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Air Quality Analysis for the 9880 Campus Point Project, San Diego, California

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RECON Number 8655
July 28, 2017

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ATTACHMENT

Acronyms

μg/m^3	micrograms per cubic meter
AB	Assembly Bill
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CARB	California Air Resources Board
CCAA	California Clean Air Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
City	City of San Diego
CO	carbon monoxide
CO Protocol	Transportation Project-level Carbon Monoxide Protocol
DPM	diesel-exhaust particulate matter
H&SC	Health and Safety Code
LOS	Level of Service
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
ºF	degrees Fahrenheit
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
ppb	parts per billion
ppm	parts per million
RAQS	Regional Air Quality Strategy
ROG	reactive organic gas
SANDAG	San Diego Association of Governments
SDAB	San Diego Air Basin
SDAPCD	San Diego Air Pollution Control District
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_X	oxides of sulfur
TACs	toxic air contaminants
TCM	Transportation Control Measure
U.S. EPA	United States Environmental Protection Act
USC	United States Code
VMT	vehicle miles travelled
VOC	volatile organic compounds

Executive Summary

This report evaluates potential air quality impacts associated with the proposed 9880 Campus Point Project (project) located at 9880 Campus Point Drive in San Diego, California. The project involves construction of a new 102,649-square-foot research and development building. The project site is currently developed with an approximately 73,000-square-foot research and development building that would be demolished as part of the project. The project would include a loading bay, three boilers, and a diesel-powered standby generator.

The purpose of this report is to assess potential short-term and long-term local and regional air quality impacts resulting from development of the project. Thresholds used to evaluate potential impacts to air quality are based on applicable criteria in the California Environmental Quality Act Guidelines Appendix G and the City of San Diego (City) Significance Determination Thresholds.

The project was evaluated for consistency with the San Diego Air Pollution Control District's Regional Air Quality Strategy (RAQS). The primary goal of the RAQS is to reduce ozone precursor emissions. The project would be consistent with the industrial land use designation established by the University Area Community Plan of the City General Plan. Therefore, the project would not result in an increase in emissions that are not already accounted for in the RAQS. The project would not obstruct or conflict with implementation of the RAQS.

Emissions associated with construction and operation of the project were calculated in order to determine if the project would result in emissions that would violate any air quality standard or contribute substantially to an existing or projected air quality violation, and to determine if the project would result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard. As calculated in this analysis, project emissions associated with construction and operation of the project would not exceed the applicable City significance thresholds. These thresholds are designed to provide limits below which project emissions would not significantly change regional air quality. Therefore, as project emissions would not exceed these limits, the project would not result in a violation of National Ambient Air Quality Standards (NAAQS) or California Ambient Air Quality Standards (CAAQS) or substantially contribute to existing violations. Impacts to regional air quality would be less than significant.

The project was evaluated to determine if it would expose sensitive receptors to substantial pollutant concentration including air toxics such as diesel-exhaust particulate matter (DPM) during construction, carbon monoxide (CO) hot spots from vehicles operating off-site, or other air toxics associated with proposed boilers, a cooling tower, and an emergency generator. The nearest sensitive receptor to the project site is the Prebys Cardiovascular Institute building of the Scripps Memorial Hospital La Jolla, which is approximately 320 feet west of the project site.

Construction of the project would result in the generation of DPM emissions from the use of off-road diesel equipment. The dose to which the receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the extent of exposure that person has with the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level. The risks estimated for an individual are higher if a fixed exposure occurs over a longer period of time. However, generation of DPM from construction would only last for approximately a year, which is roughly three to four percent of the total exposure period used for health risk calculation. Therefore, DPM generated by project construction is not expected to create conditions where the probability is greater than 10 in 1 million of contracting cancer for the Maximally Exposed Individual or to generate ground-level concentrations of noncarcinogenic toxic air contaminants that exceed a Hazard Index greater than 1 for the Maximally Exposed Individual. Due to the short-term nature of construction, cancer risk associated with DPM generated by project construction would result in an incremental cancer risk of less than 10 in 1 million and impacts to sensitive receptors would be less than significant. During operation, proposed mechanical equipment such as boilers, a cooling tower, and an emergency generator would generate air toxics. These sources would generate various pollutant emissions, however these sources would be subject to San Diego Air Pollution Control District permitting requirements and thus, impacts associated with the project itself would be less than significant. The project would not contribute to a substantial increase in traffic volumes at a failing intersection and thus would not result in or substantially contribute to a CO hotspot. Operations impacts to sensitive receptors would be less than significant.

