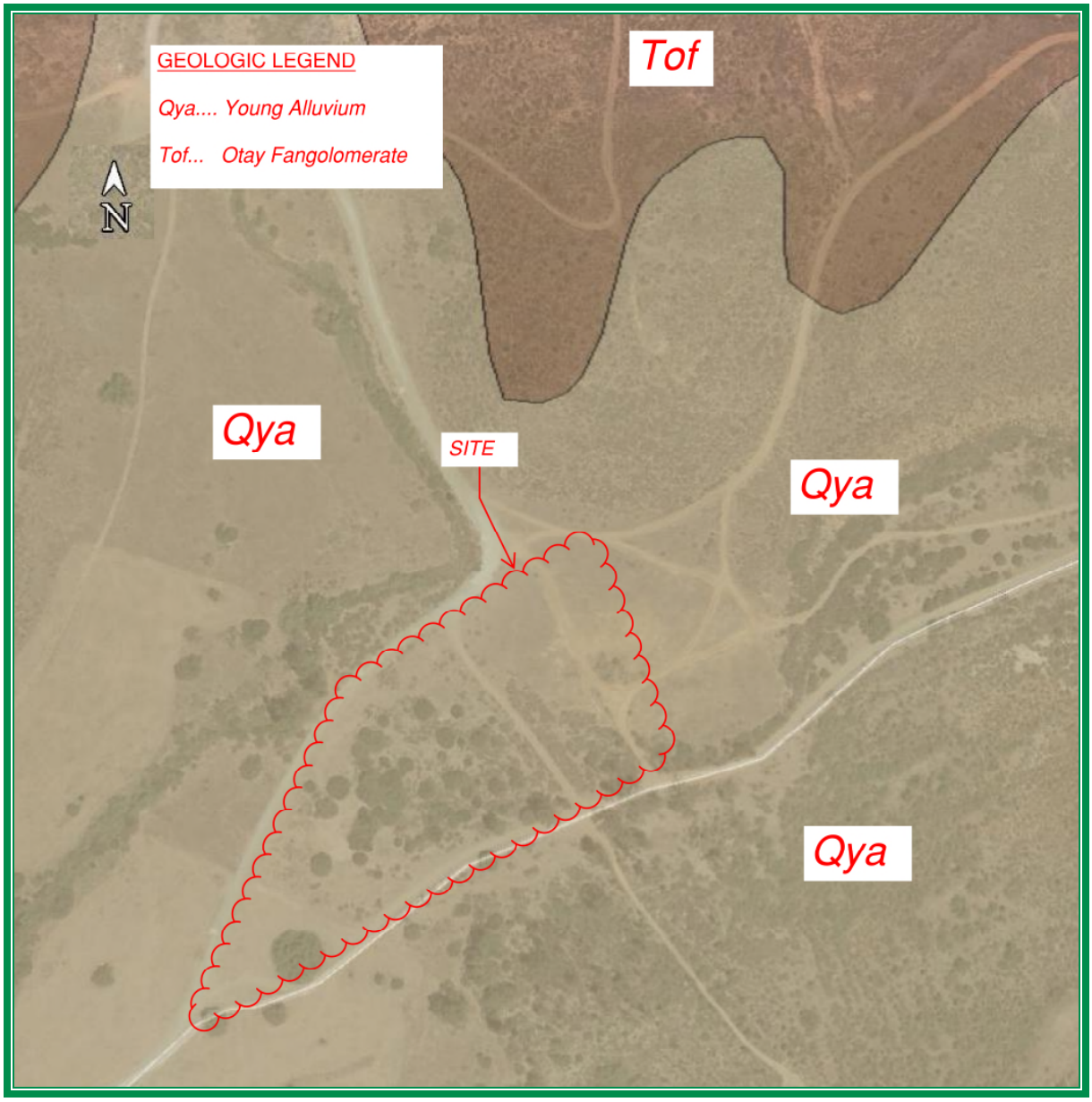
Infiltration ID#	Latitude	Longitude
I-1	32.60263	-116.94237
I-2	32.60232	-116.94272
I-3	32.60264	-116.94339
I-4	32.60244	-116.9442
I-5	32.60199	-116.94389
I-6	32.60178	-116.94472
I-7	32.60155	-116.94279
I-8	32.60145	-116.94434
I-9	32.60107	-116.94469
I-10	32.60064	-116.94483
I-11	32.60113	-116.94518
I-12	32.60153	-116.94472
I-13	32.60116	-116.94787
I-14	32.60081	-116.94848
I-15	32.60127	-116.94439

The locations and descriptions herein are based our field observations and use of readily available GPS systems. If final development plans differ significantly from those described herein, Geocon Incorporated should be contacted for review and possible revisions to this report.

3. GEOLOGIC SETTING

The site is located in the coastal plain of the Peninsular Ranges province of southern California. The Peninsular Ranges is a geologic and geomorphic province that extends from the Imperial Valley to the Pacific Ocean and from the Transverse Ranges to the north and into Baja California to the south. The coastal plain of San Diego County is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary rocks that range in age from Upper Cretaceous through the Pleistocene with intermittent deposition. Geomorphically, the coastal plain is characterized by a stair-stepped series of marine terraces, which are younger to the west and have been dissected by west flowing rivers that drain the Peninsular Ranges to the east. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault Zone and the active Rose Canyon Fault Zone. The Peninsular Ranges are also dissected by the Elsinore Fault Zone that is associated with and sub-parallel to the San Andreas Fault Zone, which is the plate boundary between the Pacific and North American Plates.

Specifically, the site is located on the western portion of the coastal plain. The Otay River Valley surficial soil makes up the geologic units at the site consisting of topsoil and young alluvium deposits. Based on review of geologic literature the Otay Fanglomerate caps the ridges at higher elevations to the north of the site. The Regional Geologic Map shows the geologic units in the area of the site.



Regional Geologic Map

4. SOIL AND GEOLOGIC CONDITIONS

4.1 General

During our field investigation, we encountered two surficial soil types (topsoil and alluvium). We expect Terrace Deposits and the Otay Formation exist below the surficial soil based on our field observations and previous geotechnical investigations in the area. We discuss the surficial and formational units herein in order of increasing age. We present the approximate lateral extent of the formational and surficial soil on the Site Plan, Figure 1.

4.2 Topsoil (unmapped)

Holocene-age topsoil is present as a relatively thin veneer locally overlying the alluvium. Based on our hand-auger borings the topsoil has a maximum thickness of approximately 1 foot and can be characterized as soft, loose to medium dense, dry to damp, light gray to grayish brown and reddish brown, sandy clay to clayey sand with gravel and cobble.

4.3 Young Alluvium (Qya)

We encountered late Quaternary to Pleistocene-age flood-plain deposits to the maximum depths explored of approximately 5½ feet below the existing ground surface. The young alluvium consists of firm to medium dense, light gray to grayish brown and reddish brown, sandy clay to clayey sand with gravel and cobble.

4.4 Terrace Deposits (Qt)

Pleistocene-age Terrace Deposits are typically shallow marine and non-marine near shore soil deposits likely associated with the Otay River Valley. We expect this unit to underlie the young alluvium at depths of approximately 10 to 50 feet below the existing ground surface. The Terrace Deposits are generally dense to very dense, reddish brown, silty to clayey sandstone with portions of the unit containing intermittent layers of cobbles and boulders up to about 2 feet in diameter.

4.5 Otay Formation

Tertiary-age Otay Formation is located below the surficial soil and Terrace Deposits. The upper sandstone/siltstone/claystone member of this unit (To) consists of interbeds of dense to very dense, slightly cemented, silty to clayey sandstone and hard, siltstone and claystone layers. In addition, the Otay Formation possesses layers of bentonitic claystone. However, the bentonite layer will not be encountered during proposed grading operations. The middle gritstone Otay Formation member (Tog), generally located below the To consists of very dense, slightly to moderately cemented, silty to clayey sandstone with interbeds of gravel and cobble generally with a maximum rock dimension of 1 foot. The lower basal conglomerate member of the Otay Formation (Toc) is normally located below the Tog

layer. Excavations within both the upper and middle members will generally be possible with heavy-duty grading equipment with heavy effort; however, we do not expect we will encounter the Otay Formation during the planned improvements.

5. GROUNDWATER

We did not encounter a static groundwater table in the exploratory excavations and during the grading operations. We do not expect groundwater to adversely impact the development of the site. It is not uncommon for groundwater seepage conditions to develop where none previously existed due to the permeability characteristics of the geologic units encountered on site. During the rainy season, perched water conditions are likely to develop within the drainage areas that may require special consideration during grading operations. Groundwater elevations are dependent on seasonal precipitation, irrigation, and land use, among other factors, and vary as a result.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 We did not encounter soil or geologic conditions during our exploration that would preclude the proposed improvements. We will provide supplemental recommendations if we observe variable or undesirable conditions during construction, or if the proposed construction will differ from that anticipated herein.

6.1.2 We expect up to 5½ feet of topsoil and alluvium exists below areas of the proposed improvements. We did not encounter formational Terrace Deposits or the Otay Formation in our borings for the infiltration testing on the property. We expect the Terrace Deposits is located within the upper 10 feet from existing grades.

6.1.3 We performed constant-head infiltration tests using the Aardvark permeameter at the locations shown on the Site Plan, Figure 1. We also perform laboratory testing as shown in Appendix B.

6.2 Hydrologic Soil Group

6.2.1 The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table 6.2.1 presents the descriptions of the hydrologic soil groups. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

TABLE 6.2.1
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

6.2.2 The Hydrologic Soil Group Map presents output from the USDA website showing the limits of the soil units.

Hydrologic Soil Group Map

6.2.3 Table 6.2.2 presents the information from the USDA website for the subject property. The data presented in Table 2 is based on the previous grades, prior to the placement of fill.

TABLE 6.2.2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Huerhuero loam, 2 to 9 percent slopes	HrC	82	D	0.00 – 0.06
Riverwash	Rm	14	D	5.95 – 19.98
Huerhuero loam, 2 to 9 percent slopes	HrE2	4	D	0.00 – 0.06

6.3 Infiltration and Laboratory Testing Results

6.3.1 Table 6.3.1 presents the results of the infiltration tests. Appendix B presents the field infiltration data sheets. We included the infiltration rate we obtained in the field and a factored

infiltration rate using a factor of safety of 2. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil.

TABLE 6.3.1
INFILTRATION TEST RESULTS

Test No.	Geologic Unit	Test Depth (Feet)	Infiltration Rate, k_{sat} (inch/hour)	Factored Infiltration Rate[1], k_{sat} (inch/hour)
I-1	Qya	1.2	0.032	0.016
I-2	Qya	2.5	0.113	0.057
I-3	Qya	0.7	0.076	0.038
I-4*	Qya	--	--	--
I-5	Qya	1.2	0.028	0.014
I-6	Qya	1.0	0.141	0.071
I-7	Qya	0.8	0.516	0.258
I-8*	Qya	3.0	5.102	2.551
I-9	Qya	3.0	1.334	0.667
I-10	Qya	3.0	0.224	0.112
I-11	Qya	1.5	0.146	0.073
I-12	Qya	1.0	1.551	0.776
I-13	Qya	2.5	0.113	0.057
I-14	Qya	2.5	0.099	0.050
I-15	Qya	1.5	0.363	0.182
Average (Including I-8)			0.703	0.352
Average (Excluding I-8)			0.364	0.182

*Unit unsuitable for testing due to cobble, or "wash-out" in hand-auger boring

6.3.2 The infiltration rate for I-8 appears to be high and is likely due to the cobble we encountered within the excavation. Therefore, you may consider not including the higher infiltration rate in your analyses. Based on our observations and test results, the infiltration rates for the surficial materials onsite (younger alluvium) has an average of about 0.703 inches/hour (0.352 inches/hour with a factor of safety of 2) if you include I-8 and 0.364 inches/hour (0.182 inches/hour with a factor of safety of 2) if you exclude I-8.

6.3.3 The laboratory test results indicate the coil consists of silty to clayey sand and sandy clay. Table 6.3.2 presents the result of the grain size analyses and the fines content for the tests performed.

TABLE 6.3.2
LABORATORY FINES CONTENT TEST RESULTS

Test No.	Geologic Unit	Test Depth (Feet)	Approximate Fines Content, Passing the #200 Sieve (%)
I1-1	Qya	0 to 2.5	54
I2-1	Qya	1 to 2.5	52
I3-1	Qya	1.5 to 4.5	43
I6-1	Qya	1 to 2.5	58
I7-1	Qya	0.5 to 1.5	26
I8-1	Qya	2 to 3	14
I9-1	Qya	0.75 to 1.25	45
I10-1	Qya	1 to 2	42
I11-1	Qya	0.5 to 1.5	53
I11-2	Qya	3.5 to 4.5	23
I12-1	Qya	0.5 to 1.5	77
I13-1	Qya	1 to 2	53
I14-1	Qya	0 to 1	50
I14-2	Qya	2 to 3	64
Average			47

6.3.4 We should be contacted to provide additional geotechnical information, if required.

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.

OTAY VALLEY
CHULA VISTA, CALIFORNIA

0’ 150’ 300’
SCALE 1”= 150’ (On 11x17)

GEOCON LEGEND

I-15 ⊙ .....APPROX. LOCATION OF INFILTRATION TEST

INFILTRATION LOCATION MAP

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PROJECT NO. 06930 - 52 - 13A
FIGURE 1
DATE 07- 29- 2020

Plotted:07/28/2020 1:14PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06930-52-13A Otay Valley\SHEETS\06930-52-13A Infiltration Location Map.dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

We performed the hand-auger operations on July 8th through July 10th, 2020. The hand-auger borings extended to maximum depth of approximately 5½ feet. The show locations of the exploratory hand-auger borings on the Site Plan, Figure 1. We present the boring logs in this Appendix. We located the borings in the field using readily available GPS software and existing reference points; therefore, actual boring locations may deviate slightly.

We obtained bulk samples during our subsurface exploration in the borings, placed them in moisture-tight containers, and transported them to the laboratory for testing. We note the type of sample on the exploratory boring logs.

We estimated elevations shown on the boring logs either from a topographic map or by using a benchmark. Each excavation was backfilled with the soil cuttings.

We visually examined, classified, and logged the soil encountered in the borings in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which we obtained samples.

