Preliminary
Stormwater Control Plan

For

Santa Cruz SMOB

5940 Soquel Avenue
Santa Cruz, California
APN: 029-021-47

By: Joshua MacCallister
Reviewed By: Richard Tso, RCE #60628

October 24, 2018
Revised: June 2019

Job # 18019

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Existing Conditions

The subject property is an approximately 4.97 acre parcel located just south of the Soquel Avenue frontage road to Highway One, in Santa Cruz, California. The closest cross streets are Chanticleer Avenue approximately 730 feet to the west and Mattison Lane approximately 500 feet to the east. A site location map has been included as Figure 1 of this report. The site is bounded by an industrial storage parcel and nursery to the east, a mobile home park to the south, an assisted living facility to the southwest, Live Oak Business Park to the west and an industrial property to the northwest.

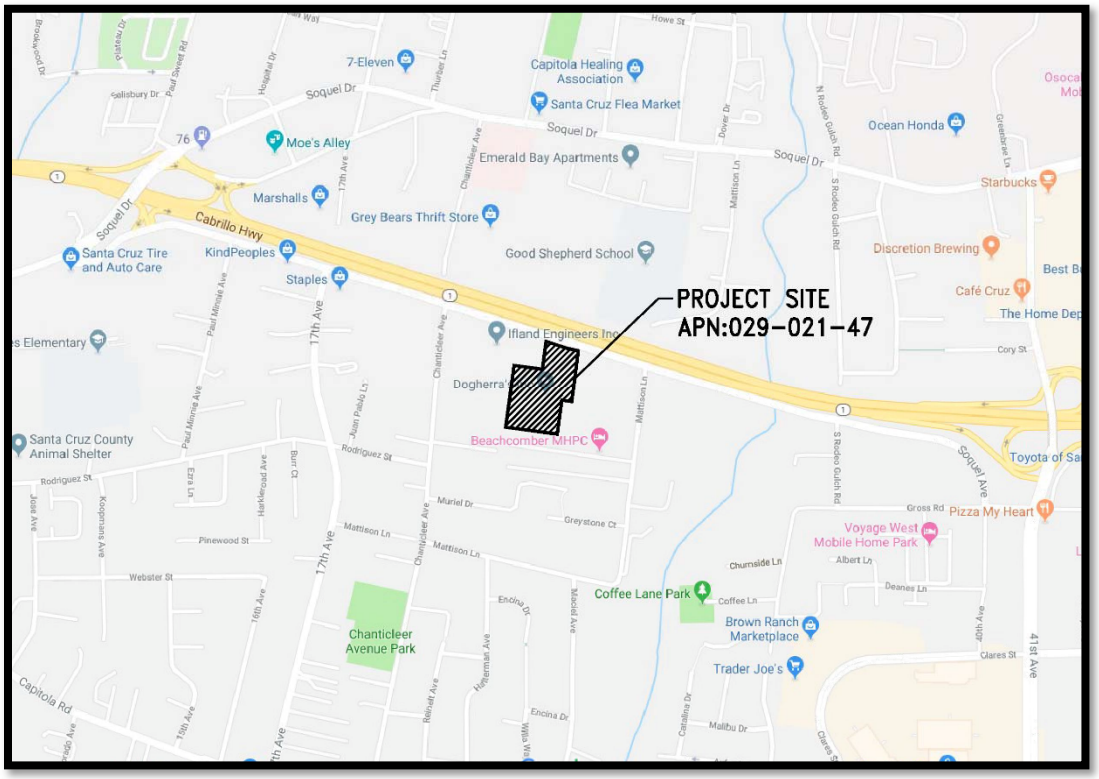


Figure 1 – Site Location Map
Not to scale – Source: Google Maps (Map data ©2018 Google)

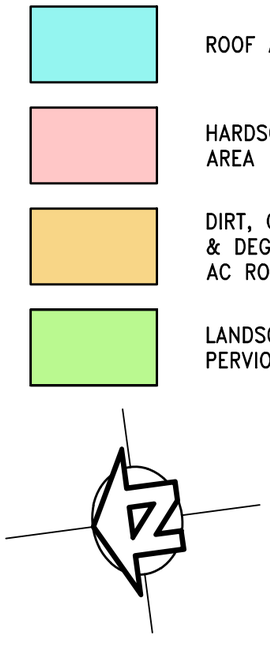
Currently, the site is used as a storage and staging yard for a towing company, and houses numerous boats, trucks, recreational vehicles, shipping containers and trailers. There is little vegetation onsite, and no natural waterways. There are a number of appurtenant buildings onsite, including sheds, trailers and storage buildings. The rest of the site is a mix of hardscape, hardpacked dirt, gravel, decomposed asphaltic concrete (AC) and pervious grasses. See figure 2A – Existing Pervious & Impervious areas for a breakdown of existing surfaces on the project site.

EXISTING AREA SUMMARY

ROOF AREA	7,755 SF
HARDSCAPE AREA	20,752 SF
DIRT, GRAVEL & DEGRADED AC ROAD AREA*	28,109 SF
IMPERVIOUS AREA	56,616 SF
DIRT, GRAVEL & DEGRADED AC ROAD AREA*	28,109 SF
LANDSCAPE & PERVIOUS AREA	132,025 SF
PERVIOUS AREA	160,134 SF
TOTAL AREA	216,750 SF
* COUNTED AT 50% IMPERVIOUS, 50% PERVIOUS	

HATCH LEGEND

- ROOF AREA
- HARDSCAPE AREA
- DIRT, GRAVEL & DEGRADED AC ROAD AREA
- LANDSCAPE & PERVIOUS AREA



80' 0 40' 80' 160'

GRAPHIC SCALE: 1 INCH = 80 FEET

FIGURE 2A - EXISTING PERVIOUS & IMPERVIOUS AREAS

PAGE NO. 3
SCALE 1" = 80'
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DESCRIPTION FIG. 2A - EXISTING PERVIOUS & IMPERVIOUS AREAS
CALCULATED BY JJM

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Elevations onsite vary from approximately 109 at the southwest corner, to 116 near Soquel Avenue, with slopes generally between 0% to 5%. Limited areas of steeper slopes lie near the northern boundary, where the grade slopes toward a roadside drainage ditch, and along the eastern boundary of the site near the adjacent nursery. At present, the site is 26% impervious, with the dirt, gravel and degraded AC conservatively counted at 50% pervious and 50% impervious.

The NRCS classifies soil in the site area as Elkhorn Sandy Loam, a deep, well-drained soil with moderately slow permeability. The NRCS estimates saturated conductivity (Ksat) of the limiting layer of soil at 0.383 inches/hour, and the Ksat of the soil in general to be 1.609 inches/hour. A Geotechnical Investigation provided by Dees & Associates, Inc., dated September 2018, has been included as Appendix A to this report. This investigation confirms that subsurface conditions match the NRCS classification, with interbedded layers of clayey sand & sandy clay to a depth of approximately 20 feet, underlain by sandy gravel and sand stone encountered at a depth of approximately 40 feet. There is also a layer of loose fill that covers the project site with an average depth of 3 feet. The groundwater table was encountered in 3 of the 8 borings performed by Dees, at depths varying from 9 to 43.5 feet. Perched groundwater was also found above clay layers in some of the borings, and there is potential for perched groundwater to develop during and following the rainy season. It is expected that the average seasonal high groundwater table may vary from the groundwater encountered during the borings performed by Dees.

Along with borings, Dees and Associates provided percolation test results for two areas of the site. The first test was performed at the south end of the site, and the second in the driveway near the front of the proposed medical office building.

Location	Average Infiltration (0-4 ft Depth)	Average Infiltration (4-8 ft Depth)
South Test	0.40 in/hr	0.02 in/hr
North Test	0.25 in/hr	0.10 in/hr

Table 1 – Infiltration Test Results

To account for a number of risk factors dealing with soil variability and redundancy of the system, a factor of safety was calculated using the method put forth in the Orange County Technical Guidance Document Exhibit 7.III, Appendix VII, dated 12/30/2013. To determine the factor of safety, a weighted risk level is determined for each of four categories related to soil variability and four categories relating to redundancy. These weighted risk factors were then summed for each category and multiplied together to give a final factor of safety, S_{TOTAL}. As a result of this method, a factor of safety of 3 was applied, giving design infiltration rates of 0.01 inches/hour and 0.03 inches per hour, respectively, at the level where infiltration would occur. See Table 2 for computation of the adjusted percolation rates for the project site.

A patchwork of storm drain improvements exists around the site, which conveys runoff generally to the south east toward Rodeo Gulch. Currently, along the south side of the project frontage on Soquel Avenue, there is a drainage ditch which flows toward the northeastern corner of the property. There is a 36-inch diameter concrete culvert that terminates near the northern property line of the site. This culvert conveys runoff from the drive-in movie theater/flea market site, Good Shephard School, and an apartment complex to the north of Highway One, and the culvert outfalls into the drainage ditch. Runoff in the drainage ditch is picked up through an 18" CMP culvert, then conveyed generally to the south through a system of pipes, vegetated swales, and open concrete channels, until it reaches the Greystone subdivision, at which point it is conveyed through a closed pipe system through the development to Mattison Lane. At the bend in Mattison Lane, the collection system turns to the east and outfalls into Rodeo Gulch, approximately 1,350 feet southeast of the closest property corner. For a more detailed description of the existing drainage system, see the Drainage Study For Nigh Property prepared by Ifland Engineers and dated August, 2008, which is included in this report as Appendix B.

Average Tested Infiltration Rate, K_T (In/Hr)			S - 0.02, N - 0.10	
Consideration	**Concern Level**	**Risk Factor**	**Weight**	**Product**
Assessment Methods	Medium	2	0.25	0.5
Texture Class	Medium	2	0.25	0.5
Site Soil Variability	Medium	2	0.25	0.5
Depth to Groundwater	Medium	2	0.25	0.5
S_a			2	
Consideration	**Concern Level**	**Risk Factor**	**Weight**	**Product**
Tributary Area Size	Medium	2	0.25	0.5
Level of Pretreatment	Low	1	0.25	0.25
Redundancy of Treatment	Medium	2	0.25	0.5
Compaction During Construction	Low	1	0.25	0.25
S_b			1.5	
S_{TOTAL}			3.00	
Design Infiltration Rate, K_D (In/Hr)			S – 0.01, 0.03	

Table 2 – Infiltration Factor of Safety

At present, there are minimal onsite storm drain improvements. Runoff from the site is either retained onsite, or allowed to flow uncontrolled offsite to neighboring properties. Approximately 24% of the site drains west to the Live Oak Business Park, where it is collected in catch basins. From here, it travels south in the storm drain along Chanticleer Avenue, until it reaches an outfall in Rodeo Gulch near Ivy Lane, approximately 3,700 feet to the south. The remaining 76% of the site drains into Rodeo Gulch through the existing storm drain system described above. It reaches the storm drain system either by flowing into the drainage ditch to the north along Soquel Avenue, or by sheet flow over the property lines to the east and south of the project, where it continues south through neighboring businesses, the nursery, mobile home park, and residential subdivision until it reaches an underground storm drain system in Greystone Court. From there runoff is conveyed east to Mattison Lane, then south to a pipeline and easement through APN 029-061-19 where runoff is discharged to Rodeo Gulch.

Project Description

Proposed improvements for the site will consist of a four-story specialty medical office building on the eastern portion of the site and a four-story parking garage at the southwest. To service these buildings, an access drive and drop off point will be provided between the two. There will also be a service yard to the east of the medical office building, which will house an imaging trailer, an ambulance entrance, and the utility equipment required to service the project. There will also be hardscape, landscape and open space improvements constructed onsite to provide a path of travel and recreational opportunities for employees.

There will also be significant offsite improvements associated with this project. Soquel Avenue will be widened based upon the Plan Line Study produced by the County of Santa Cruz, with an area at the northeast corner along the frontage left open for potential dedication as Soquel Avenue is widened to the east of the project at some future date. Sanitary sewer improvements will be required along Soquel Avenue, leaving the site and flowing westerly to Chanticleer Avenue, then south until intercepting an existing 8” main with the depth required to service the project. The approximate extents of existing main replacement is the intersection at Mattison Lane, but this is subject to change subsequent to conducting a survey to verify manhole depths once the route concept has been approved by County Sanitation.

The project proposes to redirect stormwater runoff flowing under Highway One to the existing Soquel Avenue drainage ditch using a large pipe traveling east along Soquel Avenue to a new outfall at Rodeo Gulch. This is consistent with a Condition of Approval established when the project site re-zoning was approved for high density housing in 2008. Proposed offsite storm drain improvements will be discussed in more depth later in this report. Refer to the Civil Plans included as Appendix C to this report for detailed site work to be performed both on- and offsite.

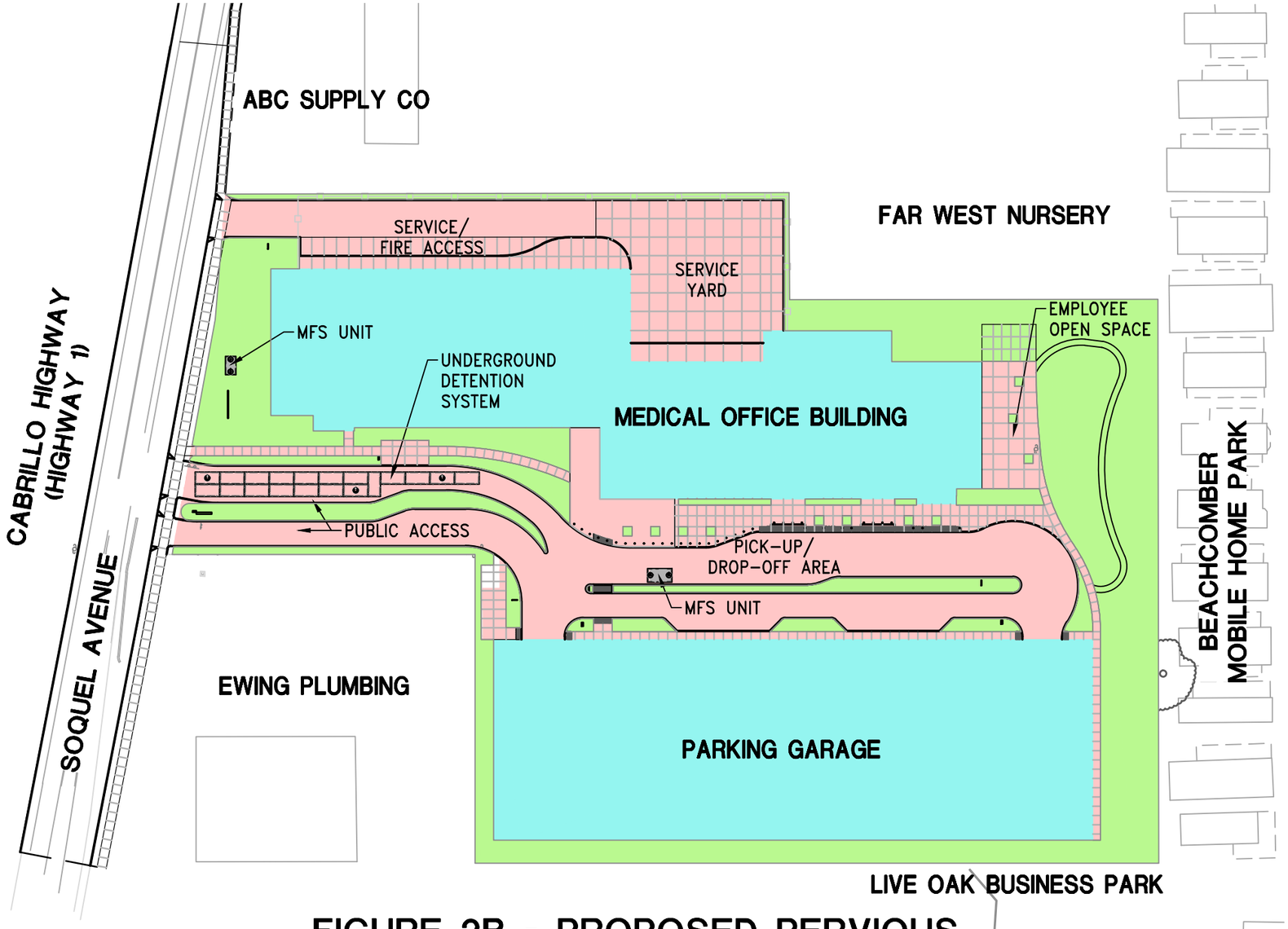
Stormwater mitigation requirements for the project will be met using a proprietary filtration and detention system located within the access road and landscape areas onsite. An outlet control structure will be placed near the project frontage, and will connect to the proposed storm drain in Soquel Avenue, metering the release of runoff from the site and allowing runoff beyond the design storm to bypass and exit. In total, the project will create or replace approximately ±162,500 square feet of impervious surface, leaving ±54,250 square feet of pervious area. See Figure 2B for more information regarding proposed pervious and impervious areas. For more in-depth project information, see Table 3 – Project Information Summary.

HATCH LEGEND

ROOF AREA

HARDSCAPE AREA

LANDSCAPE & PERVIOUS AREA



80' 0 40' 80' 160'

GRAPHIC SCALE: 1 INCH = 80 FEET

FIGURE 2B - PROPOSED PERVIOUS & IMPERVIOUS AREAS

PAGE NO. 7
SCALE 1" = 80'
DATE 06/18/2019

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DESCRIPTION FIG. 2B-PROP PERVIOUS & IMPERVIOUS AREAS
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Stormwater Management Requirements

The new specialty medical office building project falls within the jurisdiction of the County of Santa Cruz. The County Public Works Design Criteria, dated February 2018, provides requirements for stormwater mitigation for all new development within the unincorporated areas of Santa Cruz County. These requirements are based upon the requirements put forth by the Central Coast Regional Water Quality Control Board in Resolution R3-2013-0032 for Watershed Management Zones 1, 4 &10. As shown in Figure 3, based upon the Live Oak WMZ Map, the site falls within Watershed Management Zone 1.

Project Name:	Santa Cruz SMOB
Project Reference Number:	TBD
Address:	5940 Soquel Avenue, Santa Cruz CA 95062
APN:	029-021-47
Applicant:	Ben Rosenfeld Pacific Medical Buildings 3392 Carmel Mountain Road, Suite 200 San Diego, CA 92121
Project Type:	Medical Building
Detached Single Family Home:	No
Development Type:	New Development
Total Project Area (Ac):	4.97
Existing Impervious Area (SF):	56,616
New Impervious Area (SF):	106,654
Replaced Impervious Area (SF):	56,616
Total Proposed Impervious Area (SF):	163,270
Net Impervious Area (SF):	106,654

Table 3 – Project Information Summary

Because the project is creating more than 5,000 square feet of new or replaced impervious area, it is categorized as a Large Project by the County. Large Projects must incorporate Low Impact Development (LID) and Best Management Practices (BMP) to reduce and treat pollution from the 85th percentile storm. Large projects are also required to retain runoff from the 2 – year, 2 – hour storm onsite and maintain predevelopment discharge rates up to the 10 – year, 15 – minute design storm through the use of detention and metered release. For complete stormwater runoff mitigation requirements, refer to the County Design Criteria.

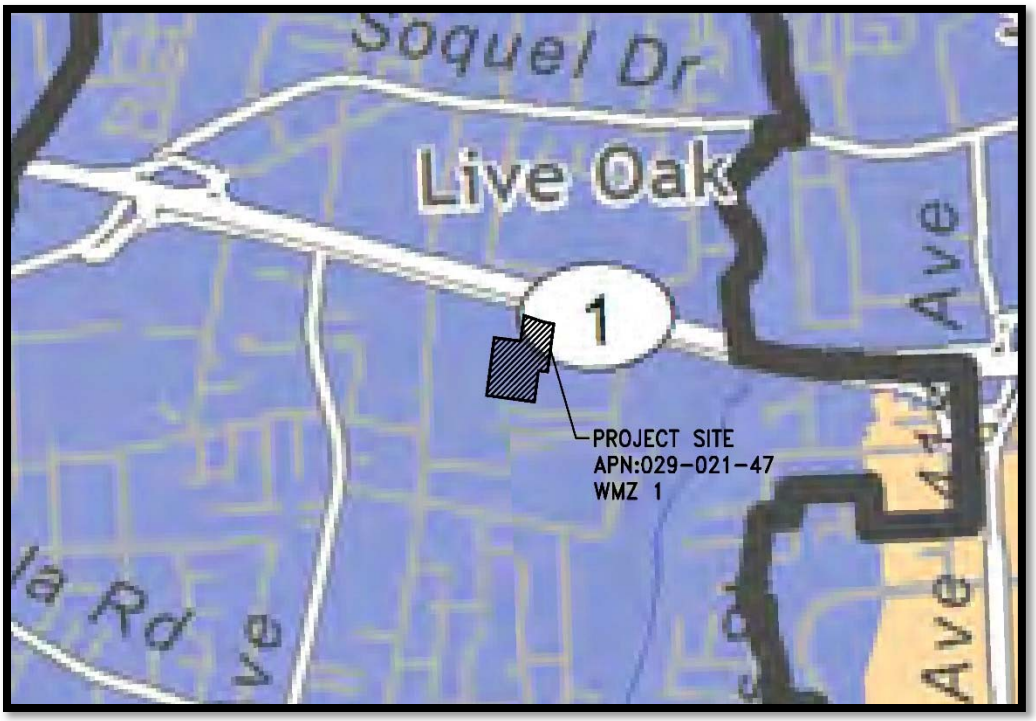


Figure 3 – Watershed Management Zone Map
Not to scale – Source: Stillwater Sciences, 2012

Stormwater Management Strategy

As the proposed development in this report will create approximately 163,300 square feet of impervious area, well above the 5,000 square feet threshold for Large Projects, it will be required to comply with the requirements for large projects summarized above. However, due to a number of constraints upon the project, especially the low percolation rate, it will be infeasible to retain stormwater onsite. The following section is an outline of the strategies that will be used to meet the runoff mitigation requirements, with detailed information and sizing calculations to follow.

To minimize runoff and pollution from the development, a number of LID measures will be implemented on the project. The project will be constructed to limit the disturbance to natural drainage features. There will be some disturbance to Rodeo Gulch, which will require an outfall for the new storm line in Soquel Avenue discussed below. However, the necessity of this outfall is triggered by the project mitigating a problematic existing drainage channel, and will be constructed to minimize disturbance to the maximum extent practicable, with oversite from the required regulatory bodies. Soil Compaction will be limited to areas below hardscape, building and parking garage areas. The existing site does not have any areas of native vegetation, so none will be cleared as part of this project. Finally, the project will reduce the amount of offsite runoff by capturing stormwater from areas that currently runoff over the property line.

The project will also use a number of source control measures to address & reduce potential pollution sources created as a part of this project. The source control measures used are found in Table 4 of this report.

Stormwater treatment will be achieved onsite by directing all runoff from impervious areas through an Oldcastle Perk Filter Vault Media Filtration System (MFS) Unit. Runoff is collected onsite and directed to the unit. It first enters into the inlet chamber, which provides pretreatment to remove large debris and floatables by passing runoff through a series a baffles. The stormwater then enters the treatment chamber, which houses a number of perk filter cartridges required to treat the design storm. The treatment chamber begins to fill from the bottom up, and flows through the cartridges from the outside to a collection tube in the center of each cartridge. As the chamber fills, gravity will cause sedimentation of large particles, which are collected in the bottom of the treatment chamber. Water then flows through the media cartridges, where physical filtration and chemical sorption remove small solids, hydrocarbons and heavy metals from the runoff. Finally, it flows through a false floor into the outlet chamber, where it is gathered and directed to the outlet pipe. In the event of storms larger than the treatment design storm, a high-level overflow is incorporated into each cartridge, allowing water to directly enter the collection tube while bypassing the treatment media. Details for the MFS Units used onsite are included as Appendix D of this report.

After passing through an MFS Unit, water will continue into a detention vault. The vaults being proposed for this project are Oldcastle Stormcapture vaults. Specifically, the project will use 4-foot deep SC1 vaults with a top slab. The Stormcapture system uses modular, precast concrete vaults that can be buried to provide storage volume for runoff below grade. Each vault has an external footprint of 8 feet by 16 feet, and will provide approximately 420 cubic feet of storage. These vaults will be located beneath the outbound drive aisle, and will be sized to meet the detention requirements for the difference in runoff pre- to post-construction. An outlet control structure located in the landscape area between the MOB and Soquel Avenue will release water through an orifice at the pre-development rate for a 10 – year storm, and will provide safe overflow over a weir plate for storms beyond the design storm. Water released from the OCS will then flow offsite through a catch basin located within the Soquel Avenue right-of-way. Details of the Stormcapture vaults used onsite are included as Appendix E of this Report.

Pollution Source	Applicable?	Source Control Measures
Accidental Spills or Leaks	Y	- Owner/operator shall prepare a spill prevention plan to be located onsite - Employees shall be trained on spill prevention and cleanup - Spill cleanup materials shall be located onsite
Interior Floor Drains	Y	- All interior floor drains will be connected to sanitary sewer system
Parking/Storage Area Maintenance	Y	- Covered parking garage areas shall drain to sanitary sewer - Parking area shall be maintained per project O&M Manual and CASQA BMP Fact Sheets SC-43 Parking Area Maintenance & SC-74 Drainage System Maintenance
Indoor and Structural Pest Control	Y	- Owner/operator shall incorporate integrated pest management practices into maintenance plan
Landscape/Outdoor Pesticide Use	Y	- Owner/operator shall incorporate integrated pest management practices into maintenance plan - Owner/operator shall minimize pesticide use onsite - Pesticides shall be applied with a handheld sprayer to minimize quantity used and spray drift - Pesticides shall not be applied prior to rain - Landscape areas shall be maintained per project O&M Manual and CASQA BMP Fact Sheets SC-41 Building Grounds & Maintenance & SC-73 Landscape Maintenance
Pools, Spas, Ponds, Decorative Fountains and Other Water Features	N	- No water features onsite
Restaurants, Grocery Stores, and Other Food Service Operations	N	- No food service operations onsite
Refuse Areas	Y	- Refuse area will be covered and drained to sanitary sewer
Industrial Processes	N	- No industrial processes will occur onsite
Outdoor Storage of Equipment or Materials	N	- No outdoor storage of equipment or materials will occur onsite
Vehicle and Equipment Cleaning	N	- No vehicle or equipment cleaning will occur onsite
Vehicle and Equipment Repair and Maintenance	N	- No vehicle or equipment maintenance will occur onsite
Fuel Dispensing Areas	N	- No vehicle or equipment fueling will occur onsite
Loading Docks	N	- No loading dock onsite
Fire Sprinkler Test Water	Y	- Fire sprinkler test water shall not be released to the storm drain system - A fire sprinkler test drain will be installed and connected to the sanitary sewer system
Drain or Wash Water from Boiler Drain Lines, Condensate Drain Lines, Rooftop Equipment, Drainage Sumps and Other Sources	Y	- Condensate lines will discharge to the sanitary sewer or landscape areas
Unauthorized Non-stormwater Discharges	Y	- Storm drains will be painted "NO DUMPING - DRAINS TO BAY. NO TIRE - DESECHO CORRE AL MAR"
Building and Ground Maintenance	Y	- Building and landscape shall be maintained per project O&M Manual and CASQA BMP Fact Sheets SD-20 Pervious Pavement, SC-41 Building Grounds & Maintenance, SC-43 Parking Area Maintenance, SC-73 Landscape Maintenance & SC-74 Drainage System Maintenance

Table 4 – Source Control Measures (CSCDC Part 3, Section C.2)

Proposed Drainage Management Areas

Based upon site improvements and grading, the site will be divided into two separate Drainage Management Areas (DMA's), with one DMA further divided into two sub-DMA's, as described below. See Figure 4 – Stormwater Management Plan for more detailed information about each DMA.

- DMA 1 encompasses all of the improvements that will be built as part of this project. This DMA is subdivided into DMA 1A and DMA 1B, which each have a separate treatment measure. However, runoff from each of these sub-DMA's will be detained in the same detention vault, and will outfall at the same point.
    - DMA 1A – 49,271 SF, 89% impervious – Covers approximately half of the MOB, the rear service yard and landscaping to the north of the MOB
    - DMA 1B – 135,674 SF, 88% impervious – Covers approximately half of the MOB, plus the parking garage, access drive and pedestrian hardscape
- DMA 2 makes up the remainder of the site, and will be left completely pervious. It will drain offsite, following the existing drainage patterns, but will reduce runoff from pre- to post-construction by approximately 76%.
    - DMA 2 – 31,805 SF, 0% impervious – Covers pervious area and graded slopes around parking garage, south end of site and east of the MOB

Runoff Retention Sizing And Infeasibility (CSCDC Part 3, Section I)

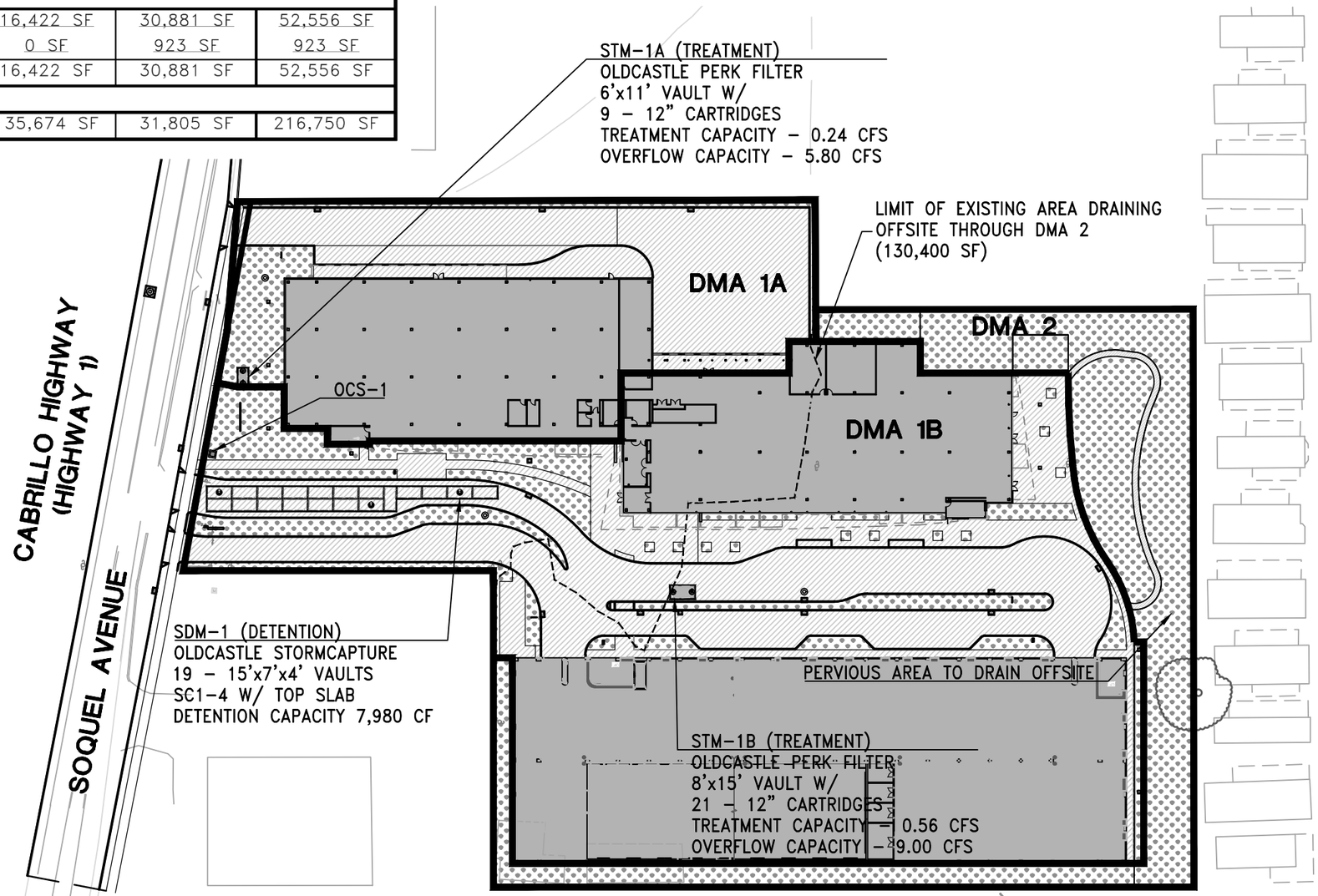
The Santa Cruz County Public Works Design Criteria gives a requirement to provide retention-based treatment measure sized to retain the difference in runoff from the 2 – year, 2 – hour storm in the pre-development condition against a number of post-development 2 – year storms. Sizing of retention-based treatment measures is done per CSCDC Part 3, Section I, which gives procedures for sizing retention measures for both the slope infiltration method and the storage percolation method, with the latter being more commonly used on relatively flat sites. Part 3, Section I.5.d gives a minimum percolation rate for feasibility of storage percolation of 0.6 inches per hour, and Part 3, Section I.9.b.2. gives a maximum drawdown time for the retention system of 48 hours. While we have found that infiltration rates of less than 0.6 inches per hour can be useful given a large enough footprint, the adjusted infiltration rates for the project site of 0.01 – 0.03 inches per hour are far too low to be useful for infiltration, and constitute a technical infeasibility for onsite retention of stormwater. This infeasibility can be demonstrated using the County spreadsheet Figure SWM24. With favorable conditions used in the spreadsheet, including a predevelopment runoff coefficient of 0.50, the higher adjusted infiltration rate of 0.03 inches per hour, and the entire site footprint of 216,750 square feet used for infiltration, the best drawdown time possible is 73.4 hours. This gets even worse using conservative factors of 0.25 as the pre-development runoff coefficient and 0.01 inches per hour as the infiltration rate, which would give a drawdown of 425.6 hours. Given this infeasibility, a lower priority treatment measure will be used to mitigate stormwater pollution onsite, per Part 3, Section C.3.b.

AREA SUMMARY TABLE

	DMA 1A	DMA 1B	DMA 2	TOTAL
MOB ROOF AREA	22,950 SF	23,685 SF	0 SF	46,635 SF
PARKING GARAGE ROOF AREA	0 SF	50,440 SF	0 SF	50,440 SF
PAVEMENT AREA	21,068 SF	45,127 SF	0 SF	66,195 SF
IMPERVIOUS AREA	44,018 SF	119,252 SF	0 SF	163,270 SF
LANDSCAPE AREA	5,253 SF	16,422 SF	30,881 SF	52,556 SF
PERVIOUS PATH	0 SF	0 SF	923 SF	923 SF
PERVIOUS AREA	5,253 SF	16,422 SF	30,881 SF	52,556 SF
TOTAL AREA	49,271 SF	135,674 SF	31,805 SF	216,750 SF

HATCH LEGEND

- ROOF AREA
- HARDSCAPE AREA
- LANDSCAPE AREA
- PERVIOUS WALK
- DMA LINE
- EX. DRAINAGE AREA LINE



80' 0 40' 80' 160'

GRAPHIC SCALE: 1 INCH = 80 FEET

FIGURE 4 - STORMWATER MANAGEMENT PLAN

PAGE NO. 13
SCALE 1" = 80'
DATE 06/18/2019

JOB NO. 18019
DESCRIPTION FIG. 4 - STORMWATER MANAGEMENT PLAN
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Runoff Treatment Measure Sizing (CSCDC Part 3, Section C.3.b.)