The project does not include heavy industrial or agricultural uses that are typically associated with objectionable odors. Thus, once operational, the project would not be a significant source of odors. The project would involve the use of diesel-powered equipment during construction. Diesel exhaust odors may occasionally be noticeable at adjacent properties; however, construction activities would be temporary and the odors would dissipate quickly in an outdoor environment. Therefore, odor impacts would be less than significant.

Project particulate matter emissions were assessed and were found to be less than applicable City significance thresholds. Impacts from particulate matter would be less than significant.

The project was evaluated for potential to alter air movement and thereby worsen air quality. The project is not anticipated to restrict air movement or otherwise result in an accumulation of air pollutants. Impacts related to air movement would be less than significant.

Air quality impacts associated with the project would be less than significant.

1.0 Introduction

The purpose of this report is to assess potential short-term and long-term local and regional air quality impacts resulting from development of the 9880 Campus Point Project (project). The project site is located within the San Diego Air Basin (SDAB). The SDAB is currently classified as a federal and state non-attainment area for ozone, and a state non-attainment area for particulate matter less than 10 microns (PM_{10}), and particulate matter less than 2.5 microns ($PM_{2.5}$).

Air quality impacts can result from the construction and operation of the project. Construction impacts result from fugitive dust, equipment exhaust, and indirect effects associated with construction workers and deliveries. Operational impacts can occur on two levels: regional impacts resulting from growth-inducing development, or local hot-spot effects stemming from sensitive receivers being placed close to highly congested roadways. In the case of this project, operational impacts would be primarily due to emissions from mobile sources associated with vehicular travel along the roadways within the project area.

The analysis of impacts is based on national and state Ambient Air Quality Standards and is assessed in accordance with the guidelines, policies, and standards established by the San Diego Air Pollution Control District (SDAPCD). Project compatibility with the adopted air quality plan for the area is also assessed. Measures are recommended, as required, to reduce potentially significant impacts.

2.0 Project Description

The project would include redevelopment of the existing research and development campus located at 9880 Campus Point Drive. The 4.5-acre project site is located within the University community planning area of the city of San Diego and is bound by Genesee Avenue to the west, 10010 Campus Point Drive to the north (Scripps Health Campus Point Campus), Campus Point Drive to the east, and 9800 Campus Point Drive to the southeast (Nissan Design America Campus). Figure 1 shows the regional location of the project site. Figure 2 shows an aerial photograph of the project site and vicinity.

The project would include demolition of the two-story, approximately 73,000-square-foot research and development building and construction of a new research and development building. The new research and development building would be approximately 102,649 square feet and would include five aboveground stories and a basement. Figure 3 shows the proposed site plan for the project.

Project Location

FIGURE 1
Regional Location

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Image Source: NearMaps (flown Jan 2017)

FIGURE 2

Project Location on Aerial Photograph

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Map Source: DGA Planning, Architecture, Interiors