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**INFILTRATION I 1** ELEV. (MSL.) **270'** DATE COMPLETED **07-08-2020** EQUIPMENT **Hand Auger** BY: **D. GITHENS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	I1-1			SC/CL	**TOPSOIL** Loose to soft, dry, grayish brown, fine to coarse, Clayey SAND to Sandy CLAY			
				CL	**YOUNG ALLUVIUM (Qya)** Firm, moist, grayish brown, fine to coarse Sandy CLAY			
2					HAND AUGER TERMINATED AT 2.5 FEET No groundwater			

Figure A-1,
Log of Infiltration I 1, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

INFILTRATION I 2

ELEV. (MSL.) **263'** DATE COMPLETED **07-08-2020**

EQUIPMENT **Hand Auger** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC/CL	**TOPSOIL** Loose to soft, dry, grayish brown, fine to coarse, Clayey SAND to Sandy CLAY			
				CL	**YOUNG ALLUVIUM (Qya)** Firm, moist, grayish brown, Sandy CLAY			
	I2-1							
2				CL	Firm, moist, grayish brown, Sandy CLAY -Cobble encountered			
					HAND AUGER TERMINATED AT 2.5 FEET No groundwater			

Figure A-2,
Log of Infiltration I 2, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	INFILTRATION I 3 ELEV. (MSL.) 263' DATE COMPLETED 07-08-2020 EQUIPMENT Hand Auger BY: D. GITHENS MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC/CL	**TOPSOIL** Loose to firm, dry, grayish brown, fine to coarse, Clayey SAND to Sandy CLAY			
				CL/SC	**YOUNG ALLUVIUM (Qya)** Loose to firm, moist, grayish brown, fine to coarse, Clayey SAND to Sandy CLAY			
	I3-1							
2				CL/SC	Firm, moist, grayish brown, fine to coarse Clayey SAND			
4					-Cobble encountered REFUSAL AT 5.5 FEET No groundwater			

Figure A-3,
Log of Infiltration I 3, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**INFILTRATION I 4** ELEV. (MSL.) **259'** DATE COMPLETED **07-08-2020** EQUIPMENT **Hand Auger** BY: **D. GITHENS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GP	**YOUNG ALLUVIUM (Qya)** Medium dense to dense, dry, reddish brown, Sandy GRAVEL; abundant cobble clasts			
					REFUSAL AT 0.5 FEET No groundwater			

Figure A-4,
Log of Infiltration I 4, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**INFILTRATION I 5** ELEV. (MSL.) **255'** DATE COMPLETED **07-08-2020** EQUIPMENT **Hand Auger** BY: **D. GITHENS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Medium dense, dry, grayish brown, Clayey, fine to coarse SAND; few cobble clasts up to 3 inches			
				SC	**YOUNG ALLUVIUM (Qya)** Medium dense, dry, light brown to reddish brown, Clayey, fine to coarse SAND; few cobble clasts up to 4 inches			
2					HAND AUGER TERMINATED AT 2.0 FEET No groundwater			

Figure A-5,
Log of Infiltration I 5, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**INFILTRATION I 6** ELEV. (MSL.) **255'** DATE COMPLETED **07-09-2020** EQUIPMENT **Hand Auger** BY: **D. GITHENS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Soft, dry, grayish brown, fine to coarse Sandy CLAY			
	I6-1			SC/CL	**YOUNG ALLUVIUM (Qya)** Medium dense to firm, moist, grayish brown, fine to coarse, Clayey SAND to Sandy CLAY -Becomes medium- to coarse-grained			
2								
4					-Becomes reddish brown, few gravels			
					HAND AUGER TERMINATED AT 5.0 FEET No groundwater			

Figure A-6,
Log of Infiltration I 6, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

INFILTRATION I 7

ELEV. (MSL.) **245'** DATE COMPLETED **07-09-2020**

EQUIPMENT **Hand Auger** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CL	**TOPSOIL** Soft, dry, light grayish to reddish brown, fine to coarse Sandy CLAY			
	I7-1			SM	**YOUNG ALLUVIUM (Qya)** Medium dense, damp to moist, light brown to reddish brown, Silty, fine to coarse SAND; few cobble clasts up to 4 inches			
					HAND AUGER TERMINATED AT 1.5 FEET No groundwater			

Figure A-7,
Log of Infiltration I 7, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	INFILTRATION I 8 ELEV. (MSL.) 252' DATE COMPLETED 07-10-2020 EQUIPMENT Hand Auger BY: D. GITHENS MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL** Medium dense, dry, Clayey, fine to coarse SAND; few cobble clasts up to 3 inches			
				SM	**YOUNG ALLUVIUM (Qya)** Medium dense, dry, light brown to reddish brown, Silty, fine to coarse SAND; few cobble clasts up to 4 inches			
2	I8-1				-Trace gravel and cobble sized clasts			
					HAND AUGER TERMINATED AT 3.0 FEET No groundwater			

Figure A-8,
Log of Infiltration I 8, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**INFILTRATION I 9** ELEV. (MSL.) **251'** DATE COMPLETED **07-09-2020** EQUIPMENT **Hand Auger** BY: **D. GITHENS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	I9-1			SC	**YOUNG ALLUVIUM (Qya)** Medium dense, dry, light brown to grayish brown, Clayey, fine to coarse SAND; few cobble clasts up to 4 inches			
2				SC/CL	Firm, damp to moist, grayish brown, fine to coarse, Clayey SAND to Sandy CLAY			
					HAND AUGER TERMINATED AT 3.0 FEET No groundwater			

Figure A-9,
Log of Infiltration I 9, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

INFILTRATION I 10

ELEV. (MSL.) **247'** DATE COMPLETED **07-09-2020**

EQUIPMENT **Hand Auger** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Soft, dry, grayish brown, Sandy CLAY			
2	I10-1			SC/CL	**YOUNG ALLUVIUM (Qya)** Medium dense to firm, moist, grayish brown, Clayey, fine to coarse SAND to Sandy CLAY			
					HAND AUGER TERMINATED AT 3.0 FEET No groundwater			

Figure A-10,
Log of Infiltration I 10, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

INFILTRATION I 11

ELEV. (MSL.) **250'** DATE COMPLETED **07-09-2020**

EQUIPMENT **Hand Auger** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL** Soft, dry, grayish brown, fine to coarse Sandy CLAY			
	I11-1			SC/CL	**YOUNG ALLUVIUM (Qya)** Medium dense to firm, damp to moist, grayish brown, Clayey, fine to coarse SAND to Sandy CLAY; trace gravel			
2								
				SM	Medium dense, damp to moist, grayish brown, Silty, fine- to medium-grained SAND			
	I11-2							
4					HAND AUGER TERMINATED AT 4.5 FEET No groundwater			

Figure A-11,
Log of Infiltration I 11, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

INFILTRATION I 12

ELEV. (MSL.) **250'** DATE COMPLETED **07-09-2020**

EQUIPMENT **Hand Auger** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CL	**TOPSOIL** Soft, dry, grayish brown, Sandy CLAY			
	I12-1			CL	**YOUNG ALLUVIUM (Qya)** Firm, damp to moist, grayish brown, Sandy CLAY			
2								
				SM	Loose, dry, light brown, Silty, fine to coarse SAND			
				SC	Firm, damp, grayish brown, fine to course Sandy CLAY			
					HAND AUGER TERMINATED AT 3.5 FEET No groundwater			

Figure A-12,
Log of Infiltration I 12, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**INFILTRATION I 13** ELEV. (MSL.) **254'** DATE COMPLETED **07-10-2020** EQUIPMENT **Hand Auger** BY: **D. GITHENS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Soft, dry, grayish brown, fine to coarse, Sandy CLAY			
	I13-1			CL	**YOUNG ALLUVIUM (Qya)** Medium dense to firm, damp to moist, reddish brown, Clayey, fine to coarse SAND to Sandy CLAY			
2					-Becomes fine to medium grained			
					HAND AUGER TERMINATED AT 3.0 FEET No groundwater			

Figure A-13,
Log of Infiltration I 13, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06930-52-13A

INFILTRATION I 14

ELEV. (MSL.) **253'** DATE COMPLETED **07-10-2020**

EQUIPMENT **Hand Auger** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	I14-1			CL	**TOPSOIL** Soft, dry, grayish brown, Sandy CLAY			
2	I14-2			CL	**YOUNG ALLUVIUM (Qya)** Firm, damp, reddish brown, Sandy CLAY			
					HAND AUGER TERMINATED AT 3.0 FEET No groundwater			

Figure A-14,
Log of Infiltration I 14, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. 06930-52-13A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**INFILTRATION I 15** ELEV. (MSL.) **253'** DATE COMPLETED **07-10-2020** EQUIPMENT **Hand Auger** BY: **D. GITHENS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Soft, dry, grayish brown, Sandy CLAY			
				CL	**YOUNG ALLUVIUM (Qya)** Firm, damp to moist, grayish brown, Sandy CLAY			
					HAND AUGER TERMINATED AT 1.5 FEET No groundwater			

Figure A-15,
Log of Infiltration I 15, Page 1 of 1

06930-52-013A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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APPENDIX B

APPENDIX B

LABORATORY TESTING

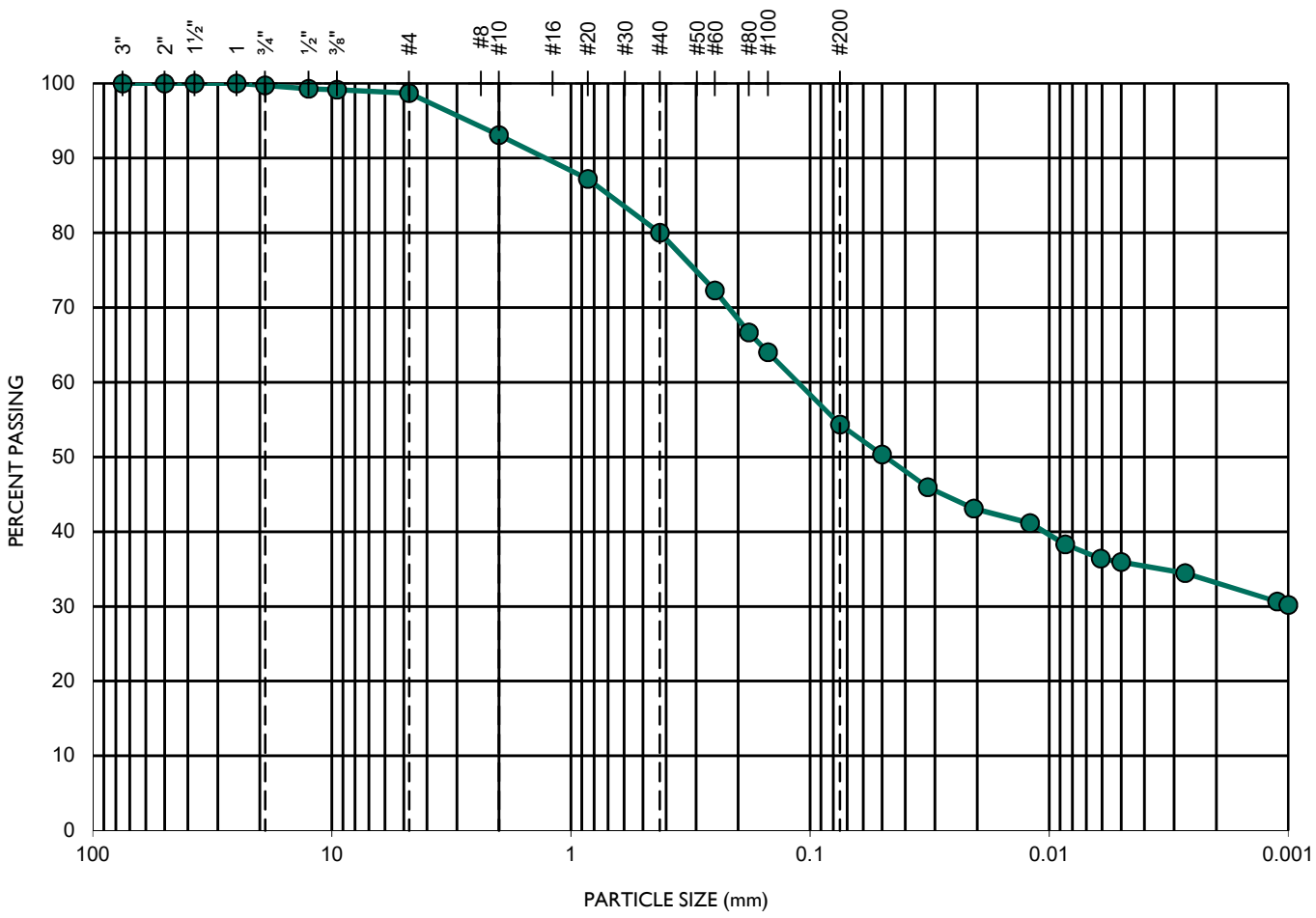
We performed laboratory tests in accordance with generally currently accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for grain size analyses as shown herein.