Given the infeasibility of onsite runoff retention, a different treatment measure will be required to meet runoff mitigation requirements. The project will utilize Media Filtration Units, which are sized using a flow-based design to determine treatment volume. The design criteria gives a mitigation requirement of either twice the 85th percentile storm, or a storm of 0.2 inches per hour intensity, with the latter being used to size the MFS units on this project. To get the treatment flow rate for each subsection of DMA 1, the total impervious area was multiplied by 0.2 inches per hour, including a unit adjustment to get the amount into cubic feet per second. The MFS units were then sized based upon treatment capacity provided by Oldcastle Precast, Inc. Given the long pipe runs and need to fight grade to get stormwater to the north end of the site, as well as the substantial offsite stormwater facilities required as part of this project discussed below, it was determined that minimizing depth of the MFS units is the most important criteria for this project. As such, larger footprint, shallower vaults utilizing a higher number of 12 inch filter cartridges were determined to be the best option. DMA 1A will require a treatment volume of 0.204 cubic feet per second to meet the mitigation requirement, while DMA 1B will require a volume of 0.552 cubic feet per second. These treatment volumes will be mitigated using a 6 x 11 foot vault with 9 cartridges, and an 8 x 15 foot vault with 21 cartridges, respectively. All calculations performed for this project are included as Appendix F to this report.

Runoff Detention Vault Sizing (CSCDC Part 3, Section H)

Because of the amount of impervious area proposed, stormwater control measures will be required to offset the peak discharge from the site for the 10 – year design storm. The method of detaining runoff from the site will be to store it within Oldcastle Stormcapture vaults located beneath the outgoing access drive and mete out the runoff through an orifice located within the outlet control structure (OCS). The orifice will be on a weir plate downstream of the inlet pipe into the OCS. The weir will allow runoff from larger storm events to spill over and bypass the orifice. Details will be provided for the OCS during the construction document phase, and will be added to the final stormwater report.

The required detention volume was determined using the Santa Cruz County Figure SWM-17 Calculator. This calculator is used to determine runoff detention using the Modified Rational Method for the 10 – year design storm. It determines the volume of storage required to detain the maximum difference in runoff volume for the pre-construction 10 – year, 15 – minute storm and post-construction 10 – year storm across a variety of times of concentration. Based upon the proposed site plan, the required 10 – year detention volume is 7,762 cubic feet of water, with a discharge rate of 1.681 cubic feet per second. Given the storage capacity per Stormcapture unit of 420 cubic feet, a minimum of 7,762 cubic feet / 420 cubic feet = 18.5 Stormcapture units will be necessary. Rounding up gives the final number of 19 units to be installed. While this number of units could be reduced by using a deeper system, it was determined that a shallower system with a larger footprint would better serve the project, for reasons discussed above in the treatment sizing section.

To ensure that post-construction discharge rates do not exceed pre-construction rates, the orifice located on the weir plate was sized using the following equations:

$$A = \frac{Q}{C_d \times \sqrt{2gh}}$$

where

$$A = Orifice\ Area$$
$$Q = Pre-construction\ Flow\ Rate$$
$$C_d = Coefficient\ of\ Discharge\ (0.61)$$
$$g = Acceleration\ of\ Gravity$$
$$h = Hydrostatic\ Head$$

and

$$d = 2\sqrt{\frac{A}{\pi}}$$

where

$$d = Maximum\ Orifice\ Diameter$$

Using these equations, the 10 – year orifice diameter is 5.58 inches. Therefore, the orifice will be conservatively rounded to 5-1/2 inches diameter for ease of fabrication of the outlet control structure.

Runoff Reduction Across Property Lines

Due to the lack of drainage facilities located at the south, southeast and southwest property lines of DMA 2, as well as the elevation that varies from 5 to 7 feet lower than the discharge point at the far northern end of the site, it is infeasible to capture runoff from this DMA while still conforming at the property lines. Because of this, runoff from DMA 2 will be allowed to leave the site from DMA 2 to the west, south and east of the site, mimicking the existing drainage patterns onsite. However, to lessen the impact of runoff leaving the site through this DMA, only stormwater from pervious areas will be allowed to drain offsite in this manner. Furthermore, a hydrologic analysis was performed on the existing site, and in the current condition, runoff from approximately 130,400 square feet is allowed to run offsite. In the proposed condition, only 31,805 square feet will be allowed to runoff through DMA 2. Applying a runoff coefficient of 0.30 to both the existing and proposed conditions, which is conservative given the compacted dirt roads, existing buildings and pavement currently onsite, this gives a reduction runoff of 75.6% from the existing to the proposed condition. This is a major improvement in overall amount of run-on to all neighboring properties to the project.

Offsite Stormwater Upgrades

As discussed in the existing conditions section of this report, the main stormwater improvements in the area of this project consist of the patchwork stormdrain system described in Appendix B. In the proposed condition, this stormdrain is inadequate to convey the required amount of runoff, and it passes directly beneath the medical office building. Furthermore, the drainage ditch currently located at the frontage of the parcel will be filled as part of the widening of Soquel Avenue, removing the opportunity for existing pipes which daylight into the ditch to use it for conveyance. Given these issues with the existing storm drainage in the area, and the lack of a viable path for stormdrain facilities to the south, east or west of the project, improvements will be required within Soquel Avenue to accommodate both the existing drainage and any additional runoff from the proposed project area.

There are a number of proposed stormdrain improvements to be installed within Soquel Avenue, including curb and gutter along the frontage with Type G0 inlets to be installed at the curb returns near the driveways. These will also connect to an existing curb inlet near the northeastern corner of the Live Oak Business Park, as well as a catch basin from the northeast corner of the Ewing property, both of which currently daylight to the drainage ditch. Finally, the project outlet control structure will discharge through the back of one of the proposed G0 Inlets. These improvements can be found in Appendix C.

The far more substantial improvements required will be downstream of the project frontage. To provide drainage for the existing 36 inch RCP culvert from the north side of Highway 1, the culvert will be intercepted where it crosses under the westbound travel lane at the north edge of Soquel Avenue. A 72 inch square junction box will be installed, and the remaining section of 36 inch RCP will be abandoned. Downstream of this junction box, a 48 inch RCP pipe will travel east along Soquel Avenue for approximately 1,050 feet, with junction boxes as necessary to service the line. At this point, Soquel Avenue begins to dip into Rodeo Gulch, and the 48 inch pipe takes a turn to the south to cross the street into Rodeo Gulch. After turning once again to the south east, the RCP pipe will travel perpendicular to the slope until it daylights at a flat bench set back from the flowline of Rodeo Gulch. See Appendix C for plans showing the expected extent of offsite stormdrain improvements.

A number of assumptions have been made to allow for preliminary design of the offsite stormdrain system, which will need to be corroborated and coordinated prior to final design of the offsite stormdrain improvements. Existing design flows for the 36 inch RCP culvert were taken from the Zone 5 Master Drainage Plan, and are assumed to be 35 cubic feet per second, the existing section capacity. The 48 inch pipe is sized preliminarily to have capacity for 100% impervious build out of all parcels along the frontage which could reasonably be expected to discharge to it. Given these assumptions, the total 100-year discharge from the 36 inch RCP culvert, the 100% build out, and the proposed project would be approximately 100 cubic feet per second, which could be conveyed without surcharge by a 48 inch RCP pipe laid at 0.3% slope. Preliminary design of the 48 inch pipe was performed using information from the County GIS system, and will require a survey to better locate trees, grades and obstructions both within Soquel Avenue and Rodeo Gulch. Also, an easement will be required across APN's 029-31-11 & 029-31-14 to get to the discharge point within the gulch. Finally, there is a water line assumed to run along the south side of Soquel Avenue, and a sewer trunk line that runs within Rodeo Gulch, both of which will need to be located prior to final design, as they will be crossed by the 48 inch pipe.

Operations and Maintenance Requirements

Prior to completion and issuance of the certificate of occupancy for this project, an Operation and Maintenance Agreement with the County of Santa Cruz shall be prepared. This agreement shall be recorded against the property with the County Recorder's Office, and it will be binding on all subsequent owners of the property. This Maintenance Agreement shall remain in place for the life of the project.

The maintenance agreement will set forth a schedule of maintenance tasks, to be performed by the medical office building maintenance staff, which are required for safe and efficient function of the onsite stormwater treatment & detention facilities. It will also specify procedures for yearly inspections and record keeping of inspections, maintenance and repairs performed. Refer to the County of Santa Cruz Design Criteria for more information regarding the Operation and Maintenance Agreement requirements.

APPENDIX A
GEOTECHNICAL INVESTIGATION – DEES & ASSOCIATES, INC

GEOTECHNICAL INVESTIGATION
For
PROPOSED MEDICAL BUILDING AND PARKING STRUCTURE
5940 Soquel Avenue, Santa Cruz
Santa Cruz County, California

Prepared
For
PMB SANTA CRUZ LLC
San Diego, California

Prepared By
DEES & ASSOCIATES, INC.
Geotechnical Engineers
Project No. SCR-1231
SEPTEMBER 2018

Dees & Associates, Inc.
Geotechnical Engineers
501 Mission Street, Suite 8A Santa Cruz, CA 95060 Phone (831) 427-1770 Fax (831) 427-1794

September 12, 2018 Project No. SCR-1231

PMB SANTA CRUZ LLC
3394 Carmel Mountain Road, Suite 200
San Diego, California 92121

Attention: Mark Toothacre

Subject: Geotechnical Investigation

Reference: Proposed Medical Building and Parking Structure
5940 Soquel Avenue, Santa Cruz
APN 029-021-47
Santa Cruz County, California

Dear Mr. Toothacre:

As requested, we have completed a Geotechnical Investigation for the new medical building and parking structure proposed at the referenced site. The purpose of our investigation was to explore surface and subsurface soil conditions in the vicinity of the proposed improvements and develop geotechnical recommendations and criteria for design and construction of the proposed project.

This report presents the results, conclusions and recommendations of our investigation. If you have any questions regarding this report, please call our office.

Very truly yours,

DEES & ASSOCIATES, INC.

Rebecca L. Dees
Geotechnical Engineer
G.E. 2623

Copies: 4 to Addressee

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GEOTECHNICAL INVESTIGATION

Introduction

This report presents the results of our Geotechnical Investigation for the new medical building and parking structure proposed at 5940 Soquel Avenue in Santa Cruz County, California.

Purpose and Scope

The purpose of our investigation was to explore and evaluate surface and near surface soil conditions in the vicinity of the proposed improvements and provide geotechnical recommendations for design and construction of the proposed improvements.

The specific scope of our services was as follows:

1. Site reconnaissance and review of available data in our files pertinent to the site and vicinity.

2. Exploration of subsurface conditions consisting of logging and sampling of eight (8) exploratory borings terminated 16.5 to 46.5 feet below the ground surface.

3. Laboratory testing to evaluate the engineering properties of the subsoils.

4. Engineering analysis and evaluation of the resulting field and laboratory test data. Based on our findings, we have developed geotechnical design criteria for general site grading, concrete slabs-on-grade, pavements, foundations, retaining walls and general site drainage.

5. Preparation of this report presenting the results of our investigation.

Project Location and Description

The 5-acre project site is located at 5940 Soquel Avenue in the unincorporated area of Santa Cruz County, California, Figure 1. The site is currently used as a yard/storage facility and most of the site is partitioned into separate fenced yard areas. See Figure 2. The buildings at the site are temporary structures primarily consisting of trailers and shipping containers, and the driveways are gravel.

The project consists of removing the existing improvements and constructing a new medical building and parking structure at the site. The plans for the project are in the preliminary stages, but the plans provided to us indicate the four-story medical building will be centrally located along the east side of the parcel and will occupy roughly 46,000 square feet of area. The three to four-story parking garage will be located in the southwest portion of the parcel and will occupy roughly 43,000 square feet of area. See Figure 3.

The site is bordered by Soquel Avenue to the north, commercial office space to the west, residential housing to the south and commercial/industrial storage and work space

to the east. The parcel and the surrounding area are level to gently sloping to the south and southeast with slope gradients on the order of 1 to 1.5 percent. Drainage from Soquel Avenue, above the site, is collected in a ditch that discharges into a culvert that passes through the northeast corner of the site. There are no existing drainage improvements for the site itself and we understand runoff temporarily ponds then percolates into the soil.

Field Investigation

Subsurface conditions at the site were explored on August 6, 2018 with eight (8) exploratory borings drilled with 6-inch diameter continuous flight augers advanced with truck mounted drilling equipment. The exploratory borings were drilled 16.5 to 46.5 feet below existing grades. The approximate locations of the exploratory borings are indicated on Figure 3. Our boring locations were limited to accessible areas and while they are expected to be representative of the soils in other areas the site, our test boring logs denote subsurface conditions at the locations and times observed are not warranted they are representative of subsurface conditions at other locations or times.

The soils observed in the test borings were logged in the field and described in accordance with the Unified Soil Classification System (D2487 and D2488), Figure 4. Representative soil samples were obtained from the exploratory borings at selected depths, or at major strata changes. These samples were recovered using the 3.0-inch O.D. Modified California Sampler (L) or the Standard Terzaghi Sampler (T). The penetration resistance blow counts for the (L) and (T) noted on the boring logs were obtained as the sampler was dynamically driven into the in-situ soil. The process was performed by dropping a 140-pound hammer a 30-inch free fall distance and driving the sampler 6 to 18 inches and recording the number of blows for each 6-inch penetration interval. The blows recorded on the boring logs present the accumulated number of blows that were required to drive the last 12 inches. The blow counts indicated on the logs have been converted to equivalent standard penetration test (SPT) values.

Laboratory Testing

The laboratory testing program was directed toward a determination of the physical and engineering properties of the soils underlying the site. Moisture content and dry densities were performed on representative soil samples to determine the consistency of the soil and the moisture variation throughout the explored soil profile. Atterberg Limits were performed to evaluate the soils relative shrink/swell potential. Direct shear testing was performed to evaluate the soil shear strength properties. Grain size analysis was performed to aid in soil classification. Corrosion testing was performed on select samples. The results of our field and laboratory testing appear on the "Test Boring Logs", next to the sample tested or in the appendix.

Subsurface Soil Conditions

The County of Santa Cruz Geologic Map indicates the site is underlain by Lowest Emergent Coastal Terrace Deposits (Pleistocene), which are described as, "Semiconsolidated, generally well-sorted sand with a few thin, relatively continuous layers of gravel. Deposited in nearshore high-energy marine environment. Thickness

variable; maximum approximately 40 ft. Weathered zone ranges from 5 to 20 ft. thick. As mapped, locally includes many small areas of fluvial and colluvial silt, sand and gravel, especially at or near old wave-cut cliffs.

Our borings indicate the site is underlain by up to 40 feet of terrace deposits that overly Purisima Formation sandstone. The terrace deposits generally consisted of clayey sand and sandy clay down to about 20 feet where sandy gravels were encountered. There was up to 3 feet of loose fill (±) encountered at the ground surface in the borings drilled on the western side of the site. The deepest fill was in the southwest corner.

The upper 3 to 8 feet of native soil (below the fill), with the exception of Boring 7, consisted of clayey sand. Boring 7 encountered clay from the ground surface to a depth of 8 feet. The native soils were mostly medium dense with some loose areas with up to 3.5 feet of loose native soil below the fill. The deepest loose soil area was in Boring 2, where 6.5 feet of loose fill and native soils were encountered. The soils below the upper loose zones are medium dense to very dense.

Very dense sandstone was encountered around 40 feet in Boring 2 and around 26 feet in both Borings 3 and 7. Sandstone was not encountered in our other borings, which were drilled up to 26 feet in depth.

The foundation zone soils generally have a low to moderate expansion potential with Atterberg Limits between 18 and 24. There were 1 to 2 feet thick layers of expansive clay encountered in Borings 3 and 5 and a couple thin layers of expansive clay encountered in Boring 2.

Groundwater

A fully developed groundwater table was encountered 18 feet below grade in Boring 1, 43.5 feet below grade in Boring 2, and 9 feet below grade in Boring 8. Perched groundwater was encountered 12 feet below grade in Boring 1; 5.5 to 6 feet and 18 to 19 feet below grade in Boring 2; and wet soils with no seepage were observed 24 to 27 feet below grade in Boring 3. Groundwater was not encountered in the other test borings.

Although not encountered in our test borings, there is a potential for perched groundwater to develop on top of the clayey soils during and following the rainy season. Clayey soils were encountered 3 to 7 feet below the ground surface.

Our boring logs denote groundwater conditions at the locations and times observed, and they are not warranted they are representative of groundwater conditions at other locations and times.

Seismicity

The project site is located in a seismically active region and several active and potentially active faults are located in the vicinity of the site. The following is a general discussion of seismicity in the project area. A more detailed discussion of faulting and

seismicity is beyond the scope of our services.

The faults closest to the site are the Zayante-Vergeles Fault, Monterey Bay Fault, San Andreas Fault and San Gregorio Fault. See Figure 13. The San Andreas Fault is the largest and most active of the faults in the site vicinity. However, each fault is considered capable of generating moderate to severe ground shaking. It is reasonable to assume that the proposed development will be subject to at least one moderate to severe earthquake from one of the faults during the next fifty years.

Zayante-Vergeles Fault	Monterey Bay-Tularcitos Fault	San Andreas Fault	San Gregorio Fault
7.3 miles Northeast	9.1 miles Southwest	9.2 miles Northeast	12.3 miles Southwest

Structures designed according to the 2016 California Building Code may use the following parameters in their analysis. The following ground motion parameters may be used in seismic design and were determined using the USGS Seismic Design Map and ASCE 7-10.

Design Parameter	ASCE 7-10
Site Class	D
Mapped Spectral Acceleration for Short Periods	Ss = 1.500 g
Mapped Spectral Acceleration for 1-second Period	S_1 = 0.600 g
MCE Spectral Response Acceleration for Short Period	S_{MS} = 1.500 g
MCE Spectral Response Acceleration for 1-Second Period	S_{M1} = 0.900 g
5% Damped Spectral Response Acceleration for Short Period	S_{DS} = 1.500 g
5% Damped Spectral Response Acceleration for 1-Second Period	S_{D1} = 0.600 g
Seismic Design Category	D
PGAm	0.500 g

Ground Rupture

There are no known fault traces located near the site and the potential for seismic ground rupture is very low.

Landsliding

The site is nearly level and the nearest steep slope is located over 1000 feet away. There is a very low potential for landsliding to affect the proposed improvements.

Liquefaction

Liquefaction occurs when saturated fine grained sands, silts and sensitive clays are subject to shaking during an earthquake and the water pressure within the pores builds

up leading to loss of strength.

An analysis of the liquefaction potential was performed using a design earthquake of 0.5g. Groundwater was only encountered in Borings 1, 2 and 8, but there is a potential for groundwater to develop in the vicinity of Boring 3. The groundwater levels used in our analysis represent our best estimate of historic high groundwater levels.

The results of our liquefaction analysis indicate there is a potential for liquefaction to develop from 18 to 21 feet in Boring 1 and from 24 to 26 feet in Boring 3. There are no surface effects expected as a result of liquefaction due to the small thickness and depth of the liquefiable layers. There is a very low potential for lateral spreading to occur due to the discontinuity of the liquefiable soils.

DISCUSSIONS & CONCLUSIONS

Based on the results of our investigation, the proposed development is feasible from a geotechnical standpoint. Primary geotechnical concerns for the project include total and differential settlement in the loose and variable surface soils, soil expansion within the thin zones of highly expansive clay encountered near the ground surface, strong seismic shaking from nearby faults and controlling site drainage.

The near surface soils are variable in terms of composition, density and engineering characteristics. There was up to three feet of man-made fill encountered in our borings. The fill consisted of granular soils and ranged from loose to medium dense. Below the fill, the native soils varied between clayey sand, silty sand and sandy clay that were medium dense except in Boring 6 where the soils were loose in the upper 4.5 feet. The clayey soils vary from slightly expansive to highly expansive and the thickness and depth of the expansive soil varies across the site.

To create a uniform building pad and mitigate differential movement below the proposed structures, we recommend blending and densifying the top 6 feet of soil within 5 feet of buildings and blending and densifying the top 3 feet of soil within 3 feet of pavements. The site soils will shrink during compaction. We estimate shrinkage will be on the order of 15 percent. Structures may be supported on conventional foundations embedded into engineered fill. There should be at least 4 feet of engineered fill below the bases of the foundation elements.

The foundation zones soils are slightly to moderately expansive with thin zones of highly expansive clay. The thin zones of highly expansive clay should be removed from the site or used in landscape areas. To help mitigate soil expansion and provide a firm uniform base for slab floors, we recommend capping the native fill with 12 inches of select granular fill. Our calculations indicate properly moisture conditioned and blended soils with at least 12 inches of granular fill on top will have a low potential to swell under the proposed building loads.

The proposed structures will most likely experience strong seismic shaking during the design lifetime. The foundations and structures should be designed utilizing the most current seismic design standards.

The ground surface adjacent to buildings should be sloped away so water is not allowed to pond next to foundations. The site is fairly level so buildings may have to be raised to get the ground to slope away. Walkways and driveways should be sloped towards suitable collection areas. The majority of the soils at the site have low permeability and surface runoff may pond if adequate drainage is not provided. Our firm performed percolation testing in the upper eight feet of soil and the soils had infiltration rates between 0.02 and 0.4 incher per hour which is not well suited for on-site retention. Storm runoff should be collected and discharged off-site in a controlled manner.

RECOMMENDATIONS

The following recommendations may be used as guidelines for preparing project plans and specifications. At the time of this report, structures will be constructed at or above existing grades with no basements proposed. If basements are proposed in the future, additional geotechnical recommendations and criteria should be developed.

General Site Grading

1. The geotechnical engineer should be notified **at least four days** prior to any grading or foundation excavating so the work in the field can be coordinated with the grading contractor and arrangements for testing and observation can be made. The recommendations of this report are based on the assumptions that the geotechnical engineer will perform the required testing and observation during grading and construction. It is the owner's responsibility to make the necessary arrangements for these required services.

3. Areas to be graded should be cleared of all obstructions including existing fill and any other unsuitable material or debris. All organic materials shall be stripped from any areas to receive engineered fill, foundations, slabs or pavements. The exact depth of stripping should be determined in the field during grading. Organically contaminated soils may be stockpiled and used in landscape areas.

4. All voids created during site clearing should be backfilled with engineered fill.

5. The soil within 5 feet of building foundations should be excavated to 6 feet or at least 4 feet below the bases of the proposed foundation elements, whichever is deeper; be moisture conditioned to 2 percent over optimum moisture content; be blended to a uniform consistency; then be replaced as engineered fill. Expansive clays encountered during grading should be removed. The fill below structures should be capped with 12 inches of select granular fill or baserock. Select granular fill should consist of well graded granular soil with approximately 10 percent fines.

6. The soil within 3 feet of pavements should be excavated to a depth of 3 feet, be moisture conditioned to 2 percent over optimum moisture content, be blended to a uniform consistency, then be replaced as engineered fill.

7. Areas to receive engineered fill should be scarified and compacted to provide a firm base for fill placement.

8. The on-site soil may be used for engineered fill (as specified in this report) with the exception of the 1 to 2 feet thick layers of highly expansive clay encountered in some areas. The clay soils encountered in the upper 5 feet in the vicinity of Boring 7 meet the requirements for engineered fill, but the clayey soil may require substantial moisture conditioning and extra compaction effort to be used as engineered fill.

Imported soils used for engineered fill should be granular, have a Plasticity Index less

than 15, be free of organic material, and contain no rocks or clods greater than 6 inches in diameter, with no more than 15 percent larger than 4 inches. Imported soils to be used as engineered fill should be provided to our firm at least 4 days prior to importing the material to the site so the soil may be tested for conformance with our recommendations.

9. Engineered fill placed beneath buildings should be moisture conditioned to about 2 percent over optimum moisture content, placed in thin lifts less than 8-inches in loose thickness and compacted to at least 95 percent relative compaction.

10. Engineered fill placed elsewhere on the site should be moisture conditioned to about 2 percent over optimum moisture content, placed in thin lifts less than 8-inches in loose thickness and compacted to at least 90 percent relative compaction.

11. Where referenced in this report, Percent Relative Compaction and Optimum Moisture Content shall be based on ASTM Test Designation D1557.

12. Engineered fill should be observed and tested by our firm. At a minimum, in-place density tests should be performed as follows: one test for every foot of fill, one test for every 1,000 sq. ft. of material for relatively thin fill sections and one test whenever there is a definite suspicion of a change in the quality of moisture control or effectiveness in compaction.

13. After the earthwork operations have been completed and the geotechnical engineer has finished their observation of the work, no further earthwork operations shall be performed except with the approval of and under the observation of the geotechnical engineer.

Concrete Slabs-on-Grade

14. All existing fill should be removed from areas to receive concrete slabs-on-grade.

15. The upper 8 inches of subgrade soil below non-load bearing concrete slabs-on-grade should be moisture conditioned to 1 to 2 percent over optimum moisture content and compacted to at least 90 percent relative compaction.

16. For driveway slabs the upper 3 feet of soil within 3 feet of the pavement should be moisture conditioned to 1 to 2 percent over optimum moisture content and compacted to at least 90 percent relative compaction. The upper 8 inches of subgrade and any aggregate base placed beneath the slab should be compacted to at least 95 percent relative compaction.

17. All concrete slabs-on-grade can be expected to suffer some cracking and movement. However, thickened exterior edges, a well-prepared subgrade including pre-moistening prior to pouring concrete, adequately spaced expansion joints and good workmanship should reduce cracking and movement.

18. Dees & Associates, Inc. are not experts in the field of moisture proofing and vapor barriers. In areas where floor wetness would be undesirable, an expert, experienced with moisture transmission and vapor barriers should be consulted. At a minimum, a blanket of 4 inches of free-draining gravel should be placed beneath the floor slab to act as a capillary break. In order to minimize vapor transmission, an impermeable membrane (15-mil or thicker) should be placed over the gravel.

Pavements

19. The top 8 inches of pavement subgrade should be scarified, moisture conditioned to 1 to 2 percent over optimum moisture content and compacted to at least 95 percent relative compaction.

20. For preliminary design purposes, an R-value of 15 was used to estimate the pavement sections for the proposed development. Once the site soils have been blended and placed per our grading recommendations, the actual R-value of the subgrade soil should be determined.

	Traffic Index	AC Thickness	Class 2 Aggregate Base
Driveways	5	3	5
Truck Areas	7	4.5	8

21. The aggregate base pavements should be moisture conditioned and compacted to at least 95 percent relative compaction prior to placing concrete or asphalt paving materials.

22. Only quality materials of the type and minimum thickness specified should be used. Baserock (R=78 minimum) should meet Caltrans Standard Specifications for Class II Untreated Aggregate Base.

Utility Trenches

23. Utility trenches placed parallel to structures should not extend within an imaginary 1:1 (horizontal to vertical) plane projected downward from the bottom edge of the adjacent footing.

24. Trenches may be backfilled with compacted engineered fill placed in accordance with the grading section of this report. The backfill material should not be jetted in place.

25. The portion of utility trenches that extend beneath foundations should be sealed with 2-sack sand slurry (or equivalent) to prevent subsurface seepage from flowing under buildings.

Earthwork Construction Considerations

26. At the time of our study, moisture contents of the surface and near-surface soils ranged from about 9 percent to 20 percent. Based on these moisture contents, some moisture conditioning will likely be needed for the project. The soils moisture contents

may need to be dried by aeration or wetted to achieve the recommended moisture content range.

27. There is a potential for near surface perched groundwater to develop 3 to 6 feet below grade causing the near surface soils to become saturated. If grading is performed in the winter or spring, excavations may become flooded and have to be dewatered. The on-site soils may pump and unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Should unstable subgrade conditions develop stabilization measures may need to be developed.

28. Upon completion of grading, care should be taken to maintain the subgrade moisture content prior to construction of the floor slab. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and re-compacted prior to floor slab and pavement construction.

29. We recommend the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically October through May) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

Spread Footings Foundations

30. Structures may be supported on spread footing foundations embedded into compacted engineered fill. Spread footing foundations may be designed in accordance with the following:

Number of Stories	Minimum Depth (inches)	Minimum Width (inches)	Allowable Bearing Capacity (psf)
1	12	12	2,600
2	18	15	3,100
3 to 4	24	18	3,700

31. Total and differential settlements are anticipated to be less than 1 inch and 1/2 inch respectively for footings designed and constructed in accordance with the above.

32. Lateral load resistance for structures supported on footings may be developed in friction between the foundation bottom and the supporting subgrade. A friction coefficient of 0.5 is considered applicable. Where footings are poured neat against

engineered fill, a passive lateral earth pressure of 375 pcf may be used. The top 12 inches of soil should be neglected in passive design.

33. Footings located adjacent to other footings or utility trenches should have their bearing surfaces founded below an imaginary 1.5:1 plane projected upward from the bottom edge of the adjacent footings or utility trenches.

34. The foundation trenches must be kept moist until the concrete is placed to mitigate soil shrinkage. If the soils are allowed to dry out and shrinkage cracks develop, the soils will need to be moisture conditioned until the cracks close and the surrounding soil is moist.

35. Prior to placing concrete, foundation excavations should be observed by the soils engineer.

Retaining Wall Lateral Pressures

36. Retaining walls should be designed to resist both lateral earth pressures and any additional surcharge loads.

37. Unrestrained retaining walls may be designed to resist an active lateral earth pressure of 42 pcf equivalent fluid weight for level backfills, 48 pcf equivalent fluid weight for backslopes inclined up to 3:1 (horizontal to vertical) and 72 pcf equivalent fluid weight for backslopes inclined up to 2:1 (horizontal to vertical).

38. Restrained retaining walls may be designed to resist an at rest earth pressure of 63 pcf equivalent fluid weight for level backfills, 84 pcf equivalent fluid weight for backfills inclined up to 3:1 (horizontal to vertical) and 111 pcf equivalent fluid weight for backslopes inclined up to 2:1 (horizontal to vertical).

39. Retaining walls over 6 feet high should include a seismic surcharge load of 16 pcf, EFW, in addition to the above lateral earth pressures. The dynamic pressure should be applied as an inverted triangle with the resulted located at a point 0.6 H above the base of the wall.

40. The above lateral pressures assume that the walls are fully drained to prevent hydrostatic pressure behind the walls. Drainage materials behind the wall should consist of either Class 1 or Class 2 permeable material (Caltrans Specification 68). Place filter fabric between Class 1 permeable material and backfill. No filter fabric is required with Class 2 permeable material. The drains should extend from the base of the walls to within 12 inches of the top of the backfill. A perforated pipe should be placed (holes down) about 2 inches above the bottom of the wall and be tied to a suitable drain outlet. Wall backdrains should be plugged at the surface with clayey material to prevent infiltration of surface runoff into the backdrains.

Site Drainage

41. Surface drainage should include provisions for positive gradients so that surface runoff is not permitted to pond adjacent to improvements.

42. Where bare soil or pervious surfaces are located next to building foundations, the ground surface within 10 feet of the structure should be sloped at least 5 percent away from the foundation.

43. Where impervious surfaces are used within 10 feet of building foundations, the impervious surface within 10 feet of the structure should be sloped at least 2 percent away from the foundation.

45. Where the ground cannot be sloped the full 10 feet width, swales should be used to collect and remove surface runoff away from the structure. Swales should be sloped towards the discharge point.

46. Full roof gutters should be placed around the eves of structures and water from the downspouts should be conveyed away from the structure.

47. Sufficient driveway gradients should be provided for rapid removal of storm water and to prevent ponding water on or adjacent to pavements.

48. The subsoils at the site have low permeability and are not well suited for on-site retention of concentrated storm runoff. Concentrated storm water should be discharged off-site in conformance with local drainage requirements.

Plan Review, Construction Observation, and Testing

49. Dees & Associates, Inc. should be provided the opportunity for a general review of the final project plans prior to construction to evaluate if our geotechnical recommendations have been properly interpreted and implemented. If our firm is not accorded the opportunity of making the recommended review, we can assume no responsibility for misinterpretation of our recommendations. We recommend that our office review the project plans prior to submittal to public agencies, to expedite project review. Dees & Associates, Inc. also requests the opportunity to observe and test grading operations and foundation excavations at the site. Observation of grading and foundation excavations allows anticipated soil conditions to be correlated to those encountered in the field during construction.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the time, our firm should be notified so that supplemental recommendations can be given.

2. 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 called to the attention of the Architects and Engineers for the project and incorporated into the plans, and that the necessary steps are taken to ensure that the Contractors and Subcontractors carry out such recommendations in the field. The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice. No other warranty expressed or implied is made.

3. 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 are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards 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 should not be relied upon after a period of three years without being reviewed by a soil engineer.