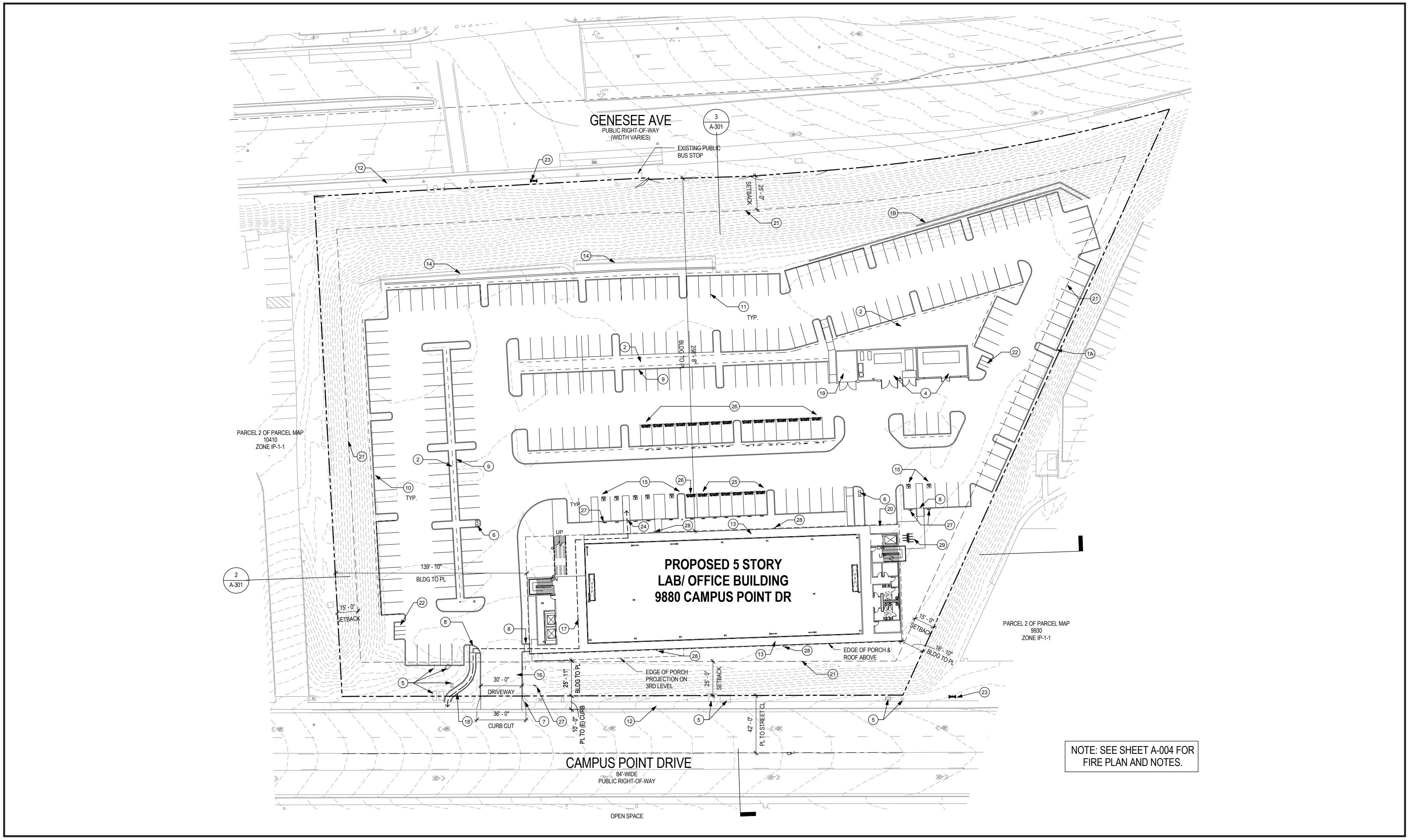

FIGURE 3

Site Plan

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The project would include the installation of new mechanical equipment including boilers, cooling tower, air handling units, and a standby emergency generator. The boiler room would be located in the basement and is anticipated to accommodate three boilers each rated at approximately 1.5 million British Thermal Units per hour. An external equipment yard to the northeast of building would accommodate mechanical equipment including an approximately 1,250 kilowatt standby generator. The project would require an authority to construct and a permit to operate per the requirements of SDAPCD Rule 20 for each new source.

This would include compliance with other pertinent SDAPCD rules that may include, but are not limited to the following.

Rule 20.1 – New Source Review – General Provisions
Rule 20.2 – New Source Review – Non-Major Stationary Sources
Rule 69.2 – Industrial and Commercial Boilers, Process Heaters and Steam Generators
Rule 69.3 – Stationary Gas Turbine Engines – Reasonably Available Control Technology
Rule 69.3.1 – Stationary Gas Turbine Engines – Best Available Retrofit Control Technology
Rule 69.4.1 – Stationary Reciprocating Internal Combustion Engines – Best Available Retrofit Control Technology
Rule 1200 – Toxic Air Contaminants – New Source Review

3.0 Regulatory Framework

3.1 Federal Regulations

The National Ambient Air Quality Standards (NAAQS) represent the maximum levels of background pollution considered safe, with an adequate margin of safety, to protect the public health and welfare. The Clean Air Act (CAA) was enacted in 1970 and amended in 1977 and 1990 [42 United States Code (USC) 7401] for the purposes of protecting and enhancing the quality of the nation's air resources to benefit public health, welfare, and productivity. In 1971, in order to achieve the purposes of Section 109 of the CAA [42 USC 7409], the U.S. Environmental Protection Agency (EPA) developed primary and secondary NAAQS.