SAMPLE NO.: **11-1**

SAMPLE DEPTH (FT.): **0.5'-2'**

GEOLOGIC UNIT: **Qya**

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
--	0.00096	0.11878	--	--	Sandy CLAY

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OTAY VALLEY

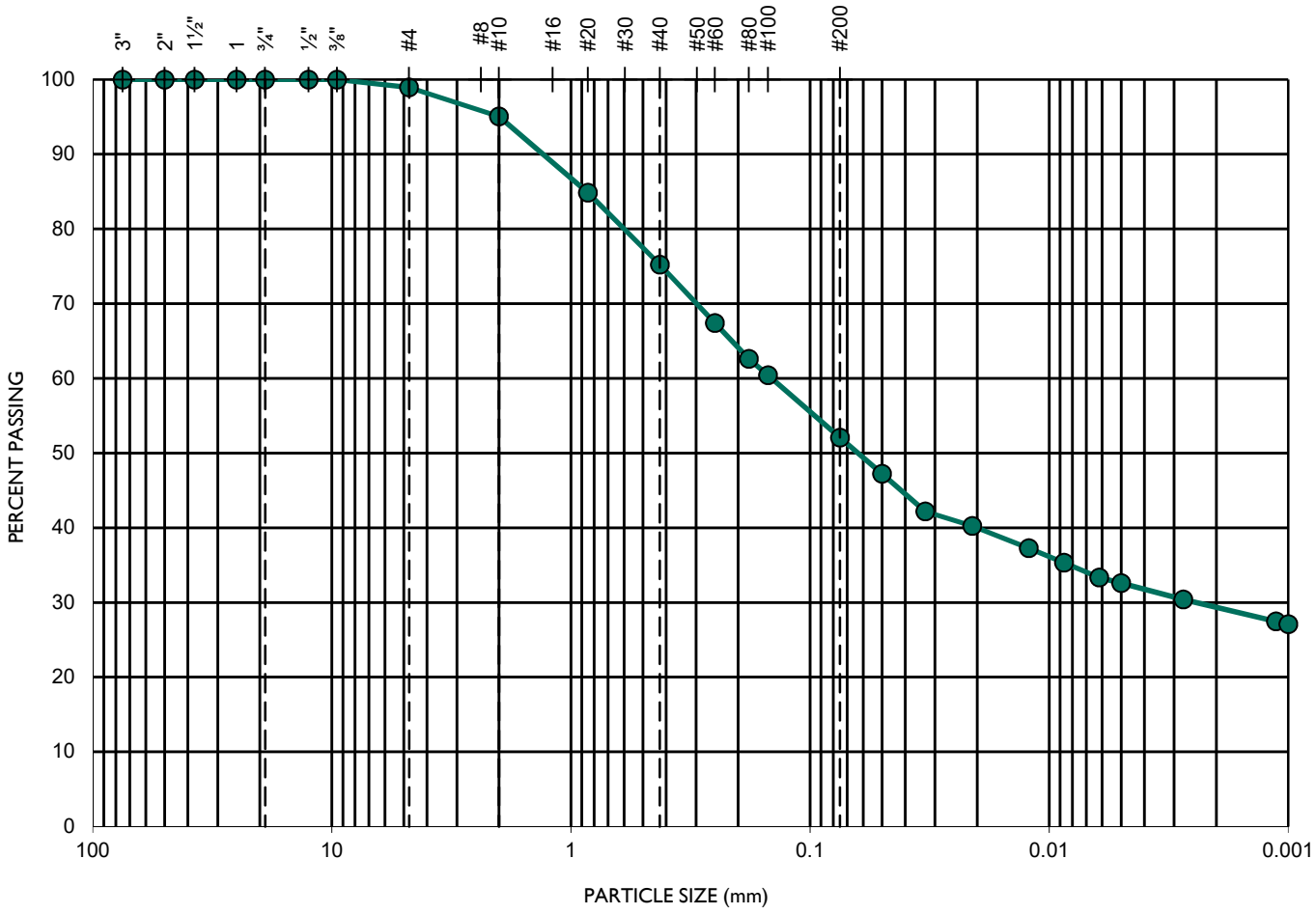
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **I2-1** GEOLOGIC UNIT: **Qya**

SAMPLE DEPTH (FT.): **1'-2'**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.00252	0.14616	--	--	Sandy CLAY

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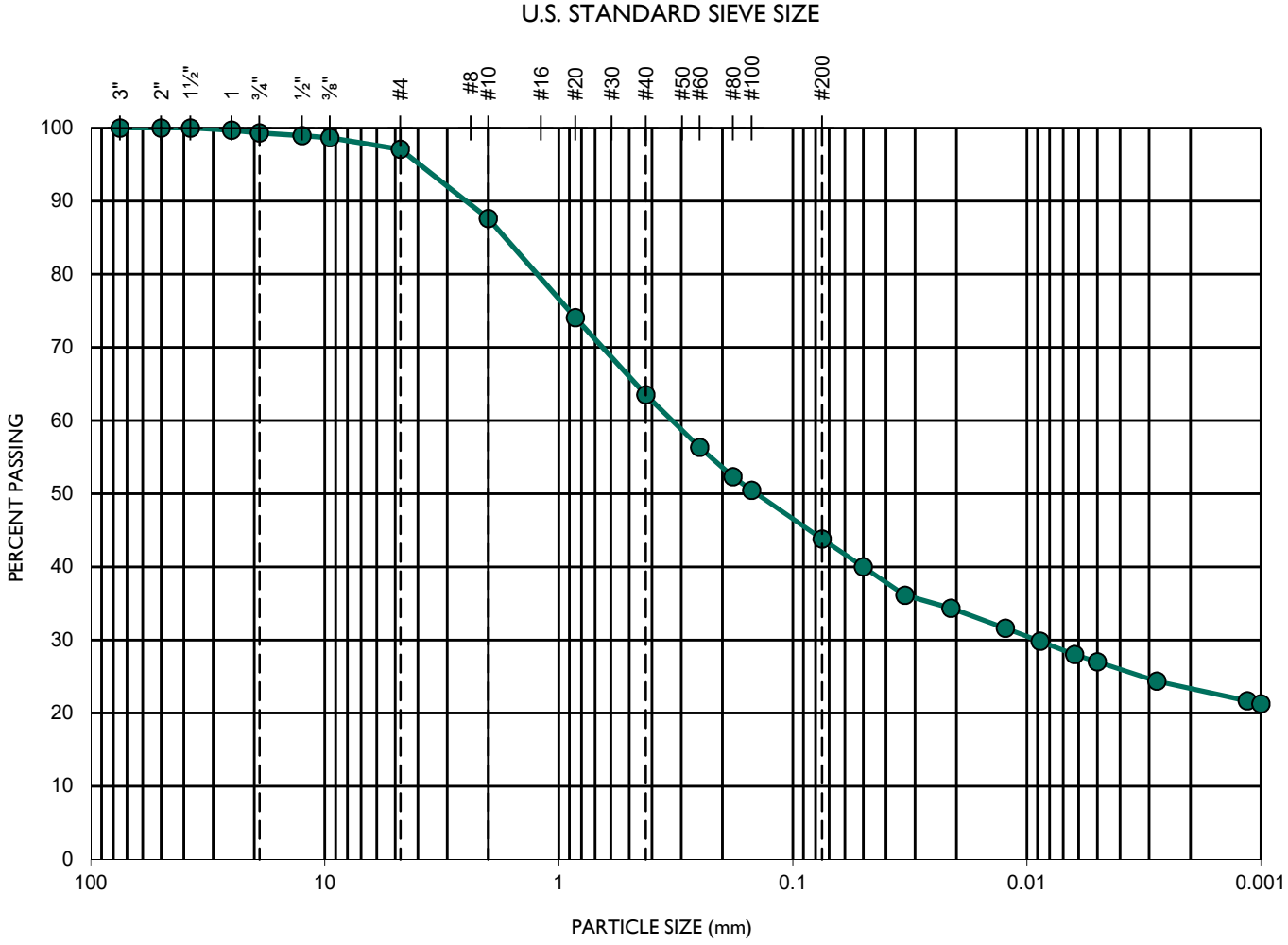
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **I3-1** GEOLOGIC UNIT: **Qya**

SAMPLE DEPTH (FT.): **1.5'-4.5'**

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
--	0.00917	0.33914	--	--	Clayey SAND

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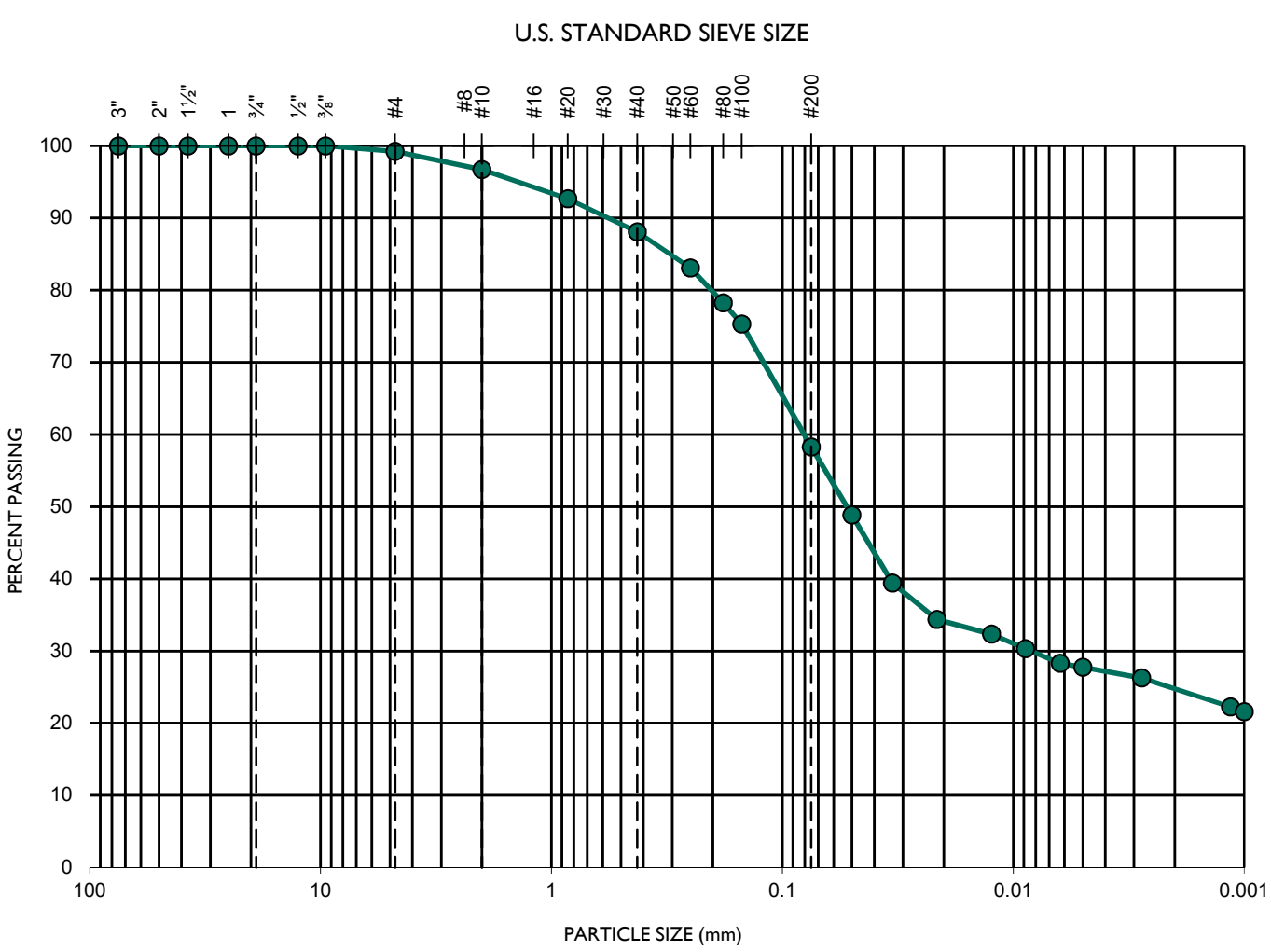
OTAY VALLEY

PROJECT NO.: 6930-52-13A

SAMPLE NO.: **16-1** GEOLOGIC UNIT: **Qya**

SAMPLE DEPTH (FT.): **1'-2.5'**

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
--	0.00843	0.08261	--	--	Sandy CLAY

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OTAY VALLEY

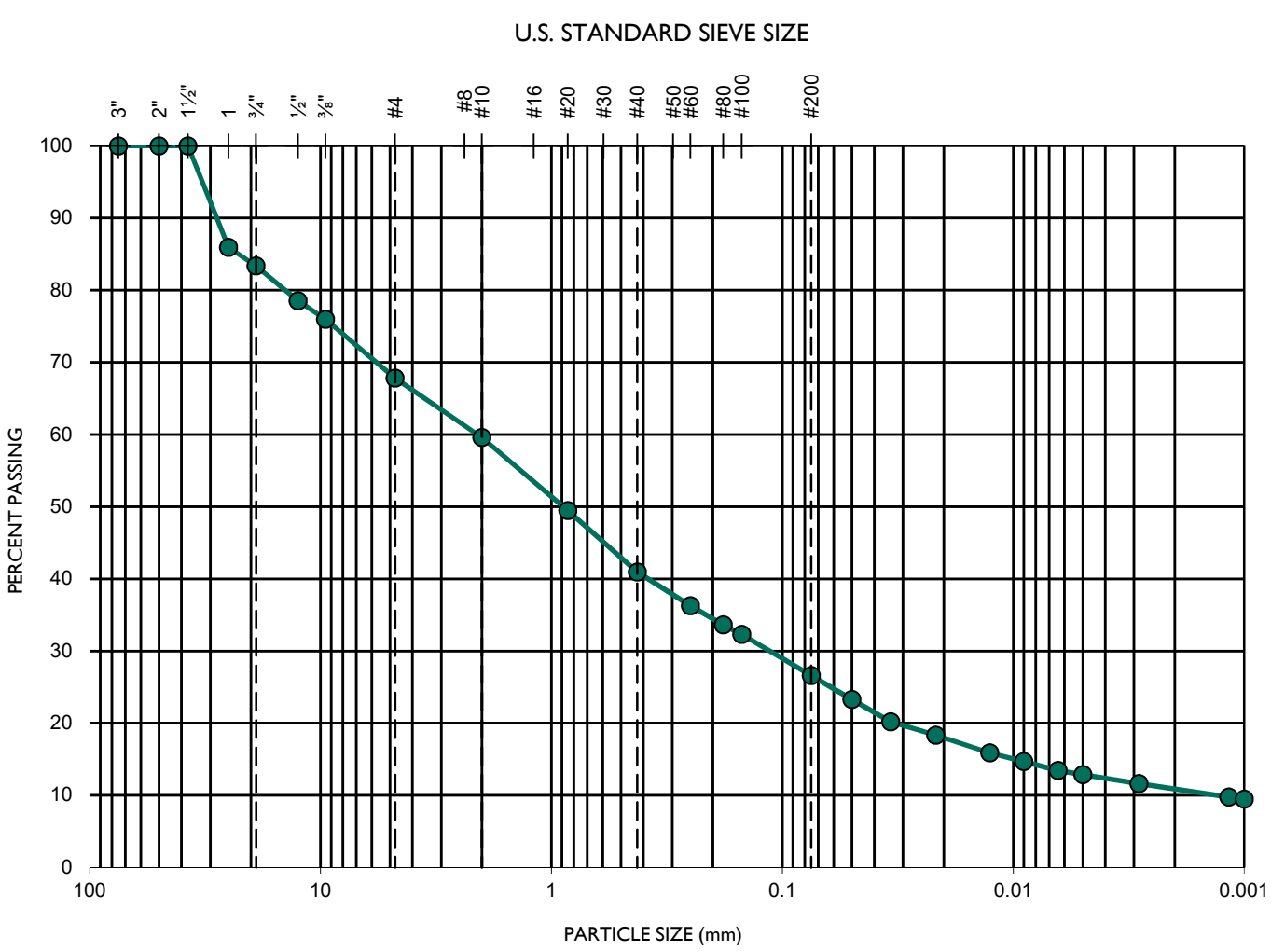
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **I7-1**