APPENDIX A

Site Vicinity Map

Site Image

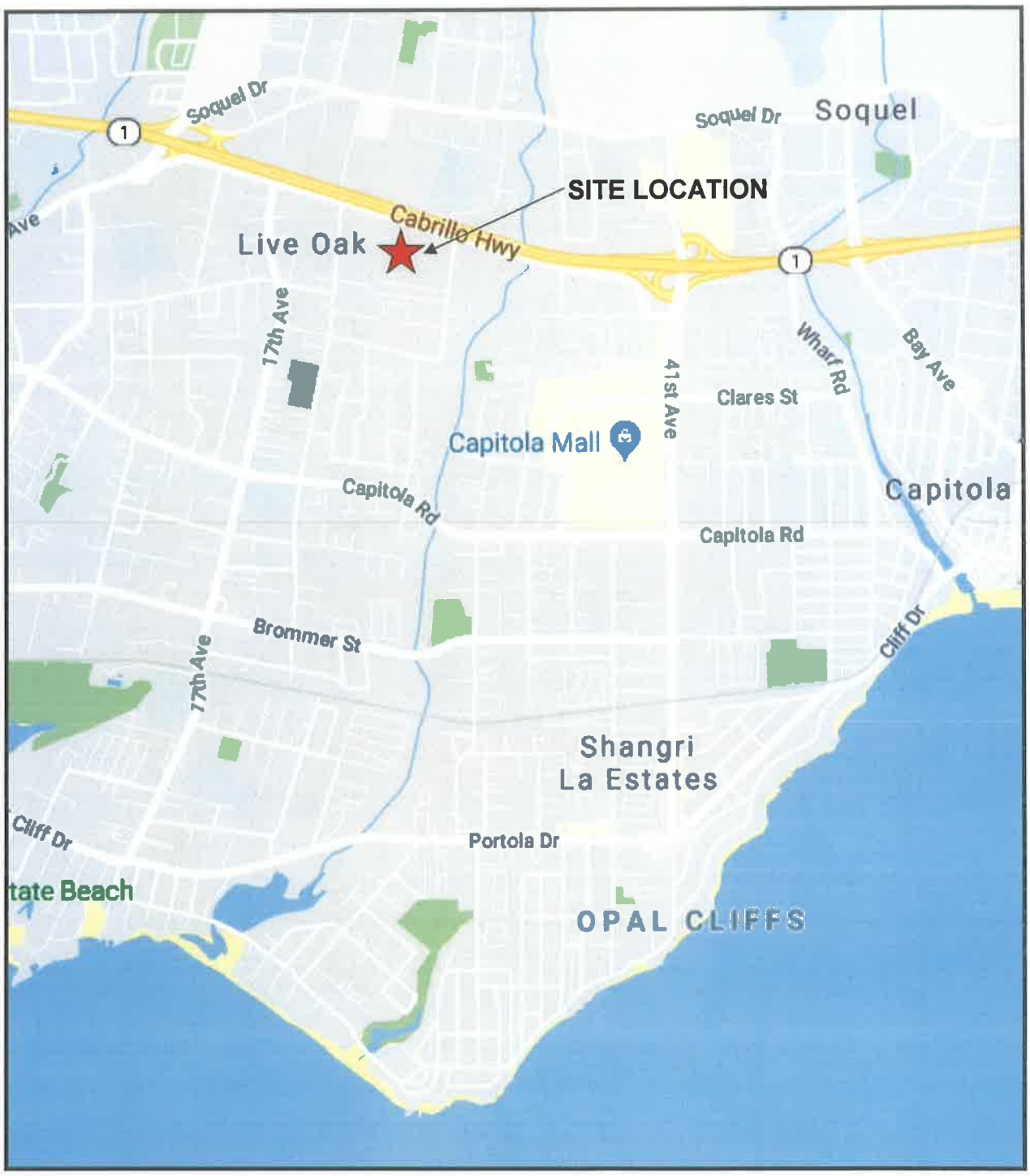
Boring Site Map

Unified Soil Classification System

Test Borings Logs

Fault Map

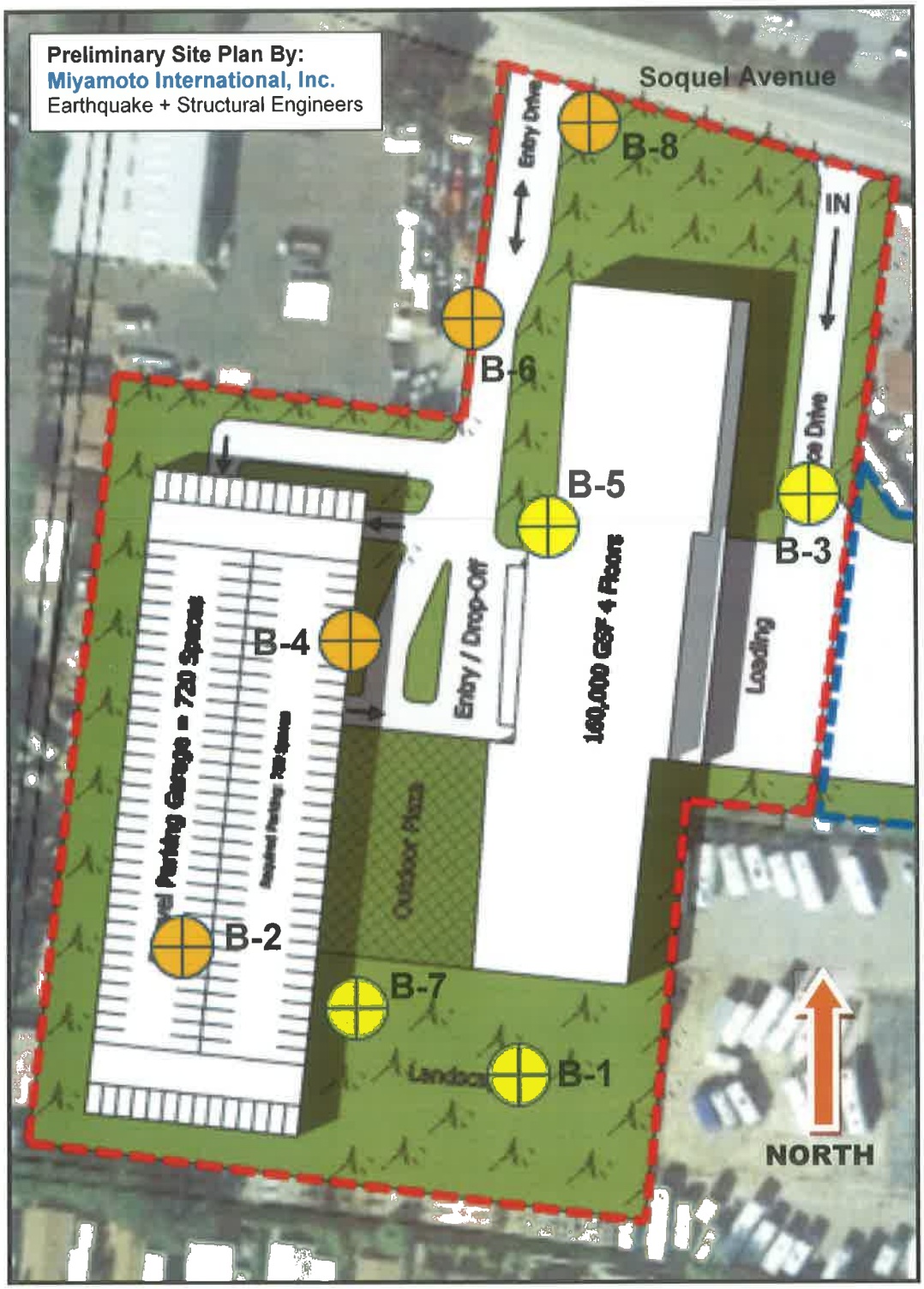
Laboratory Test Results



SITE VICINITY MAP
Figure 1

EXISTING SITE IMAGE

Figure 2



BORING SITE MAP

Figure 3

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS** MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE (THE NO. 200 SIEVE SIZE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE)	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS (< 5% FINES)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Predominantly one size or a range of sizes with some intermediate sizes missing Not meeting all gradation requirements for GW	
		GRAVELS WITH FINES (>12% FINES)	GM	Silty gravels, gravel-sand-silt mixtures	Non plastic fines or fines with low plasticity Atterberg limits below "A" line or PI < 4	Above "A" line with 4 < PI < 7 are borderline cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Plastic fines Atterburg limits above "A" line with PI > 7	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS (<5% FINES)	SW	Well-graded sands, gravelly sands, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate sizes missing	
			SP	Poorly graded sands, gravelly sands, little or no fines	Predominantly one size or a range of sizes with some intermediate sizes missing Not meeting all gradation requirements for SW	
		SANDS WITH FINES (>12% FINES)	SM	Silty sands, sand-silt mixtures	Non plastic fines or fines with low plasticity Atterburg limits below "A" line or PI < 4	Limits plotting in hatched zone with 4 < PI < 7 are borderline cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Plastic fines Atterburg limits above "A" line with PI > 7	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE (THE NO. 200 SIEVE SIZE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE)	SILTS AND CLAYS (LIQUID LIMIT < 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	SILTS AND CLAYS (LIQUID LIMIT > 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of medium to high plasticity, organic silts		
			OH	Organic clays of medium to high plasticity, organic silts		

**Gravels and sands with 5% to 12 % fines are borderline cases requiring use of dual symbols.

RELATIVE DENSITY OF SANDS AND GRAVELS

DESCRIPTION	BLOW / FT*
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	30 – 50
VERY DENSE	OVER 50

CONSISTENCY OF SILTS AND CLAYS

DESCRIPTION	BLOWS / FT*
VERY SOFT	0 – 2
SOFT	2 – 4
FIRM	4 – 8
STIFF	8 – 16
VERY STIFF	16 – 32
HARD	OVER 32

*Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. 12 vertical inches.

Figure 4

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: SC | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 1

DEPTH (feet)	SAMPLE NO.	SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-		Fill?										
1	1-1-1			10								
-	L	Dark brown mottled Clayey SAND, damp, medium dense	SC	12								
2				28	20	86.7	14.1	33.7	799.0	27.0		
-	1-2-			7								PI=
3	T			14								23.6
-				12	26							LL=
4	1-3-1			15								38.5
-	L			24								
5		Dark yellowish brown Clayey SAND, damp, medium dense	SC	32	28	104.8	22.6	25.6	995.2	26.7		
-	1-4			8								
6	T			9								
-		Dark yellowish brown Sandy CLAY - Clayey SAND, moist,	CL/	10	19							
7		medium dense to stiff	SC									
-												
8	1-5			2								
-	T	Grayish brown Sandy CLAY, moist, firm	CL	2								
9				4	6		30.9					
-												
10												
-												
11												
-												
12	1-6	▼ water seepage at 12 feet										
-	T	Gray mottled Sandy CLAY, moist, firm		3								
13				3								
-				4	7							
14												
-												
15		Increase in sand and mottling										
-												
16	1-7			3								
-	T	Mottled gray Sandy CLAY, damp, medium stiff		3								
17				4	7							
-												
18		▼ Perched groundwater at 18 feet										
-												
19												
-			SM									
20		Brown Silty SAND, saturated, loose		4								
-	1-8			4								
21	T	Gray mottled Sandy CLAY, moist, stiff	CL	5	9		28.9				23.7	
-												
22												
-		Boring Terminated at 21.5 Feet										
23		Groundwater Seep at 12 Feet										
-		Groundwater Encountered at 18 Feet										
24												
-												
25												
-												
26												
-												

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Figure 5

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 2

DEPTH (feet)	SAMPLE NO.	SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-		FILL?										
1	2-1-1			12								
-	L	Mottled very dark gray brown Silty and Clayey SAND with	SC	12								
2		pockets of CLAY, moist, medium dense		12	12		12.2					
-	2-2			4								
3	T	NATIVE? Gray brown mottled Clayey SAND, moist,		4								
-		medium dense	SC	4	8							
4												
-												
5	2-3			2								
-	T	Grades to black Sandy CLAY, very moist	CL	7								
6		Thin Sand lens at 5.5 feet, saturated		8	15							
-		Dark gray CLAY with SAND, very moist, very stiff										
7												
-												
8												
-												
9												
-												
10	2-4			8								
-	T	Gray brown Sandy SILT/CLAY, moist to very moist, very	ML/	12								
11		stiff	CL	12	24		17.4					
-												
12												
-		Contact is approximate										
13												
-												
14												
-												
15	2-5			10								
-	T	Grades to a pale gray brown SILT, moist to very moist,	ML	18								
16		hard		25	43							
-												
17												
-												
18												
-												
19												
-	2-6			4								
20	T											
-		Pale gray brown fine Sandy SILT, very moist, medium stiff	ML	5								
21				6	11		28.5					
-												
22												
-												
23												
-												
24												
-												
25	2-7	Gray Sandy SILT, very moist, medium stiff		8								
-	T	Gray to dark yellow brown Silty SAND lens	ML/	8								
26		Gray Sandy SILT/Silty SAND, very moist, medium dense	SM	7	15							
-												

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Figure 6

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 2

DEPTH (feet)	SAMPLE NO.	SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
28	2-8 T	Gray Silty SAND to SAND with SILT, moist, dense	SM	7 10 20	30							
35	2-9 T	Gray brown SILT with Sand, very moist, very stiff	ML	4 8 15	23		26.7					
40	2-10 T	Gray brown well graded SAND with few gravels up to 1", moist, very dense (Purisima Formation)	SW	12 21 28	49							
45	2-11 T	Gray fine Silty SAND, wet, very dense	SM	20 20 35	55							
		Boring Terminated at 46.5 Feet Perched Water Encountered at 5.5-6 Feet Perched Water Encountered at 18-19 Feet Groundwater Encountered at 43.5 Feet										

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Figure 6

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 3

DEPTH (feet)	SAMPLE NO.			USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
1	3-1-1 L		Gray brown fine Silty SAND, dry-damp, medium dense	SM	10 15								
2					17	16	83.4	17.4	38.2	485.5	31.8		
3	3-2 T				5 7								PI=
4			Gray Fat CLAY, moist, stiff	CH	10	17							61.2
5	3-3-1 L				12								LL= 72.7
6					12								
7			Gray Silty SAND, damp, very dense	SM	30/3"	30/3"							
10	3-4 T		Thin seam coarse SAND and GRAVEL		5 5								
11			Gray fine Sandy SILT, very moist, medium stiff	ML	5	10		23.1					
14			Approximate Contact										
15	3-5-1 L				10 20								
16			Gray Clayey GRAVEL, wet, dense	GP	50/6"	50/6"							
17			Approximate Contact										
20	3-6 T		Gray brown Clayey SAND with lenses of Silty SAND, damp to moist, medium dense	SC	10 10 15	25		16.2					
24			Approximate Contact										
25	3-7 T		▼ Perched groundwater Gray fine Silty SAND, saturated, very loose (sample sucked out)	SM	1 1 2	3							

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Figure 7

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 3

DEPTH (feet)	SAMPLE NO.	SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
30	3-8 T	Dark yellow brown Gravelly SAND, damp to moist, dense (subangular gravels up to ¼ inch)	SP	17 20 24	44		9.4					
35	3-9 T			12 19								
36		Yellow brown fine Silty SAND, damp, very dense (Purisima Formation)	SM	50/6"	50/6"							
		Boring Terminated at 36.5 Feet Perched Water Encountered at 24 Feet										

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Figure 7

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 4

DEPTH (feet)	SAMPLE NO.			USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-			FILL										
1	4-1-1			SM	10								
-	L		Dark brown Gravelly Silty SAND, damp, medium dense		15								
2					16	31							
-	4-2		NATIVE		4								
3	T		Dark brown clayey SAND grading to Sandy CLAY, moist,	SC/	6								
-			medium dense - stiff	CL	7	13		20.1					
4			Grades to gray brown Clayey SAND, moist to very moist,	SC									
-			medium dense										
5	4-3-1				4								
-	L				9								
6					9	9		23.3					
-													
7													
-			Contact Unknown										
8													
-													
9													
-													
10	4-4				3								
-	T		Gray brown fine Sandy SILT/CLAY, very moist, medium	ML/	3								
11			stiff	CL	7	10							
-													
12													
-													
13													
-			Contact Unknown										
14													
-													
15	4-5				9								
-	T		Gray brown fine Clayey SAND, moist, medium dense	SC	11								
16					15	26		19.8					
-													
17													
-													
18													
-													
19													
-													
20	4-6				17								
-	T		Brown Sandy GRAVEL-Gravelly SAND, moist dense	GP/	17								
21				SP	26	43							
-													
22													
-													
23													
-													
24													
-													
25	4-7				38								
-	T				24								
26			Brown Gravelly SAND, moist, dense	SP	36	60		9.7					
-													
			Boring Terminated @ 26.5 Feet No Groundwater Encountered										

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Figure 8

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: SC | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 5

DEPTH (feet)	SAMPLE NO.			USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
1	5-1-1 L		Dark brown Silty/Clayey SAND with Gravel, damp, loose	SC	11 4								
2					3	7	116.0	16.1	16.7	480.7	33.0		
3	5-2 T				2 4								PI=
4	5-3-1 L		Dark mottled yellowish brown Sandy CLAY, moist, stiff	CL	7 3	11							27.7 LL=
5					4 8	12							39.7
6													
7			Approximate Contact										
8	5-4 T		Dark mottled yellowish brown Clayey SAND, trace angular ½ " gravels, moist, medium dense	SC	4 5								
9					5	10		25.4					
10													
11													
12	5-5 T				3 4								
13			Gray mottled Sandy CLAY, moist, stiff	CL	5	9							
14													
15			Approximate Contact										
16	5-6 T		Dark yellow to grayish brown fine to medium grained Clayey SAND, damp, medium dense	SC	5 11								
17					14	25		20.1					
18													
19													
20	5-7 T		Yellowish brown Clayey angular GRAVEL with SAND, moist, very dense	GP	12 25 25	50							
21			Boring Terminated @ 21.5 Feet No Groundwater Encountered										
22													
23													
24													
25													
26													

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Figure 9

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: SC | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 6

DEPTH (feet)	SAMPLE NO.			USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
1			FILL Yellowish brown Silty SAND with Gravel up to 2", moist, loose	SM									
2	6-1-1				4								
	L				5								
3			Dark yellowish brown Silty SAND, moist, loose	SM	5	5	94.4	18.4	29.4	382.3	35.1		
	6-2				2								
4	T		Dark brown Silty to Clayey SAND, wet, loose	SC	2								
					3	5		20.5					
5			Black Sandy CLAY with trace rounded Gravel, moist, firm	CL									
6													
			Approximate Contact										
7													
8	6-3		Pale yellow to grayish brown mottled Sandy SILT-Silty	ML/	5								
	T		SAND, trace angular Gravel, damp, medium dense	SM	10								
9					10	20		19.5					
10													
11													
12	6-4				8								
	T		Gravels at 12 feet		10								
13			Dark yellowish brown Clayey SAND with angular Gravel, moist, medium dense	SC	10	20							
14													
			Approximate Contact										
15													
16	6-5				11								
	T		Dark brown Sandy GRAVEL, moist, medium dense	GP	15								
17					15	30		11.5					
18													
			Approximate Contact										
19													
20	6-6		Yellowish brown medium to coarse grained well graded	SW	15								
	T		SAND with rounded Gravel up to 3/4", damp, dense		16								
21					18	34							
22													
23			Boring Terminated @ 21.5 Feet No Groundwater Encountered										
24													
25													
26													

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Figure 10

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 7

DEPTH (feet)	SAMPLE NO.			USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
1	7-1-1			CL/	10								
-	L		Black fine Sandy CLAY – Clayey SAND, moist, medium	SC	7								
2			dense/stiff		12	10	85.1	20.6	35.1	325.8	31.5		
-	7-2				2								
3	T				2								
-			Black fine Sandy CLAY, moist, firm	CL	4	6							PI=
4													17.8
-													
5	7-3-1				5								
-	L		Brown Sandy CLAY, very moist, stiff	CL	9								
6					12	21							
-													
7													
-													
8			Contact unknown										
-													
9													
-													
10	7-4				6								
-	T		Gray brown Clayey SAND, damp-moist, medium dense	SC	6								
11					10	16		19.5					
-													
12													
-			Contact Unknown										
13													
-													
14													
-													
15	7-5				8								
-	T		Gray brown Sandy CLAY, moist, very stiff	CL	8								
16					8	16							
-													
17													
-			Contact Unknown										
18													
-													
19													
-													
20	7-6				6								
-	T		Gray brown SILT, wet, stiff	ML	6								
21					10	16		37.1					
-													
22													
-													
23													
-													
24													
-													
25	7-7				12								
-	T		Yellow brown Sandy GRAVEL, moist, dense		30								
26			Yellow brown fine to medium SAND, moist, very dense		50'6"	50/6"							
-			(Purisima Formation)										
			Boring Terminated @ 26.5 Feet No Groundwater Encountered										

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Figure 11

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 8

DEPTH (feet)	SAMPLE NO.			USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
1	8-1		FILL	SP	15								
2	T		Yellow brown Gravelly SAND, dry, dense to 18" then medium dense		12 10	22		8.8					
3			NATIVE Black fine Clayey SAND, damp-moist, medium dense	SC									
5	8-2		Seep on top of Clay		5								
6	T		Black CLAY, moist, stiff	CL	8 7	15							
9			▼ Perched groundwater at 9 feet										
10	8-3		Mottled gray and yellow brown Sandy CLAY		8 12								
	T				12	24		17.4				32.9	
11			Mottled dark gray brown Clayey SAND, very moist, medium dense	SC									
			Contact Unknown										
15	8-4		Yellow brown SAND with Gravel, moist, dense	SP	12 20								
16	T				28	48		12.2				12.6	
			Boring Terminated @ 16.5 Feet Perched Groundwater Encountered at 9 Feet										

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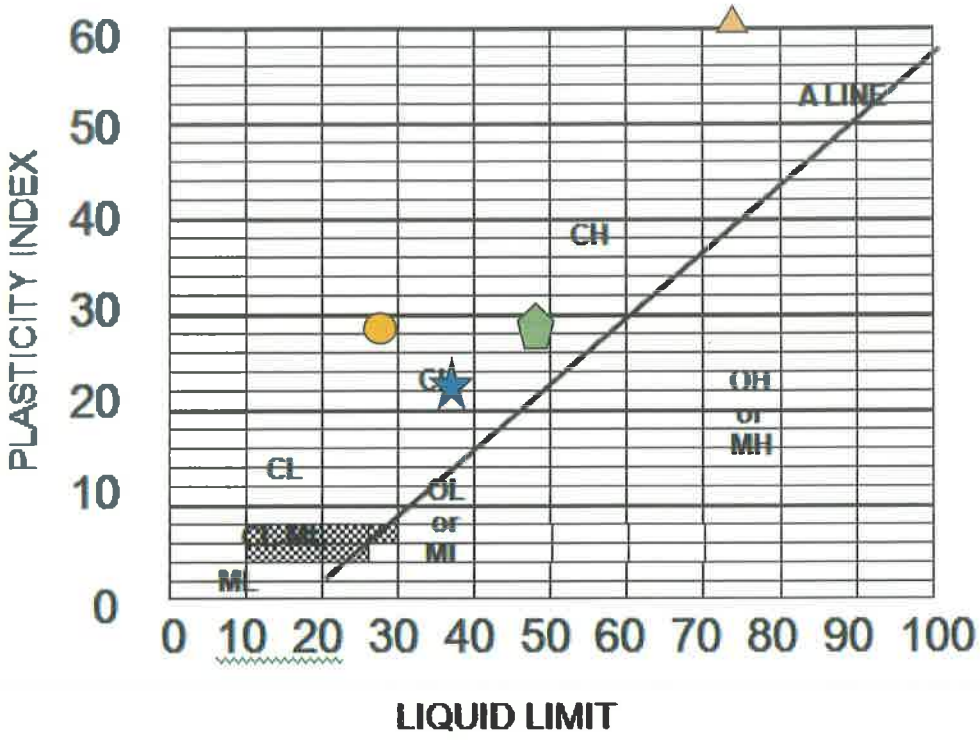
www.deesgeo.com | (831) 427-1770 | Fax: (831) 427-1794

Figure 12

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

FAULT MAP

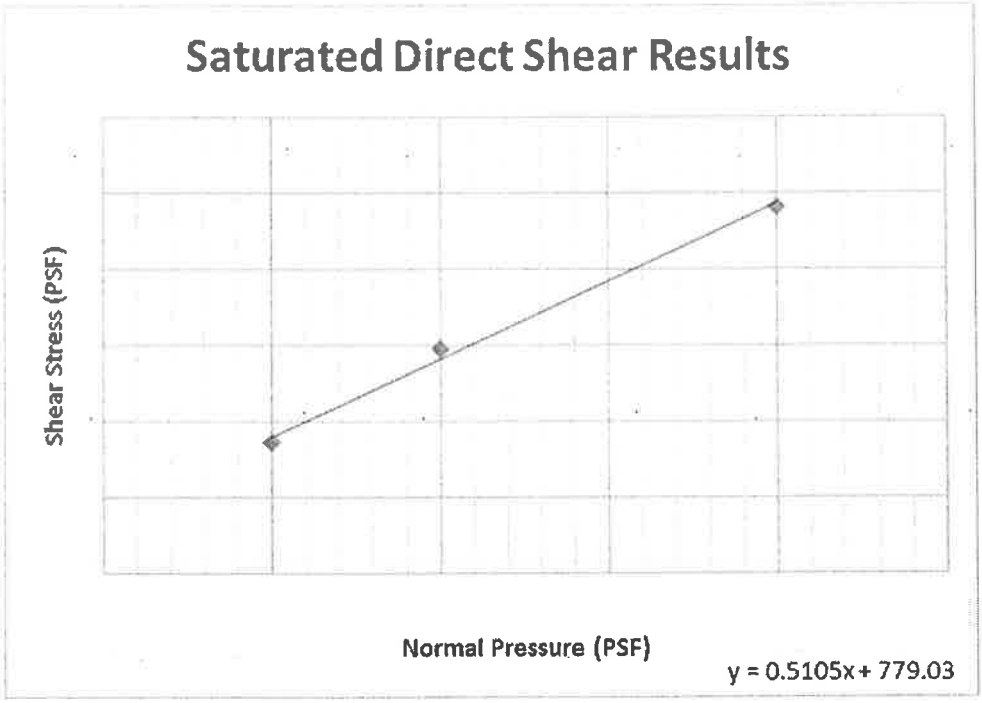
Figure 13



MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
CH	Inorganic clays of medium to high plasticity, organic silts, fat clays	CL	Inorganic clays of low to medium plasticity, gravelly clay sandy clays, silty clays, lean clays
OH	Organic clays of medium to high plasticity, organic silts	OL	Organic silts and organic silty clays of low plasticity
Pt	Peat and other highly organic soils		

PLASTICITY DATA

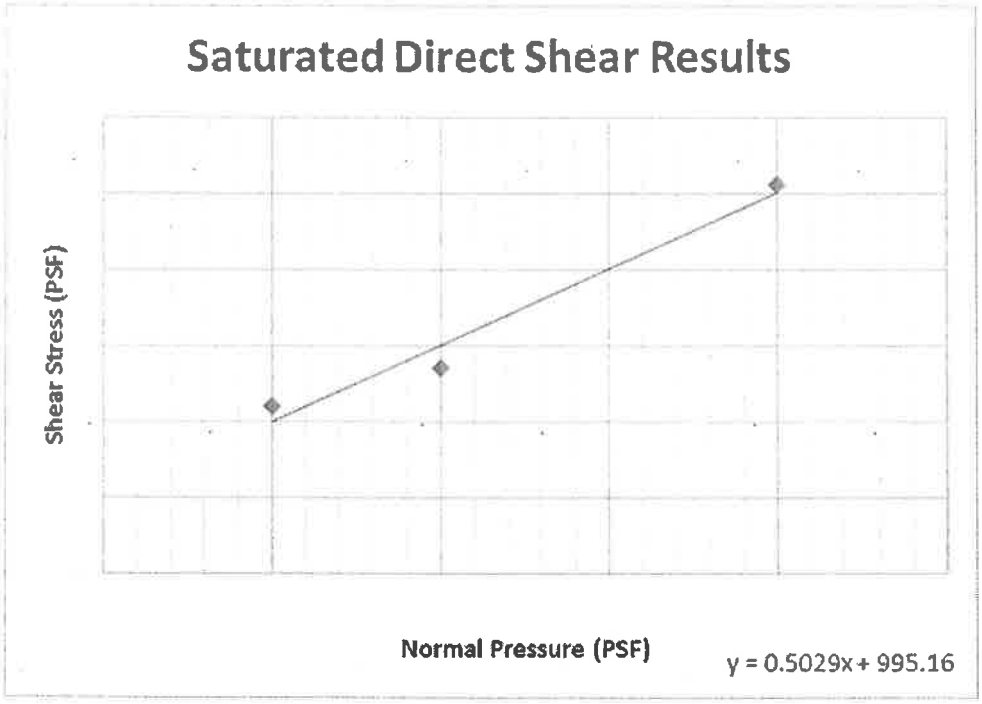
SYMBOL	SAMPLE NO.	DEPTH (FEET)	IN-SITU MOISTURE CONTENT (%)	LIQUID LIMIT (%	PLASTIC LIMIT (%	PLASTICITY INDEX (%)	LIQUIDITY INDEX (W-PL)/(LL PL)	UNIFIED SOIL CLASSIFICATION SYMBOL
★	1-2	3.5	14.1	38.5	14.9	23.6	-	CL
△	3-2	3.5	17.4	74.0	12.7	61.2	0.08	CH
⬟	5-2	3.5	16.1	39.7	12.0	27.7	0.15	CL
●	7-2	3.5	20.6	28.4	10.6	28.4	0.35	CL



Sample 1-1-1

Phi = 27.0 Degrees

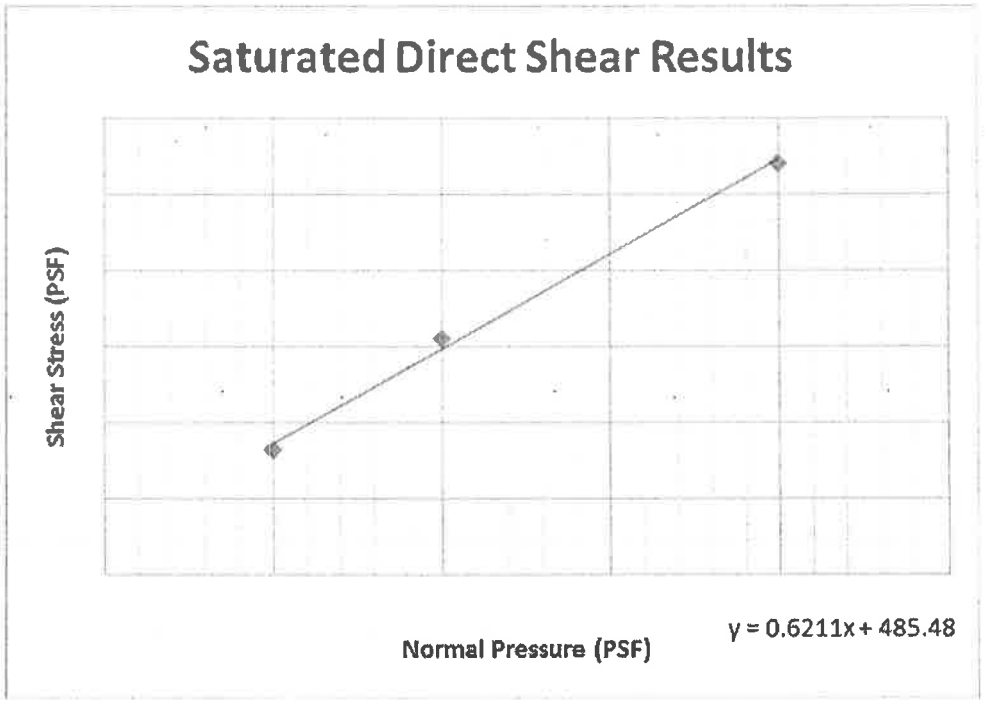
Cohesion = 779.0 psf



Sample 1-3-1

Phi = 26.7 Degrees

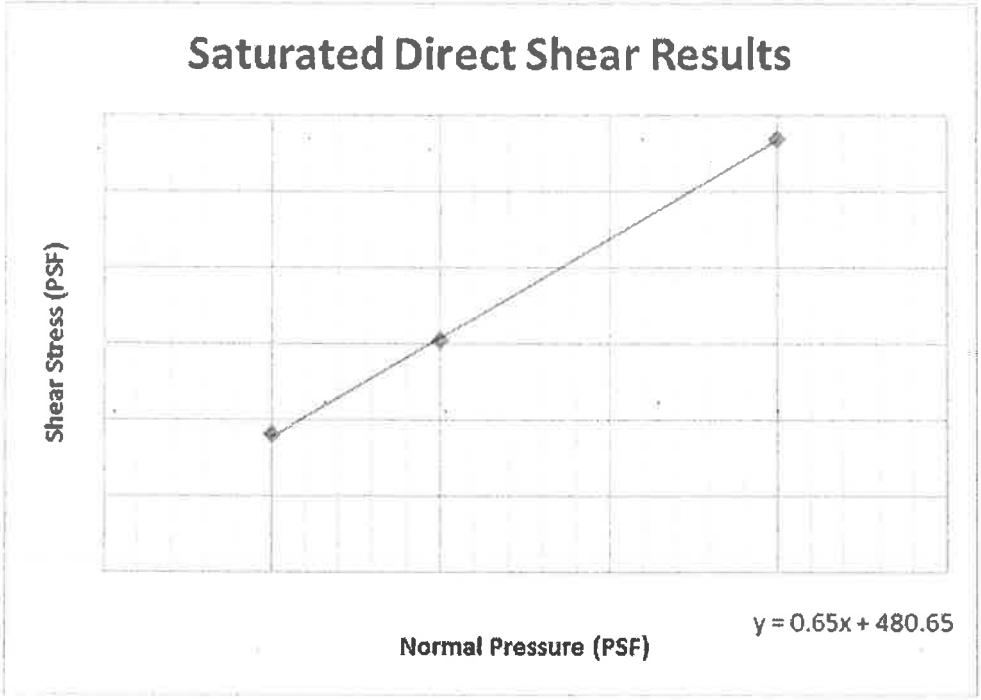
Cohesion = 995.2 psf



Sample 3-1-1

Phi = 31.8 Degrees

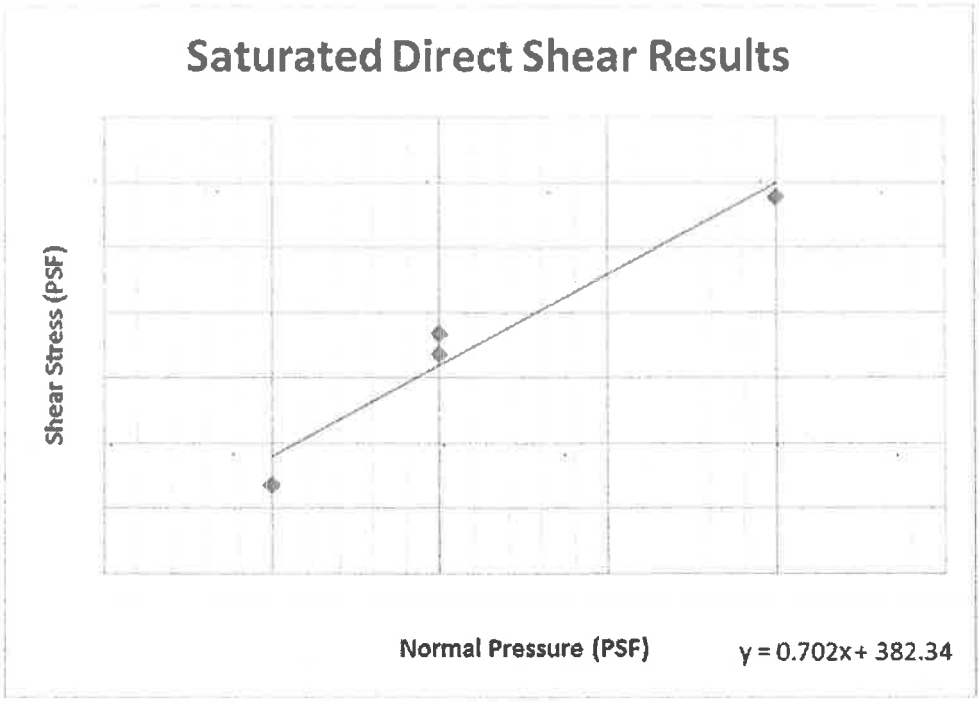
Cohesion = 485.5 psf



Sample 5-1-1

Phi = 33.0 Degrees

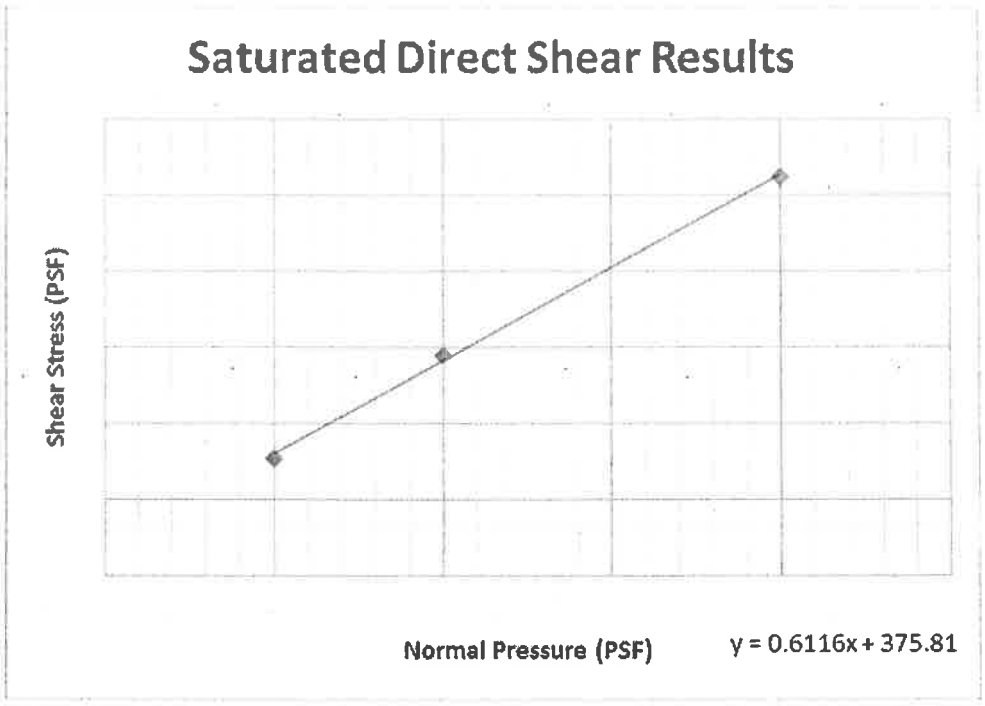
Cohesion = 480.7 psf



Sample 6-1-1

Phi = 35.1 Degrees

Cohesion = 382.3 psf



Sample 7-1-1

Phi = 31.5 Degrees

Cohesion = 375.8 psf

Corrosivity Test Summary

CTL # 577-035 Date: 8/24/2018 Tested By: PJ Checked: PJ
Client: Dees & Associates Project: Soquel Ave Proj. No: SCQ-1231
Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate		pH	ORP	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg	mg/kg	%		(Redox)	At Test	
						Dry Wt.	Dry Wt.	Dry Wt.		mv	%	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	Cal 643	SM 2580B	ASTM D2216	
4-1-1	-	1-2.5	-	5604	-	-	-	-	8.9	-	2.4	Dark Olive Brown Sandy CLAY w/ Gravel
5-3	-	4-5.5	-	1957	-	-	-	-	8.7	-	5.5	Olive Brown Sandy CLAY
8-2	-	5-6.5	-	2347	-	<2	30	0.0030	8.4	-	4.9	Black Sandy CLAY w/ Gravel

APPENDIX B
DRAINAGE STUDY FOR
NIGH PROPERTY

DRAINAGE STUDY

FOR

Nigh Property

Santa Cruz County, California

APN: 029-021-46, 47

FOR:

Santa Cruz County Planning Department

August, 2008

Job 08041

Prepared by: Ryan Chapatte

IFLAND ENGINEERS
Civil Engineering ■ Structural Design ■ Land Development

5200 Soquel Avenue Suite 102
Santa Cruz, CA 95062
(831) 426-5313 FAX (831) 426-1763
www.iflandengineers.com

Introduction:

The purpose of the subject drainage study is to evaluate probable impacts to Rodeo Gulch resulting from development of the two most westerly parcels of the site commonly known as Nigh Lumber and consisting of 7.7 acres. The area under study is shown on the "Existing Conditions" vicinity map included herein.