Six criteria pollutants of primary concern have been designated: ozone, carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead (Pb), and respirable particulate matter less than 10 microns and less than 2.5 microns (PM_{10} and $PM_{2.5}$, respectively). The primary NAAQS ". . . in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health . . . " and the secondary standards ". . . protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air" [42 USC 7409(b)(2)]. The NAAQS are presented in Table 1 (California Air Resources Board [CARB] 2016a).

Table 1
Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		National Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone[8]	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	–	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.07 ppm (137 µg/m^3)		0.070 ppm (137 µg/m^3)		
Respirable Particulate Matter (PM_{10})[9]	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		–		
Fine Particulate Matter ($PM_{2.5}$)[9]	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12 µg/m^3	15 µg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-dispersive Infrared Photometry	35 ppm (40 mg/m^3)	–	Non-dispersive Infrared Photometry
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	–	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		–	–	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemi-luminescence	100 ppb (188 µg/m^3)	–	Gas Phase Chemi-luminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		0.053 ppm (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	–	Ultraviolet Fluorescence; Spectro-photometry (Pararosaniline Method)
	3 Hour	–		–	0.5 ppm (1,300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)[11]	–	
	Annual Arithmetic Mean	–		0.030 ppm (for certain areas)[11]	–	
Lead[12,13]	30 Day Average	1.5 µg/m^3	Atomic Absorption	–	–	High Volume Sampler and Atomic Absorption
	Calendar Quarter	–		1.5 µg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	–		0.15 µg/m^3		
Visibility Reducing Particles[14]	8 Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chroma-tography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chroma-tography			

See footnotes on next page.

Table 1 Ambient Air Quality Standards
ppm = parts per million; ppb = parts per billion; μg/m[3] = micrograms per cubic meter; – = not applicable. [1] California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations. [2] National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies. [3] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas. [4] Any equivalent measurement method which can be shown to the satisfaction of the Air Resources Board to give equivalent results at or near the level of the air quality standard may be used. [5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. [6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. [7] Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA. [8] On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm. [9] On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standards of 15 $\mu g/m^3$. The existing 24-hour PM_{10} standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years. [10] To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm. [11] On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved. Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm. [12] The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants. [13] The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved. [14] In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively. SOURCE: CARB 2016a.

An area within a state is designated as either attainment or non-attainment for a particular pollutant. States are required to adopt enforceable plans, known as a State Implementation Plan (SIP), to achieve and maintain air quality meeting the NAAQS. State plans also must control emissions that drift across state lines and harm air quality in downwind states. Once a non-attainment area has achieved the NAAQS for a particular pollutant, it is redesignated as an attainment area for that pollutant. To be redesignated, the area must meet air quality standards for three consecutive years. After re-designation to attainment, the area is known as a maintenance area and must develop a 10-year plan for continuing to meet and maintain air quality standards, as well as satisfy other requirements of the CAA.

3.2 State Regulations

3.2.1 Criteria Pollutants

The California Clean Air Act (CCAA) was enacted in 1988 (California Health & Safety Code (H&SC) Section 39000 et seq.). Under the CCAA, CARB has developed the California Ambient Air Quality Standards (CAAQS) and generally has set more stringent limits on the criteria pollutants than the NAAQS (see Table 1). In addition to the federal criteria pollutants, the CAAQS also specify standards for visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride (see Table 1).

The state of California is divided geographically into 15 air basins for managing the air resources of the state on a regional basis. Areas within each air basin are considered to share the same air masses and, therefore, are expected to have similar ambient air quality. Similar to the CAA, the state classifies these specific geographic areas as either “attainment” or “nonattainment” areas for each pollutant based on the comparison of measured data with the CAAQS. The SDAB is a non-attainment area for the state ozone standards, the state PM_{10} standard, and the state $PM_{2.5}$ standard.

3.2.2 Toxic Air Contaminants

The public’s exposure to toxic air contaminants (TACs) is a significant public health issue in California. Diesel-exhaust particulate matter (DPM) emissions have been established as TACs. In 1983, the California Legislature enacted a program to identify the health effects of TACs and to reduce exposure to these contaminants to protect the public health (Assembly Bill [AB] 1807: H&SC Sections 39650–39674). The Legislature established a two-step process to address the potential health effects from TACs. The first step is the risk assessment (or identification) phase. The second step is the risk management (or control) phase of the process.