SAMPLE DEPTH (FT.): **0.5'-1.5'**

GEOLOGIC UNIT: **Qya**

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
0.00137	0.11966	2.13997	4.9	1559.9	Silty SAND

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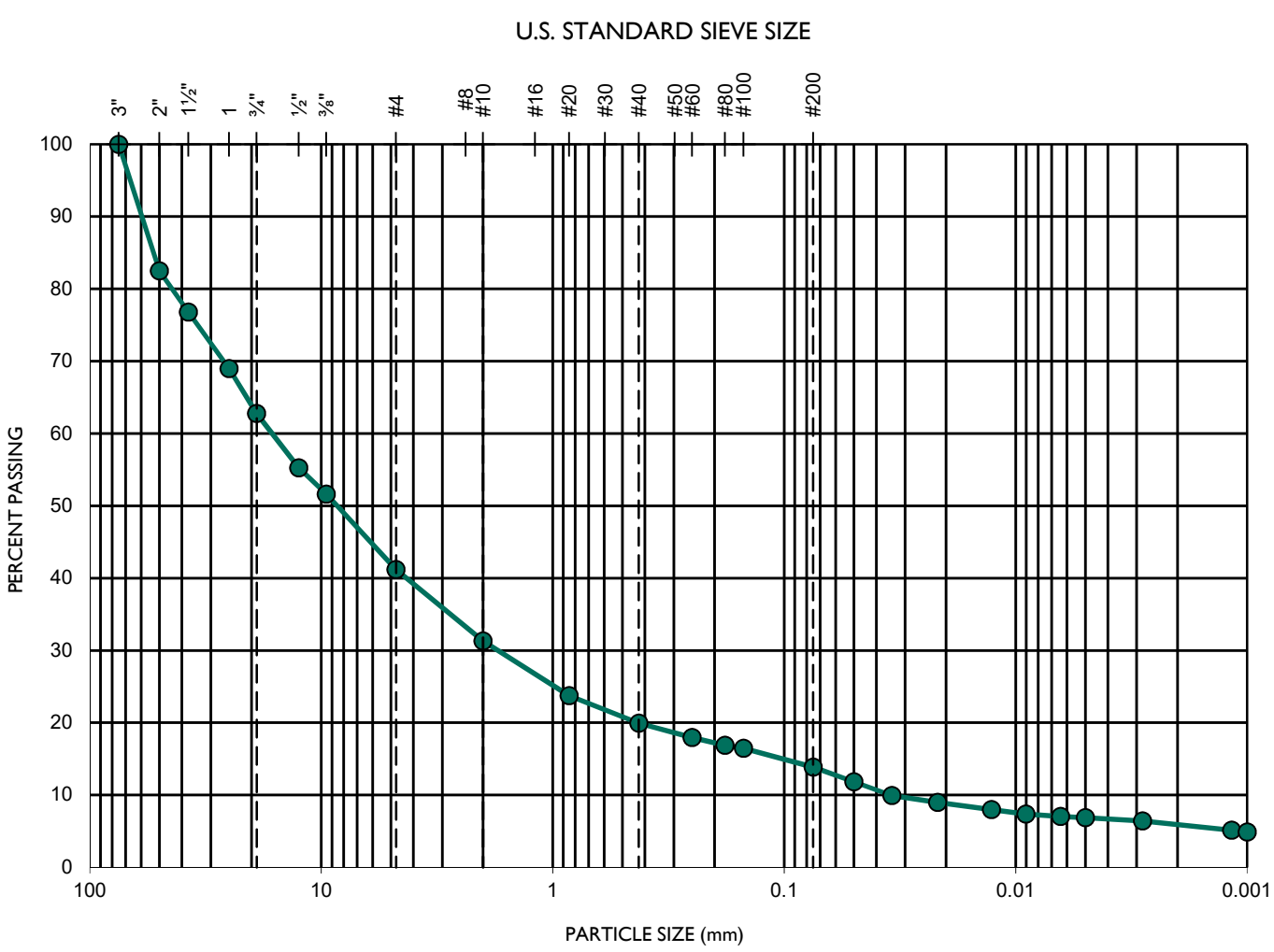
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **I8-1**

SAMPLE DEPTH (FT.): **2'-3'**

GEOLOGIC UNIT: **Qya**

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
0.03483	1.80262	16.60861	5.6	476.9	Silty SAND

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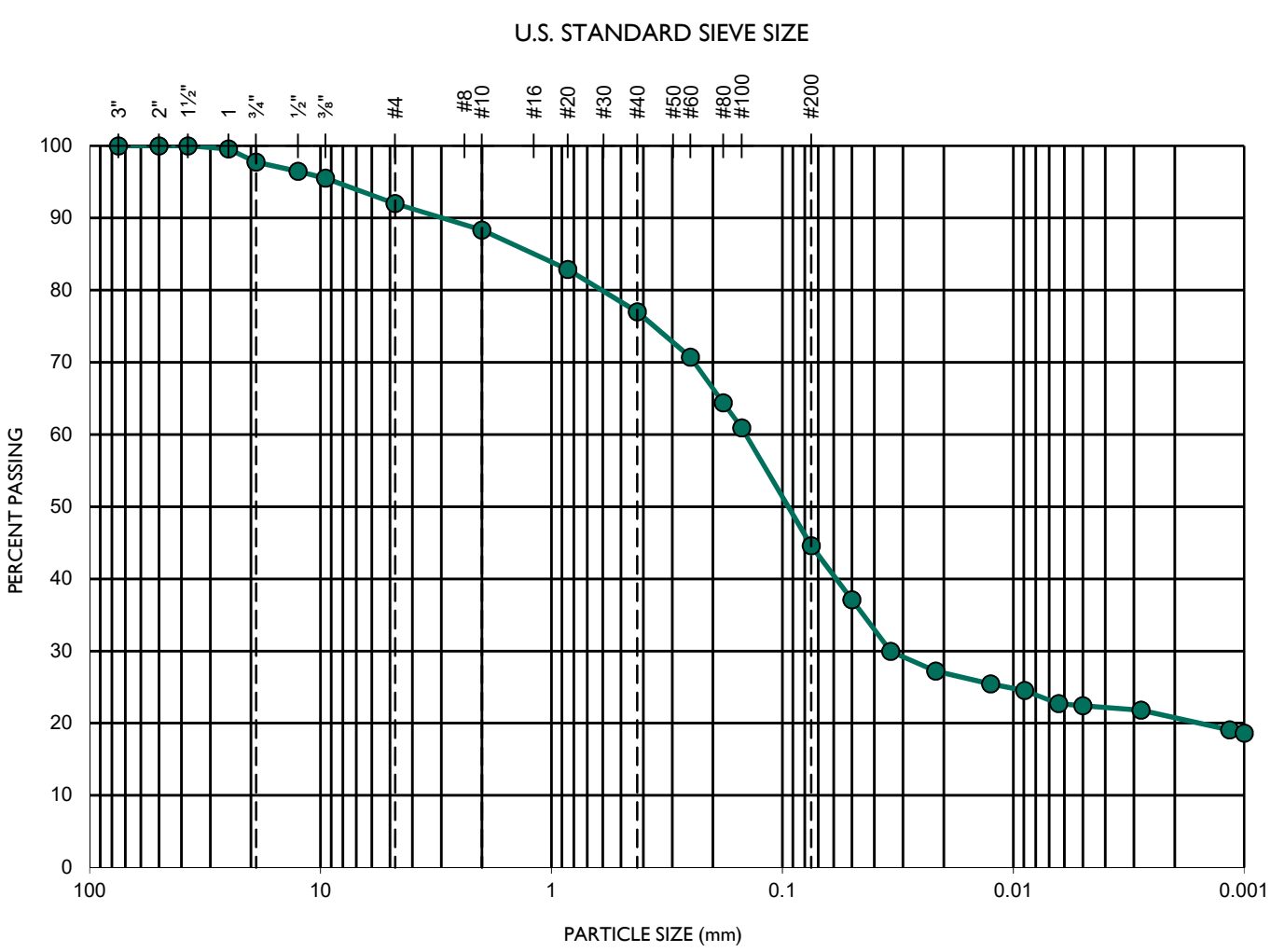
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **19-1**

SAMPLE DEPTH (FT.): **1'-1.5'**

GEOLOGIC UNIT: **Qya**

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
--	0.03406	0.14574	--	--	Sandy Silty CLAY

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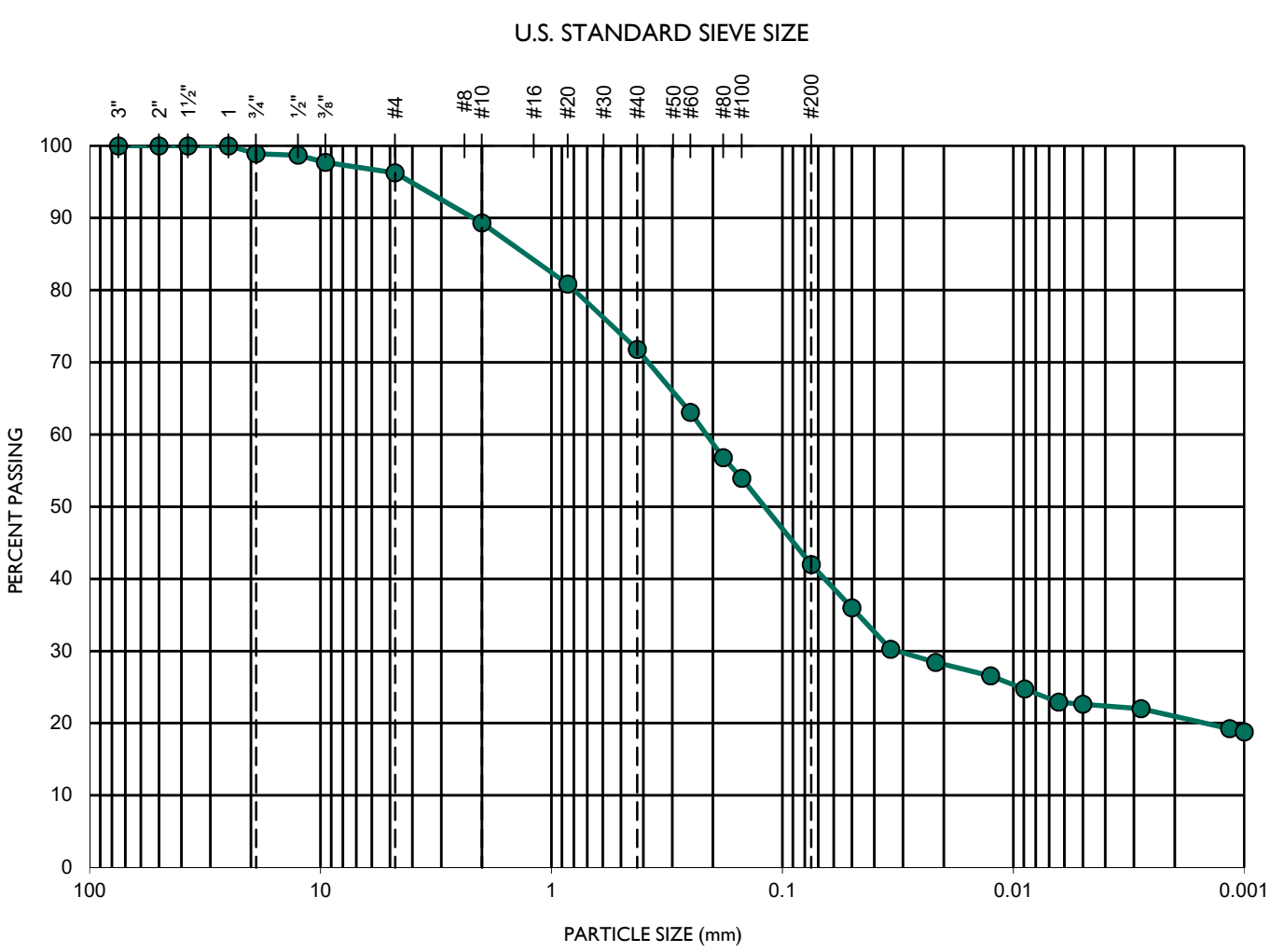
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **110-1**

SAMPLE DEPTH (FT.): **1'-2'**

GEOLOGIC UNIT: **Qya**

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
--	0.03242	0.21591	--	--	Clayey SAND