The drainage area included in the study consists of approximately 60 acres lying both north and south of Highway 1 and includes the former Drive-In movie theater site, recently purchased by Sutter Health. This study assumes that no impacts will result from the change in use of that site.

Resources for the study include the County of Santa Cruz Zone 5 Master Plan, field site reconnaissance of existing channel conditions and outfalls, as well as subdivision improvement plans and constructed drainage systems within the study area.

Existing Conditions:

The subject property is approximately 7.7 acres in total size and is located just south of Soquel Avenue between Mattison Lane and Chanticleer Avenue. The property is separated into two parcels. The east parcel contains a construction material supplier yard. The west parcel is an undeveloped plot of land that is used for storing cars, boats, RV's, etc.

Currently, the drainage from the properties north of Highway 1 flows through a 36" RCP culvert under Highway 1 followed by a combination of drainage ditches, vegetated swales, graded swales, concrete channels and underground storm drain pipes. The drainage makes its way through the subject property and then across multiple properties before it is finally discharged into Rodeo Gulch through the outfall approximately 1,500 feet south of Highway 1. A more detailed description of the existing drainage path is outlined in the *Existing Drainage* section of this report. The attached *Existing Drainage Map* shows the existing drainage features.

Since there have been no major developments in recent years in the drainage basin just north of Highway 1, the Zone 5 Master Drainage Plan will serve as the source for the drainage quantity used in the analysis of the drainage from the properties north of Highway 1. These properties include the former Drive-In movie theater, Good Shepard Middle School, the Emerald Bay Apartments along Soquel Drive and some of the residential properties along Mattison Lane.

The Zone 5 Master Drainage Plan was also used to quantify the existing drainage in Rodeo Gulch at the points of interest (A, B, C & D). According to Master Drainage Plan, the flow rates and capacities at points along Rodeo Gulch are as follows.

Point:	Type	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)	Capacity (cfs)
A	Natural channel	332	520	677	864	663
B	Concrete culvert	332	520	677	864	656
C	Natural channel	339	528	688	877	549
D	Natural channel	371	574	744	945	675

Based on this data, the existing channel is capable of handling a 25 year storm event within the study area.

The attached *Vicinity Map – Existing Conditions* shows the existing drainage basin as well as the points of interest.

Legend

- EXISTING DRAINAGE BASIN
- PROPERTY BOUNDARY
- PARCEL LINE
- EXISTING STORM DRAIN
- POINT OF INTEREST

Vicinity Map - Existing Conditions

SCALE: 1" = 300'

300' 0' 150' 300' 600'

GRAPHIC SCALE: 1 INCH = 300 FEET

JOB NO. 08041 - NIGH PROPERTY

SHEET NO. _____ OF _____

CALCULATED BY RYAN DATE 7/15/08

SCALE: 1" = 300'

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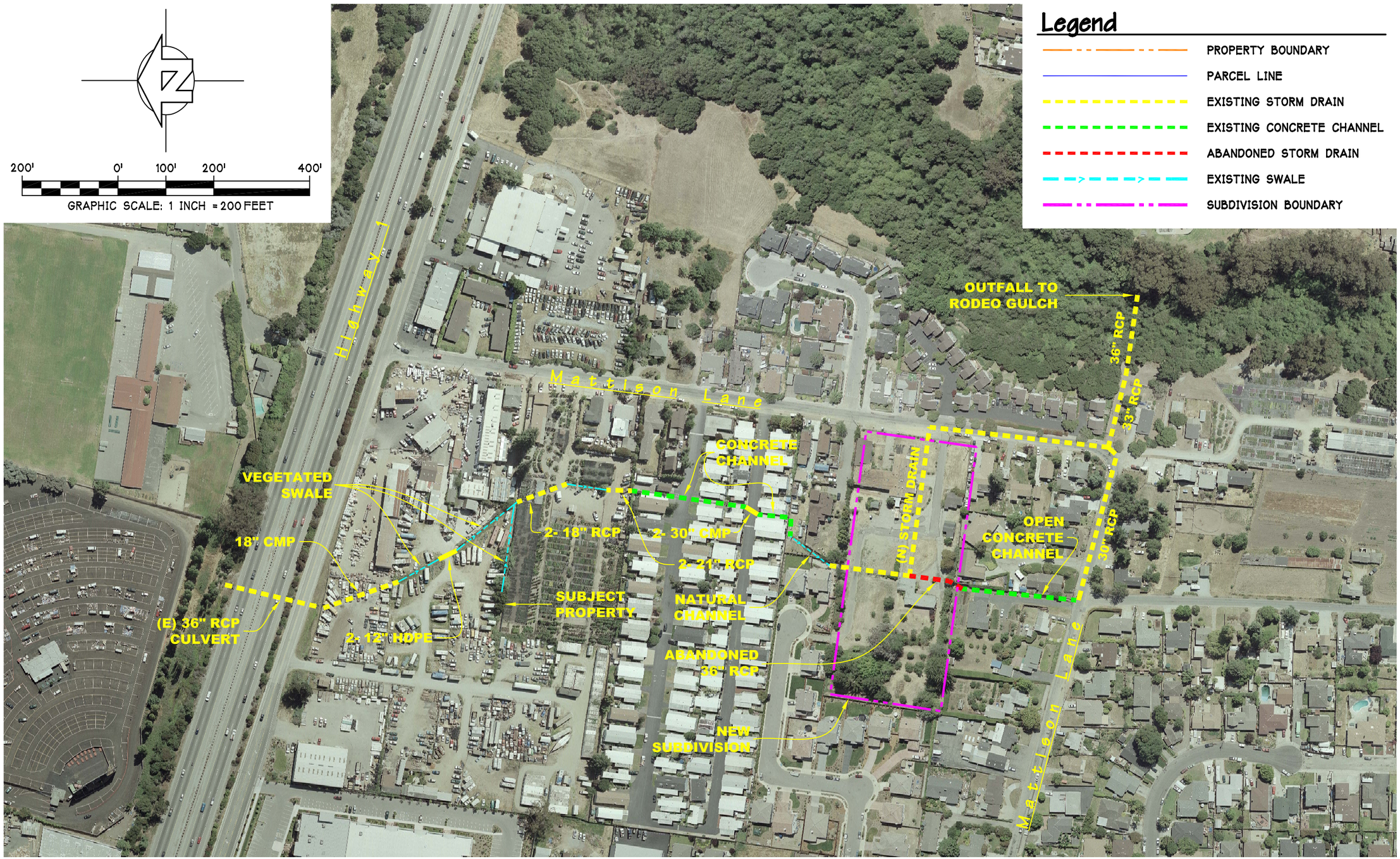
CIVIL ENGINEERING ■ LAND PLANNING ■ STRUCTURAL DESIGN

200' 0' 100' 200' 400'

GRAPHIC SCALE: 1 INCH = 200 FEET

Legend

- PROPERTY BOUNDARY
- PARCEL LINE
- EXISTING STORM DRAIN
- EXISTING CONCRETE CHANNEL
- ABANDONED STORM DRAIN
- EXISTING SWALE
- SUBDIVISION BOUNDARY



Existing Drainage Map

SCALE: 1" = 200'

JOB NO. 08041 - NIGH PROPERTY
SHEET NO. ____ OF ____
CALCULATED BY RYAN DATE 7/28/08
SCALE: 1" = 200'

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Existing Drainage

The following is a summary of the existing drainage path within the study area beginning north of Highway 1 and discharging into Rodeo Gulch approximately 1,500 ft south of the Highway.

All runoff from the drainage basin just north of Highway 1 is collected in a drainage ditch paralleling the northern side of the Highway and conveyed under the freeway through a 36" RCP culvert. The partially filled 36" RCP outlets to another drainage ditch south of Highway 1 along Soquel Avenue. Along with the discharge from the 36" RCP, this ditch also collects some surface runoff from Soquel Avenue and the adjacent property.

Concrete headwall with 36" RCP outlet and 18" CMP inlet

Runoff exits the drainage ditch through a partially buried 18" CMP that carries runoff into the subject property.

The 18” CMP cuts across the northeast corner of the west parcel of the subject property and discharges into a heavily vegetated swale on the east parcel of the subject property. The condition of the 18” CMP at the outlet is very poor (see image below).

18” CMP outlet

The vegetated swale is broken up into two separate swales connected by dual 12” HDPE pipes which carry the runoff under a gravel road.

Dual 12” HDPE inlet pipes in vegetated swale

Both the inlets and outlets of the 12” HDPE pipes are partially buried and subject to clogging.

Dual 12” HDPE outlets in vegetated swale

The vegetated swale extends to the southwest corner of the property just north of the plant nursery where it merges with another vegetated swale that runs along the southern property line.

Looking downstream at vegetated swale

At the point where the swales converge, there is a concrete headwall with two 18” RCP inlets.

Concrete headwall with 18” RCP inlets

These 18” pipes carry runoff under the plant nursery (Far West Nursery) where they discharge into a graded swale.

Outlets into graded Swale

Almost all of the drainage from the nursery site is collected in the graded swale. There are two inlets on the property that collect runoff and discharge to the swale through 6” pipes. One 6” outlet is located at the beginning of the swale (see picture above) and the other is located towards the end of the swale.

The graded swale terminates at a concrete headwall. The headwall has two inlet pipes which carry runoff to the northern property line of the mobile home park. A 6" outlet is shown in the picture below.

Concrete headwall and inlets in graded swale

At the property line between the nursery and the mobile home park, runoff discharges from the outlet structure and into a concrete channel that runs under the mobile home park.

Concrete headwall outlet structure

Concrete channel

The concrete channel carries runoff into the mobile home park. From the Santa Cruz County Zone 5 Drainage Inventory Maps, it appears that drainage makes its way through the mobile home park by way of two concrete channels connected by dual 30" CMP's. Once exiting the mobile home park, drainage enters a natural channel and is picked up in a drainage inlet.

Prior to construction of the subdivision, drainage was conveyed across the property through a 36" RCP and discharged into an open concrete channel that leads to an inlet along Mattison Lane.

Open concrete channel and inlet along Mattison Lane

However, it is assumed that the 36” RCP was removed during the construction of the subdivision and the drainage from the mobile home park is now intercepted by the subdivision’s storm drain system and is piped to the storm drain running down Mattison Lane (N/S).

Although the 36” RCP no longer conveys runoff to the open channel, the channel still collects runoff from the adjacent properties. Runoff is then piped to a curb inlet along Mattison Lane (E/W) and then piped in a 30” RCP down to the bend in Mattison Lane.

Curb inlet along Mattison Lane

The storm drain lines running north/south and east/west down Mattison Lane eventually meet at a manhole in the sidewalk where the street bends. At this intersection, there are two curb inlets which also tie into the manhole. Drainage is carried from this manhole via 33” RCP to another manhole and then is finally discharged out a 36” RCP into Rodeo Gulch.

Proposed Conditions:

The proposal is to discharge the drainage from the properties north of Highway 1 into Rodeo Gulch approximately 1,500 feet upstream from its current discharge point. This is would likely be achieved by intercepting the drainage once it crosses under the freeway and diverting it through a storm drain to the gulch.

The recommended route of the diversion pipe is along Soquel Avenue within the road right-of-way. Although the pipe would be as much as 10 feet deep at the high point in the road, this route would not require the acquisition of an easement through private property. This route is not only the most practical but also the most economical.

The attached *Vicinity Map – Proposed Conditions* shows proposed drainage basins and the location of the proposed outfall to Rodeo Gulch.

Since, there is no development associated with this proposal; there will be no net increase in runoff. Therefore, there will be no impacts south of the existing outfall, since the flow rates will remain the same. The area affected would be the 1,500 feet of Rodeo Gulch between Highway 1 and the existing outfall. This area would see and increase in runoff roughly equal to the amount of runoff from the properties north of Highway 1 (Drainage Basin F).

The following table illustrates the change in flow rates in Rodeo Gulch based on adding an additional outfall 1,500 feet north of outfall 1.

Point:	Type	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)	Capacity (cfs)
A	Natural channel	332	520	677	864	663
B	Concrete culvert	332	520	677	864	656
C	Natural channel	**376**	**579**	**748**	**948**	549
D	Natural channel	371	574	744	945	675

By diverting the drainage from the properties north of Highway 1 to the gulch 1,500 feet north of its current discharge point, the flow rate in the gulch increased by 51 cfs, or 9.7%, for a 25 year storm.

According to the Zone 5 Master Drainage Plan, the flow capacity for the 1,500 foot section of Rodeo Gulch north of outfall 1 is 549 cfs. Therefore, the increase flow rate would exceed the capacity of the gulch. However, after further analysis of the 1,500 foot span of gulch, it was determined that the capacity, as determined by the Zone 5 Master Drainage Plan, was underestimated.

Based on three cross-sections, it has been concluded that the 1,500 foot section of Rodeo Gulch has the capacity to easily handle runoff for a 25 year storm and a 100 year storm with plenty of capacity to spare.

Pages 13, 14 & 15 show the calculations used to determine the depth of flow at points along the gulch. The cross-sections are shown on page 12.

Legend

- PROPOSED DRAINAGE BASIN
- PROPERTY BOUNDARY
- PARCEL LINE
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- POINT OF INTEREST

Vicinity Map - Proposed Conditions

SCALE: 1" = 300'

300' 0' 150' 300' 600'

GRAPHIC SCALE: 1 INCH = 300 FEET

JOB NO. 08041 - NIGH PROPERTY

SHEET NO. ____ OF ____

CALCULATED BY RYAN DATE 7/15/08

SCALE: 1" = 300'

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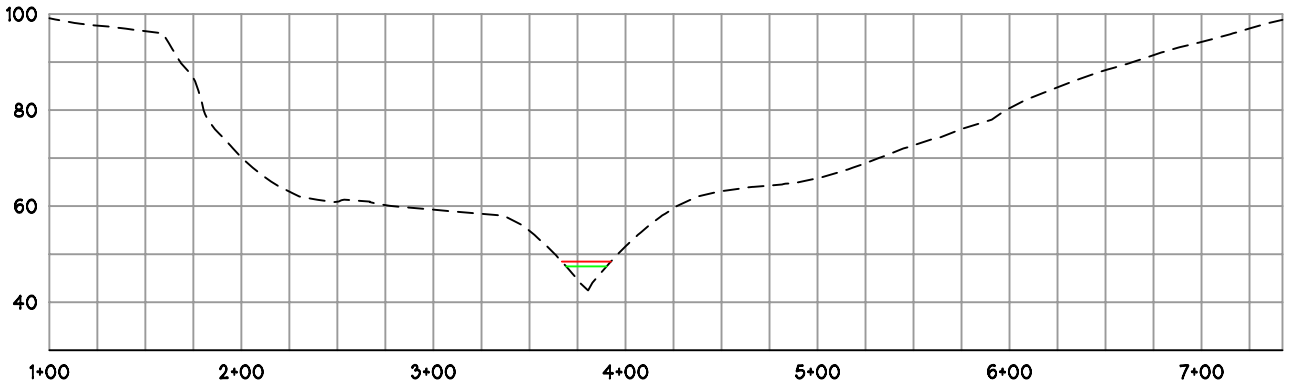
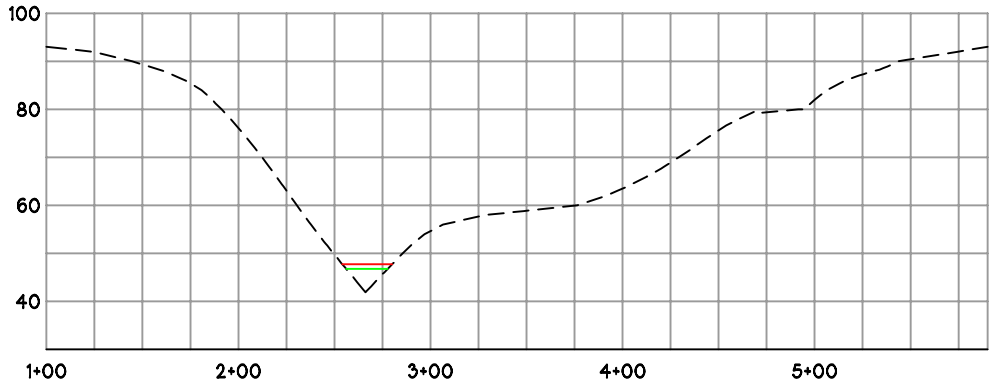
JOB NO. 08041 - NIGH PROPERTY
SHEET NO. _____ OF _____
CALCULATED BY RYAN DATE 07/31/08
SCALE: AS SHOWN



Section 1

SCALE: 1" = 10' (HORZ)
1" = 5' (VERT)

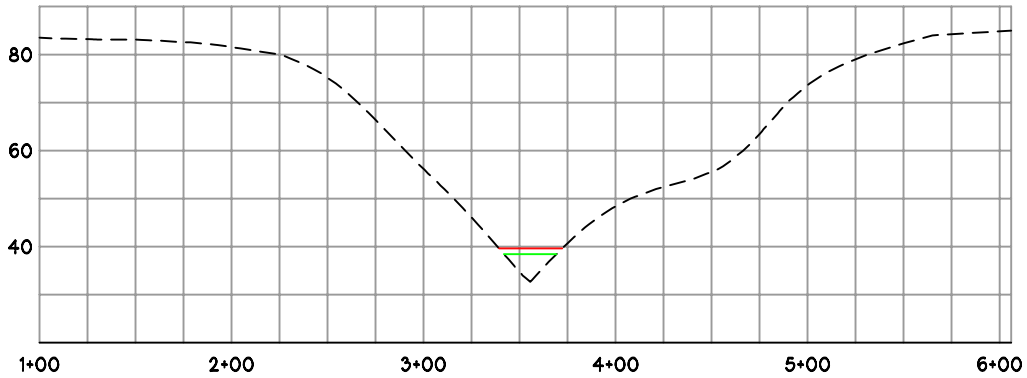


Section 2

SCALE: 1" = 10' (HORZ)
1" = 5' (VERT)

Legend

- EXISTING GRADE
- WATER SURFACE (100 YEAR STORM)
- WATER SURFACE (25 YEAR STORM)



Section 3

SCALE: 1" = 10' (HORZ)
1" = 5' (VERT)

Rodeo Gulch Cross-Sections w/ Diverted Flow

Section 1

Channel Calculator

Given Input Data:
Shape ..... Trapezoidal
Solving for ..... Depth of Flow
Flowrate ..... 579.0000 cfs (25 year)
Slope ..... 0.0180 ft/ft
Manning's n 0.0400
Height ..... 0.0000 in
Bottom width ..... 0.0000 in
Left slope ..... 0.3545 ft/ft (V/H)
Right slope ..... 0.4105 ft/ft (V/H)

Computed Results:
Depth ..... 60.0935 in
Velocity ..... 8.7838 fps
Full Flowrate ..... 579.0000 cfs
Flow area 65.9166 ft2
Flow perimeter ..... 338.0979 in
Hydraulic radius ..... 28.0747 in
Top width ..... 315.9072 in
Area 65.9166 ft2
Perimeter ..... 338.0979 in
Percent full ..... 100.0000 %

Channel Calculator

Given Input Data:
Shape ..... Trapezoidal
Solving for ..... Depth of Flow
Flowrate ..... 948.0000 cfs (100 year)
Slope ..... 0.0180 ft/ft
Manning's n 0.0400
Height ..... 120000.0000 in
Bottom width ..... 0.0000 in
Left slope ..... 0.3545 ft/ft (V/H)
Right slope ..... 0.4105 ft/ft (V/H)

Computed Results:
Depth ..... 72.2980 in
Velocity ..... 9.9361 fps
Full Flowrate ..... 948.0000 cfs
Flow area 95.4096 ft2
Flow perimeter ..... 406.7627 in
Hydraulic radius ..... 33.7764 in
Top width ..... 380.0653 in
Area 95.4096 ft2
Perimeter ..... 406.7627 in
Percent full ..... 100.0000 %

Section 2

Channel Calculator

Given Input Data:
Shape ..... Trapezoidal
Solving for ..... Depth of Flow
Flowrate ..... 579.0000 cfs (25 year)
Slope ..... 0.0320 ft/ft
Manning's n 0.0400
Height ..... 120000.0000 in
Bottom width ..... 0.0000 in
Left slope ..... 0.5000 ft/ft (V/H)
Right slope ..... 0.4167 ft/ft (V/H)

Computed Results:
Depth ..... 58.0567 in
Velocity ..... 11.2443 fps
Full Flowrate ..... 579.0000 cfs
Flow area 51.4927 ft2
Flow perimeter ..... 280.7558 in
Hydraulic radius ..... 26.4107 in
Top width ..... 255.4383 in
Area 51.4927 ft2
Perimeter ..... 280.7558 in
Percent full ..... 100.0000 %

Channel Calculator

Given Input Data:
Shape ..... Trapezoidal
Solving for ..... Depth of Flow
Flowrate ..... 948.0000 cfs (100 year)
Slope ..... 0.0320 ft/ft
Manning's n 0.0400
Height ..... 120000.0000 in
Bottom width ..... 0.0000 in
Left slope ..... 0.5000 ft/ft (V/H)
Right slope ..... 0.4167 ft/ft (V/H)

Computed Results:
Depth ..... 69.8475 in
Velocity ..... 12.7194 fps
Full Flowrate ..... 948.0000 cfs
Flow area 74.5321 ft2
Flow perimeter ..... 337.7750 in
Hydraulic radius ..... 31.7745 in
Top width ..... 307.3157 in
Area 74.5321 ft2
Perimeter ..... 337.7750 in
Percent full ..... 100.0000 %

Section 3

Channel Calculator

Given Input Data:
Shape ..... Trapezoidal
Solving for ..... Depth of Flow
Flowrate ..... 579.0000 cfs (25 year)
Slope ..... 0.0100 ft/ft
Manning's n 0.0400
Height ..... 120000.0000 in
Bottom width ..... 0.0000 in
Left slope ..... 0.4308 ft/ft (V/H)
Right slope ..... 0.4000 ft/ft (V/H)

Computed Results:
Depth ..... 69.5086 in
Velocity ..... 7.1587 fps
Full Flowrate ..... 579.0000 cfs
Flow area 80.8809 ft2
Flow perimeter ..... 362.8409 in
Hydraulic radius ..... 32.0990 in
Top width ..... 335.1194 in
Area 80.8809 ft2
Perimeter ..... 362.8409 in
Percent full ..... 100.0000 %

Channel Calculator

Given Input Data:
Shape ..... Trapezoidal
Solving for ..... Depth of Flow
Flowrate ..... 948.0000 cfs (100 year)
Slope ..... 0.0100 ft/ft
Manning's n 0.0400
Height ..... 120000.0000 in
Bottom width ..... 0.0000 in
Left slope ..... 0.4308 ft/ft (V/H)
Right slope ..... 0.4000 ft/ft (V/H)

Computed Results:
Depth ..... 83.6252 in
Velocity ..... 8.0978 fps
Full Flowrate ..... 948.0000 cfs
Flow area 117.0693 ft2
Flow perimeter ..... 436.5308 in
Hydraulic radius ..... 38.6181 in
Top width ..... 403.1793 in
Area 117.0693 ft2
Perimeter ..... 436.5308 in
Percent full ..... 100.0000 %

Summary

By diverting the drainage from north of Highway 1 to Rodeo Gulch, there will be a substantial decrease in runoff traveling through the subject property as well as the neighboring properties. With most of the drainage structures in these properties undersized and/or poorly maintained, the decrease in runoff should allow the these structures to function more properly, thus alleviating the impacts on the properties.

As shown in the cross-sections, the additional runoff in the gulch will have only a minimal affect on the massive gulch. The capacity of the 1,500 foot section of Rodeo Gulch far exceeds any amount of runoff that could be generated by the contributing drainage basins. Additionally, any development to the former Drive-In Theater property would be required to maintain pre-development rate of runoff per Zone 5 requirements. Since this property is currently totally paved over, it is likely that any development would decrease the amount of pervious surface thus, decrease the amount of runoff.

Santa Cruz County
Zone 5 Master Drainage Plan

(Maps & Tables)

County of Santa Cruz
Stormwater Facilities Management System
Conveyance Facilities
05 - Rodeo Creek Basin

10/20/98

ID	LOCATION Comments	Type	EXISTING SECTION USIE	DSIE	USGE	DSGE	Length	Slope	Man N	No	Size*	Base*	DESIGN DISCHARGE (cfs) 2	5	10	25	50	100	Section Capacity
050010-050020	O/S Zone 5	Natural Channel					2856		.035				13	34	53	85	111	143	
050020-050030	O/S Zone 5	Natural Channel					2793		.035				33	84	133	212	278	355	
050030-050040	O/S Zone 5	Natural Channel					805		.035		37.9	45.0	46	119	187	298	390	499	
050040-050050	O/S Zone 5	Natural Channel					925		.035		39.0	29.3	57	145	228	363	476	608	
050050-050060	O/S Zone 5	Natural Channel					1862		.035		147.5	66.4	61	155	243	386	505	646	
050060-050070	O/S Zone 5	Natural Channel					890		.035		56.5	27.4	64	161	253	401	525	671	
050070-050080	O/S Zone 5	Natural Channel					584		.035	1	76.1	34.7	65	164	257	407	534	683	
050080-050090	O/S Zone 5	Natural Channel					673		.035		109.3	74.3	71	180	282	448	587	752	
050090-050100		Natural Channel			90	70	1030	.0194	.035		80.7	43.2	73	186	290	460	604	774	724
050100-050110		Natural Channel			70	63	1138	.0062	.035		132.0	65.0	75	190	297	470	615	789	708
050110-050120		Natural Channel			63	60	1527	.0020	.035		188.2	64.1	79	201	311	490	641	820	733
050120-050122		Natural Channel	60.00	55.00			68	.0735	.035		53.3	47.4	86	216	332	520	677	864	663
050122-050130		Box	55.00	50.40			311	.0148	.013	1	6.0	6.0	86	216	332	520	677	864	656
050130-050140		Natural Channel	50.40		58	47	1436	.0077	.035		123.8	95.3	88	220	339	528	688	877	549
050140-050150		Natural Channel			47	36	930	.0118	.035		116.5	82.8	99	244	371	574	744	945	675
050150-050152		Natural Channel			36	33	1110	.0027	.035		131.5	56.9	103	251	382	590	763	970	507
050152-050154		Pipe			50	49	64	.0156	.013	2	72.0		103	251	382	590	763	970	1058
050154-050160		Natural Channel			32	30	126	.0159	.035	1	95.8	00.5	103	251	382	590	763	970	497
050160-050170		Natural Channel			30	26	924	.0043	.035		158.3	55.2	123	280	421	645	833	1056	447
050170-050180		Natural Channel			26	18	822	.0097	.035	1	134.2	79.7	166	359	512	734	911	1153	794
050180-050190		Natural Channel			18	14	530	.0075	.035		223.9	68.6	180	392	561	803	990	1237	995
050190-050200		Natural Channel			14	12	1065	.0019	.035		258.7	32.1	199	432	616	878	1079	1340	750
050200-050210	Pond	Natural Channel					882		.035				208	451	644	918	1125	1394	
050210-050215	Pond	Natural Channel					1207		.035				217	470	670	953	1167	1442	
050215-050220	Pond	Natural Channel					1054		.035				246	528	750	1059	1292	1585	

*NOTE: Size = diameter in inches for pipes, depth in feet for boxes and improved channels, and area in square feet for natural channels.
Base = Base width in feet for boxes and improved channels, and wetted perimeter in feet for natural channels.

County of Santa Cruz
Stormwater Facilities Management System
Conveyance Facilities
05 - Rodeo Creek Basin

10/20/98

ID	LOCATION Comments	Type	EXISTING SECTION USIE	DSIE	USGE	DSGE	Length	Slope	Man N	No	Size*	Base*	DESIGN DISCHARGE (cfs) 2	5	10	25	50	100	Section Capacity
050300-050040		Natural Channel			182	163	613	.0310	.035		60.3	21.1	5	13	20	32	42	54	283
050310-050040	Ditch	Natural Channel					534		.035				3	8	13	21	27	35	
050400-050410		Natural Channel			240	180	629	.0954	.035		4.7	12.8	2	5	7	11	14	17	32
050410-050050		Natural Channel			180	140	410	.0976	.035		4.7	12.8	4	9	14	21	26	32	32
050500-050510	O/S Zone 5	Natural Channel					1056		.035		12.9	44.4	2	5	8	13	17	22	
050510-050520	O/S Zone 5	Natural Channel					1277		.035		11.3	31.8	3	8	13	20	26	33	
050520-050080	O/S Zone 5	Natural Channel					789		.035		6.9	14.3	5	12	19	30	39	50	
050600-050610		Pipe	216.50	212.79	226	218	365	.0102	.013		18.0		1	2	3	5	6	8	11
050610-050090		Pipe	212.79	90.00			617	.1990	.013		18.0		2	4	6	8	11	13	47
050700-050702		Pipe	105.82	104.27	108	110	269	.0058	.013		27.0		8	13	16	21	23	27	24
050702-050710		Pipe	104.27	102.18	110	113	378	.0055	.013		30.0		8	13	16	21	23	27	30
050710-050112		Pipe	102.18	100.01	113		179	.0121	.013		30.0		26	43	56	71	82	95	45
050712-050114		Pipe	100.01	98.02			155	.0128	.013		36.0		26	43	56	71	82	95	76
050714-050120	Ditch	Natural Channel					131		.035				26	43	56	71	82	95	
050720-050722		Pipe	107.44	106.00	115	114	241	.0060	.013	1	18.0		10	16	21	26	30	34	8
050722-050710		Pipe	105.60	102.18	114	113	301	.0114	.013		24.0		10	16	21	26	30	34	24
050800-050802		Pipe	107.40	106.90			180	.0028	.013	1	36.0		13	26	37	51	60	71	35
050802-050804	Ditch	Natural Channel					806		.035	1			13	26	37	51	60	71	
050804-050805		Pipe			108	108	40	.0125	.013	2	21.0		13	26	37	51	60	71	35
050805-050806	Ditch	Natural Channel					110		.035	1			13	26	37	51	60	71	
050806-050807		Pipe	102.00	101.40			35	.0171	.013	2	30.0		13	26	37	51	60	71	107
050807-050808	Ditch	Natural Channel					215	.0149	.035				13	26	37	51	60	71	
050808-050809		Pipe	98.31	95.30	102	99	233	.0129	.013	1	36.0		13	26	37	51	60	71	76
050809-050810	Ditch	Natural Channel					268		.035	1			13	26	37	51	60	71	
050810-050820		Pipe	87.90	77.60			306	.0337	.013		30.0		22	44	62	85	100	119	75

*NOTE: Size = diameter in inches for pipes, depth in feet for boxes and improved channels, and area in square feet for natural channels.
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County of Santa Cruz
Stormwater Facilities Management System
Conveyance Facilities
05 - Rodeo Creek Basin

10/20/98

ID	LOCATION Comments	Type	EXISTING SECTION USIE	DSIE	USGE	DSGE	Length	Slope	Man N	No	Size*	Base*	DESIGN DISCHARGE (cfs) 2	5	10	25	50	100	Section Capacity
050820-050822		Pipe	77.60	60.00			177	.0994	.013		36.0		26	52	73	99	117	138	210
050822-050824		Pipe	60.00	52.00			59	.1356	.013		36.0		26	52	73	99	117	138	246
050824-050140	Ditch	Natural Channel					76			1			26	52	73	99	117	138	
050900-050150	Ditch	Natural Channel					482						5	10	15	21	25	30	
051000-051005		Pipe	81.70	76.58		91	922	.0056	.013	1	36.0		9	19	27	36	43	50	50
051005-051010		Pipe	76.58	61.24	91	76	1803	.0085	.013	1	42.0		9	19	27	36	43	50	93
051010-051020		Pipe	61.24	49.50	76	63	708	.0166	.013	1	42.0		19	38	54	75	89	105	130
051020-050160		Pipe	49.50	29.00	63		565	.0363	.013	1	42.0		24	49	69	96	114	135	192
051100-051110		Pipe	87.82	77.26	97	87	1103	.0096	.013	1	36.0		15	27	37	48	56	65	65
051110-051118		Pipe	77.26	60.58	87	71	2019	.0083	.013	1	36.0		25	44	59	78	90	106	61
051118-051120		Pipe	60.58	56.59	71		464	.0086	.013	1	42.0		25	44	59	78	90	106	93
051120-051130		Natural Channel			66	56	666	.0150	.035		39.8	38.6	45	83	114	154	179	209	211
051130-050170		Natural Channel			56	28	531	.0527	.035	1	39.8	38.6	45	85	118	161	189	223	396
051200-051203		Pipe	78.08	76.26	84	81	347	.0052	.013	1	27.0		11	21	28	38	44	51	22
051203-051204		Pipe	76.26	69.68	81		373	.0176	.013		30.0		11	21	28	38	44	51	54
051204-051206		Natural Channel			74	70	301	.0133	.035		16.1	26.6	11	21	28	38	44	51	56
051206-051208		Pipe	66.00	63.60			134	.0179	.013		36.0		11	21	28	38	44	51	89
051208-051210		Pipe	63.60	63.51			45	.0020	.013	2	30.0		11	21	28	38	44	51	37
051210-051120		Natural Channel	63.51	56.59	67	56	427	.0162	.035		10.4	13.5	19	36	49	65	76	89	47
051300-051308		Pipe	52.12	49.20	60		476	.0061	.013	1	21.0		5	9	13	17	20	24	12
051308-051310		Pipe	49.20	44.27	58	52	297	.0166	.013	1	18.0		5	9	13	17	20	24	14
051310-050112		Pipe	42.50	31.24	53		161	.0699	.013	2	18.0		13	27	38	53	62	74	56
051312-050180		Natural Channel			42	18	634	.0379	.035		11.9	16.1	13	27	38	53	62	74	80
051320-051322		Pipe	54.20	48.72		52	498	.0110	.013		18.0		3	7	10	15	17	21	11
051322-051310		Pipe	48.72	44.27	52	52	207	.0215	.013		24.0		3	7	10	15	17	21	33

*NOTE: Size = diameter in inches for pipes, depth in feet for boxes and improved channels, and area in square feet for natural channels.
Base = Base width in feet for boxes and improved channels, and wetted perimeter in feet for natural channels.