The California Air Toxics Program establishes the process for the identification and control of TACs and includes provisions to make the public aware of significant toxic exposures and for reducing risk. Additionally, the Air Toxics "Hot Spots" Information and Assessment Act (AB 2588, 1987, Connelly Bill) was enacted in 1987 and requires stationary sources to report the types and quantities of certain substances routinely released into the air. The goals of the Air Toxics "Hot Spots" Act are to collect emission data, to identify facilities having localized impacts, to ascertain health risks, to notify nearby residents of significant risks, and to reduce those significant risks to acceptable levels.

The Children's Environmental Health Protection Act, California Senate Bill 25 (Chapter 731, Escutia, Statutes of 1999), focuses on children's exposure to air pollutants. The act requires CARB to review its air quality standards from a children's health perspective, evaluate the statewide air monitoring network, and develop any additional air toxic control measures needed to protect children's health. Locally, toxic air pollutants are regulated through the SDAPCD's Regulation XII. Of particular concern statewide are DPM emissions. DPM was established as a TAC in 1998, and is estimated to represent a majority of the cancer risk from TACs statewide (based on the statewide average). Diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB and are listed as carcinogens either under the State's Proposition 65 or under the federal Hazardous Air Pollutants program.

Following the identification of DPM as a TAC in 1998, CARB has worked on developing strategies and regulations aimed at reducing the risk from DPM. The overall strategy for achieving these reductions is found in the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (CARB 2000). A stated goal of the plan is to reduce the statewide cancer risk arising from exposure to DPM by 85 percent by 2020.

In April 2005, CARB published the *Air Quality and Land Use Handbook: A Community Health Perspective* (CARB 2005). The handbook makes recommendations directed at protecting sensitive land uses from air pollutant emissions while balancing a myriad of other land use issues (e.g., housing, transportation needs, economics, etc.). It notes that the handbook is not regulatory or binding on local agencies and recognizes that application takes a qualitative approach. As reflected in the CARB Handbook, there is currently no adopted standard for the significance of health effects from mobile sources. Therefore, the CARB has provided guidelines for the siting of land uses near heavily traveled roadways. Of pertinence to this study, CARB guidelines indicate that siting new sensitive land uses within 500 feet of a freeway or urban roads with 100,000 or more vehicles per day should be avoided when possible.

As an ongoing process, CARB will continue to establish new programs and regulations for the control of diesel particulate and other air-toxics emissions as appropriate. The continued development and implementation of these programs and policies will ensure that the public's exposure to DPM will continue to decline.

3.2.3 State Implementation Plan

The SIP is a collection of documents that set forth the state's strategies for achieving the NAAQS. In California, the SIP is a compilation of new and previously submitted plans, programs (such as air quality management plans, monitoring, modeling, permitting, etc.), district rules, state regulations, and federal controls. The CARB is the lead agency for all purposes related to the SIP under federal law. Local air districts and other agencies, such as the Department of Pesticide Regulation and the Bureau of Automotive Repair, prepare SIP elements and submit them to CARB for review and approval. The CARB then forwards SIP revisions to the U.S. EPA for approval and publication in the Federal Register. All of the items included in the California SIP are listed in the Code of Federal Regulations (CFR) at 40 CFR 52.220.

The SDAPCD is responsible for preparing and implementing the portion of the SIP applicable to the SDAB. The SIP plans for San Diego County specifically include the Redesignation Request and Maintenance Plan for the 1997 National Ozone Standard for San Diego County (2012), and the 2004 Revision to the California State Implementation Plan for Carbon Monoxide – Updated Maintenance Plan for Ten Federal Planning Areas.

3.2.4 The California Environmental Quality Act

Section 15125(d) of the California Environmental Quality Act (CEQA) Guidelines requires discussion of any inconsistencies between the project and applicable general plans and regional plans, including the applicable air quality attainment or maintenance plan (or SIP).

3.3 San Diego Air Pollution Control District

The SDAPCD is the agency that regulates air quality in the SDAB. The SDAPCD prepared the Regional Air Quality Strategy (RAQS) to address state requirements, pursuant to the CCAA of 1988 (California H&SC Section 39000 et seq.). The CCAA requires areas that are designated nonattainment of state ambient air quality standards for ozone, CO, SO_2, or NO_2 to prepare and implement state plans to attain the standards by the earliest practicable date (H&SC Section 40911(a)). With the exception of state ozone standards, each of these standards has been attained in the SDAB (SDAPCD 2016).