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PROJECT NO.: 6930-52-13A

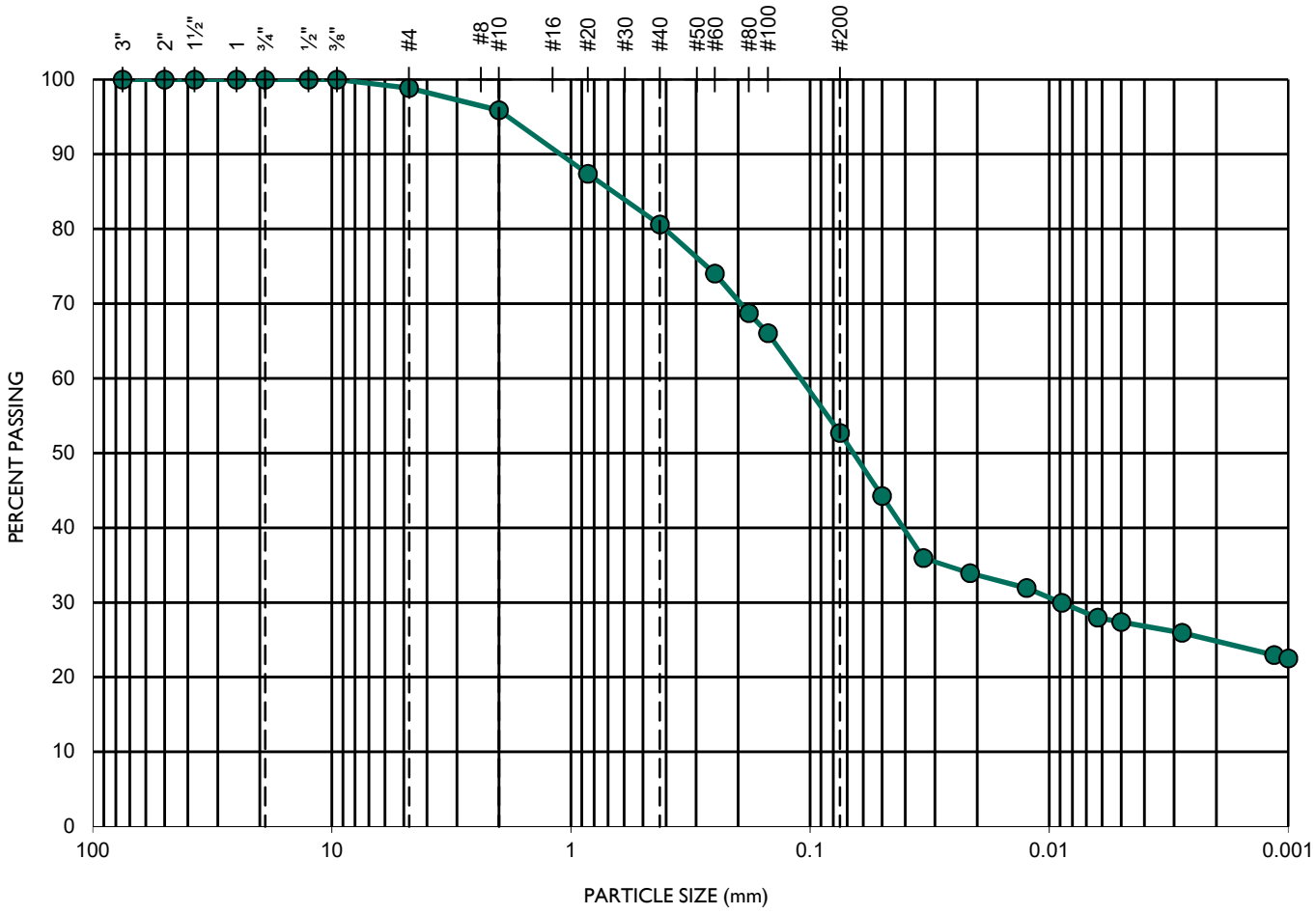
SAMPLE NO.: **111-1**

SAMPLE DEPTH (FT.): **0.5'-1.5'**

GEOLOGIC UNIT: **Qya**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.00895	0.11613	--	--	Sandy CLAY

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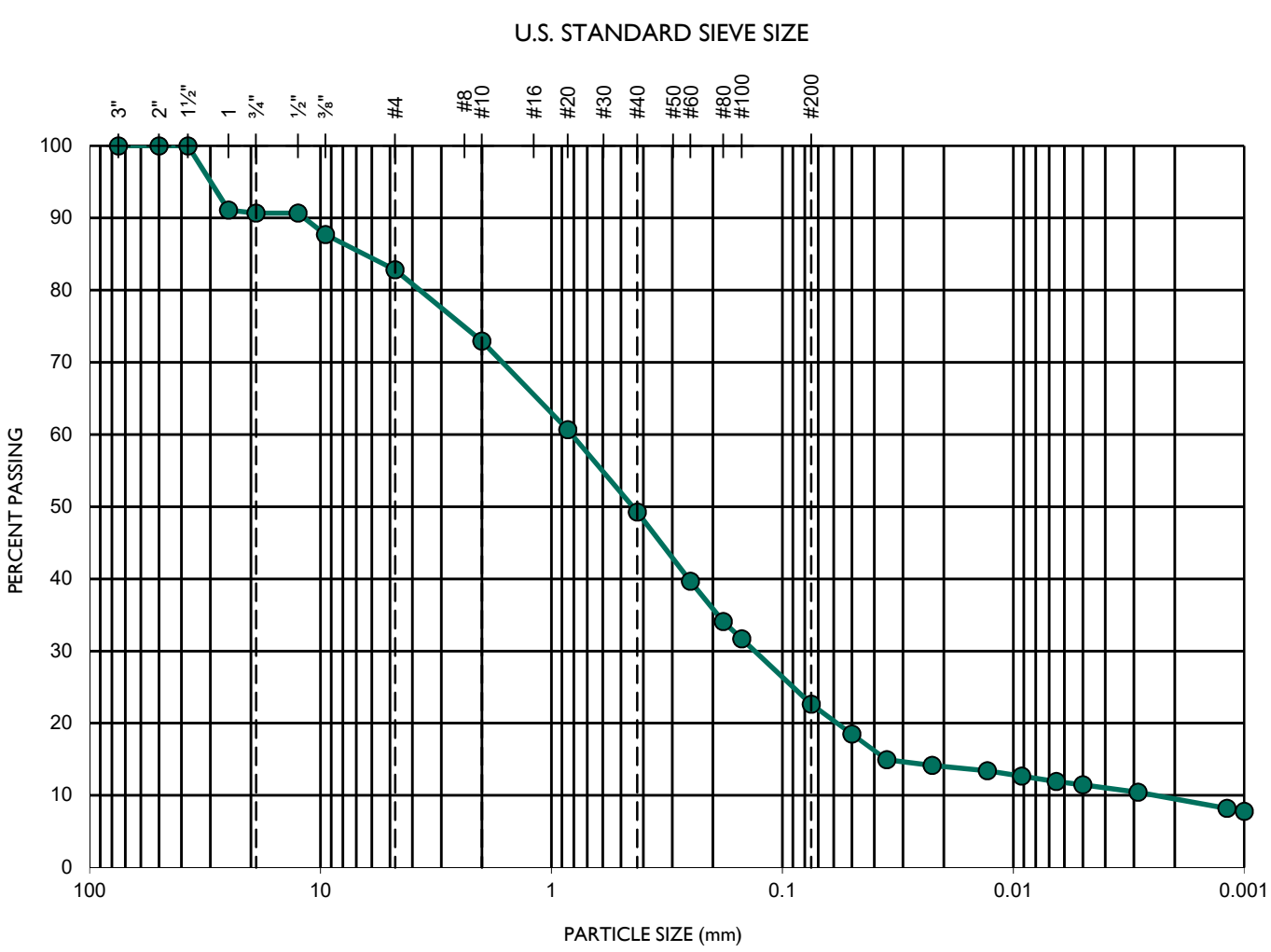
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **111-2**

SAMPLE DEPTH (FT.): **3.5'-4.5'**

GEOLOGIC UNIT: **Qya**

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
0.00255	0.13611	0.82558	8.8	324.0	Silty SAND

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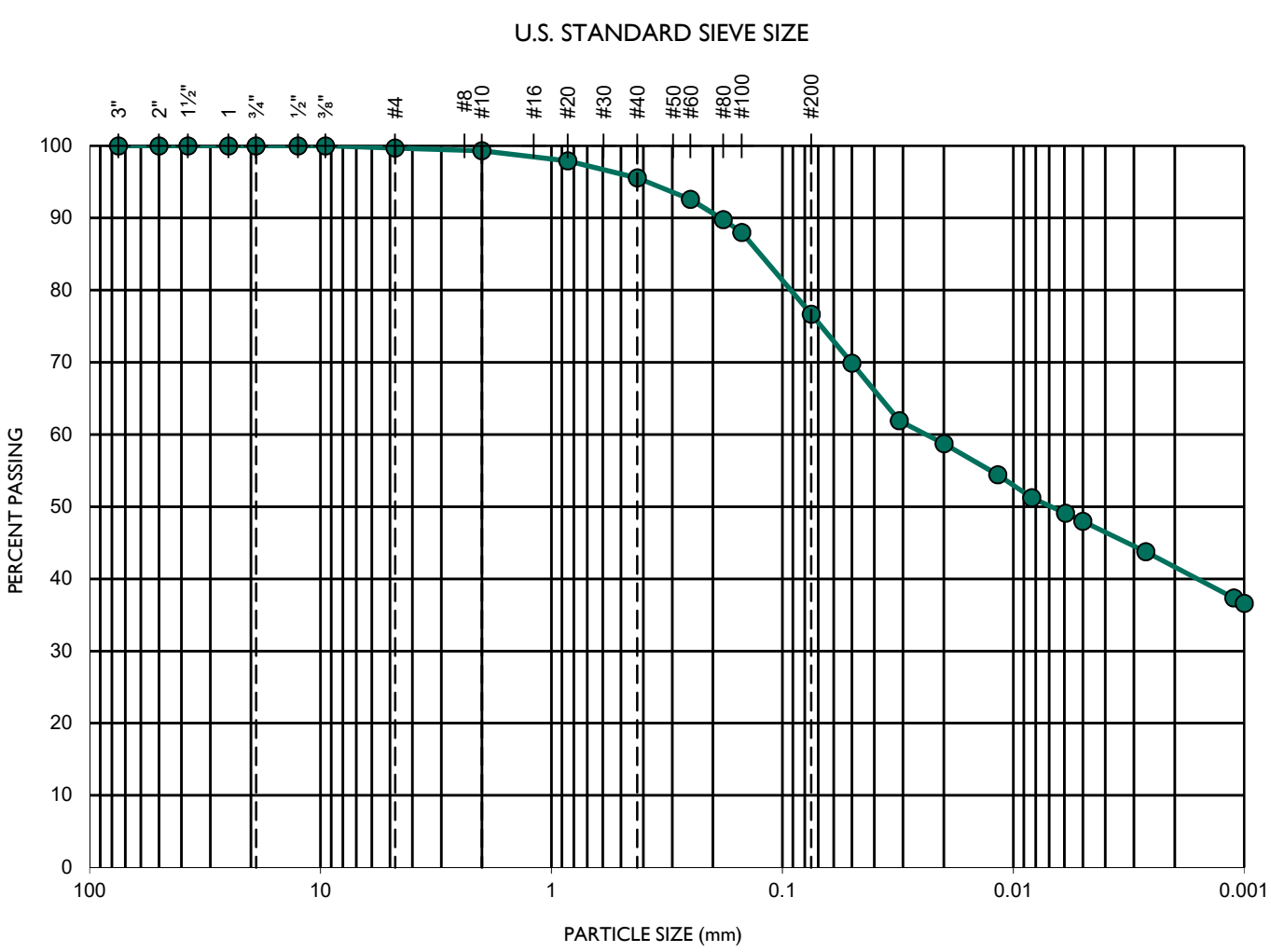
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **112-1**

SAMPLE DEPTH (FT.): **0.5'-1.5'**

GEOLOGIC UNIT: **Qya**

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
--	0.00005	0.02445	--	--	CLAY with sand

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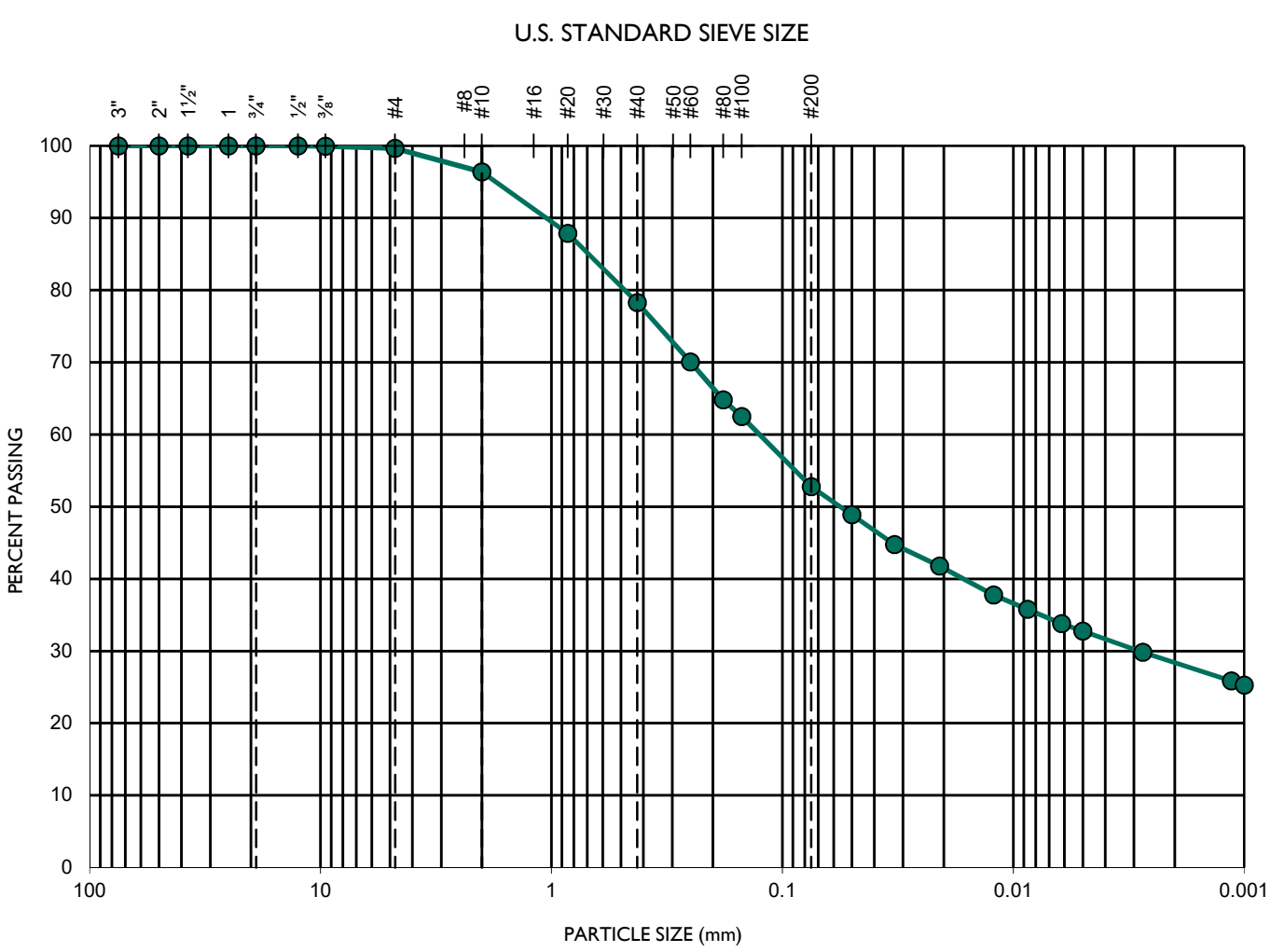
PROJECT NO.: 6930-52-13A