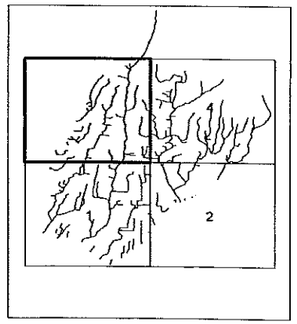
County of Santa Cruz Modeled Stormwater System

N

1000' 0 1000'

LEGEND

- Analysis Node
- Storage Basin
- Basin Boundary
- Drainage Area
- Roadway Reach
- Channel
- Pipe/Culvert



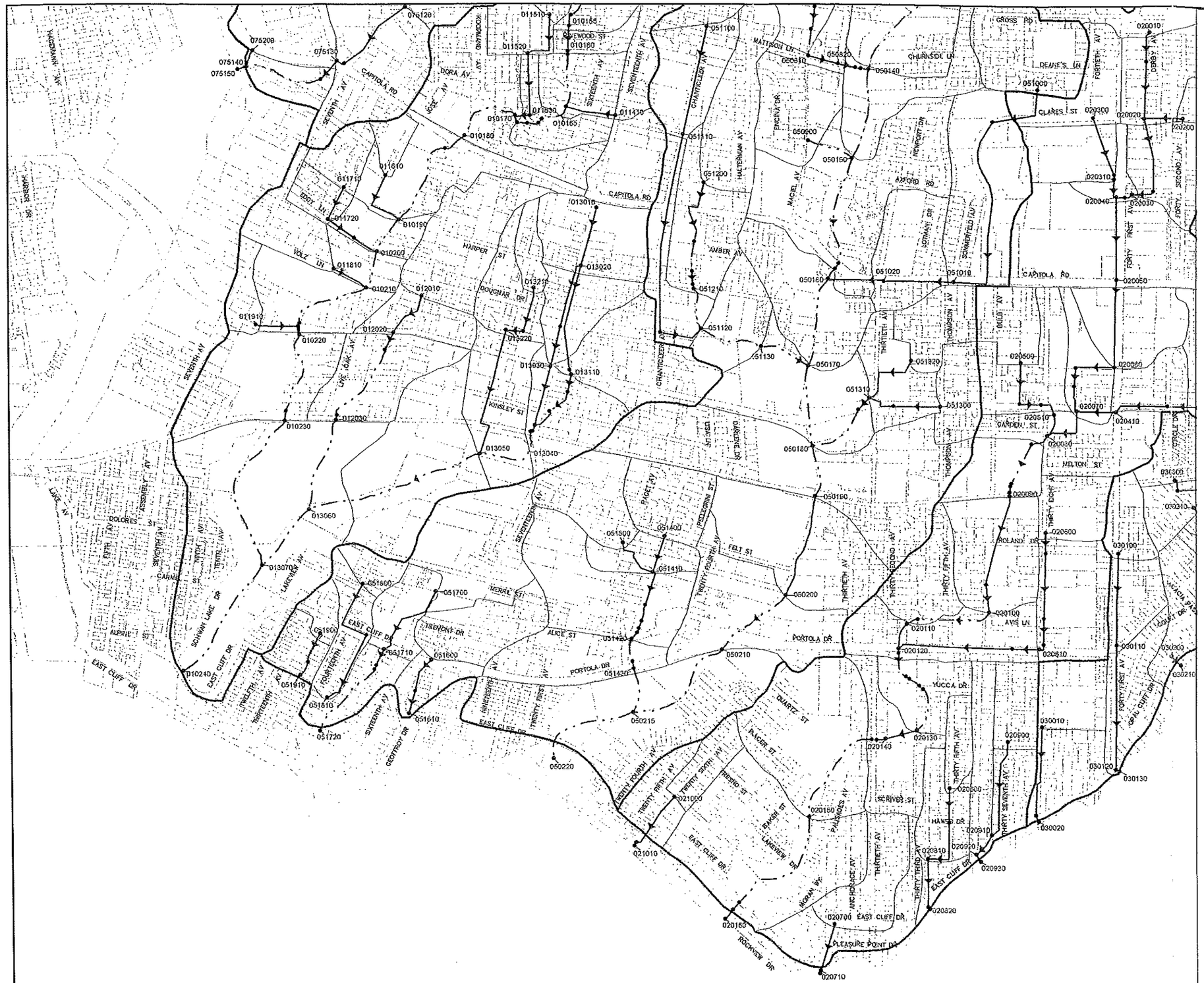
Map Index

Map 3

modelmap.wor

Stormwater Facilities Management System

County of Santa Cruz Modeled Stormwater System



LEGEND

- Analysis Node
- Storage Basin
- Basin Boundary
- Drainage Area
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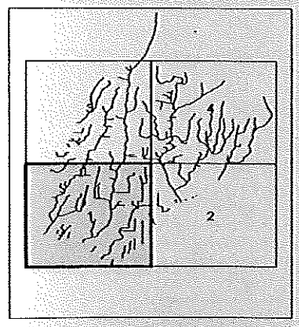
- Channel
- Pipe/Culvert

N

1000' 0 1000'



Map Index

Map 1

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Stormwater Facilities Management System

APPENDIX C
CIVIL IMPROVEMENT PLANS

PRELIMINARY IMPROVEMENT PLANS

FOR

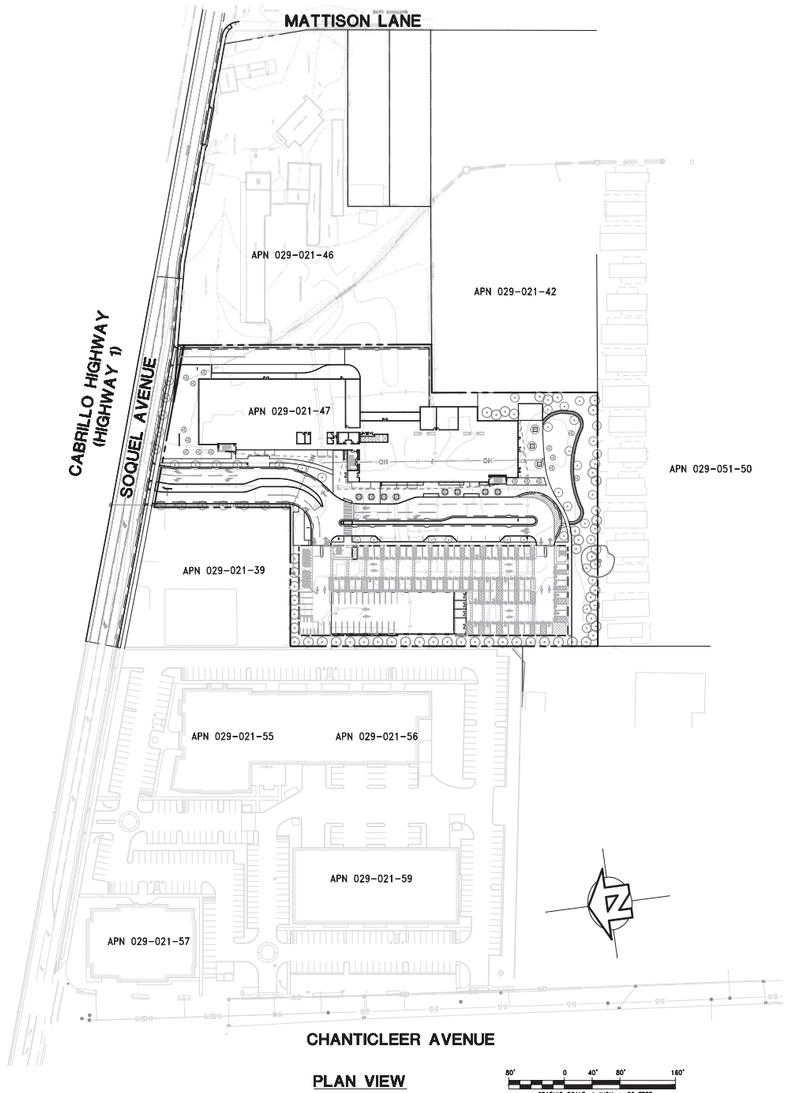
SANTA CRUZ SMOB

5940 SOQUEL AVENUE

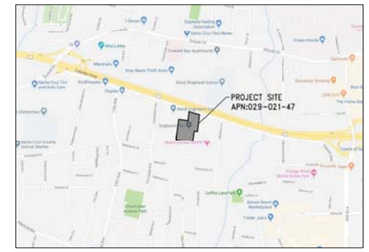
SANTA CRUZ, SANTA CRUZ COUNTY, CALIFORNIA

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	AIR RELEASE VALVE	
	BLOW-OFF VALVE	
	CATCH BASIN	
	CURB INLET	
	CLEANOUT STRUCTURE	
	FIRE HYDRANT	
	GUY ANCHOR	
	MANHOLE STRUCTURE	
	WATER THRUST BLOCK	
	WATER METER	
	WATER VALVE	
E	ELECTRICAL LINE	E
FO	FIBER OPTIC LINE	FO
FW	FIRE WATER LINE	FW
G	GAS LINE	G
IRR	IRRIGATION LINE	IRR
JT	JOINT TRENCH LINE	JT
OH	OVERHEAD LINE	OH
RW	RECYCLED WATER LINE	RW
SD	STORM DRAIN LINE	SD
SS	SANITARY SEWER LINE	SS
T	TELEPHONE LINE	T
TV	CABLE TV LINE	TV
W	WATER LINE	W



PLAN VIEW



MAP DATA ©2018 GOOGLE

VICINITY MAP

N.T.S.

BENCHMARK

THE ELEVATIONS SHOWN ON THIS SURVEY ARE BASED ON NAVD88 DATUM DERIVED FROM GPS OBSERVATIONS AND COMPUTED USING GEOID12B.

BENCHMARK A UNPUBLISHED SANTA CRUZ COUNTY SURVEY BENCHMARK IS SET IN TOP OF CURB, IN FRONT OF THE FIRE HYDRANT, BY 2269 CHANTICLEER AVENUE.

OBSERVED BENCHMARK ELEVATION = 105.69 (NAVD88)

BASIS OF BEARINGS

LOCAL BEARING BASE: STATION "POINT A" TO "POINT B" N09°24'48"E, 355.21'

BEARINGS AND DISTANCES SHOWN ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83) ZONE III, (2010.00), IN ACCORDANCE WITH THE CALIFORNIA PUBLIC RESOURCES CODE SECTIONS 8801-8819; AND BASED UPON A FIELD-OBSERVED TIE TO THE FOLLOWING CALIFORNIA SPATIAL REFERENCE NETWORK (CSRN) STATION:

STATION		NORTHING (Y)	EASTING (X)
NGS STATION	HPGN D CA 04 AJ	N=1,821,205.37'	E=6,128,080.34'

THE LOCAL BASIS OF BEARINGS IS N09°24'48"E, BETWEEN POINT "A" AND POINT "B" AS SHOWN HEREON AND ESTABLISHED ON THAT CERTAIN MAP RECORDED IN VOLUME 102 OF MAPS, PAGE 27, SANTA CRUZ COUNTY RECORDS, BEING A ROTATION OF 00°00'29" FROM CALCULATED THE RECORD BEARING (N09°25'17"E).

DISTANCES SHOWN HEREON ARE GROUND DISTANCES UNLESS OTHERWISE NOTED.

STATION	GRID NORTHING (Y)	GRID EASTING (X)	CONVERGENCE	COMBINED FACTOR
POINT A	1,820,390.077	6,129,719.191	-00°54'19.43881106"	1.000017900702
POINT B	1,820,039.649	6,129,661.095	-00°51'19.83533816"	1.000018123927

ALL COORDINATES AND DISTANCES SHOWN ARE IN TERMS OF THE U.S. SURVEY FOOT. DISTANCES SHOWN HEREON, ARE GROUND DISTANCES UNLESS OTHERWISE NOTED. TO APPROXIMATE CCS83 GRID DISTANCES, MULTIPLY THE GROUND DISTANCES BY THE COMBINATION FACTOR. WHERE CCS83 GRID DISTANCES ARE SHOWN, DIVIDE BY THE COMBINATION FACTOR TO OBTAIN GROUND DISTANCES.

INDEX OF SHEETS

PMB Real Estate Services
Real Estate Management Solutions for Healthcare

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San Diego, CA 92121

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7TH FLOOR
SAN FRANCISCO, CA 94111
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miyamoto. STRUCTURAL ENGINEERS
Structural
MIYAMOTO INTERNATIONAL, INC.
1450 Halyard Drive, Suite One
West Sacramento, CA 95691
916.373.1995

ISSUED FOR	REV	DATE
PERMIT RESUBMITTAL		06/24/2019
Discretionary Review Application		10/31/2018
PRE-APPLICATION SUBMITTAL		08/23/2018

SEALS AND SIGNATURES

NOT FOR CONSTRUCTION

SHEET TITLE

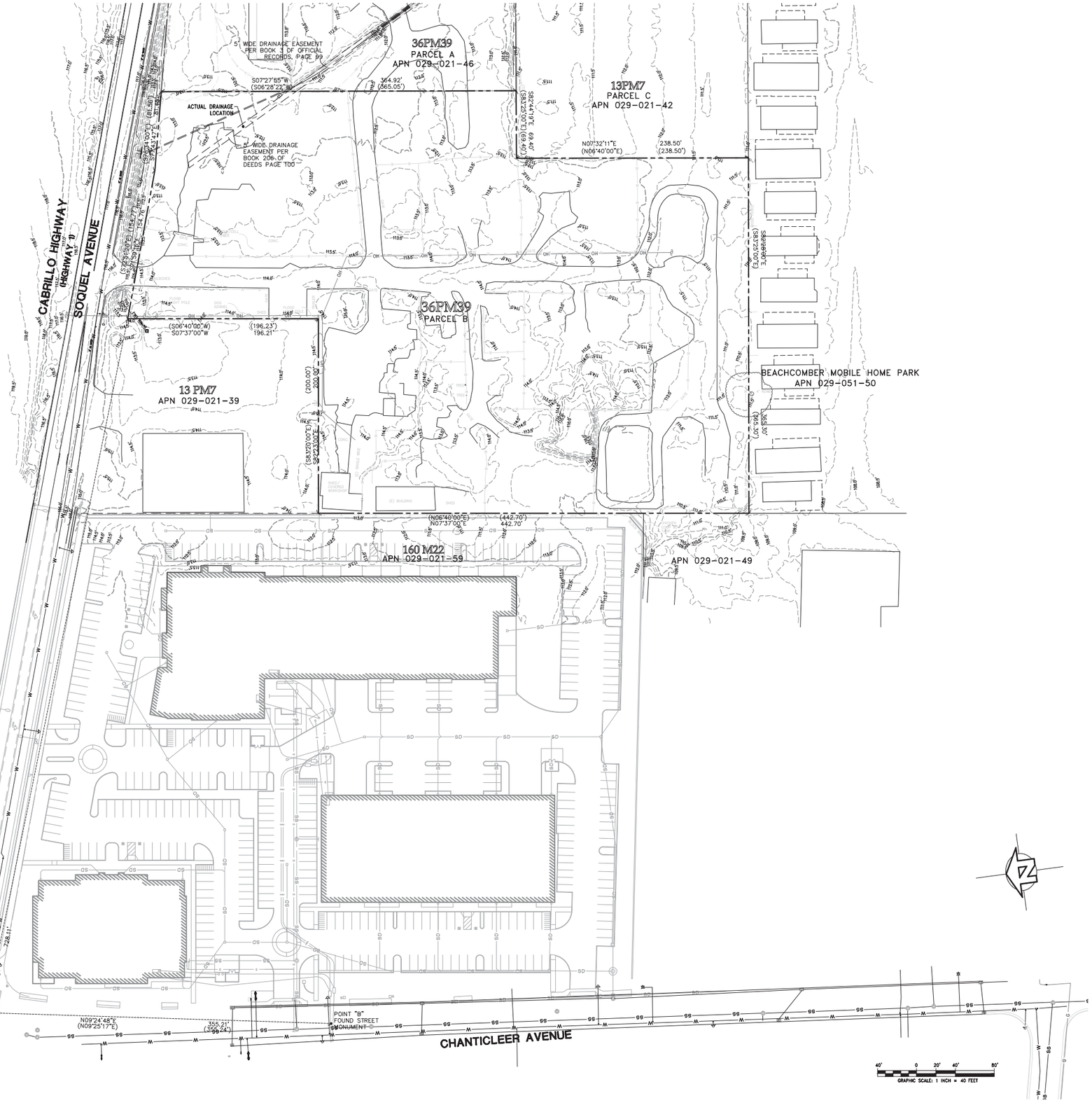
COVER SHEET

18019 (IEI) 21739.000

PROJECT NUMBER

SD C1.0

SHEET NUMBER



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SEALS AND SIGNATURES

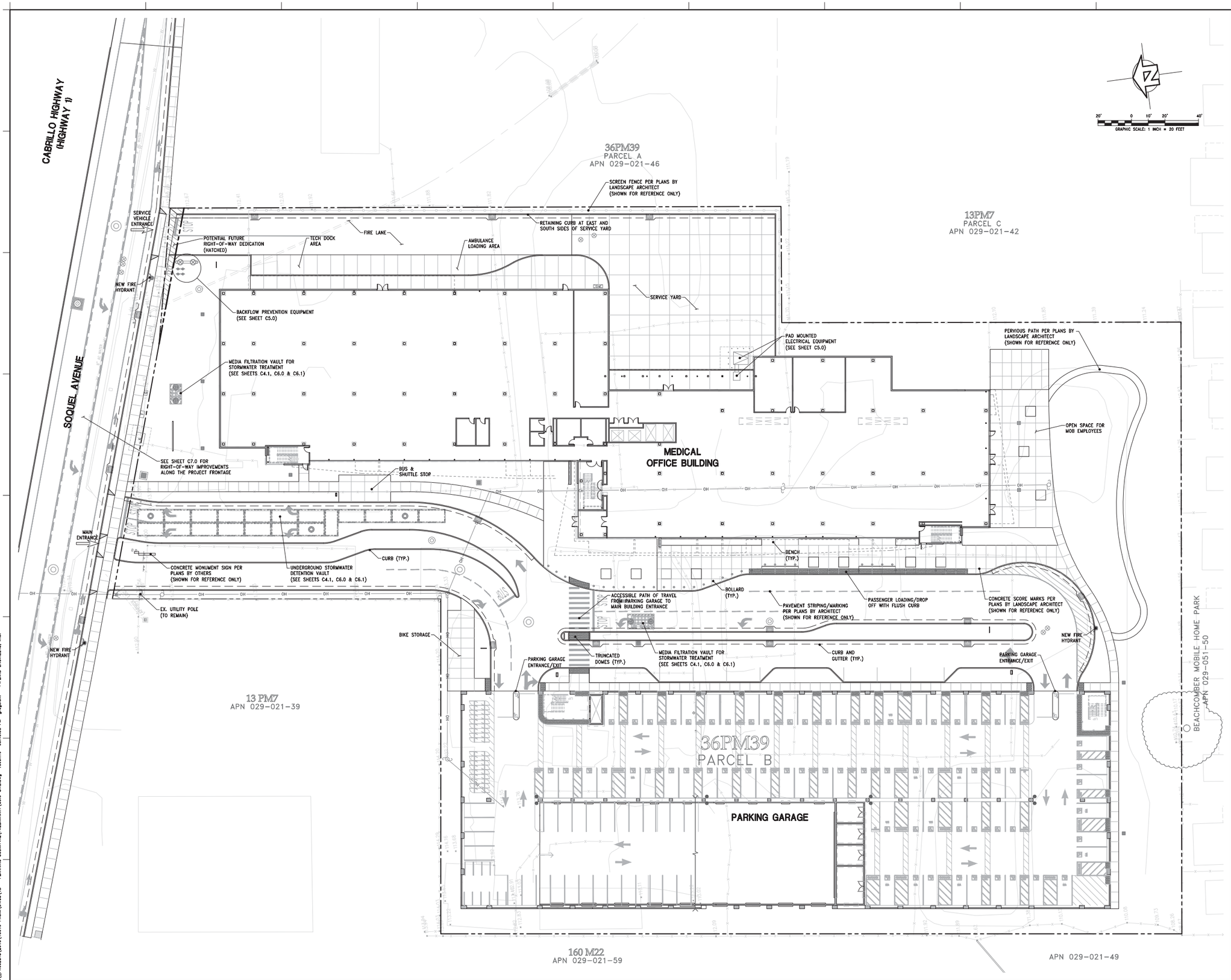
NOT FOR CONSTRUCTION

SHEET TITLE

EXISTING CONDITIONS PLAN

18019 (IEI) 21739.000
PROJECT NUMBER

SD C2.0
SHEET NUMBER



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PRE-APPLICATION SUBMITTAL		08/23/2018

SEALS AND SIGNATURES

NOT FOR CONSTRUCTION

SHEET TITLE

SITE PLAN

18019 (IEI) 21739.000
PROJECT NUMBER

SD C3.0
SHEET NUMBER

PRELIMINARY EARTHWORK QUANTITIES

±900 CUBIC YARDS EXCAVATION
±7,900 CUBIC YARDS EMBANKMENT
±7,000 CUBIC YARDS IMPORT

NOTES:
1. ESTIMATE DOES NOT INCLUDE STRIPPINGS, UTILITY TRENCH VOLUMES OR ANY OVEREXCAVATION, IF REQUIRED BY SITE CONDITIONS.
2. ESTIMATE ASSUMES A 15% COMPACTION FACTOR ON ALL FILL MATERIAL AND A 0% EXPANSION FACTOR ON ALL CUT MATERIAL.
3. EARTHWORK QUANTITIES ARE PRELIMINARY ESTIMATES ONLY. DURING FINAL PROJECT DESIGN ESTIMATES MAY BE ADJUSTED TO ACCOUNT FOR UNSUITABLE SOILS, EXISTING PAVED SURFACES AND SITE STRIPPINGS SHOULD SUCH INFORMATION BE AVAILABLE.

20' 0 10' 20' 40'
GRAPHIC SCALE: 1 INCH = 20 FEET

CABRILLO HIGHWAY (HIGHWAY 1)
SOQUEL AVENUE
MEDICAL OFFICE BUILDING
FF = 115.0
PARKING GARAGE
FF = 115.0
(APPROX. ELEVATION = FINISH GRADE WITHIN GARAGE PER PLANS BY OTHERS)
OLDCASTLE STORMCAPTURE 19 - 15'x7'x4' VAULTS SC1-4 W/ TOP SLAB BOTTOM EL 108.00 TOP EL 112.00 MIN. GRADE ABOVE 113.1
OLDCASTLE PERK FILTER 6'x11' VAULT W/ 9 - 12" CARTRIDGES RIM 115.0 INV 110.10 (IN) INV 109.35 (OUT)
OLDCASTLE PERK FILTER 8'x15' VAULT W/ 21 - 12" CARTRIDGES RIM 114.3 INV 110.75 (IN) INV 110.00 (OUT)
SDJB (72"x72") RIM 117.0 INV 106.56 (IN-S) INV 107.02 (IN-N) INV 104.56 (OUT)
SDCB RIM 116.2 INV 109.80 (IN-E) INV 107.18 (IN-W) INV 106.68 (OUT)
SDCB RIM 116.2 INV 106.17 (IN-W) INV 107.60 (IN-S) INV 107.60 (OUT)
SD OCS RIM 116.5 INV 107.80
SDMH RIM 114.2 INV 110.39
SDMH RIM 114.0 INV 109.38
SDMH RIM 114.0 INV 111.09
SDCB RIM 113.8 INV 110.65
SDCB RIM 113.6 INV 111.35
SDCB RIM 113.5 INV 111.81
SDCB RIM 113.5 INV 111.75
SDCB RIM 113.5 INV 111.56
SDCB RIM 113.5 INV 111.36
SDCB RIM 114.3 INV 112.8
SDJB RIM 114.3 INV 112.24
SDCB RIM 114.55 INV 112.14 (IN) INV 111.85 (OUT)
SDCB RIM 114.1 INV 111.20
SDJB RIM 114.0 INV 110.80
SDCB RIM 113.85 INV 111.18
SDCB RIM 113.5 INV 111.30
SDCB RIM 113.9 INV 111.67
SDCB RIM 113.7 INV 111.73
SDCB RIM 114.6 INV 112.28
SDCB RIM 114.6 INV 112.08
SDCB RIM 113.4 INV 112.0
SDCB RIM 113.9 INV 112.28
SDCB RIM 113.9 INV 112.72
SDCB RIM 116.0 INV 109.64
SDCB RIM 114.8± INV 111.5±
EX. SDCB CONNECT TO NEW SDCB IN SOQUEL AVE.
GRADED SWALE (TYP.)
GUTTER (TYP.)
CURB TRANSITION
FLUSH CURB ALONG ENTIRE LENGTH OF DROP OFF ZONE
OVERLAND RELEASE POINT
RETAINING CURB TO EX. GRADE
18" CURB CUT (OVERFLOW PATH) PV 114.3
SDCB (OVERFLOW PATH) RIM 114.3 INV 112.8
TC 114.6 PV 113.1 EG 112.3±
TC 114.4 PV 113.9 EG 112.2±
TC 114.6 PV 114.1 EG 111.7±
TC 114.85 PV 114.35
TC 114.8 PV 114.3
TC 114.75 PV 114.25 EG 112.5±
TC 114.5 PV 114.0
TC 114.9 PV 114.4
PV 114.1
PV 113.9
PV 114.3
PV 114.0
PV 114.4
HP 113.9
HP 114.8
LP 114.0
GB 114.9
GB 114.4

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ISSUED FOR	REV	DATE
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Discretionary Review Application		10/31/2018
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SEALS AND SIGNATURES

NOT FOR CONSTRUCTION

SHEET TITLE
GRADING PLAN

18019 (IEI) 21739.000
PROJECT NUMBER

SD C4.0
SHEET NUMBER

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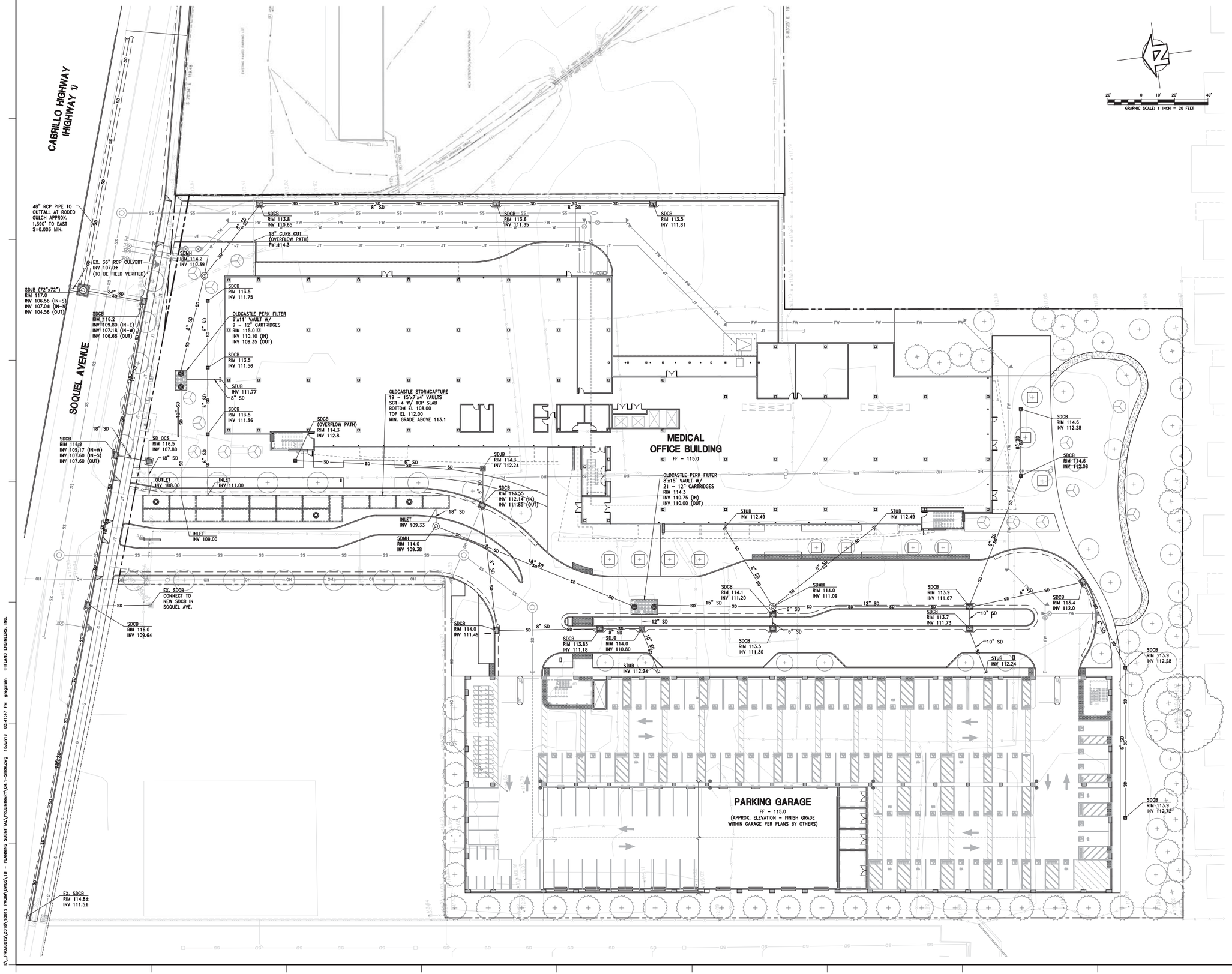

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SEALS AND SIGNATURES

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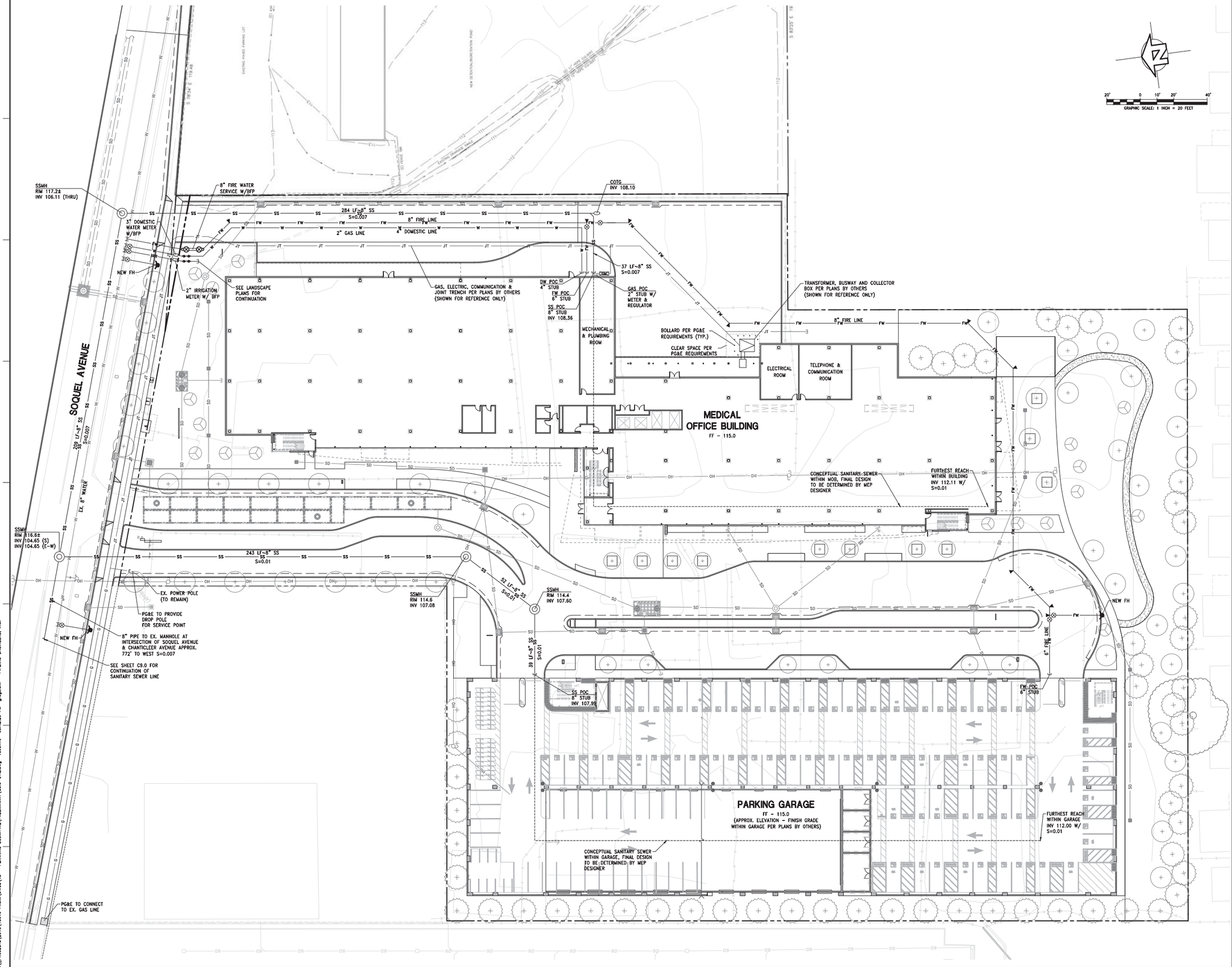
SHEET TITLE

STORM DRAIN PLAN

18019 (IEI) 21739.000
PROJECT NUMBER

SD C4.1
SHEET NUMBER



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SHEET TITLE

UTILITY PLAN

18019 (IEI) 21739.000
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SD C5.0
SHEET NUMBER

AREA SUMMARY TABLE

	DMA 1A	DMA 1B	DMA 2	TOTAL
MOB ROOF AREA	22,950 SF	23,685 SF	0 SF	46,635 SF
PARKING GARAGE ROOF AREA	0 SF	50,440 SF	0 SF	50,440 SF
PAVEMENT AREA	21,068 SF	45,127 SF	0 SF	66,195 SF
IMPERVIOUS AREA	44,018 SF	119,252 SF	0 SF	163,270 SF
LANDSCAPE AREA	5,253 SF	16,422 SF	30,881 SF	52,556 SF
PERVIOUS PATH	0 SF	0 SF	923 SF	923 SF
PERVIOUS AREA	5,253 SF	16,422 SF	30,881 SF	52,556 SF
TOTAL AREA	49,271 SF	135,674 SF	31,805 SF	216,750 SF

OFFSITE RUNOFF REDUCTION

	DMA 1A	DMA 1B	DMA 2
EXISTING RUNOFF AREA	N/A	N/A	130,400 SF
EXISTING RUNOFF COEFFICIENT	N/A	N/A	0.30
EXISTING WEIGHTED AREA	N/A	N/A	39,120 SF
PROPOSED RUNOFF AREA	N/A	N/A	31,805 SF
PROPOSED RUNOFF COEFFICIENT	N/A	N/A	0.30
PROPOSED WEIGHTED AREA	N/A	N/A	9,542 SF
PERCENTAGE REDUCTION	N/A	N/A	75.5%

REQUIRED TREATMENT VOLUME

	DMA 1A	DMA 1B	DMA 2	TOTAL
IMPERVIOUS AREA	44,018 SF	119,252 SF	0 SF	163,270 SF
TREATMENT VOLUME	0.204 CFS	0.552 CFS	0.000 CFS	0.756 CFS

VOLUME CALCULATED USING FLOW-BASED TREATMENT INTENSITY OF 0.2 INCHES / HOUR

REQUIRED DETENTION MODULES

	DMA 1 (A&B)	DMA 2
VOLUME/MODULE	420 CF	N/A
REQUIRED DETENTION	7,765 CF	N/A
MODULES REQUIRED	18.5	N/A

10-YEAR ORIFICE SIZING (DMA 1)

PREDEVELOPMENT DISCHARGE RATE (FT^3/S)	1.681
DISCHARGE COEFFICIENT	0.61
HEADWATER DEPTH (FT)	4.09
TAILWATER DEPTH (FT)	0
ORIFICE AREA (IN^2)	24.45
ORIFICE DIAMETER (IN)	5.58
VELOCITY (FT/S)	9.90
FINAL ORIFICE DIAMETER (IN)	5 1/2

PROJECT: Santa Cruz SMOB - APN: 029-021-47 Calc by: GS Date: 6/18/2019

RUNOFF DETENTION BY THE MODIFIED RATIONAL METHOD

Data Entry: PRESS TAB & ENTER DESIGN VALUES — SS Ver: 1.0

Site Location P60 Isopleth: 1.50 — Fig. SWM-2 in County Design Criteria
Rational Coefficients Cpre: 0.25 — See note # 2
Cpost: 0.90 — See note # 2
Impervious Area: 163270 ft^2 — See note # 2 and # 4