Included in the RAQS are the Transportation Control Measures (TCMs) prepared by the San Diego Association of Governments (SANDAG) that control emissions from mobile sources (SDAPCD 2016). The RAQS and TCM set forth the steps needed to accomplish attainment of CAAQS for ozone. The most recent update of the RAQS and corresponding TCMs were adopted in 2016.

The SDAPCD has also established a set of rules and regulations initially adopted on January 1, 1969, and periodically reviewed and updated. These rules and regulations are available for review on the agency's website.

The project would require an authority to construct and a permit to operate per the requirements of SDAPCD Rule 20 for each new source. This would include compliance with other pertinent SDAPCD rules that may include, but are not limited to the following.

Rule 20.1	–	New Source Review – General Provisions
Rule 20.2	–	New Source Review – Non-Major Stationary Sources
Rule 69.2	–	Industrial and Commercial Boilers, Process Heaters and Steam Generators
Rule 69.3	–	Stationary Gas Turbine Engines – Reasonably Available Control Technology
Rule 69.3.1	–	Stationary Gas Turbine Engines – Best Available Retrofit Control Technology
Rule 69.4.1	–	Stationary Reciprocating Internal Combustion Engines – Best Available Retrofit Control Technology
Rule 1200	–	Toxic Air Contaminants – New Source Review

The new equipment would not be allowed to operate without the necessary SDAPCD permits. Permits would be subject to annual reviews and would require the preparation of health risk assessments demonstrating that impacts are less than 1 in a million excess cancer risk without use of Toxics Best Available Control Technology, or less than 10 in a million excess cancer risk with Toxics Best Available Control Technology.

4.0 Environmental Setting

4.1 Geographic Setting

The project is located in San Diego, approximately 1.8 miles east of the Pacific Ocean and is subject to frequent onshore breezes.

4.2 Climate

The project site, like the rest of San Diego County, has a Mediterranean climate characterized by warm, dry summers and mild, wet winters. Based on meteorological data recorded at San Diego International Airport , which is approximately 10.5 miles south of the project site, the local temperature range is relatively limited, with winter low temperatures along the coast averaging about 49 degrees Fahrenheit (°F), and summer high temperatures average about 74°F. The average annual precipitation is 10.1 inches, falling primarily from December to March. Snowfall is infrequent (Western Regional Climate Center [WRCC] 2016).

The dominant meteorological feature affecting the region is the Pacific High Pressure Zone, which produces the prevailing westerly to northwesterly winds. These winds tend to blow pollutants away from the coast toward the inland areas. Consequently, air quality near the coast is generally better than that which occurs at the base of the coastal mountain range.

Fluctuations in the strength and pattern of winds from the Pacific High Pressure Zone interacting with the daily local cycle produce periodic temperature inversions that influence the dispersal or containment of air pollutants in the SDAB. Beneath the inversion layer pollutants become “trapped” as their ability to disperse diminishes. The mixing depth is the area under the inversion layer. Generally, the morning inversion layer is lower than the afternoon inversion layer. The greater differences between the morning and afternoon mixing depths correspond to increased dispersion of pollutants in the atmosphere.

Throughout the year, the height of the temperature inversion in the afternoon varies between approximately 1,500 and 2,500 feet above mean sea level. In winter, the morning inversion layer is about 800 feet above mean sea level. In summer, the morning inversion layer is about 1,100 feet above mean sea level. Therefore, air quality generally tends to be better in the winter than in the summer.

The prevailing westerly wind pattern is sometimes interrupted by regional “Santa Ana” conditions. A Santa Ana occurs when a strong high pressure develops over the Nevada–Utah area and overcomes the prevailing westerly coastal winds, sending strong, steady, hot, dry northeasterly winds over the mountains and out to sea.

Strong Santa Ana winds tend to blow pollutants out over the ocean, producing clear days. However, at the onset or during breakdown of these conditions, or if the Santa Ana is weak, local air quality may be adversely affected. In these cases, emissions from the South Coast Air Basin (SCAB) to the north are blown out over the ocean, and low pressure over Baja California, Mexico, draws this pollutant-laden air mass southward. As the high pressure weakens, prevailing northwesterly winds reassert themselves and send this cloud of contamination ashore in the SDAB. When this event occurs, the combination of transported and locally produced contaminants produce the worst air quality measurements recorded in the basin.