SAMPLE NO.: **113-1**

SAMPLE DEPTH (FT.): **1'-2'**

GEOLOGIC UNIT: **Qya**

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
--	0.00289	0.13080	--	--	Sandy CLAY

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PROJECT NO.: 6930-52-13A

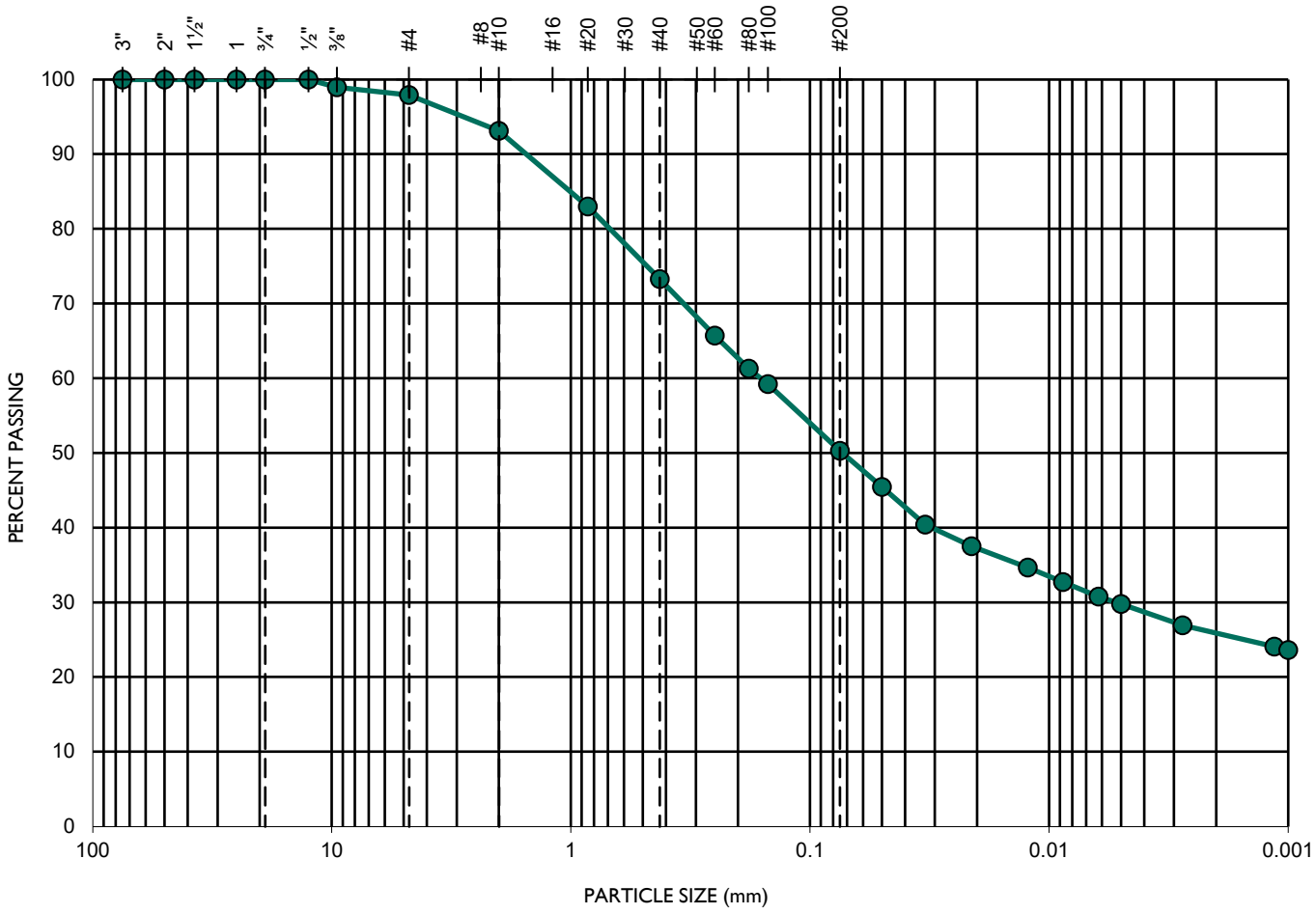
SAMPLE NO.: **114-1**

SAMPLE DEPTH (FT.): **0-1'**

GEOLOGIC UNIT: **Qtop**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.00528	0.16142	--	--	Sandy CLAY

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PROJECT NO.: 6930-52-13A

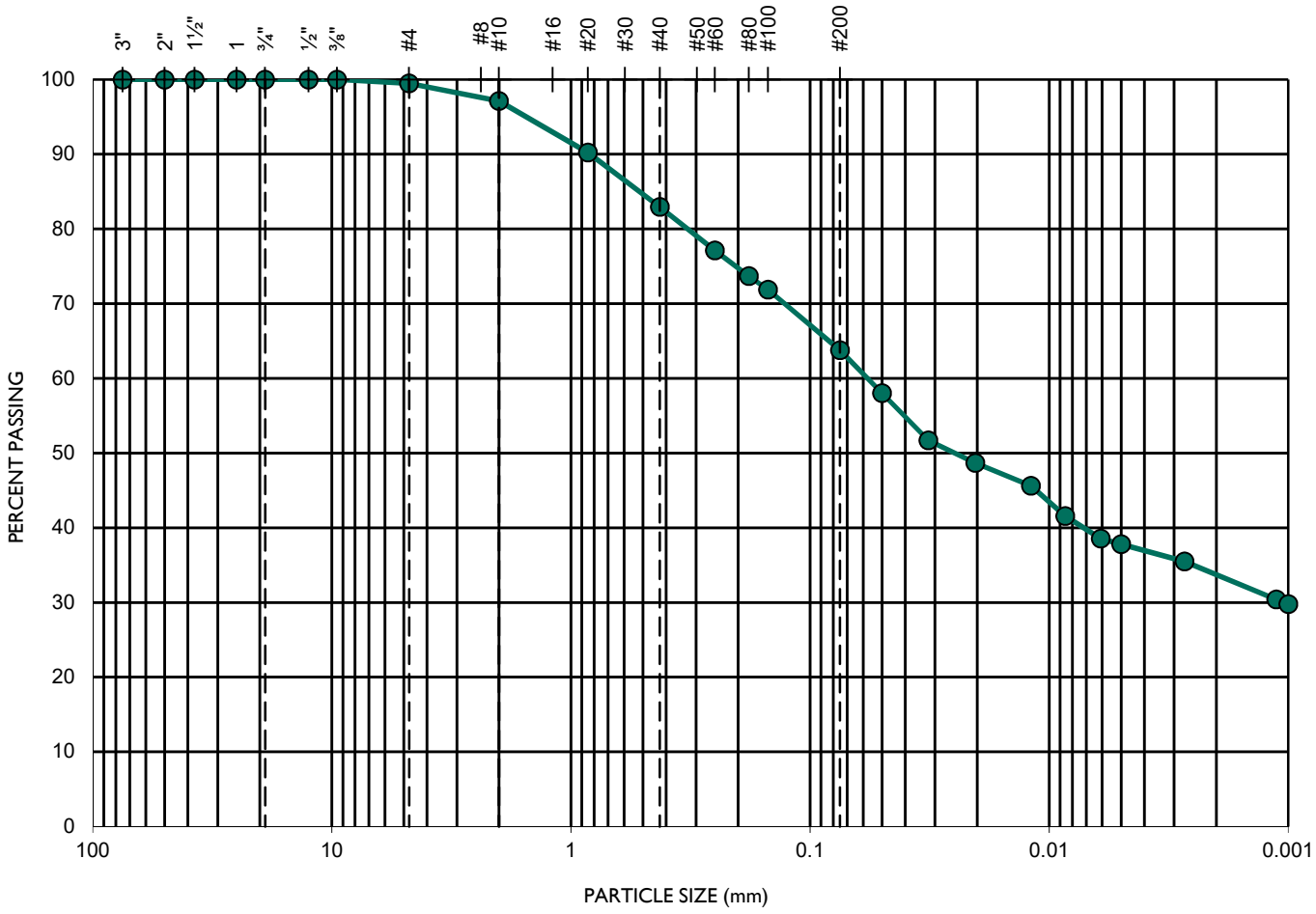
SAMPLE NO.: **114-2**

SAMPLE DEPTH (FT.): **2'-3'**

GEOLOGIC UNIT: **Qya**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.00104	0.05861	--	--	Sandy CLAY

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OTAY VALLEY

PROJECT NO.: 6930-52-13A

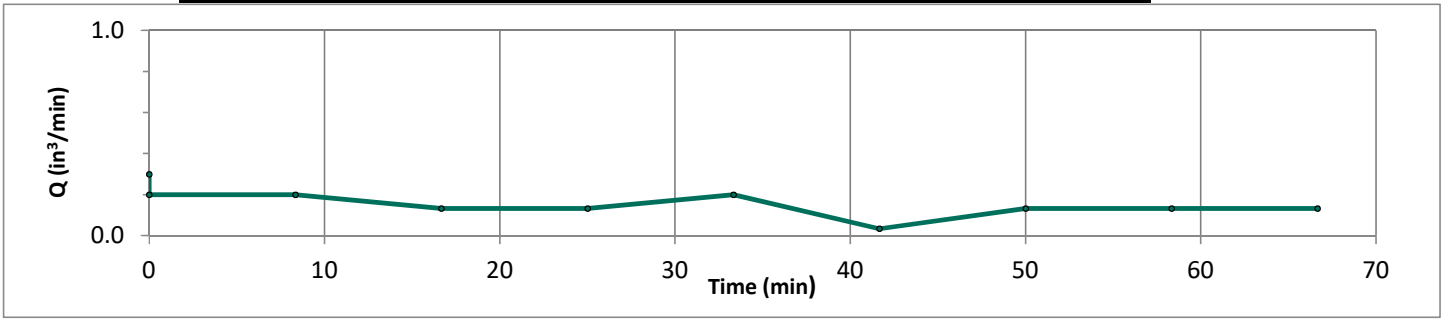
TEST NO.: **I-1**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **270**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	1.2
TEST/BOTTOM ELEVATION (MSL, FT):	269
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.6
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**0.126**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.032**
FACTORED INFILTRATION RATE (IN/HR):	**0.016**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
3	8.33	0.090	2.49	0.299
4	8.33	0.060	1.66	0.199
5	8.33	0.060	1.66	0.199
6	8.33	0.040	1.11	0.133
7	8.33	0.040	1.11	0.133
8	8.33	0.060	1.66	0.199
9	8.33	0.010	0.28	0.033
10	8.33	0.040	1.11	0.133
11	8.33	0.040	1.11	0.133
12	8.33	0.040	1.11	0.133

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

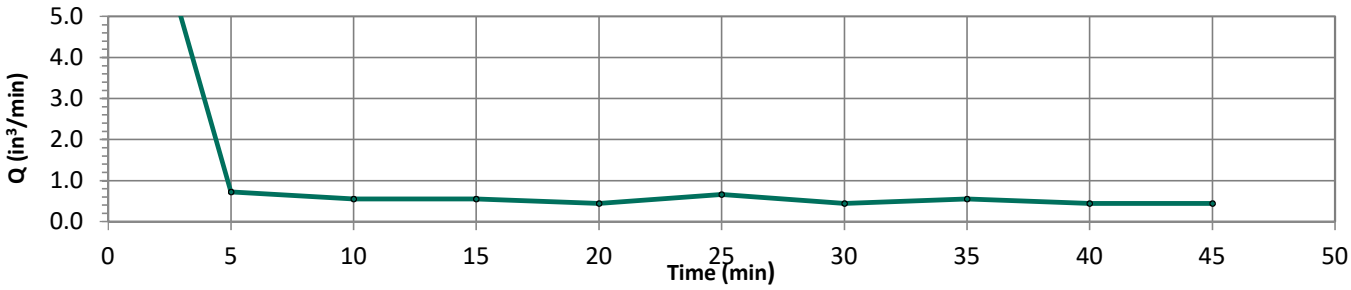
TEST NO.: **I-2**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **263**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	2.5
TEST/BOTTOM ELEVATION (MSL, FT):	261
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.9
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN^3/MIN):	**0.443**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.113**
FACTORED INFILTRATION RATE (IN/HR):	**0.057**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	2.020	55.94	11.188
3	5.00	0.130	3.60	0.720
4	5.00	0.100	2.77	0.554
5	5.00	0.100	2.77	0.554
6	5.00	0.080	2.22	0.443
7	5.00	0.120	3.32	0.665
8	5.00	0.080	2.22	0.443
9	5.00	0.100	2.77	0.554
10	5.00	0.080	2.22	0.443
11	5.00	0.080	2.22	0.443
12	5.00	0.080	2.22	0.443
13	5.00	0.080	2.22	0.443