STRUCTURE DIMENSIONS FOR DETENTION

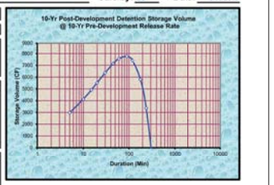
7765 ft^3 storage volume calculated
100 % void space assumed
7765 ft^3 excavated volume needed

Structure	Length	Width*	Depth*
Ratios	1.00	1.00	1.00
Dimen. (ft)	19.80	19.80	19.80

*For pipe, use the square root of the sectional area

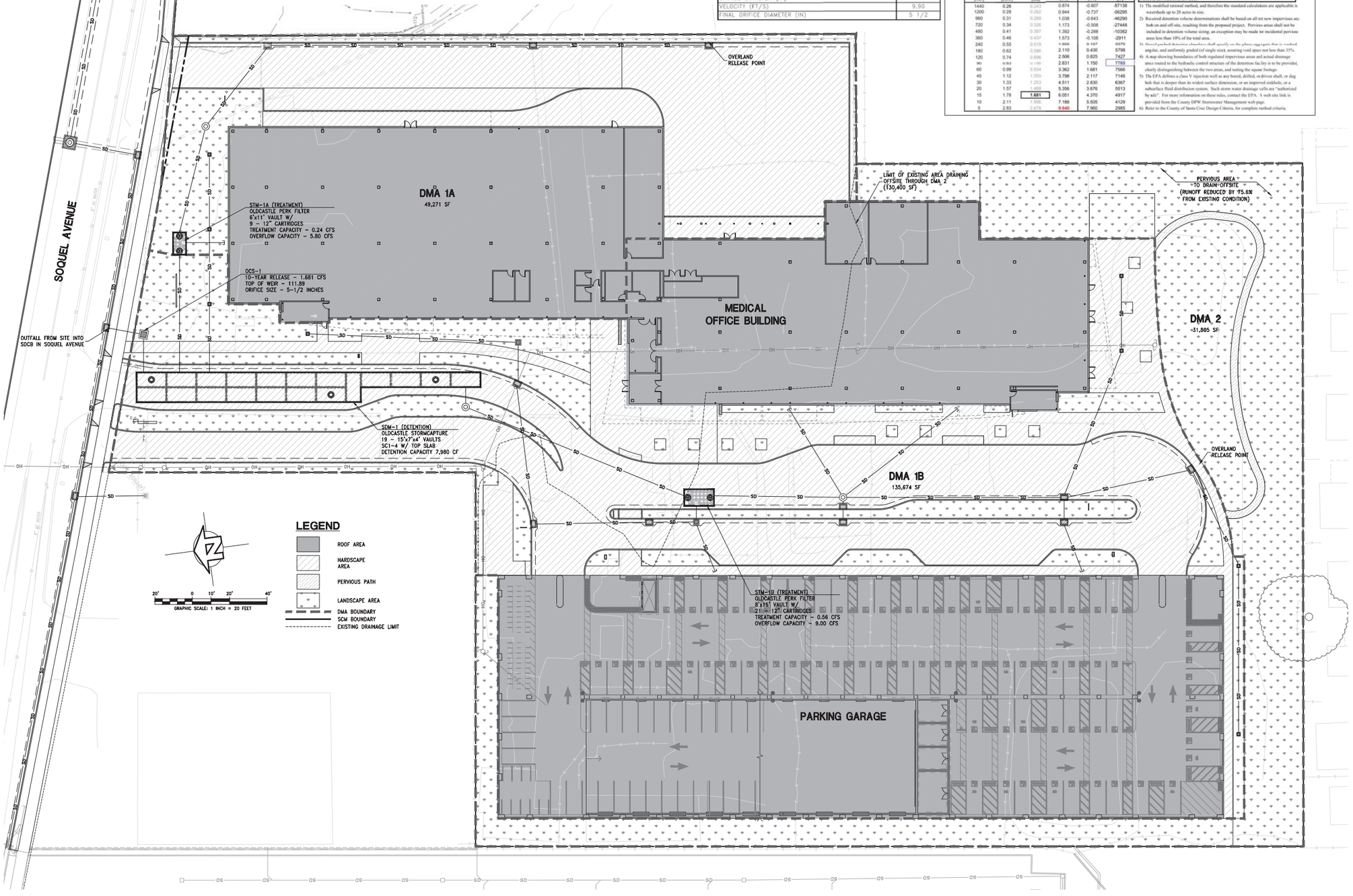
'0 - YEAR DESIGN STORM

Storm Duration (min)	10 - Year Intensity (in/hr)	10 - Yr. Release Qpre (cfs)	10 - Year Qpost (cfs)	DETENTION @ 10 MIN. Detention Rate To Storage (cfs)	Specified Storage Volume (cf)
1440	0.26	0.243	0.874	-0.807	-67138
1200	0.28	0.262	0.944	-0.737	-66295
960	0.31	0.288	1.038	-0.643	-46290
720	0.34	0.326	1.173	-0.508	-27448
480	0.41	0.387	1.392	-0.288	-10382
360	0.46	0.437	1.573	-0.108	-2911
240	0.55	0.519	1.868	0.187	3070
180	0.62	0.586	2.110	0.430	5798
120	0.74	0.696	2.506	0.825	7427
90	0.83	0.779	2.831	1.150	7765
60	0.99	0.934	3.362	1.681	7566
45	1.12	1.056	3.798	2.117	7146
30	1.33	1.253	4.511	2.830	6367
20	1.57	1.489	5.356	3.676	5513
15	1.78	1.681	6.051	4.370	4917
10	2.11	1.996	7.186	5.505	4129
5	2.83	2.678	9.640	7.960	2985



Notes & Limitations on Use:

1) The modified rational method, and therefore the standard calculations are applicable is watersheds up to 20 acres in size.
2) Required detention volume determinations shall be based on all net new impervious area both on and off-site, resulting from the proposed project. Pervious areas shall not be included in detention volume sizing; an exception may be made for incidental pervious areas less than 10% of the total area.
3) Gravel-packed detention chambers shall specify on the plans aggregate that is washed, angular, and uniformly graded (of single size), assuring void space not less than 35%.
4) A map showing boundaries of both regulated impervious areas and actual drainage area routed to the hydraulic control structure of the detention facility is to be provided, clearly distinguishing between the two areas, and noting the square footage.
5) The EPA defines a class V injection well as any bored, drilled, or driven shaft, or dug hole that is deeper than its widest surface dimension, or an improved sinkhole, or a subsurface fluid distribution system. Such storm water drainage wells are "authorized by rule". For more information on these rules, contact the EPA. A web site link is pro-vided from the County DPW Stormwater Management web page.
6) Refer to the County of Santa Cruz Design Criteria, for complete method criteria.



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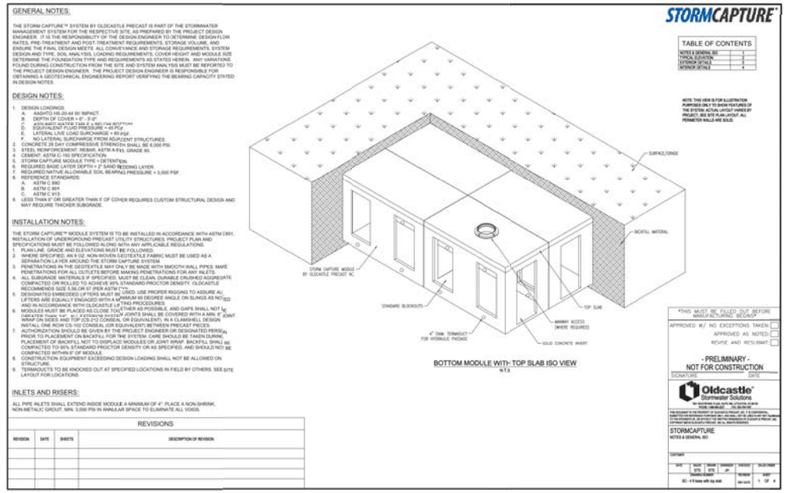
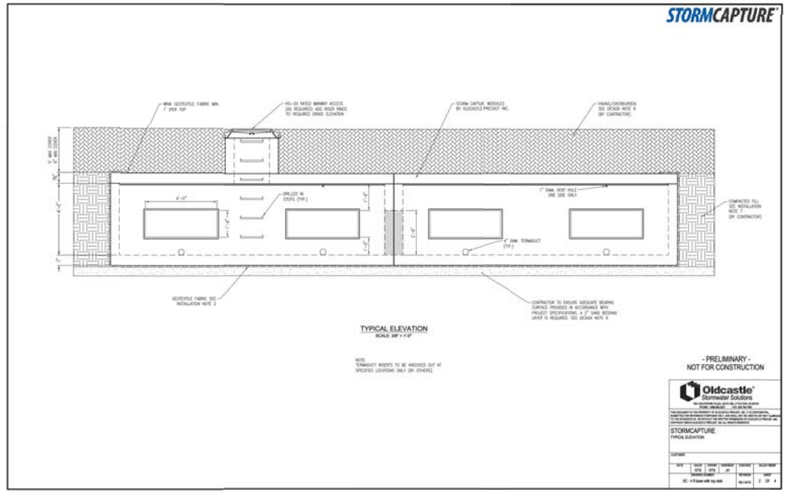
SHEET TITLE

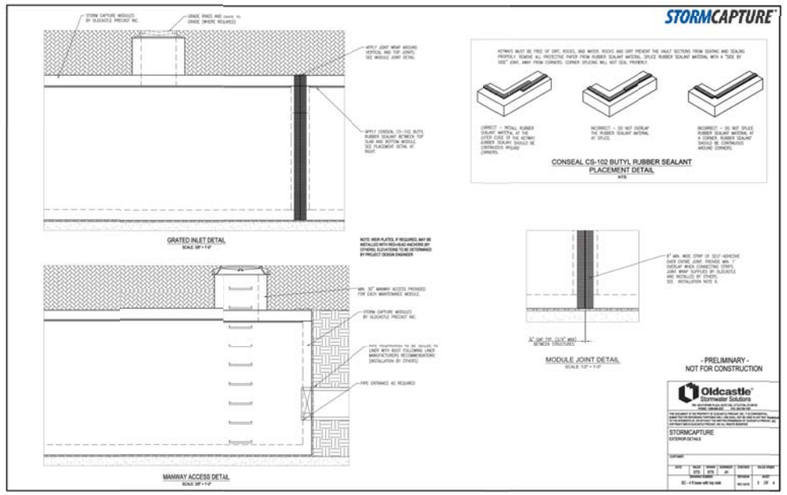
STORMWATER CONTROL PLAN

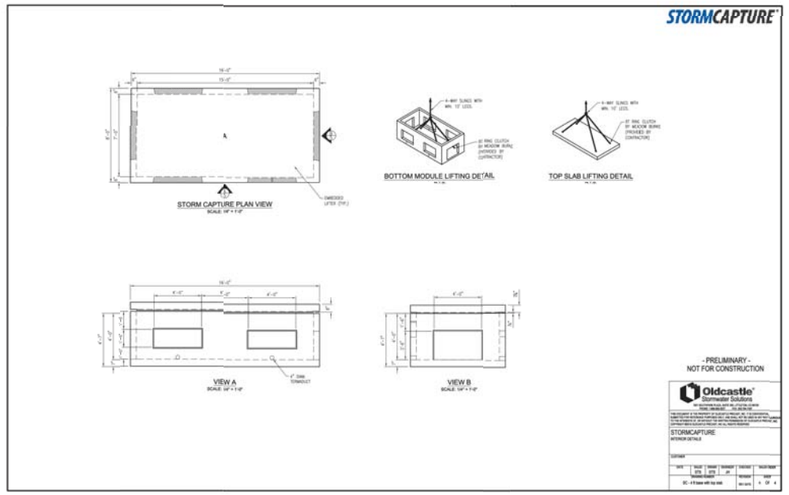
18019 (IEI) 21739.000
PROJECT NUMBER

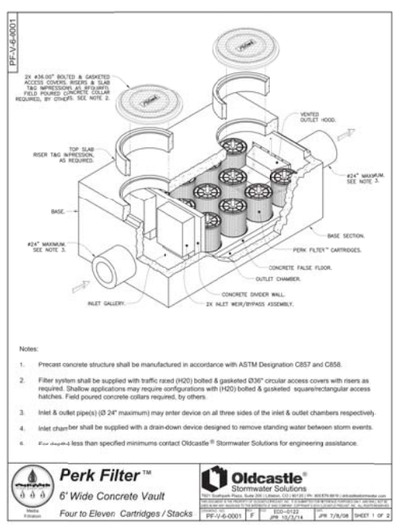
SD C6.0
SHEET NUMBER

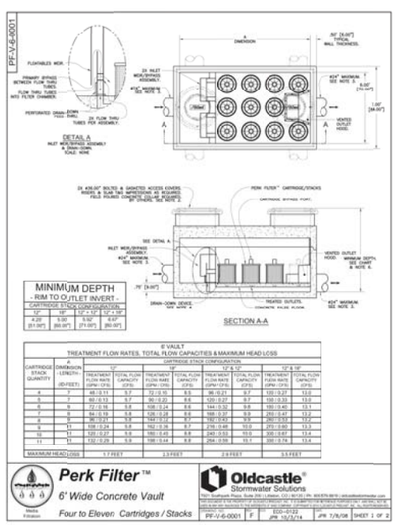


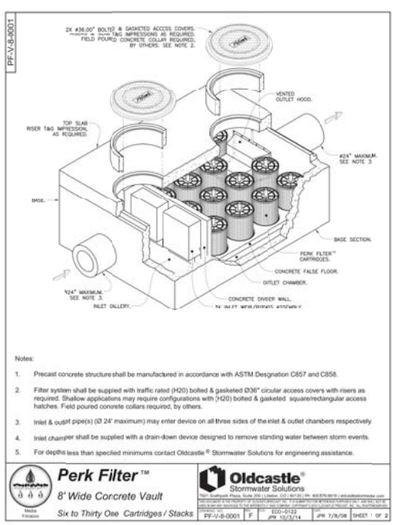


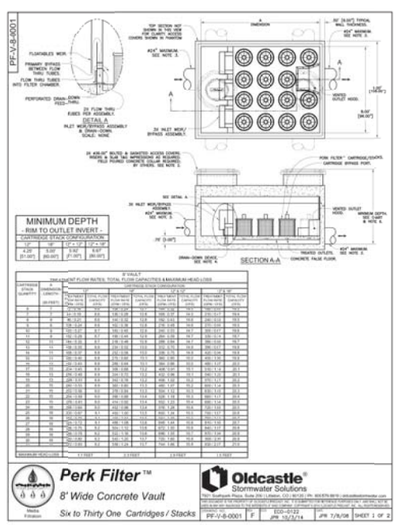












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SHEET TITLE

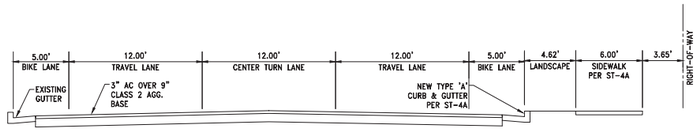
STORMWATER CONTROL DETAILS

18019 (IEI) 21739.000

PROJECT NUMBER

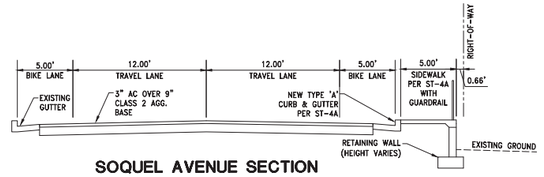
SD C6.1

SHEET NUMBER



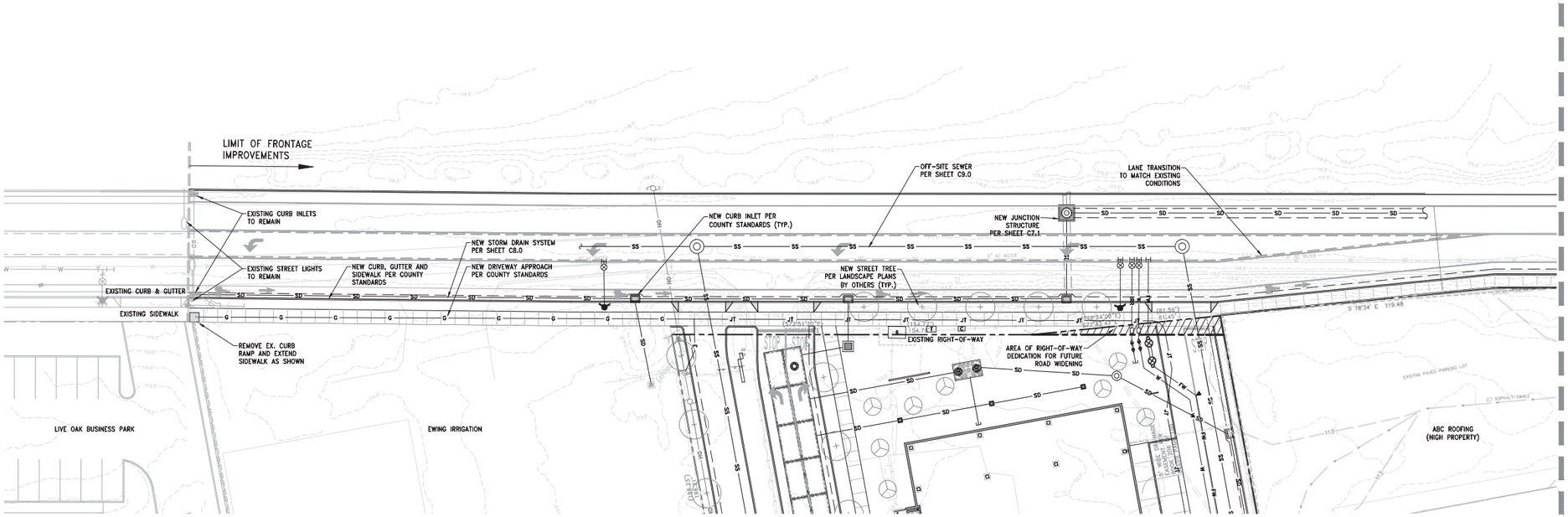
SOQUEL AVENUE SECTION (PROJECT FRONTAGE)

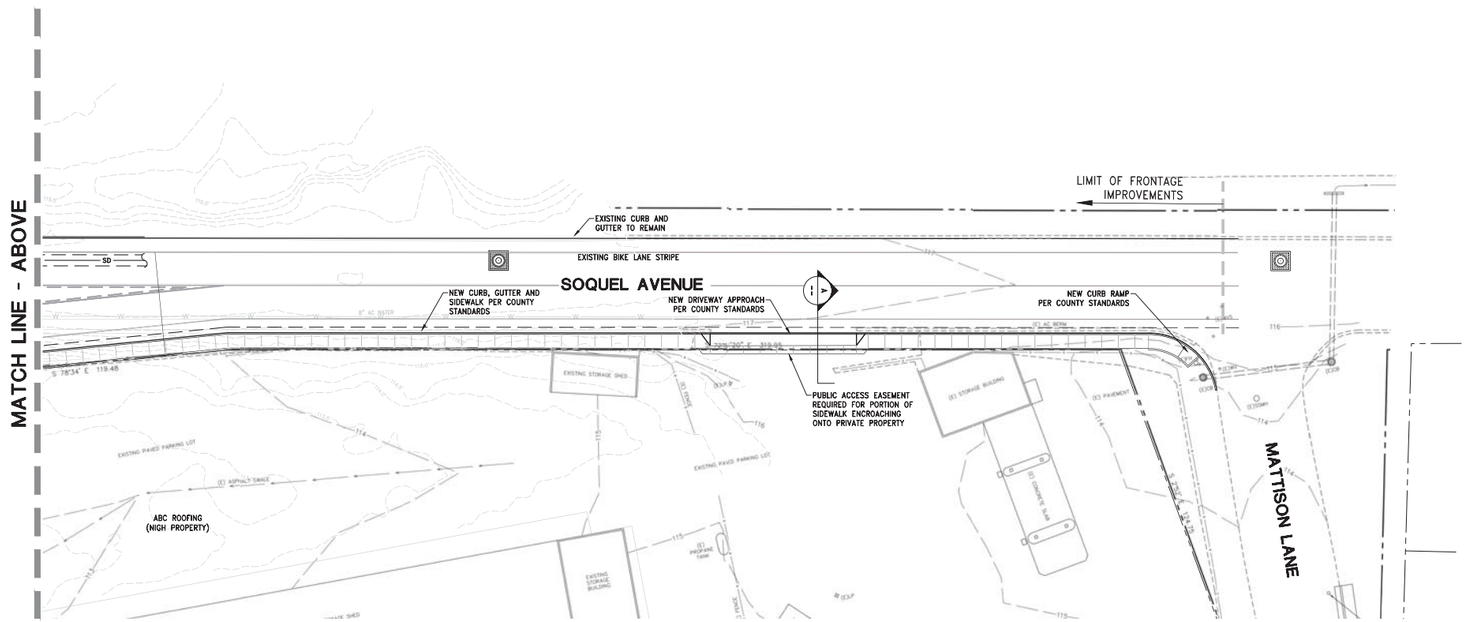
SCALE: 1" = 5'



SOQUEL AVENUE SECTION (NIGH FRONTAGE)

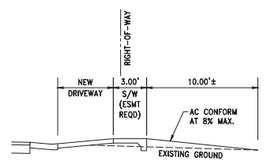
SCALE: 1" = 5'





SOQUEL AVENUE FRONTAGE IMPROVEMENT PLAN

SCALE: 1" = 20'

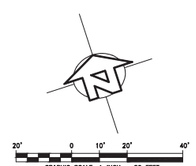


SECTION A

SCALE: 1" = 5'

NOTE

SURVEY INFORMATION SHOWN HEREON FOR THE NIGH PROPERTY PROVIDED COURTESY OF ROPER ENGINEERING



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OFF-SITE FRONTAGE IMPROVEMENT PLAN

18019 (IEI) 21739.000

PROJECT NUMBER

SD C7.0

SHEET NUMBER

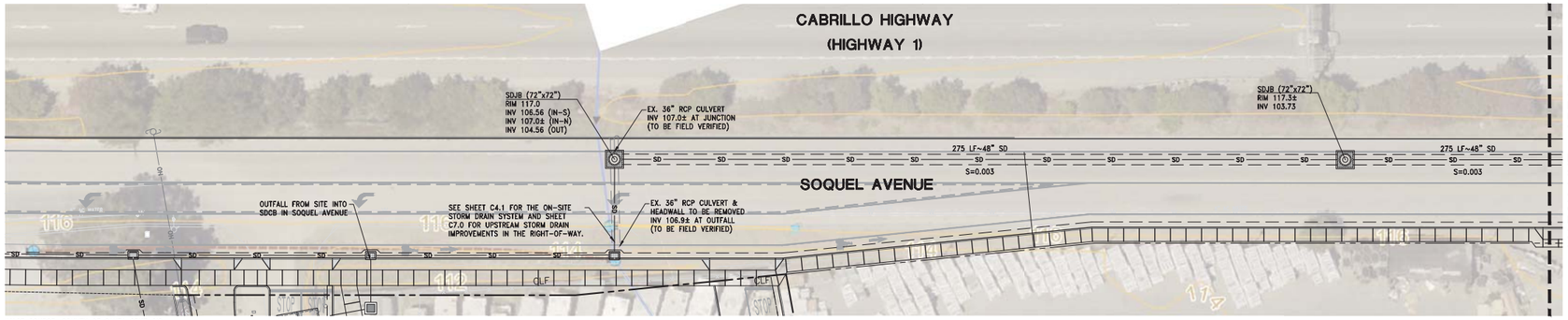

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

SOQUEL AVENUE STORM DRAIN PLAN - AREA A

SCALE: 1" = 20'

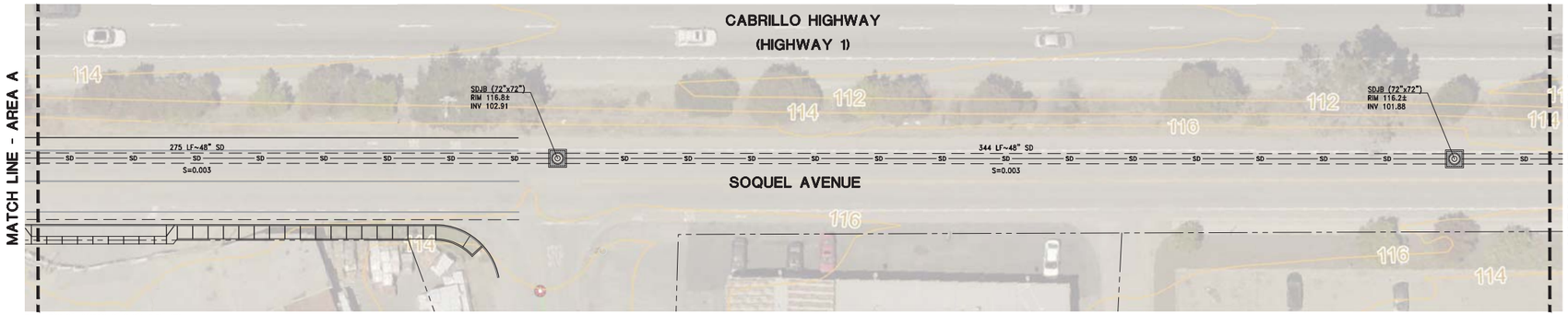

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

SOQUEL AVENUE STORM DRAIN PLAN - AREA B

SCALE: 1" = 20'

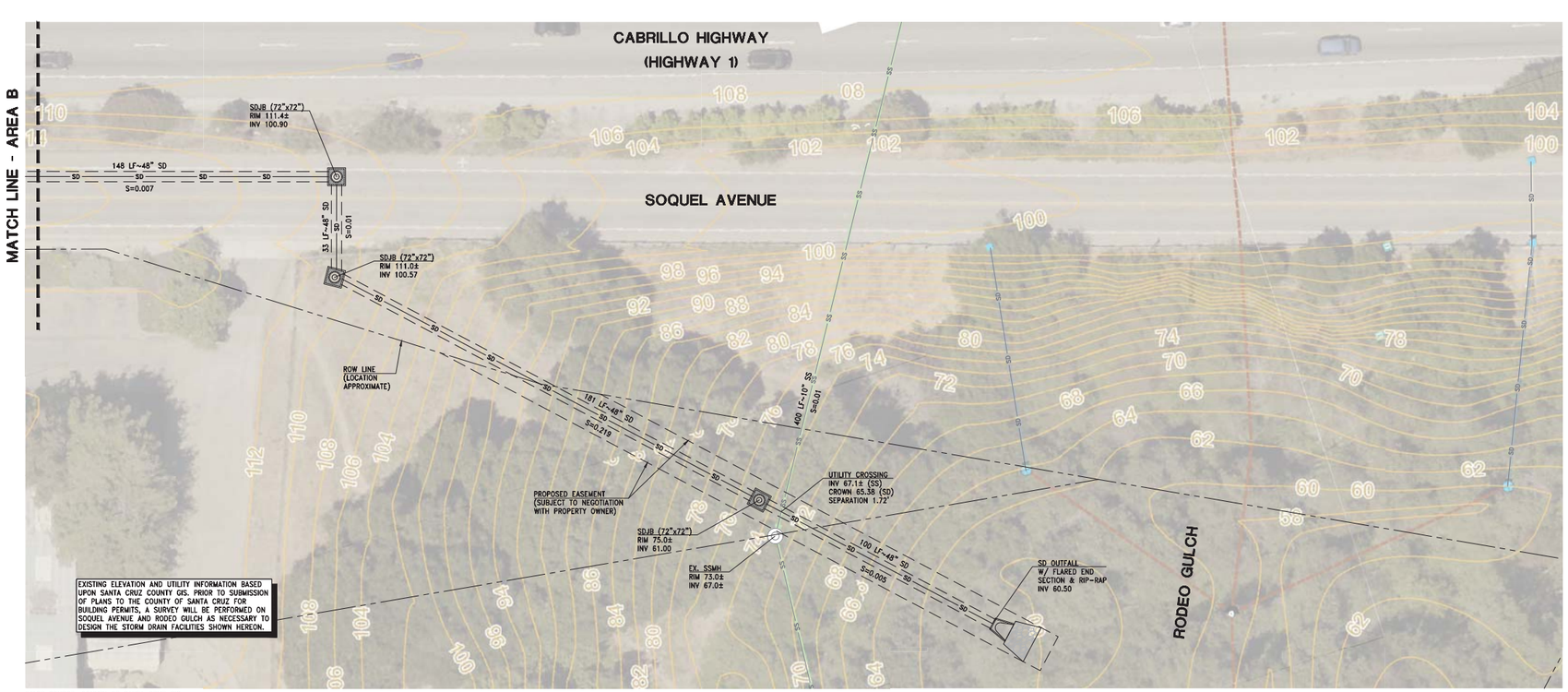

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

SOQUEL AVENUE STORM DRAIN PLAN - AREA C

SCALE: 1" = 20'

20' 0 10' 20' 40'

GRAPHIC SCALE: 1 INCH = 20 FEET

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OFF-SITE STORM DRAIN PLAN

18019 (IEI) 21739.000

PROJECT NUMBER

SD C8.0

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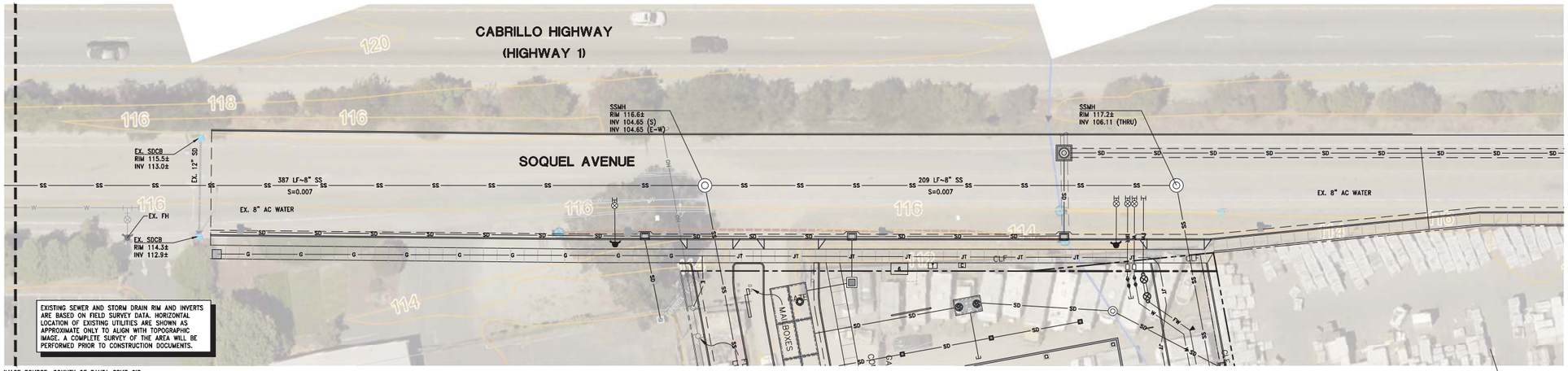

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

SOQUEL AVENUE SANITARY SEWER PLAN

SCALE: 1" = 20'

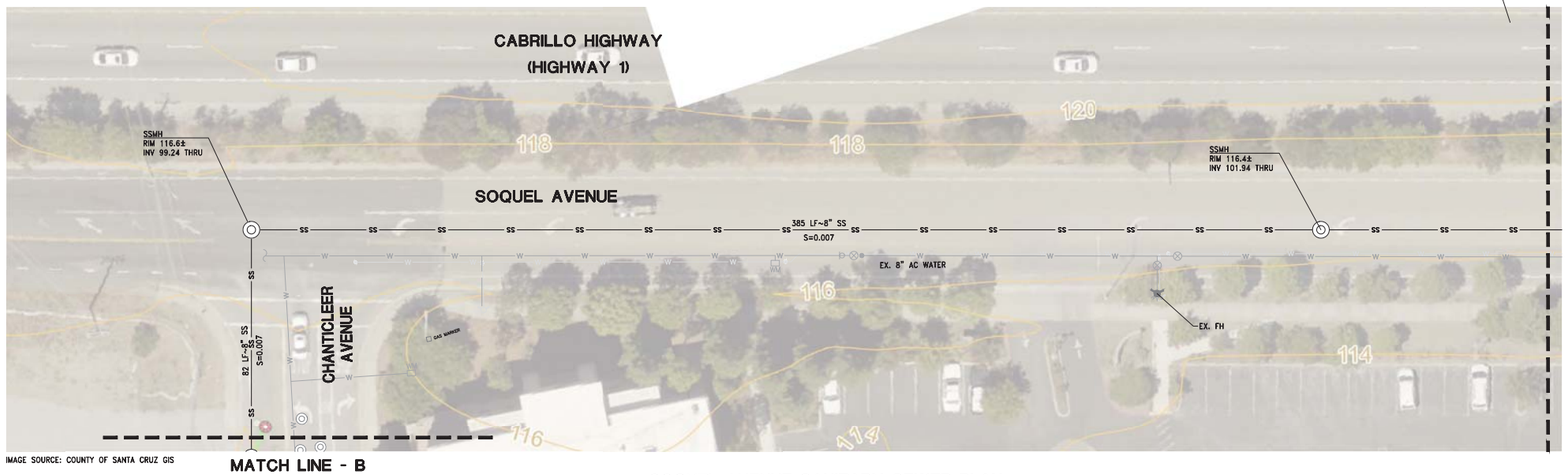

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

MATCH LINE - B

SOQUEL AVENUE SANITARY SEWER PLAN

SCALE: 1" = 20'

REPLACING THE EXISTING SEWER IN CHANTICLEER AVENUE WILL REQUIRE CONSTRUCTION OF A TEMPORARY BYPASS LINE TO MAINTAIN SERVICE TO PARCELS ALONG THE ROUTE. ONCE THE NEW MAIN IS IN PLACE, SERVICE CONNECTIONS WILL BE MADE TO THE NEW MAIN AND THE BYPASS LINE REMOVED AND BACKFILLED PER COUNTY SANITATION STANDARDS.