4.3 Existing Air Quality

Air quality at a particular location is a function of the kinds, amounts, and dispersal rates of pollutants being emitted into the air locally and throughout the basin. The major factors affecting pollutant dispersion are wind speed and direction, the vertical dispersion of pollutants (which is affected by inversions), and the local topography.

Air quality is commonly expressed as the number of days in which air pollution levels exceed state standards set by the CARB or federal standards set by the U.S. EPA. The SDAPCD maintains 10 air quality monitoring stations located throughout the greater San Diego metropolitan region. Air pollutant concentrations and meteorological information are continuously recorded at these stations. Measurements are then used by scientists to help forecast daily air pollution levels.

The nearest active monitoring station is the San Diego Kearny Villa Road Monitoring Station, approximately 6.3 miles southeast of the project site. The San Diego Kearny Villa Road Monitoring Station measures ozone, NO_2, PM_{10}, and $PM_{2.5}$. Table 2 provides a summary of measurements collected at the San Diego Kearny Villa Road Monitoring Station for the years 2013 through 2015.

Table 2
Summary of Air Quality Measurements Recorded at the San Diego Kearny Villa Road Monitoring Stations

Pollutant/Standard	2013	2014	2015
Ozone			
Days State 1-hour Standard Exceeded (0.09 ppm)	0	1	0
Days State 8-hour Standard Exceeded (0.07 ppm)	0	0	0
Days Federal 8-hour Standard Exceeded (0.075 ppm)	0	1	0
Max. 1-hr (ppm)	0.081	0.099	0.077
Max 8-hr (ppm)	0.070	0.081	0.078
Nitrogen Dioxide			
Days State 1-hour Standard Exceeded (0.18 ppm)	0	0	0
Days Federal 1-hour Standard Exceeded (0.100 ppm)	0	0	0
Max 1-hr (ppm)	0.067	0.051	0.051
Annual Average (ppm)	0.011	0.010	0.009
PM_{10}*			
Days State 24-hour Standard Exceeded (50 μg/m^3)	0	0	0
Days Federal 24-hour Standard Exceeded (150 μg/m^3)	0	0	0
Max. Daily (μg/m^3)	39.0	39.0	39.0
State Annual Average (μg/m^3)	20.0	19.5	16.7
Federal Annual Average (μg/m^3)	19.9	19.4	17.0
$PM_{2.5}$*			
Days Federal 24-hour Standard Exceeded (35 μg/m^3)	0	0	0
Max. Daily (μg/m^3)	22.0	20.2	25.7
State Annual Average (μg/m^3)	8.3	8.2	--
Federal Annual Average (μg/m^3)	8.3	8.1	7.2

SOURCE: CARB 2016b.
ppm = parts per million; μg/m^3 = micrograms per cubic meter; -- = Not available
* Calculated days value. Calculated days are the estimated number of days that a measurement would have been greater than the level of the standard had measurements been collected every day. The number of days above the standard is not necessarily the number of violations of the standard for the year.

4.3.1 Ozone

Nitrogen oxides and hydrocarbons (reactive organic gases [ROG]) are known as the chief "precursors" of ozone. These compounds react in the presence of sunlight to produce ozone, which is the primary air pollution problem in the SDAB. Because sunlight plays such an important role in its formation, ozone pollution—or smog—is mainly a concern during the daytime in summer months. The SDAB is currently designated a federal and state non-attainment area for ozone. During the past 25 years, San Diego has experienced a decline in the number of days with unhealthy levels of ozone despite the region's growth in population and vehicle miles traveled (SDAPCD 2013).

About half of smog-forming emissions come from automobiles. Population growth in San Diego has resulted in a large increase in the number of automobiles expelling ozone-forming pollutants while operating on area roadways. In addition, the occasional transport of smog-filled air from the SCAB only adds to the SDAB's ozone problem. Stricter automobile emission controls, including more efficient automobile engines, have played a large role in why ozone levels have steadily decreased.

In order to address adverse health effects due to prolonged exposure, the U.S. EPA phased out the national 1-hour ozone standard and replaced it with the more protective 8-hour ozone standard. The SDAB is currently a non-attainment area for the previous (1997) national 8-hour standard, and is recommended as a non-attainment area for the revised (2008) national 8-hour standard of 0.075 parts per million (ppm).