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

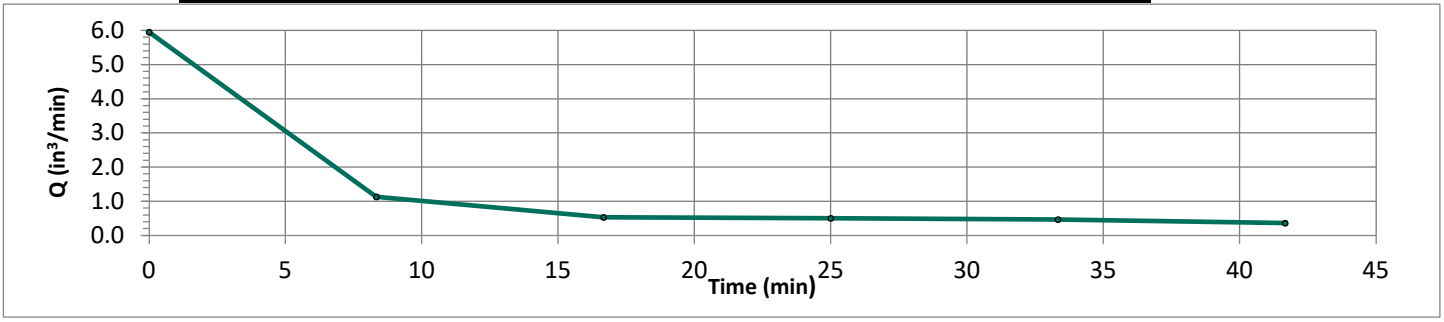
TEST NO.: **I-3**

GEOLOGIC UNIT: **Qoal**

EXCAVATION ELEVATION (MSL, FT): **263**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	0.7
TEST/BOTTOM ELEVATION (MSL, FT):	262
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.5
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**0.299**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.076**
FACTORED INFILTRATION RATE (IN/HR):	**0.038**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
6	8.33	1.790	49.57	5.948
7	8.33	0.340	9.42	1.130
8	8.33	0.160	4.43	0.532
9	8.33	0.150	4.15	0.498
10	8.33	0.140	3.88	0.465
11	8.33	0.110	3.05	0.366
12	8.33	0.080	2.22	0.266
13	8.33	0.080	2.22	0.266

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

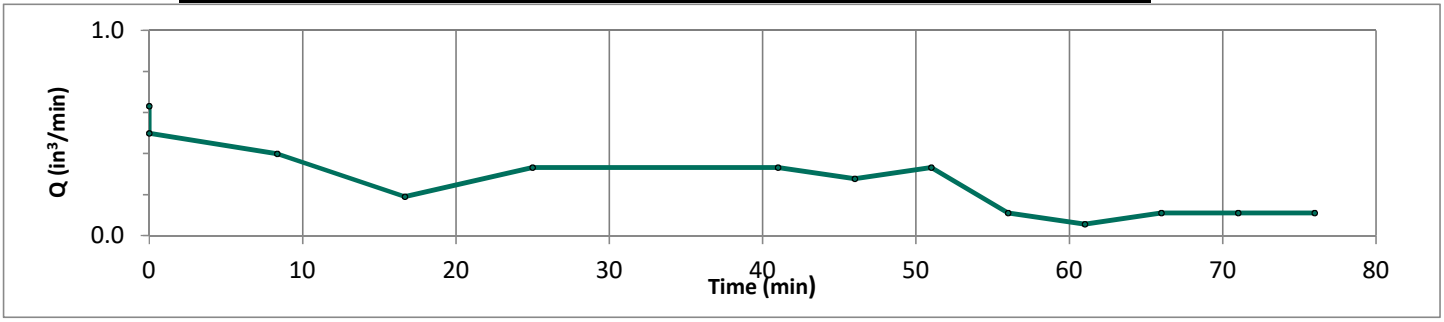
TEST NO.: **I-5**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **255**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	1.2
TEST/BOTTOM ELEVATION (MSL, FT):	254
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.5
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**0.111**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.028**
FACTORED INFILTRATION RATE (IN/HR):	**0.014**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
3	8.33	0.190	5.26	0.631
4	8.33	0.150	4.15	0.498
5	8.33	0.120	3.32	0.399
6	16.00	0.110	3.05	0.190
8	5.00	0.060	1.66	0.332
9	5.00	0.060	1.66	0.332
10	5.00	0.050	1.38	0.277
11	5.00	0.060	1.66	0.332
12	5.00	0.020	0.55	0.111
13	5.00	0.010	0.28	0.055
14	5.00	0.020	0.55	0.111
15	5.00	0.020	0.55	0.111
16	5.00	0.020	0.55	0.111

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

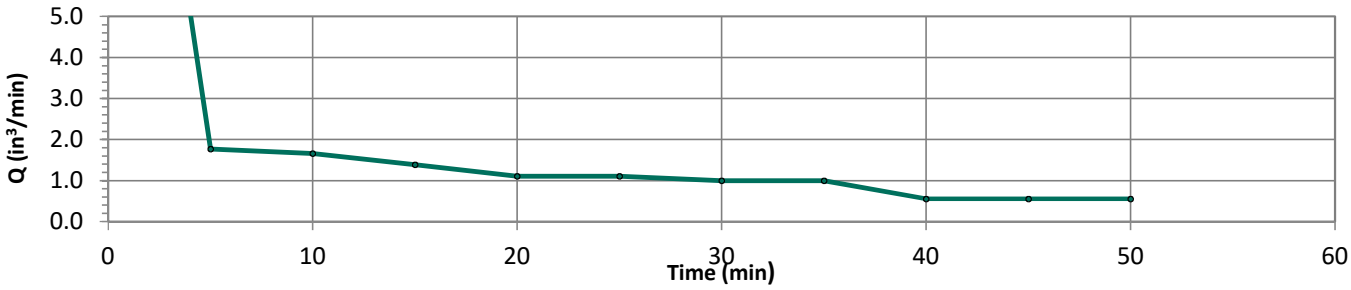
TEST NO.: **I-6**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **255**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	1.0
TEST/BOTTOM ELEVATION (MSL, FT):	254
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.6
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN^3/MIN):	**0.554**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.141**
FACTORED INFILTRATION RATE (IN/HR):	**0.071**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	3.330	92.22	18.443
3	5.00	0.320	8.86	1.772
4	5.00	0.300	8.31	1.662
5	5.00	0.250	6.92	1.385
6	5.00	0.200	5.54	1.108
7	5.00	0.200	5.54	1.108
8	5.00	0.180	4.98	0.997
9	5.00	0.180	4.98	0.997
10	5.00	0.100	2.77	0.554
11	5.00	0.100	2.77	0.554
12	5.00	0.100	2.77	0.554

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

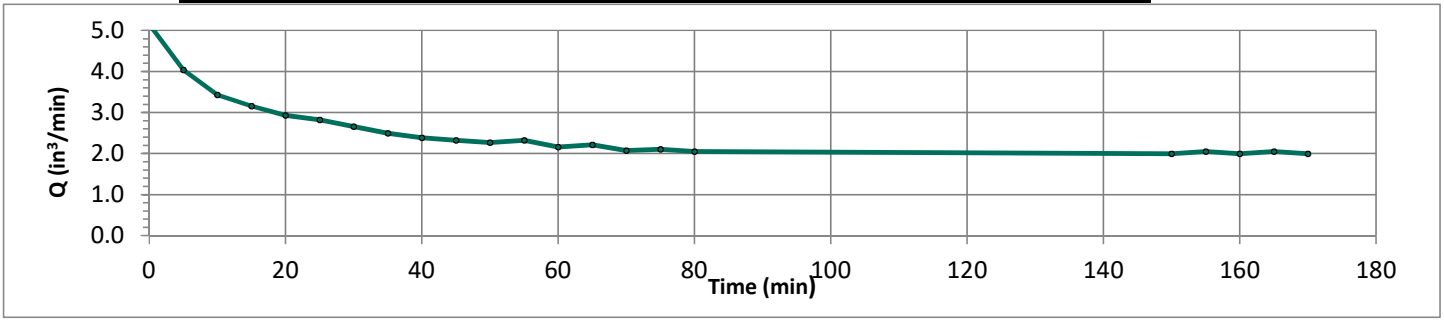
TEST NO.: **I-7**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **245**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	0.8
TEST/BOTTOM ELEVATION (MSL, FT):	244
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.6
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**2.022**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.516**
FACTORED INFILTRATION RATE (IN/HR):	**0.258**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
1	0.00	0.000	0.00	0.00
2	5.00	0.930	25.75	5.151
3	5.00	0.730	20.22	4.043
4	5.00	0.620	17.17	3.434
5	5.00	0.570	15.78	3.157
6	5.00	0.530	14.68	2.935
7	5.00	0.510	14.12	2.825
9	5.00	0.480	13.29	2.658
11	5.00	0.450	12.46	2.492
12	5.00	0.430	11.91	2.382
13	5.00	0.420	11.63	2.326
14	5.00	0.410	11.35	2.271
15	5.00	0.420	11.63	2.326
16	5.00	0.390	10.80	2.160
17	5.00	0.400	11.08	2.215
18	70.00	5.240	145.11	2.073
19	5.00	0.380	10.52	2.105
20	5.00	0.370	10.25	2.049
21	5.00	0.360	9.97	1.994
22	5.00	0.370	10.25	2.049
23	5.00	0.360	9.97	1.994
24	5.00	0.370	10.25	2.049
25	5.00	0.360	9.97	1.994

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

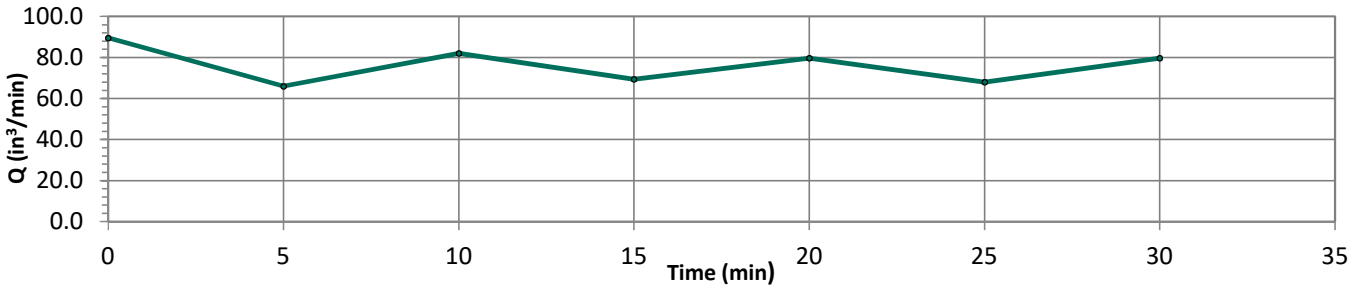
TEST NO.: **I-8**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **252**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	3.0
TEST/BOTTOM ELEVATION (MSL, FT):	249
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	5.0
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN^3/MIN):	**19.980**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**5.102**
FACTORED INFILTRATION RATE (IN/HR):	**2.551**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	16.170	447.78	89.557
3	5.00	11.920	330.09	66.018
5	5.00	14.800	409.85	81.969
6	5.00	12.530	346.98	69.397
8	5.00	14.400	398.77	79.754
9	5.00	12.270	339.78	67.957
11	5.00	14.390	398.49	79.698
12	5.00	12.240	338.95	67.791
14	5.00	14.490	401.26	80.252

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

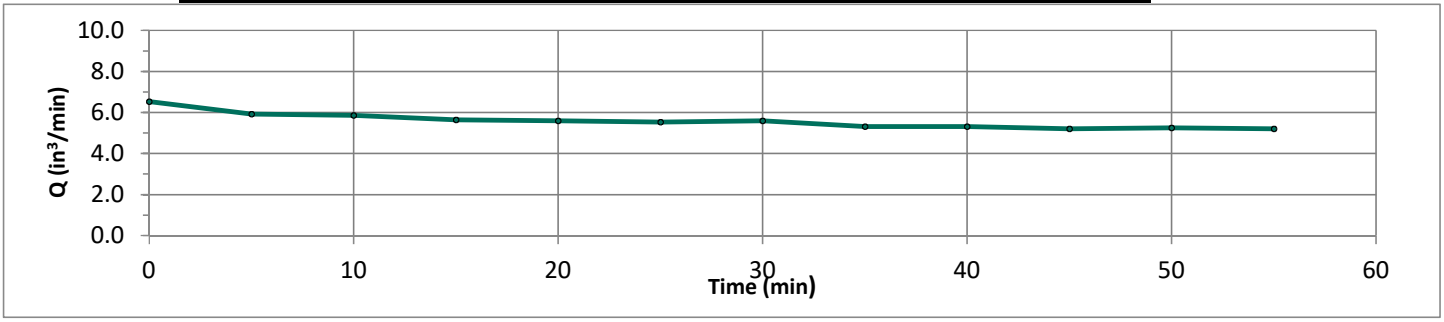
TEST NO.: **I-9**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **251**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	3.0
TEST/BOTTOM ELEVATION (MSL, FT):	248
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	5.0
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**5.225**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**1.334**
FACTORED INFILTRATION RATE (IN/HR):	**0.667**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
1	0.00	0.000	0.00	0.00
2	5.00	1.180	32.68	6.535
3	5.00	1.070	29.63	5.926
4	5.00	1.060	29.35	5.871
5	5.00	1.020	28.25	5.649
6	5.00	1.010	27.97	5.594
7	5.00	1.000	27.69	5.538
8	5.00	1.010	27.97	5.594
9	5.00	0.960	26.58	5.317
10	5.00	0.960	26.58	5.317
11	5.00	0.940	26.03	5.206
12	5.00	0.950	26.31	5.262
13	5.00	0.940	26.03	5.206
14	7.23	0.420	11.63	1.608

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

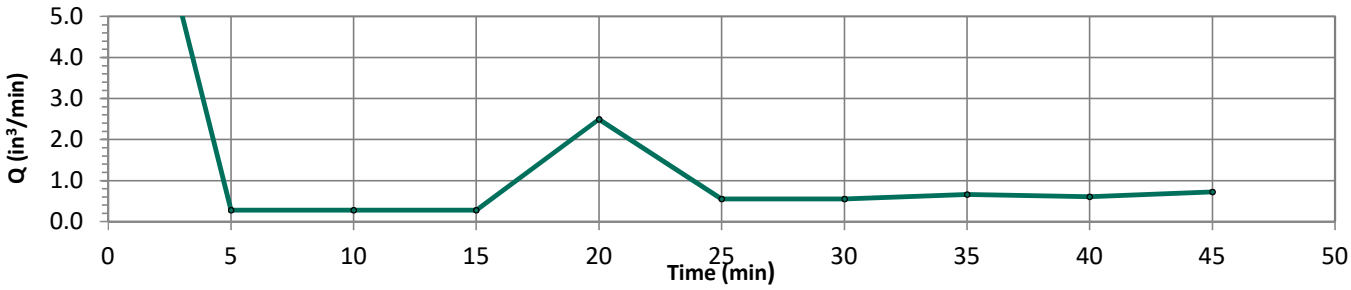
TEST NO.: **I-10**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **247**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	3.0
TEST/BOTTOM ELEVATION (MSL, FT):	244
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	5.0
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN^3/MIN):	**0.877**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.224**
FACTORED INFILTRATION RATE (IN/HR):	**0.112**