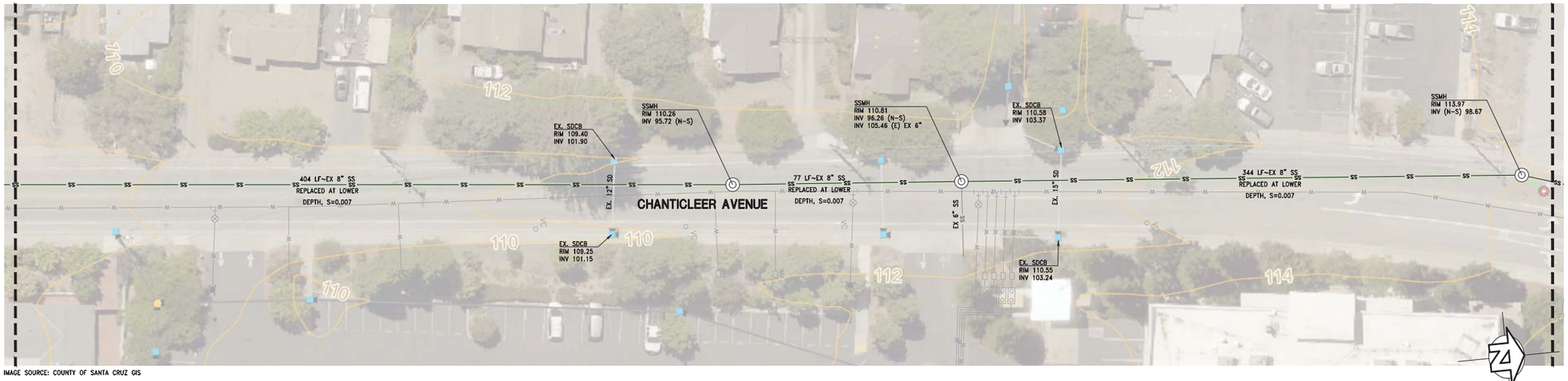

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

SOQUEL AVENUE SANITARY SEWER PLAN

SCALE: 1" = 20'

20' 0 10' 20' 40'

GRAPHIC SCALE: 1 INCH = 20 FEET

PMB Real Estate Services
Real Estate Management Solutions for Healthcare

PMB Santa Cruz, LLC
3394 Carmel Mountain Road,
Suite 200
San Diego, CA 92121

SMITHGROUP
Architect
301 BATTERY STREET
7TH FLOOR
SAN FRANCISCO, CA 94111
415.227.0100
www.smithgroup.com

ARUP
MEP
ARUP
560 Mission Street, Suite 700
San Francisco CA 94105
415.957.9445

WALKER CONSULTANTS
Parking
WALKER CONSULTANTS
601 California St, Suite 820
San Francisco, CA 94108
415.644.0820

IFLAND ENGINEERS
Civil
IFLAND ENGINEERS, INC.
5300 Soquel Avenue, Suite 101
Santa Cruz, CA 95062
831.426.5313

miyamoto. STRUCTURAL ENGINEERS
Structural
MIYAMOTO INTERNATIONAL, INC.
1450 Halyard Drive, Suite One
West Sacramento, CA 95691
916.373.1995

ISSUED FOR	REV	DATE
PERMIT RESUBMITTAL		06/24/2019
Discretionary Review Application		10/31/2018
PRE-APPLICATION SUBMITTAL		08/23/2018

SEALS AND SIGNATURES

NOT FOR CONSTRUCTION

SHEET TITLE

OFF-SITE SANITARY SEWER PLAN

18019 (IEI) 21739.000

PROJECT NUMBER

SD C9.0

SHEET NUMBER

MATCH LINE - D

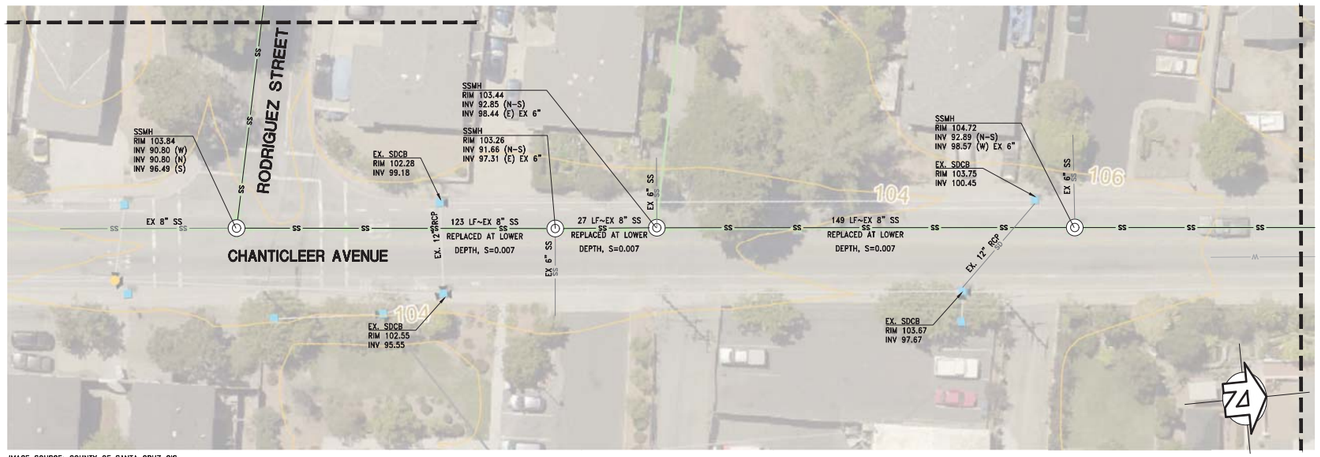

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

SOQUEL AVENUE SANITARY SEWER PLAN

SCALE: 1" = 20'

MATCH LINE - C, SHEET C9.0

IMAGE SOURCE: COUNTY OF SANTA CRUZ GIS

SOQUEL AVENUE SANITARY SEWER PLAN

SCALE: 1" = 20'

MATCH LINE - D

EXISTING SEWER AND STORM DRAIN RIM AND INVERTS ARE BASED ON FIELD SURVEY DATA. HORIZONTAL LOCATION OF EXISTING UTILITIES ARE SHOWN AS APPROXIMATE ONLY TO ALIGN WITH TOPOGRAPHIC IMAGE. A COMPLETE SURVEY OF THE AREA WILL BE PERFORMED PRIOR TO CONSTRUCTION DOCUMENTS.

REPLACING THE EXISTING SEWER IN CHANTICLEER AVENUE AND RODRIGUEZ AVENUE WILL REQUIRE CONSTRUCTION OF A TEMPORARY BYPASS LINE TO MAINTAIN SERVICE TO PARCELS ALONG THE ROUTE. ONCE THE NEW MAIN IS IN PLACE, SERVICE CONNECTIONS WILL BE MADE TO THE NEW MAIN AND THE BYPASS LINE REMOVED AND BACKFILLED PER COUNTY SANITATION STANDARDS.

20' 0 10' 20' 40'

GRAPHIC SCALE: 1 INCH = 20 FEET

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West Sacramento, CA 95691
916.373.1995

ISSUED FOR	REV	DATE
PERMIT RESUBMITTAL		06/24/2019
Discretionary Review Application		10/31/2018
PRE-APPLICATION SUBMITTAL		09/25/2018

SEALS AND SIGNATURES

NOT FOR CONSTRUCTION

SHEET TITLE

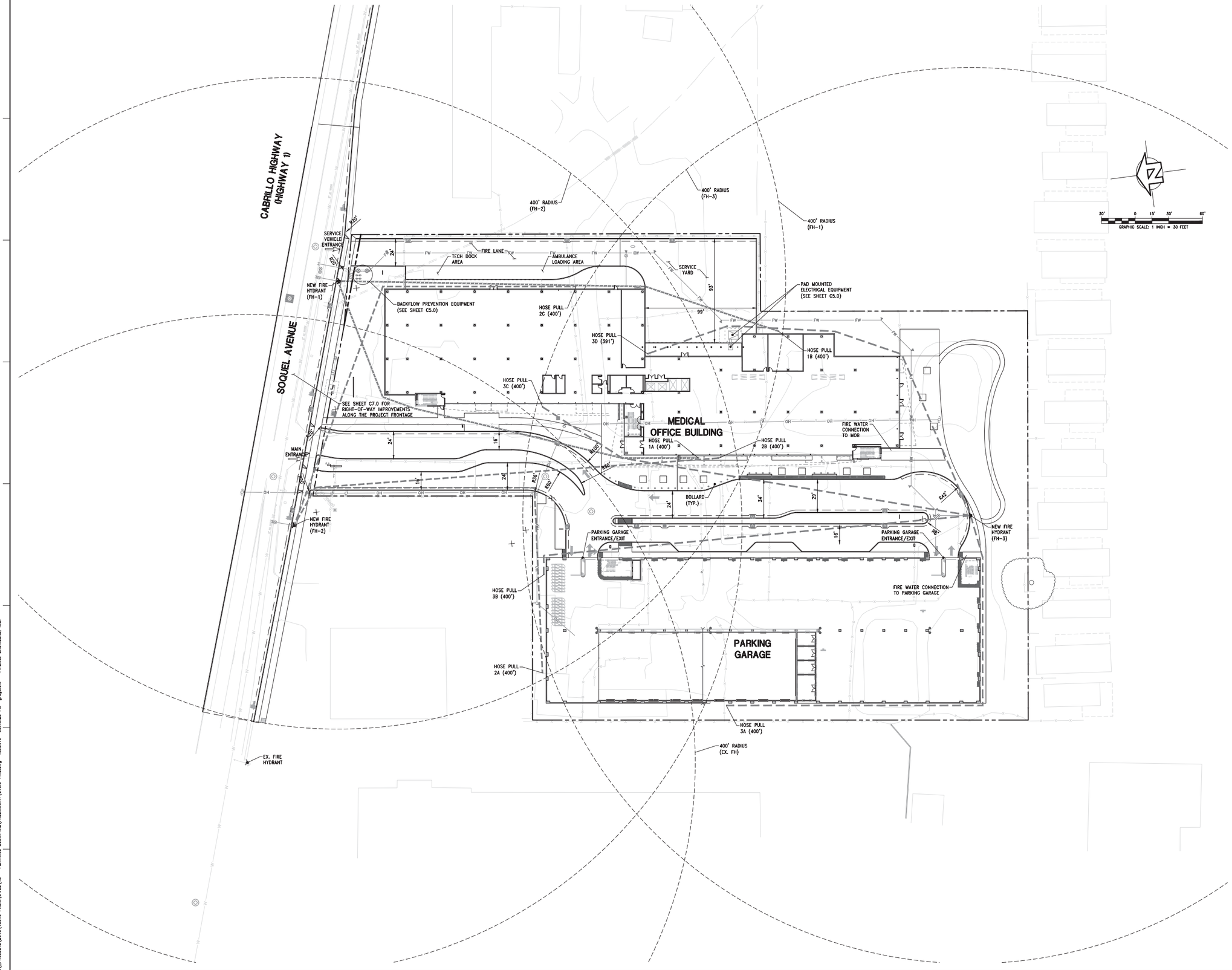
OFF-SITE SANITARY SEWER PLAN

18019 (IEI) 21739.000

PROJECT NUMBER

SD C9.1

SHEET NUMBER



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ISSUED FOR	REV	DATE
PERMIT RESUBMITTAL		06/24/2019
Discretionary Review Application		10/31/2018
PRE-APPLICATION SUBMITTAL		08/23/2018

SEALS AND SIGNATURES

NOT FOR CONSTRUCTION

SHEET TITLE

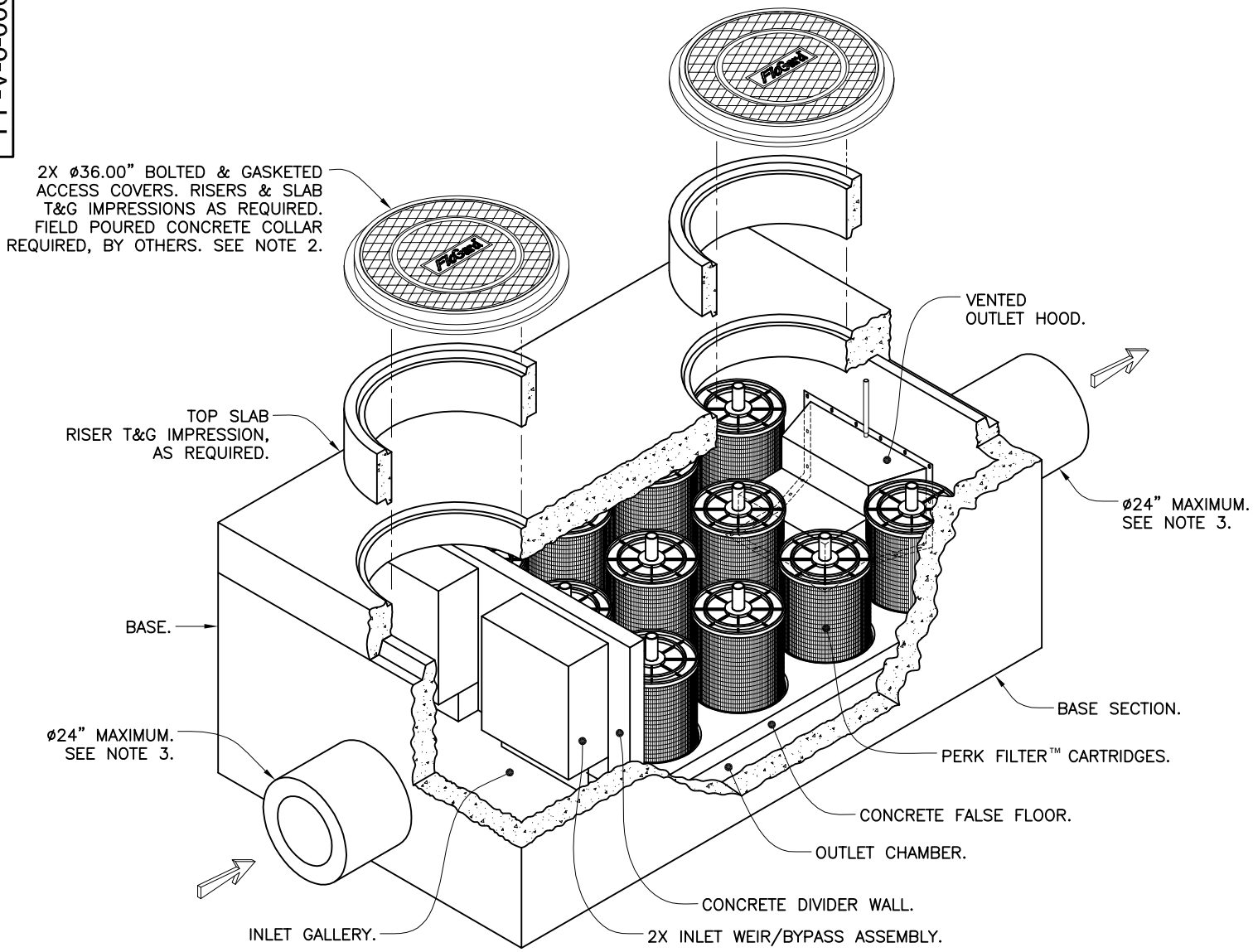
FIRE APPARATUS ACCESS PLAN

18019 (IEI) 21739.000
PROJECT NUMBER

SD C10.0
SHEET NUMBER

APPENDIX D
OLDCASTLE MFS UNIT DETAILS

PF-V-6-0001



Notes:

1. Precast concrete structure shall be manufactured in accordance with ASTM Designation C857 and C858.
2. Filter system shall be supplied with traffic rated (H20) bolted & gasketed Ø36" circular access covers with risers as required. Shallow applications may require configurations with (H20) bolted & gasketed square/rectangular access hatches. Field poured concrete collars required, by others.
3. Inlet & outlet pipe(s) (Ø 24" maximum) may enter device on all three sides of the inlet & outlet chambers respectively.
4. Inlet chamber shall be supplied with a drain-down device designed to remove standing water between storm events.
5. For depths less than specified minimums contact Oldcastle® Stormwater Solutions for engineering assistance.

Media Filtration

Perk Filter™

6' Wide Concrete Vault

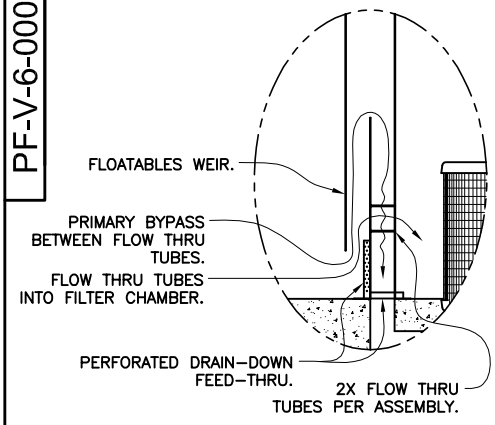
Four to Eleven Cartridges / Stacks

Oldcastle® Stormwater Solutions

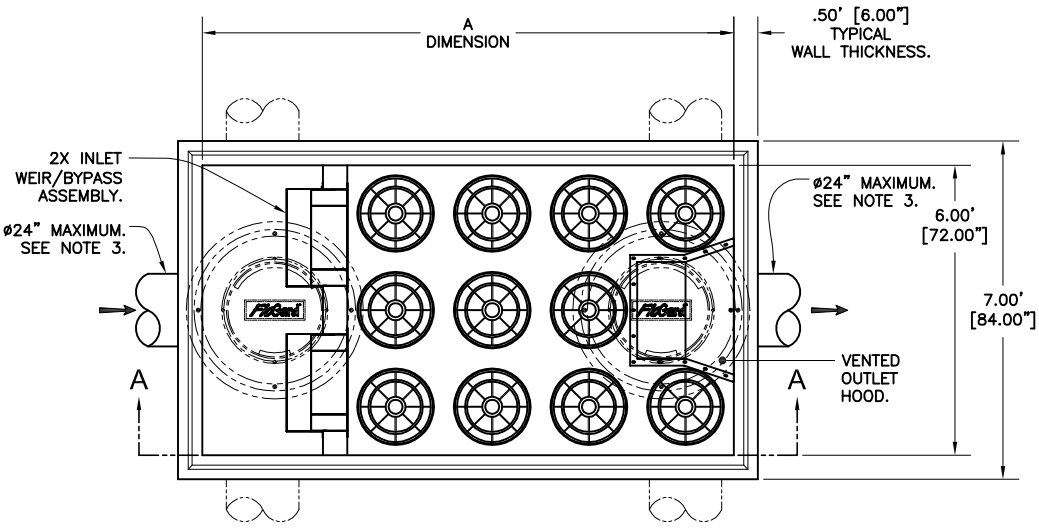
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

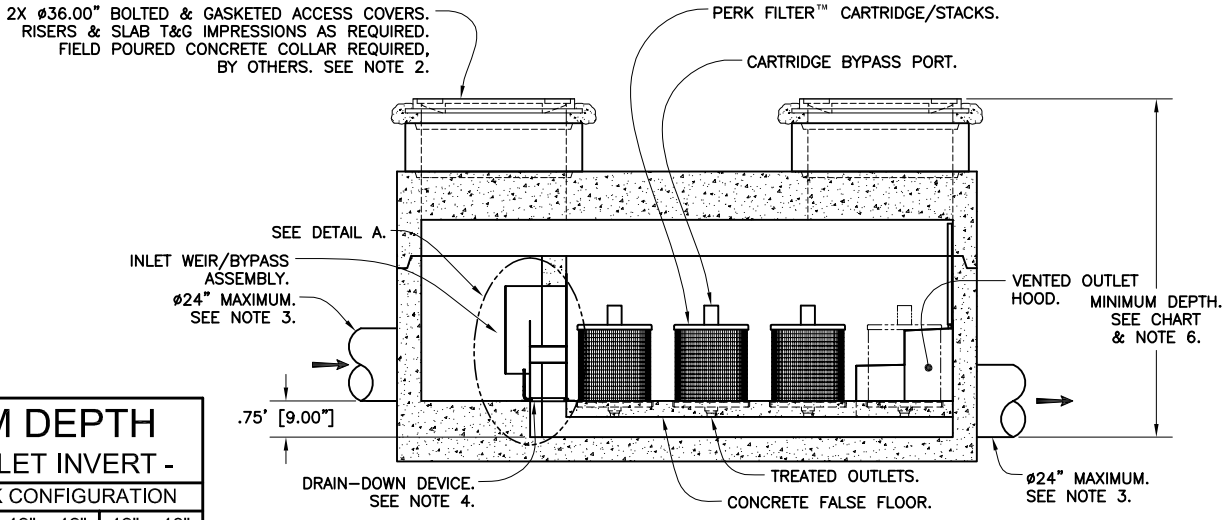
DRAWING NO.	REV	ECO	DATE	
PF-V-6-0001	F	ECO-0122 JPR 10/3/14	JPR 7/8/08	SHEET 1 OF 2

PF-V-6-0001



DETAIL A
INLET WEIR/BYPASS ASSEMBLY & DRAIN–DOWN.
SCALE: NONE





SECTION A-A

MINIMUM DEPTH - RIM TO OUTLET INVERT -			
CARTRIDGE STACK CONFIGURATION			
12"	18"	12" + 12"	12" + 18"
4.25' [51.00"]	5.00' [60.00"]	5.92' [71.00"]	6.67' [80.00"]

6' VAULT
TREATMENT FLOW RATES, TOTAL FLOW CAPACITIES & MAXIMUM HEAD LOSS

CARTRIDGE STACK QUANTITY	A DIMENSION - LENGTH - (ID-FEET)	CARTRIDGE STACK CONFIGURATION							
		12"		18"		12" & 12"		12" & 18"	
		TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)
4	7	48 / 0.11	5.7	72 / 0.16	8.5	96 / 0.21	9.7	120 / 0.27	13.0
5	7	60 / 0.13	5.7	90 / 0.20	8.6	120 / 0.27	9.7	150 / 0.33	13.0
6	9	72 / 0.16	5.8	108 / 0.24	8.6	144 / 0.32	9.8	180 / 0.40	13.1
7	9	84 / 0.19	5.8	126 / 0.28	8.6	168 / 0.37	9.9	210 / 0.47	13.2
8	9	96 / 0.21	5.8	144 / 0.32	8.7	192 / 0.43	9.9	240 / 0.53	13.2
9	11	108 / 0.24	5.8	162 / 0.36	8.7	216 / 0.48	10.0	270 / 0.60	13.3
10	11	120 / 0.27	5.9	180 / 0.40	8.8	240 / 0.53	10.0	300 / 0.67	13.4
11	11	132 / 0.29	5.9	198 / 0.44	8.8	264 / 0.59	10.1	330 / 0.74	13.4
MAXIMUM HEAD LOSS		1.7 FEET		2.3 FEET		2.9 FEET		3.5 FEET	

Media Filtration

Perk Filter™

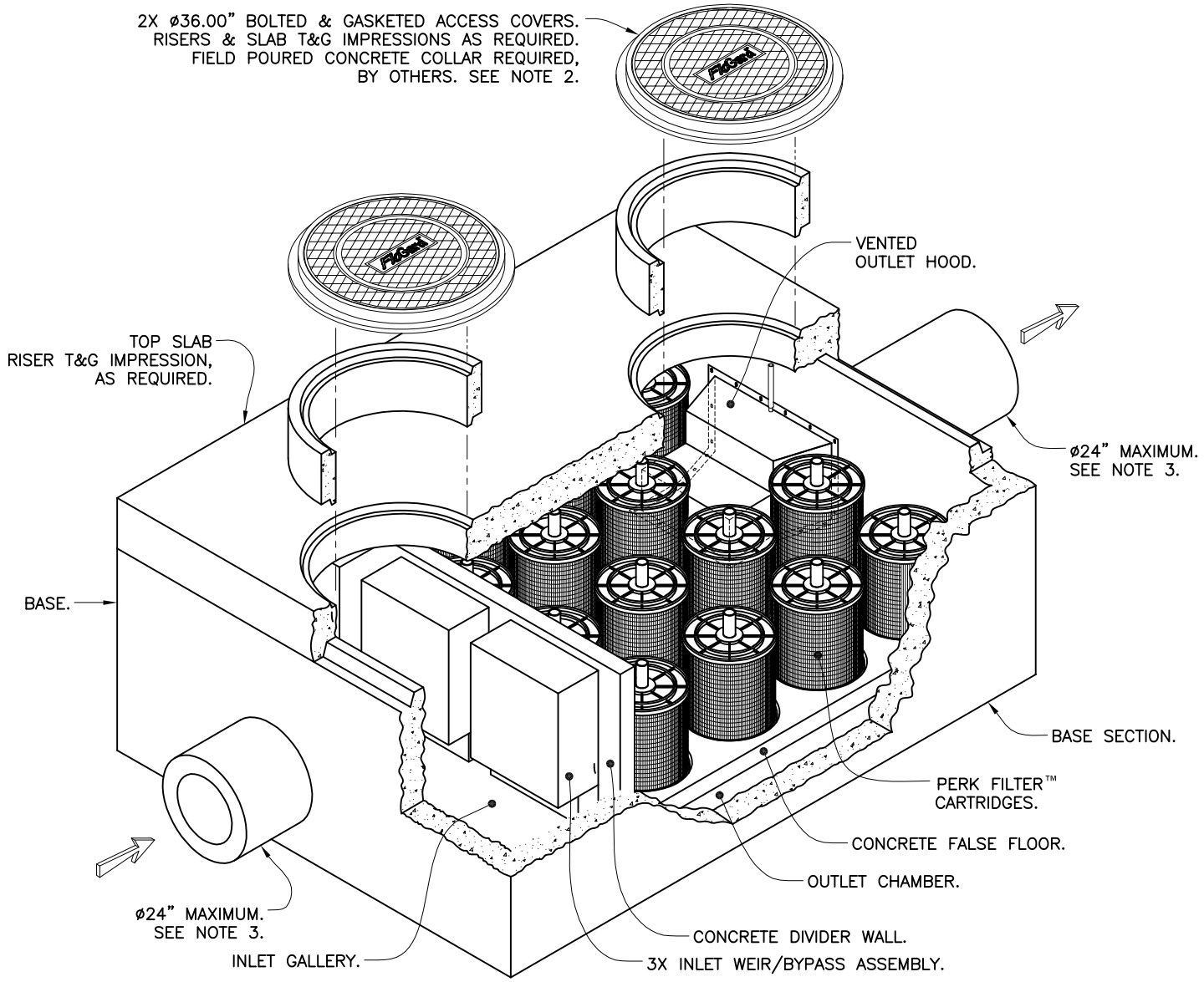
6' Wide Concrete Vault

Four to Eleven Cartridges / Stacks

Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
PF-V-6-0001	F	ECO–0122 JPR 10/3/14	JPR 7/8/08	SHEET 2 OF 2

PF-V-8-0001



Notes:

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4. Inlet chamber shall be supplied with a drain-down device designed to remove standing water between storm events.
5. For depths less than specified minimums contact Oldcastle ® Stormwater Solutions for engineering assistance.

Media Filtration

Perk Filter ™

8' Wide Concrete Vault

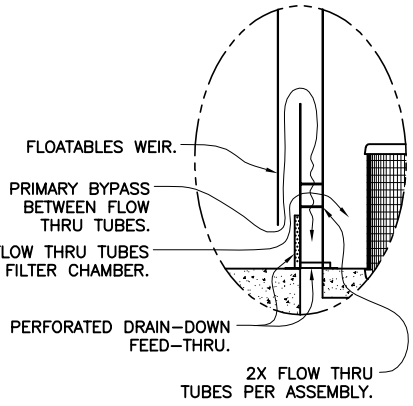
Six to Thirty One Cartridges / Stacks

Oldcastle® Stormwater Solutions

7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

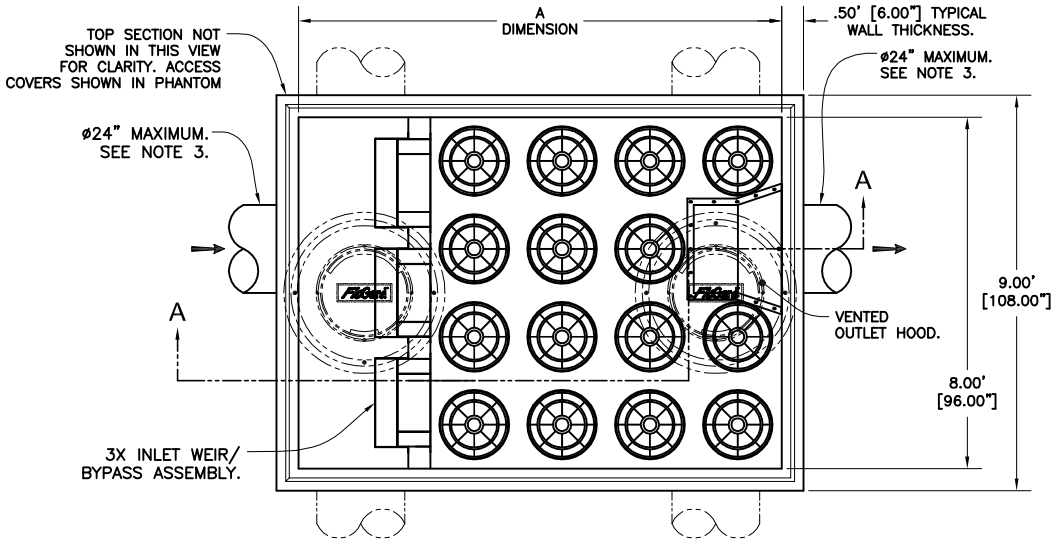
DRAWING NO.	REV	ECO	DATE	
PF-V-8-0001	F	ECO-0122 JPR 10/3/14	JPR 7/8/08	SHEET 1 OF 2

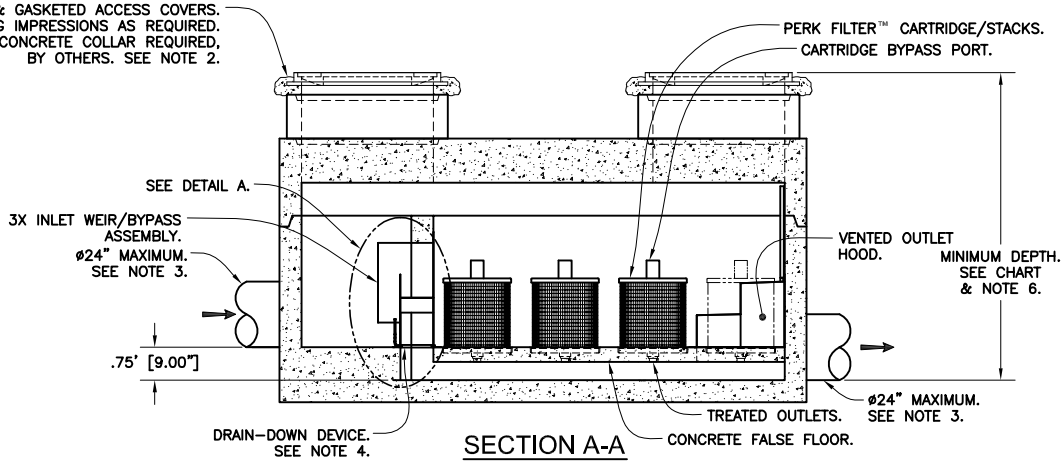
PF-V-8-0001



DETAIL A

INLET WEIR/BYPASS ASSEMBLY & DRAIN-DOWN.
SCALE: NONE





SECTION A-A

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8' VAULT
TREATMENT FLOW RATES, TOTAL FLOW CAPACITIES & MAXIMUM HEAD LOSS

CARTRIDGE STACK QUANTITY	A DIMENSION - LENGTH - (ID-FEET)	CARTRIDGE STACK CONFIGURATION							
		12"		18"		12" & 12"		12" & 18"	
		TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)
6	7	72 / 0.16	8.6	108 / 0.24	12.7	144 / 0.32	14.5	180 / 0.40	19.3
7	7	84 / 0.19	8.6	126 / 0.28	12.8	168 / 0.37	14.5	210 / 0.47	19.4
8	9	96 / 0.21	8.6	144 / 0.32	12.8	192 / 0.43	14.6	240 / 0.53	19.5
9	9	108 / 0.24	8.6	162 / 0.36	12.8	216 / 0.48	14.6	270 / 0.60	19.5
10	9	120 / 0.27	8.7	180 / 0.40	12.9	240 / 0.53	14.7	300 / 0.67	19.6
11	9	132 / 0.29	8.7	198 / 0.44	12.9	264 / 0.59	14.7	330 / 0.74	19.7
12	11	144 / 0.32	8.7	216 / 0.48	12.9	288 / 0.64	14.7	360 / 0.80	19.7
13	11	156 / 0.35	8.8	234 / 0.52	13.0	312 / 0.70	14.8	390 / 0.87	19.8
14	11	168 / 0.37	8.8	252 / 0.56	13.0	336 / 0.75	14.9	420 / 0.94	19.9
15	11	180 / 0.40	8.8	270 / 0.60	13.1	360 / 0.80	15.0	450 / 1.00	19.9
16	13	192 / 0.43	8.8	288 / 0.64	13.1	384 / 0.86	15.0	480 / 1.07	20.0
17	13	204 / 0.45	8.9	306 / 0.68	13.2	408 / 0.91	15.1	510 / 1.14	20.1
18	13	216 / 0.48	8.9	324 / 0.72	13.2	432 / 0.96	15.1	540 / 1.20	20.1
19	13	228 / 0.51	8.9	342 / 0.76	13.2	456 / 1.02	15.2	570 / 1.27	20.2
20	15	240 / 0.53	8.9	360 / 0.80	13.3	480 / 1.07	15.2	600 / 1.34	20.3
21	15	252 / 0.56	9.0	378 / 0.84	13.3	504 / 1.12	15.3	630 / 1.40	20.3
22	15	264 / 0.59	9.0	396 / 0.88	13.4	528 / 1.18	15.3	660 / 1.47	20.4
23	15	276 / 0.61	9.0	414 / 0.92	13.4	552 / 1.23	15.4	690 / 1.54	20.5
24	18	288 / 0.64	9.0	432 / 0.96	13.4	576 / 1.28	15.4	720 / 1.60	20.5
25	18	300 / 0.67	9.1	450 / 1.00	13.5	600 / 1.34	15.5	750 / 1.67	20.6
26	18	312 / 0.70	9.1	468 / 1.04	13.5	624 / 1.39	15.5	780 / 1.74	20.7
27	18	324 / 0.72	9.1	486 / 1.08	13.6	648 / 1.44	15.6	810 / 1.80	20.7
28	18	336 / 0.75	9.2	504 / 1.12	13.6	672 / 1.50	15.6	840 / 1.87	20.8
29	18	348 / 0.78	9.2	522 / 1.16	13.6	696 / 1.55	15.7	870 / 1.94	20.9
30	18	360 / 0.80	9.2	540 / 1.20	13.7	720 / 1.60	15.8	900 / 2.01	20.9
31	18	372 / 0.83	9.2	558 / 1.24	13.7	744 / 1.66	15.8	930 / 2.07	21.0
MAXIMUM HEAD LOSS		1.7 FEET		2.3 FEET		2.9 FEET		3.5 FEET	

Media Filtration

Perk Filter™

8' Wide Concrete Vault

Six to Thirty One Cartridges / Stacks

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PF-V-8-0001	F	ECO-0122 JPR 10/3/14	JPR 7/8/08	SHEET 2 OF 2

APPENDIX E
OLDCASTLE STORMCAPTURE VAULT DETAILS

GENERAL NOTES:

THE STORM CAPTURE™ SYSTEM BY OLDCASTLE PRECAST IS PART OF THE STORMWATER MANAGEMENT SYSTEM FOR THE RESPECTIVE SITE, AS PREPARED BY THE PROJECT DESIGN ENGINEER. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO DETERMINE DESIGN FLOW RATES, PRE-TREATMENT AND POST-TREATMENT REQUIREMENTS, STORAGE VOLUME, AND ENSURE THE FINAL DESIGN MEETS ALL CONVEYANCE AND STORAGE REQUIREMENTS. SYSTEM DESIGN AND TYPE, SOIL ANALYSIS, LOADING REQUIREMENTS, COVER HEIGHT AND MODULE SIZE DETERMINE THE FOUNDATION TYPE AND REQUIREMENTS AS STATED HEREIN. ANY VARIATIONS FOUND DURING CONSTRUCTION FROM THE SITE AND SYSTEM ANALYSIS MUST BE REPORTED TO THE PROJECT DESIGN ENGINEER. THE PROJECT DESIGN ENGINEER IS RESPONSIBLE FOR OBTAINING A GEOTECHNICAL ENGINEERING REPORT VERIFYING THE BEARING CAPACITY STATED IN DESIGN NOTES.

DESIGN NOTES:

1. DESIGN LOADINGS:
   - A. AASHTO HS-20-44 W/ IMPACT.
   - B. DEPTH OF COVER = 6" - 5'-0".
   - C. ASSUMED WATER TABLE = BELOW BOTTOM.
   - D. EQUIVALENT FLUID PRESSURE = 45 PCF.
   - E. LATERAL LIVE LOAD SURCHARGE = 80 PSF.
   - F. NO LATERAL SURCHARGE FROM ADJACENT STRUCTURES.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH SHALL BE 6,000 PSI.
3. STEEL REINFORCEMENT: REBAR, ASTM A-615, GRADE 60.
4. CEMENT: ASTM C-150 SPECIFICATION.
5. STORM CAPTURE MODULE TYPE = DETENTION.
6. REQUIRED BASE LAYER DEPTH = 2" SAND BEDDING LAYER.
7. REQUIRED NATIVE ALLOWABLE SOIL BEARING PRESSURE = 3,000 PSF.
8. REFERENCE STANDARDS:
   - A. ASTM C 890
   - B. ASTM C 891
   - C. ASTM C 913
9. LESS THAN 6" OR GREATER THAN 5' OF COVER REQUIRES CUSTOM STRUCTURAL DESIGN AND MAY REQUIRE THICKER SUBGRADE.