TEST DATA

Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	2.200	60.92	12.185
3	5.00	0.050	1.38	0.277
4	5.00	0.050	1.38	0.277
5	5.00	0.050	1.38	0.277
6	5.00	0.450	12.46	2.492
7	5.00	0.100	2.77	0.554
8	5.00	0.100	2.77	0.554
9	5.00	0.120	3.32	0.665
10	5.00	0.110	3.05	0.609
11	5.00	0.130	3.60	0.720
12	5.00	0.140	3.88	0.775
13	5.00	0.230	6.37	1.274
14	5.00	0.120	3.32	0.665
15	5.00	0.220	6.09	1.218

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

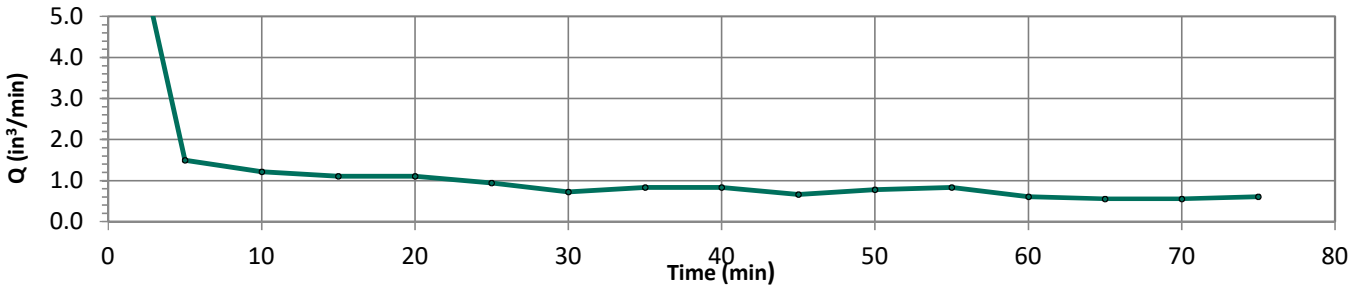
TEST NO.: **I-11**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **250**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	1.5
TEST/BOTTOM ELEVATION (MSL, FT):	249
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.7
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN^3/MIN):	**0.572**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.146**
FACTORED INFILTRATION RATE (IN/HR):	**0.073**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	1.790	49.57	9.914
3	5.00	0.270	7.48	1.495
4	5.00	0.220	6.09	1.218
5	5.00	0.200	5.54	1.108
6	5.00	0.200	5.54	1.108
7	5.00	0.170	4.71	0.942
8	5.00	0.130	3.60	0.720
9	5.00	0.150	4.15	0.831
10	5.00	0.150	4.15	0.831
11	5.00	0.120	3.32	0.665
12	5.00	0.140	3.88	0.775
13	5.00	0.150	4.15	0.831
14	5.00	0.110	3.05	0.609
15	5.00	0.100	2.77	0.554
16	5.00	0.100	2.77	0.554
17	5.00	0.110	3.05	0.609

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

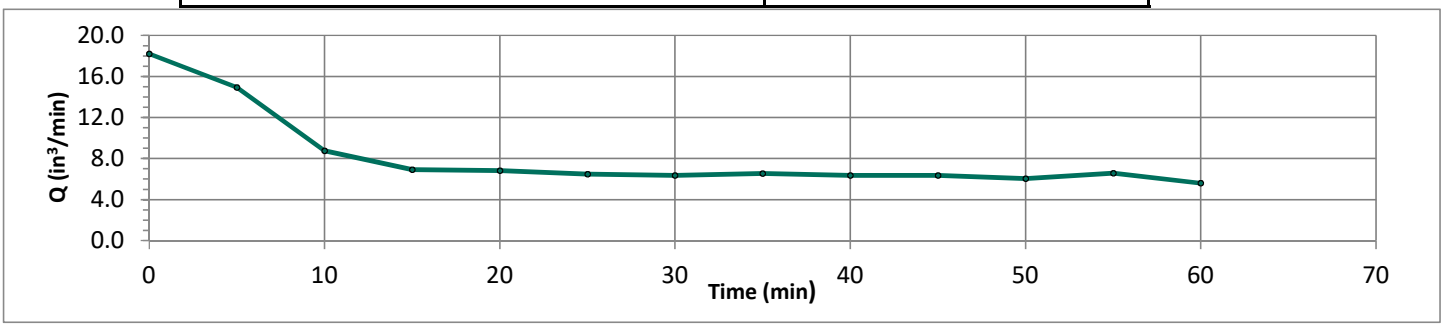
TEST NO.: **I-12**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **250**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	1.0
TEST/BOTTOM ELEVATION (MSL, FT):	249
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.6
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**6.074**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**1.551**
FACTORED INFILTRATION RATE (IN/HR):	**0.776**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
1	0.00	0.000	0.00	0.00
2	5.00	3.290	91.11	18.222
3	5.00	2.700	74.77	14.954
4	5.00	1.580	43.75	8.751
8	5.00	1.250	34.62	6.923
9	5.00	1.230	34.06	6.812
10	5.00	1.170	32.40	6.480
11	5.00	1.150	31.85	6.369
12	5.00	1.180	32.68	6.535
13	5.00	1.150	31.85	6.369
14	5.00	1.150	31.85	6.369
15	5.00	1.090	30.18	6.037
16	5.00	1.190	32.95	6.591
17	5.00	1.010	27.97	5.594
18	7.70	0.560	15.51	2.014

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

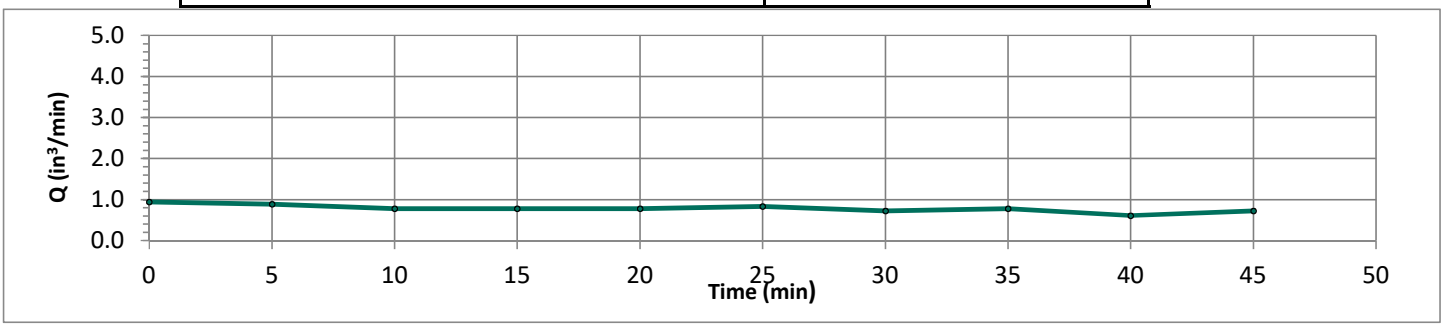
TEST NO.: **I-13**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **254**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	2.5
TEST/BOTTOM ELEVATION (MSL, FT):	252
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.9
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**0.443**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.113**
FACTORED INFILTRATION RATE (IN/HR):	**0.057**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
1	0.00	0.000	0.00	0.00
2	5.00	0.170	4.71	0.942
3	5.00	0.160	4.43	0.886
4	5.00	0.140	3.88	0.775
5	5.00	0.140	3.88	0.775
6	5.00	0.140	3.88	0.775
7	5.00	0.150	4.15	0.831
8	5.00	0.130	3.60	0.720
9	5.00	0.140	3.88	0.775
10	5.00	0.110	3.05	0.609
11	5.00	0.130	3.60	0.720
12	5.00	0.110	3.05	0.609
13	5.00	0.090	2.49	0.498
14	5.00	0.110	3.05	0.609
15	5.00	0.100	2.77	0.554
16	5.00	0.090	2.49	0.498
17	5.00	0.090	2.49	0.498
18	5.00	0.080	2.22	0.443
19	5.00	0.090	2.49	0.498
20	5.00	0.070	1.94	0.388
21	5.00	0.080	2.22	0.443
22	5.00	0.080	2.22	0.443

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

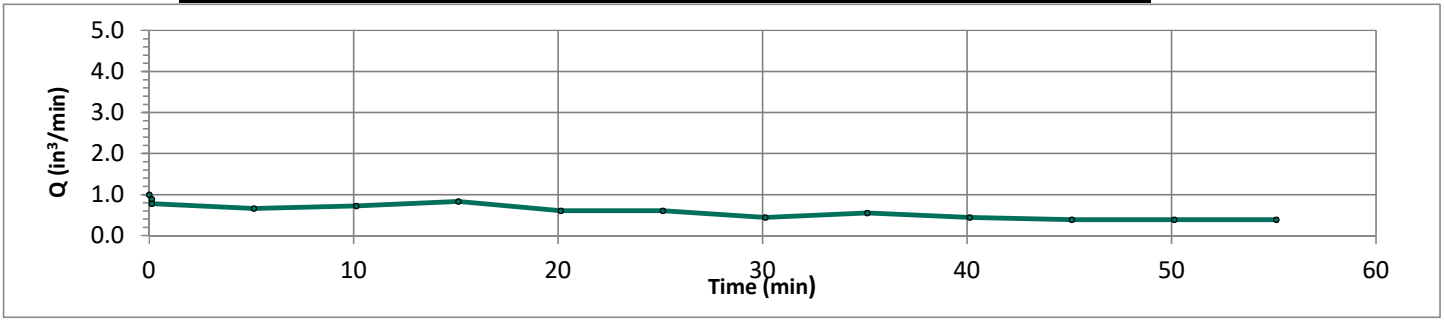
TEST NO.: **I-14**

GEOLOGIC UNIT: **Qya**

EXCAVATION ELEVATION (MSL, FT): **253**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	2.5
TEST/BOTTOM ELEVATION (MSL, FT):	251
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.9
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**0.388**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.099**
FACTORED INFILTRATION RATE (IN/HR):	**0.050**



TEST DATA

Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
4	5.00	0.180	4.98	0.997
5	5.00	0.160	4.43	0.886
6	5.00	0.140	3.88	0.775
7	5.00	0.120	3.32	0.665
8	5.00	0.130	3.60	0.720
9	5.00	0.150	4.15	0.831
10	5.00	0.110	3.05	0.609
11	5.00	0.110	3.05	0.609
12	5.00	0.080	2.22	0.443
13	5.00	0.100	2.77	0.554
14	5.00	0.080	2.22	0.443
15	5.00	0.070	1.94	0.388
16	5.00	0.070	1.94	0.388
17	5.00	0.070	1.94	0.388

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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

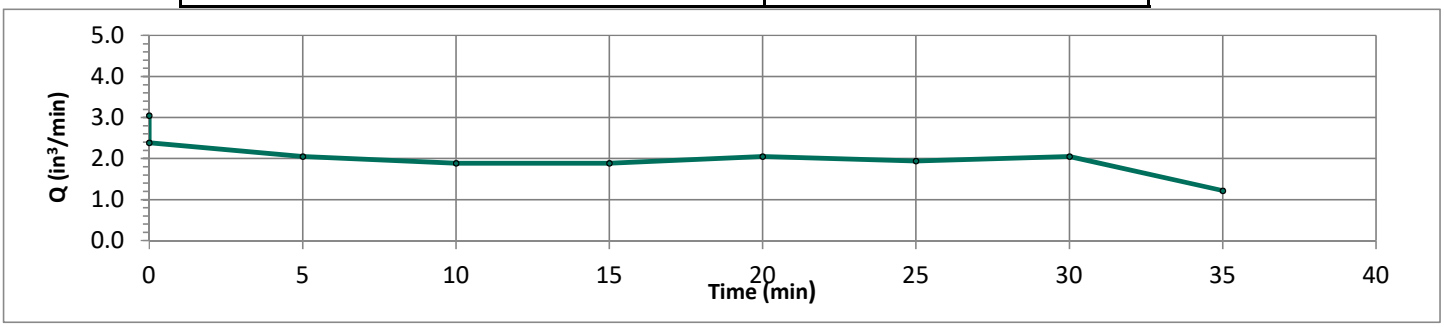
TEST NO.: **I-15**

GEOLOGIC UNIT: **Qoal**

EXCAVATION ELEVATION (MSL, FT): **252**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	1.5
TEST/BOTTOM ELEVATION (MSL, FT):	251
MEASURED HEAD HEIGHT (IN):	4.5
CALCULATED HEAD HEIGHT (IN):	4.7
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN3/MIN):	**1.422**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.363**
FACTORED INFILTRATION RATE (IN/HR):	**0.182**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in3)	Q (in3/min)
1	0.00	0.000	0.00	0.00
3	5.00	0.550	15.23	3.046
4	5.00	0.430	11.91	2.382
5	5.00	0.370	10.25	2.049
6	5.00	0.340	9.42	1.883
7	5.00	0.340	9.42	1.883
8	5.00	0.370	10.25	2.049
9	5.00	0.350	9.69	1.938
10	5.00	0.370	10.25	2.049
11	5.00	0.220	6.09	1.218
12	5.00	0.310	8.58	1.717
13	5.00	0.290	8.03	1.606
14	5.00	0.280	7.75	1.551
15	5.00	0.280	7.75	1.551
16	5.00	0.270	7.48	1.495
17	5.00	0.240	6.65	1.329
18	5.00	0.260	7.20	1.440
19	5.00	0.250	6.92	1.385
20	5.00	0.260	7.20	1.440
21	7.53	0.120	3.32	0.441

GEOCON
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AARDVARK PERMEAMETER TEST RESULTS

Otay Valley

PROJECT NO.: 06930-52-13A

LIST OF REFERENCES

1. Todd, Victoria R., *Preliminary Geologic Map of the El Cajon 30' x 60' Quadrangle, Southern*

2. Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.