INSTALLATION NOTES:

THE STORM CAPTURE™ MODULE SYSTEM IS TO BE INSTALLED IN ACCORDANCE WITH ASTM C891, INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES. PROJECT PLAN AND SPECIFICATIONS MUST BE FOLLOWED ALONG WITH ANY APPLICABLE REGULATIONS.

1. PLAN LINE, GRADE AND ELEVATIONS MUST BE FOLLOWED.
2. WHERE SPECIFIED, AN 8 OZ. NON-WOVEN GEOTEXTILE FABRIC MUST BE USED AS A SEPARATION LAYER AROUND THE STORM CAPTURE SYSTEM.
3. PENETRATIONS IN THE GEOTEXTILE MAY ONLY BE MADE WITH SMOOTH WALL PIPES. MAKE PENETRATIONS FOR ALL OUTLETS BEFORE MAKING PENETRATIONS FOR ANY INLETS.
4. ALL SUBGRADE MATERIALS IF SPECIFIED, MUST BE CLEAN, DURABLE CRUSHED AGGREGATE COMPACTED OR ROLLED TO ACHIEVE 95% STANDARD PROCTOR DENSITY. OLDCASTLE RECOMMENDS SIZE 5,56,OR 57 (PER ASTM C33) .
5. DESIGNATED EMBEDDED LIFTERS MUST BE USED. USE PROPER RIGGING TO ASSURE ALL LIFTERS ARE EQUALLY ENGAGED WITH A MINIMUM 60 DEGREE ANGLE ON SLINGS AS NOTED AND IN ACCORDANCE WITH OLDCASTLE LIFTING PROCEDURES.
6. MODULES MUST BE PLACED AS CLOSE TOGETHER AS POSSIBLE, AND GAPS SHALL NOT BE GREATER THAN 3/4". ALL EXTERIOR SYSTEM JOINTS SHALL BE COVERED WITH A MIN. 8" JOINT WRAP ON SIDES AND TOP (CS-212 CONSEAL OR EQUIVALENT). IN A CLAMSHELL DESIGN INSTALL ONE ROW CS-102 CONSEAL (OR EQUIVALENT) BETWEEN PRECAST PIECES.
7. AUTHORIZATION SHOULD BE GIVEN BY THE PROJECT ENGINEER OR DESIGNATED PERSON PRIOR TO PLACEMENT ON BACKFILL FOR THE SYSTEM. CARE SHOULD BE TAKEN DURING PLACEMENT OF BACKFILL NOT TO DISPLACE MODULES OR JOINT WRAP. BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY OR AS SPECIFIED, AND SHOULD NOT BE COMPACTED WITHIN 6" OF MODULE.
8. CONSTRUCTION EQUIPMENT EXCEEDING DESIGN LOADING SHALL NOT BE ALLOWED ON STRUCTURE.
9. TERMADUCTS TO BE KNOCKED OUT AT SPECIFIED LOCATIONS IN FIELD BY OTHERS. SEE SITE LAYOUT FOR LOCATIONS.

INLETS AND RISERS:

ALL PIPE INLETS SHALL EXTEND INSIDE MODULE A MINIMUM OF 4". PLACE A NON-SHRINK, NON-METALIC GROUT, MIN. 3,000 PSI IN ANNULAR SPACE TO ELIMINATE ALL VOIDS.

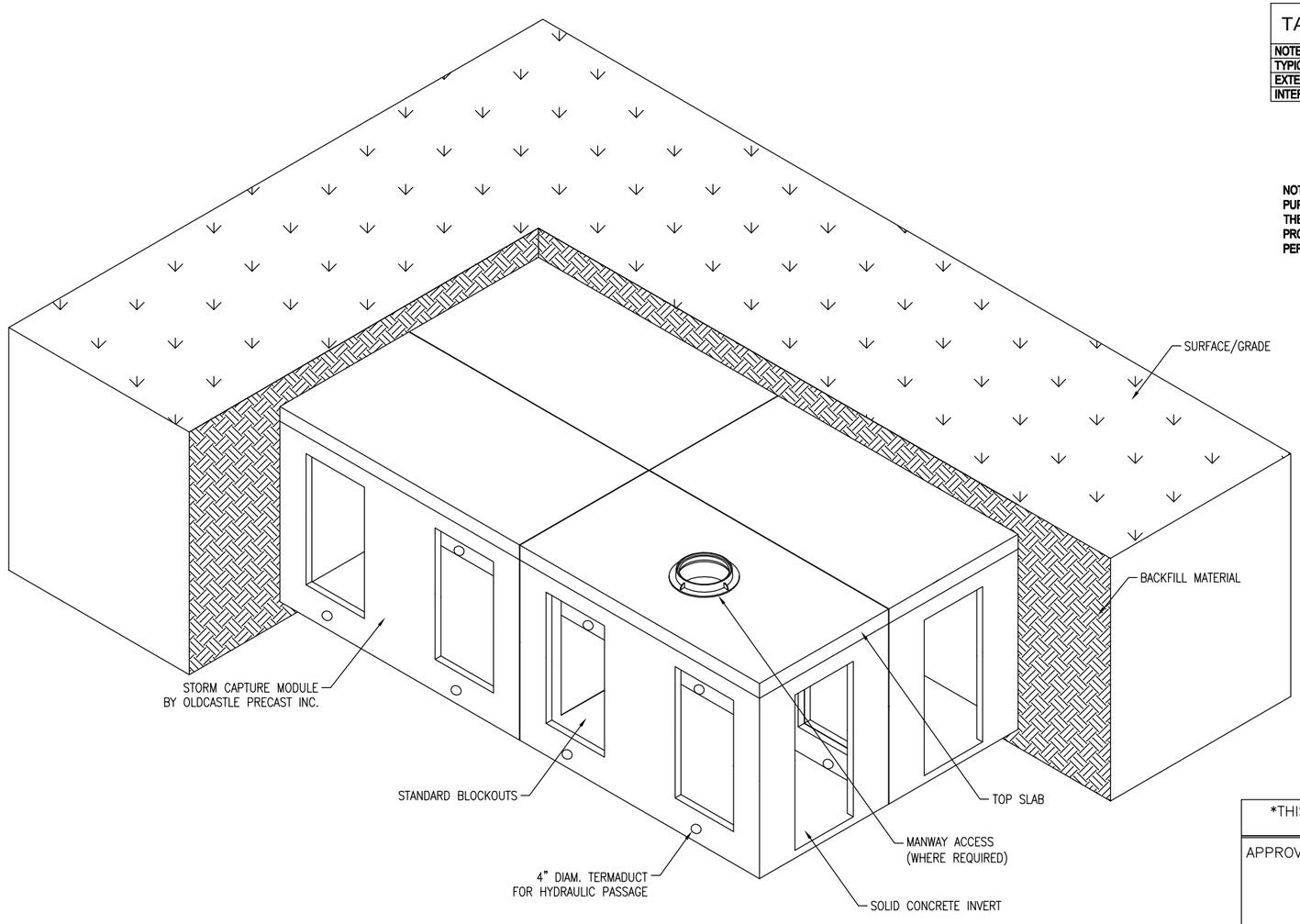
REVISIONS

REVISION	DATE	SHEETS	DESCRIPTION OF REVISION

STORMCAPTURE®

TABLE OF CONTENTS

NOTE: THIS VIEW IS FOR ILLUSTRATION PURPOSES ONLY TO SHOW FEATURES OF THE SYSTEM. ACTUAL LAYOUT VARIES BY PROJECT, SEE SITE PLAN LAYOUT. ALL PERIMETER WALLS ARE SOLID.



BOTTOM MODULE WITH TOP SLAB ISO VIEW
N.T.S.

THIS MUST BE FILLED OUT BEFORE MANUFACTURING BEGINS

APPROVED W/ NO EXCEPTIONS TAKEN: ☐
APPROVED AS NOTED: ☐
REVISE AND RESUBMIT: ☐

- PRELIMINARY -
NOT FOR CONSTRUCTION

SIGNATURE DATE

Oldcastle® Stormwater Solutions
7921 SOUTHPARK PLAZA, SUITE 200, LITTLETON, CO 80120
PHONE: 1-888-865-3227 FAX: 303-794-7497

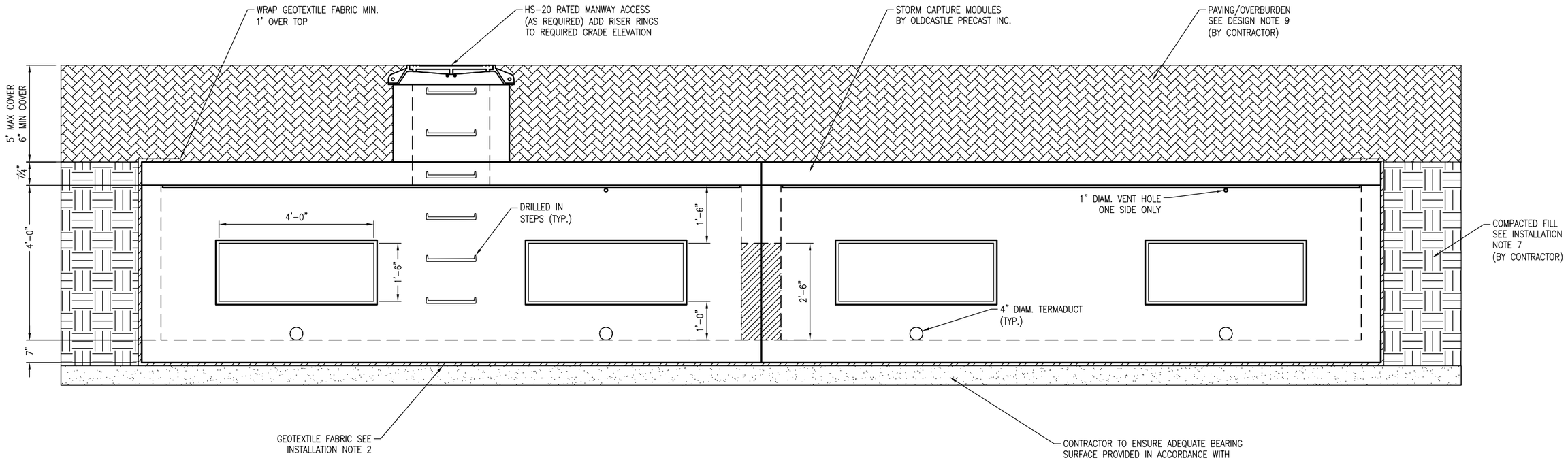
STORMCAPTURE
NOTES & GENERAL ISO

CUSTOMER

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

DRAWING NUMBER	REVISION	SHEET
SC - 4 ft base with top slab	REV DATE	1 OF 4

STORMCAPTURE®



TYPICAL ELEVATION

SCALE: 3/8" = 1'-0"

NOTE:
TERMADUCT INSERTS TO BE KNOCKED OUT AT SPECIFIED LOCATIONS ONLY (BY OTHERS).

- PRELIMINARY -
NOT FOR CONSTRUCTION

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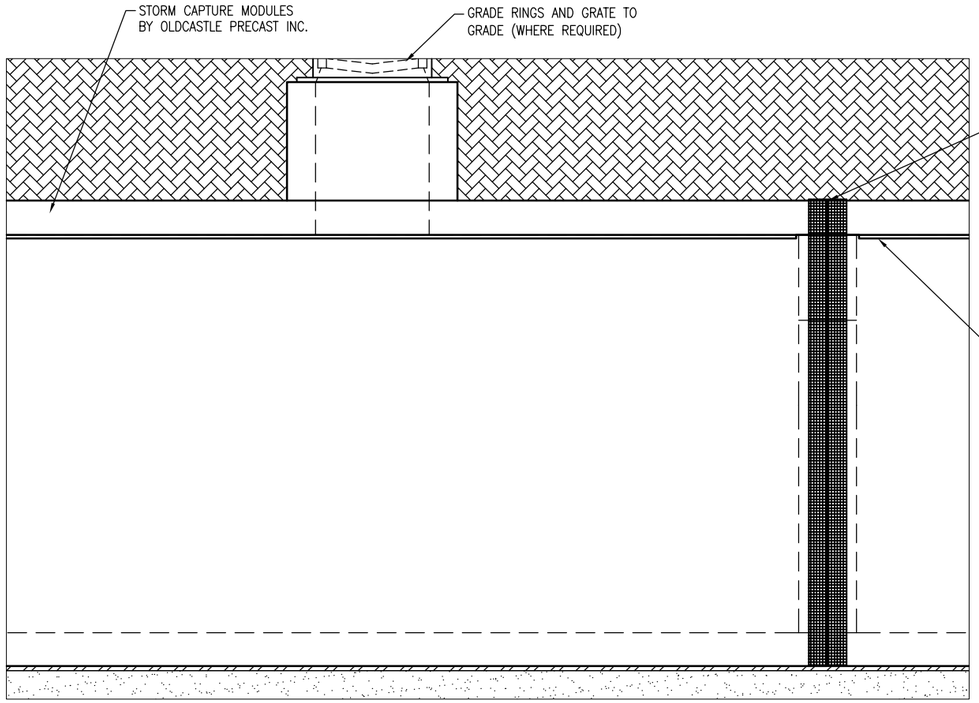
STORMCAPTURE
TYPICAL ELEVATION

CUSTOMER

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

DRAWING NUMBER	REVISION	SHEET
SC - 4 ft base with top slab	REV DATE	2 OF 4

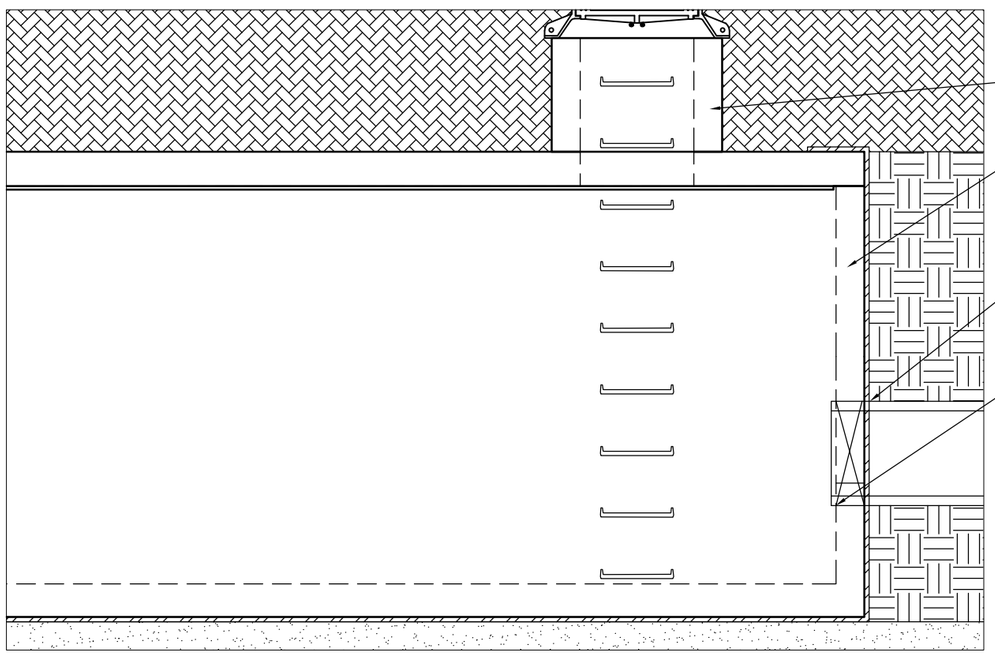
STORMCAPTURE®



GRATED INLET DETAIL

SCALE: 3/8" = 1'-0"

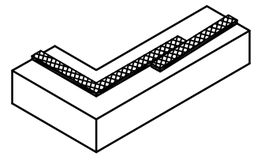
NOTE: WEIR PLATES, IF REQUIRED, MAY BE INSTALLED WITH RED-HEAD ANCHORS (BY OTHERS). ELEVATIONS TO BE DETERMINED BY PROJECT DESIGN ENGINEER



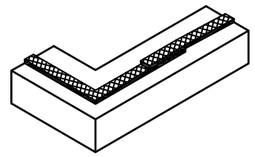
MANWAY ACCESS DETAIL

SCALE: 3/8" = 1'-0"

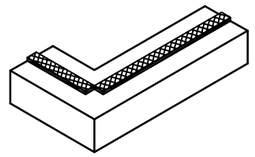
KEYWAYS MUST BE FREE OF DIRT, ROCKS, AND WATER. ROCKS AND DIRT PREVENT THE VAULT SECTIONS FROM SEATING AND SEALING PROPERLY. REMOVE ALL PROTECTIVE PAPER FROM RUBBER SEALANT MATERIAL. SPLICE RUBBER SEALANT MATERIAL WITH A "SIDE BY SIDE" JOINT, AWAY FROM CORNERS. CORNER SPLICING WILL NOT SEAL PROPERLY.



CORRECT – INSTALL RUBBER SEALANT MATERIAL AT THE OUTER EDGE OF THE KEYWAY. RUBBER SEALANT SHOULD BE CONTINUOUS AROUND CORNERS.



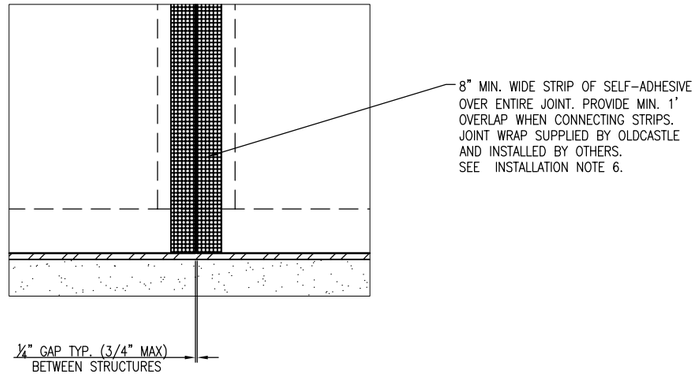
INCORRECT – DO NOT OVERLAP THE RUBBER SEALANT MATERIAL AT SPLICE.



INCORRECT – DO NOT SPLICE RUBBER SEALANT MATERIAL AT A CORNER. RUBBER SEALANT SHOULD BE CONTINUOUS AROUND CORNERS.

CONSEAL CS-102 BUTYL RUBBER SEALANT PLACEMENT DETAIL

NTS



MODULE JOINT DETAIL

SCALE: 1/2" = 1'-0"

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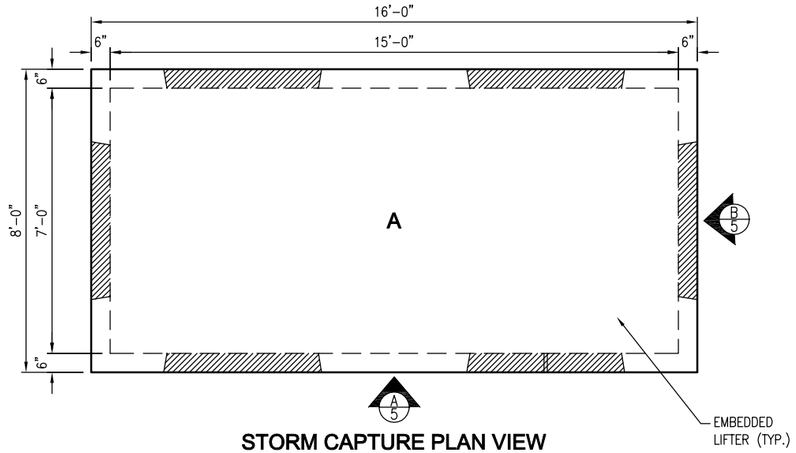
STORMCAPTURE
EXTERIOR DETAILS

CUSTOMER

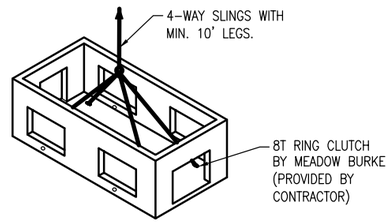
DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

DRAWING NUMBER	REVISION	SHEET
SC - 4 ft base with top slab	REV DATE	3 OF 4



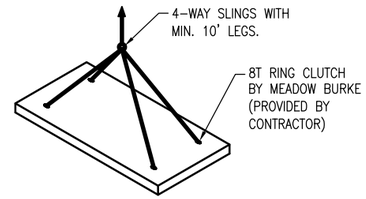
STORM CAPTURE PLAN VIEW

SCALE: 1/4" = 1'-0"



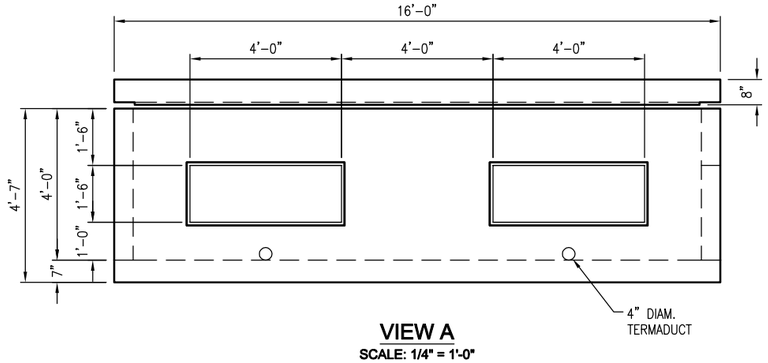
BOTTOM MODULE LIFTING DETAIL

N.T.S.



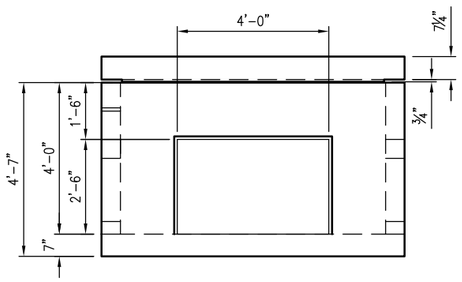
TOP SLAB LIFTING DETAIL

N.T.S.



VIEW A

SCALE: 1/4" = 1'-0"



VIEW B

SCALE: 1/4" = 1'-0"

- PRELIMINARY -
NOT FOR CONSTRUCTION

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PHONE: 1-888-985-3227 FAX: 303-794-7497

STORMCAPTURE

INTERIOR DETAILS

CUSTOMER

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

DRAWING NUMBER	REVISION	SHEET
SC - 4 ft base with top slab	REV DATE	4 OF 4

APPENDIX F
CALCULATIONS

AREA SUMMARY TABLE

	DMA 1A	DMA 1B	DMA 2	TOTAL
MOB ROOF AREA	22,950 SF	23,685 SF	0 SF	46,635 SF
PARKING GARAGE ROOF AREA	0 SF	50,440 SF	0 SF	50,440 SF
PAVEMENT AREA	21,068 SF	45,127 SF	0 SF	66,195 SF
IMPERVIOUS AREA	44,018 SF	119,252 SF	0 SF	163,270 SF
LANDSCAPE AREA	5,253 SF	16,422 SF	30,881 SF	52,556 SF
PERVIOUS PATH	0 SF	0 SF	923 SF	923 SF
PERVIOUS AREA	5,253 SF	16,422 SF	30,881 SF	52,556 SF
TOTAL AREA	49,271 SF	135,674 SF	31,805 SF	216,750 SF

PROJECT: Santa Cruz SMOB - APN: 029-021-47 **Calc by:** GS **Date:** 6/18/2019

RUNOFF DETENTION BY THE MODIFIED RATIONAL METHOD

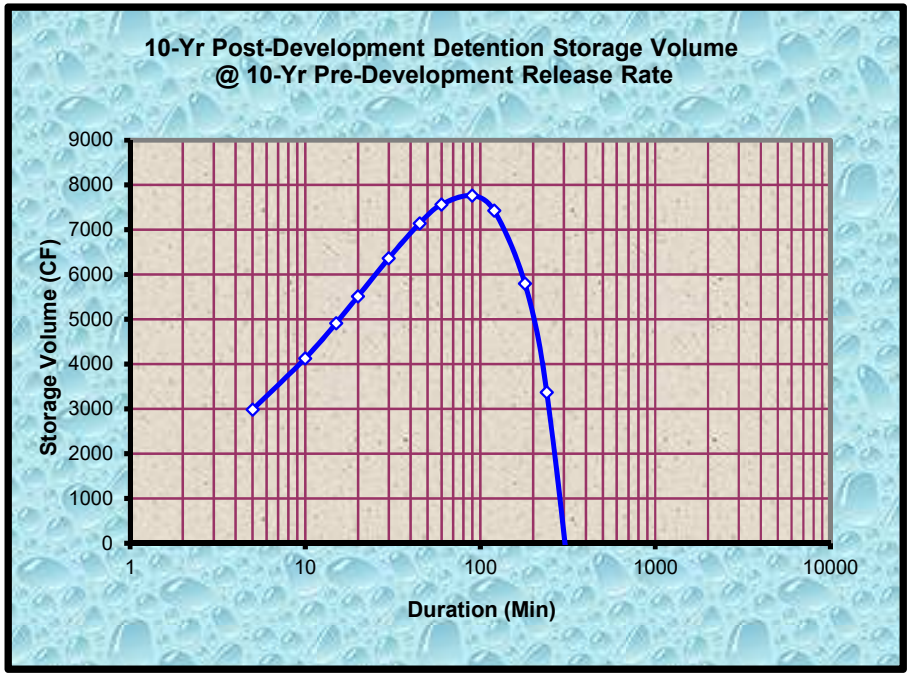
Data Entry: PRESS TAB & ENTER DESIGN VALUES SS Ver: 1.0

Site Location P60 Isopleth:	1.50		Fig. SWM-2 in County Design Criteria
Rational Coefficients Cpre:	0.25		See note # 2
Cpost:	0.90		See note # 2
Impervious Area:	163270	ft^2	See note # 2 and # 4

STRUCTURE DIMENSIONS FOR DETENTION

7765	ft^3 storage volume calculated			
100	% void space assumed			
7765	ft^3 excavated volume needed			
Structure	Length	Width*	Depth*	*For pipe, use the square
Ratios	1.00	1.00	1.00	root of the sectional area
Dimen. (ft)	**19.80**	**19.80**	**19.80**	

10 - YEAR DESIGN STORM				DETENTION @ 15 MIN.	
Storm Duration (min)	10 - Year Intensity (in/hr)	10 - Yr. Release Qpre (cfs)	10 - Year Qpost (cfs)	Detention Rate To Storage (cfs)	Specified Storage Volume (cf)
1440	0.26	0.243	0.874	-0.807	-87138
1200	0.28	0.262	0.944	-0.737	-66295
960	0.31	0.288	1.038	-0.643	-46290
720	0.34	0.326	1.173	-0.508	-27448
480	0.41	0.387	1.392	-0.288	-10382
360	0.46	0.437	1.573	-0.108	-2911
240	0.55	0.519	1.868	0.187	3370
180	0.62	0.586	2.110	0.430	5798
120	0.74	0.696	2.506	0.825	7427
90	0.83	0.786	2.831	1.150	**7765**
60	0.99	0.934	3.362	1.681	7566
45	1.12	1.055	3.798	2.117	7146
30	1.33	1.253	4.511	2.830	6367
20	1.57	1.488	5.356	3.676	5513
15	1.78	**1.681**	6.051	4.370	4917
10	2.11	1.996	7.186	5.505	4129
5	2.83	2.678	**9.640**	7.960	2985



Notes & Limitations on Use:

1) The modified rational method, and therefore the standard calculations are applicable in watersheds up to 20 acres in size.
2) Required detention volume determinations shall be based on all net new impervious area both on and off-site, resulting from the proposed project. Pervious areas shall not be included in detention volume sizing; an exception may be made for incidental pervious areas less than 10% of the total area.
3) Gravel packed detention chambers shall specify on the plans, aggregate that is washed, angular, and uniformly graded (of single size), assuring void space not less than 35%.
4) A map showing boundaries of both regulated impervious areas and actual drainage areas routed to the hydraulic control structure of the detention facility is to be provided, clearly distinguishing between the two areas, and noting the square footage.
5) The EPA defines a class V injection well as any bored, drilled, or driven shaft, or dug hole that is deeper than its widest surface dimension, or an improved sinkhole, or a subsurface fluid distribution system. Such storm water drainage wells are "authorized by rule". For more information on these rules, contact the EPA. A web site link is provided from the County DPW Stormwater Management web page.
6) Refer to the County of Santa Cruz Design Criteria, for complete method criteria.

OFFSITE RUNOFF REDUCTION

	DMA 1A	DMA 1B	DMA 2
EXISTING RUNOFF AREA	N/A	N/A	130,400 SF
EXISTING RUNOFF COEFFICIENT	N/A	N/A	0.30
EXISTING WEIGHTED AREA	N/A	N/A	39,120 SF
PROPOSED RUNOFF AREA	N/A	N/A	31,805 SF
PROPOSED RUNOFF COEFFICIENT	N/A	N/A	0.30
PROPOSED WEIGHTED AREA	N/A	N/A	9,542 SF
PERCENTAGE REDUCTION	N/A	N/A	75.6%

10-YEAR ORIFICE SIZING (DMA 1)

PREDEVELOPMENT DISCHARGE RATE (FT^3/S)	1.681
DISCHARGE COEFFICIENT	0.61
HEADWATER DEPTH (FT)	4.09
TAILWATER DEPTH (FT)	0
ORIFICE AREA (IN^2)	24.45
ORIFICE DIAMETER (IN)	5.58
VELOCITY (FT/S)	9.90
FINAL ORIFICE DIAMETER (IN)	5 1/2

REQUIRED DETENTION MODULES

	DMA 1 (A&B)	DMA 2
VOLUME/MODULE	420 CF	N/A
REQUIRED DETENTION	7,765 CF	N/A
MODULES REQUIRED	18.5	N/A

REQUIRED TREATMENT VOLUME

	DMA 1A	DMA 1B	DMA 2	TOTAL
IMPERVIOUS AREA	44,018 SF	119,252 SF	0 SF	163,270 SF
TREATMENT VOLUME	0.204 CFS	0.552 CFS	0.000 CFS	0.756 CFS

VOLUME CALCULATED USING FLOW-BASED TREATMENT INTENSITY OF 0.2 INCHES / HOUR

PROJECT: Santa Cruz SMOB - APN: 029-021-47 **Calc by:** GS **Date:** 6/18/2019

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

Notes & Limitations on Use:

SS Ver:1.0

Site Location P60 Isopleth:	1.50	Fig. SWM-2
Rational Coefficients Cpre:	0.25	
Cpost:	0.90	
Impervious Area:	163270	ft^2
Saturated Soil Permeability:	0.01	in/hr

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.
Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.
Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.
Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM

Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)
1440	0.16	0.155	0.559
1200	0.18	0.168	0.604
960	0.20	0.185	0.664
720	0.22	0.208	0.750
480	0.26	0.248	0.891
360	0.30	0.280	1.007
240	0.35	0.332	1.196
180	0.40	0.375	1.351
120	0.47	**0.446**	1.604
90	0.53	0.503	1.812
60	0.63	**0.598**	2.152
45	0.71	0.675	2.431
30	0.85	0.802	2.887
20	1.01	0.952	3.428
15	1.14	1.076	3.873
10	1.35	1.278	4.599
5	1.81	1.714	**6.170**

RETENTION @ 120 MIN.

Retention Rate To Storage (cfs)	Specified Retained Volume (cf)
0.114	**76281**
0.159	71541
0.219	65741
0.305	58476
0.446	48971
0.561	42879
0.750	35285
0.905	30590
1.158	24886
1.366	21433
1.706	17302
1.985	14833
2.441	11911
2.983	9541
3.427	8142
4.153	6501
5.724	4412

STRUCTURE DIMENSIONS FOR RETENTION

76281 ft^3 storage volume calculated
40 % void space assumed
190702 ft^3 excavated volume needed

Structure	Length	Width*	Depth* #
Ratios	361.25	600.00	0.89
Dimen. (ft)	**359.87**	**597.70**	**0.89**

215095 ft^2 internal surface area
215095 ft^2 effective surface area
425.6 hrs estimated structure drainage time

* For pipe, use the square root of the sectional area.
\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

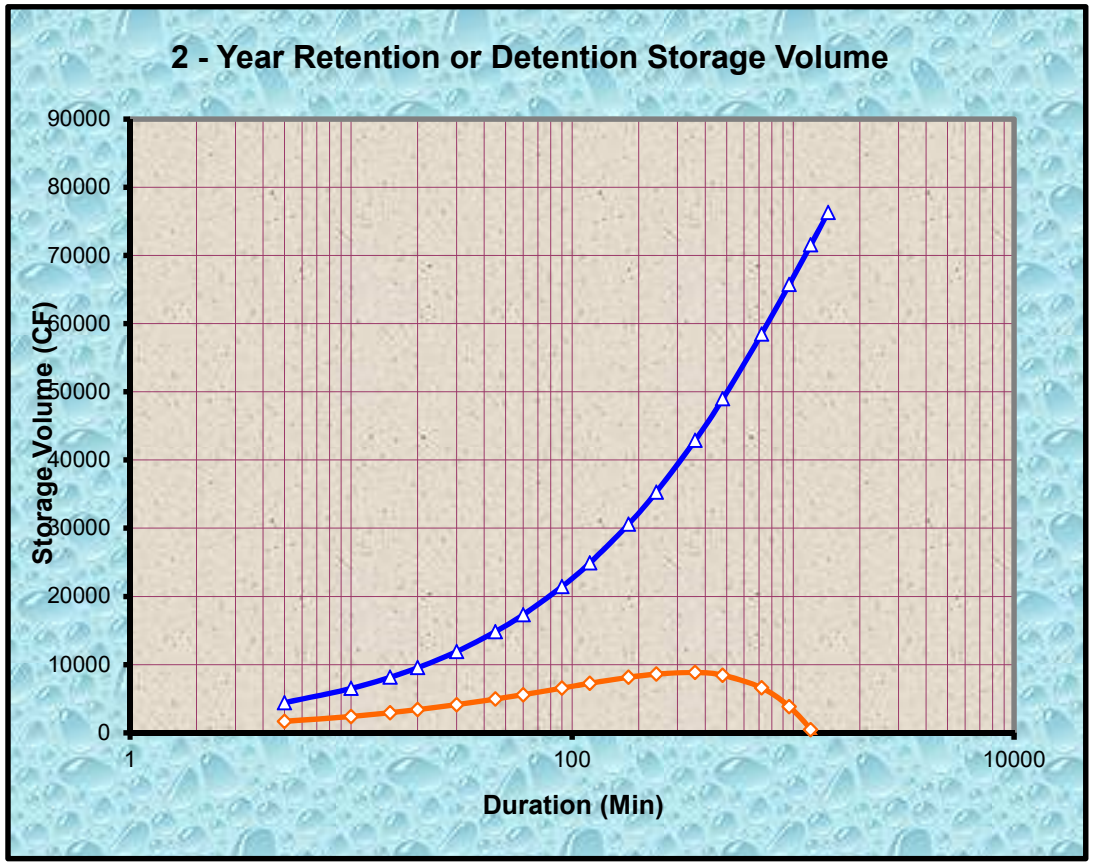
STRUCTURE DIMENSIONS FOR DETENTION

8836 ft^3 storage volume calculated
100 % void space assumed
8836 ft^3 excavated volume needed

Structure	Length	Width*	Depth*
Ratios	1.00	1.00	1.00
Dimen. (ft)	**20.67**	**20.67**	**20.67**

DETENTION @ 60 MIN.

Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
-0.038	-3312
0.007	476
0.067	3835
0.153	6598
0.293	8452
0.409	**8836**
0.598	8609
0.753	8132
1.006	7245
1.214	6557
1.554	5595
1.833	4949
2.289	4120
2.830	3396
3.275	2948
4.001	2401
5.572	1672


2 - Year Retention or Detention Storage Volume
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Storage Volume (CF)
1
100
10000
Duration (Min)