Not all of the ozone within the SDAB is derived from local sources. Under certain meteorological conditions, such as during Santa Ana wind events, ozone and other pollutants are transported from the Los Angeles Basin and combine with ozone formed from local emission sources to produce elevated ozone levels in the SDAB.

Local agencies can control neither the source nor the transportation of pollutants from outside the air basin. The SDAPCD's policy, therefore, has been to control local sources effectively enough to reduce locally produced contamination to clean air standards. Through the use of air pollution control measures outlined in the RAQS, the SDAPCD has effectively reduced ozone levels in the SDAB.

Actions that have been taken in the SDAB to reduce ozone concentrations include:

- **TCMs if vehicle travel and emissions exceed attainment demonstration levels.** TCMs are strategies that will reduce transportation-related emissions by reducing vehicle use or improving traffic flow.

- **Enhanced motor vehicle inspection and maintenance program.** The smog check program is overseen by the Bureau of Automotive Repair. The program requires most vehicles to pass a smog test once every two years before registering in the state of California. The smog check program monitors the amount of pollutants automobiles produce. One focus of the program is identifying "gross polluters," or vehicles that exceed two times the allowable emissions for a particular model. Regular maintenance and tune-ups, changing the oil, and checking tire inflation can improve gas mileage and lower air pollutant emissions. It can also reduce traffic congestion due to preventable breakdowns, further lowering emissions.

- **Air Quality Improvement Program.** This program, established by AB 118, is a voluntary incentive program administered by the CARB to fund clean vehicle and equipment projects, research on biofuels production and the air quality impacts of alternative fuels, and workforce training.

4.3.2 Carbon Monoxide

The SDAB is classified as a state attainment area and as a federal maintenance area for CO. Until 2003, no violations of the state standard for CO had been recorded in the SDAB since 1991, and no violations of the national standard had been recorded in the SDAB since 1989. The violations that took place in 2003 were likely the result of massive wildfires that occurred throughout the county. No violations of the state or federal CO standards have occurred since 2003.

Small-scale, localized concentrations of CO above the state and national standards have the potential to occur at intersections with stagnation points such as those that occur on major highways and heavily traveled and congested roadways. Localized high concentrations of CO are referred to as “CO hot spots” and are a concern at congested intersections, where automobile engines burn fuel less efficiently and their exhaust contains more CO.

4.3.3 Particulate Matter

Particulate matter is a complex mixture of microscopic solid or liquid particles including chemicals, soot, and dust. Anthropogenic sources of direct particulate emissions include crushing or grinding operations, dust stirred up by vehicle traffic, and combustion sources such as motor vehicles, power plants, wood burning, forest fires, agricultural burning and industrial processes. Additionally, indirect emissions may be formed when aerosols react with compounds found in the atmosphere.

Health studies have shown a significant association between exposure to particulate matter and premature death in people with heart or lung diseases. Other important effects include aggravation of respiratory and cardiovascular disease, lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and irregular heartbeat (U.S. EPA 2016).

As its properties vary based on the size of suspended particles, particulate matter is generally categorized as PM_{10} or $PM_{2.5}$.

4.3.3.1 PM_{10}

PM_{10}, occasionally referred to as “inhalable coarse particles” has an aerodynamic diameter of about one-seventh of the diameter of a human hair. High concentrations of PM_{10} are often found near roadways, construction, mining, or agricultural operations.

4.3.3.2 $PM_{2.5}$

$PM_{2.5}$, occasionally referred to as “inhalable fine particles” has an aerodynamic diameter of about one-thirtieth of the diameter of a human hair. $PM_{2.5}$ is the main cause of haze in many parts of the United States. Federal standards applicable to $PM_{2.5}$ were first adopted in 1997.

4.3.4 Other Criteria Pollutants

The national and state standards for NO_2, oxides of sulfur (SO_X), and the previous standard for lead are being met in the SDAB, and the latest pollutant trends suggest that these standards will not be exceeded in the foreseeable future. As discussed above, new standards for these pollutants have been adopted, and new designations for the SDAB will be determined in the future. The SDAB is also in attainment of the state standards for vinyl chloride, hydrogen sulfides, sulfates, and visibility-reducing particulates.

5.0 Thresholds of Significance

Thresholds used to evaluate potential impacts to air quality are based on applicable criteria in the CEQA Guidelines Appendix G and the City of San Diego (City) Significance Determination Thresholds. The project would have a significant air quality impact if it would (City of San Diego 2016):

1. Conflict with or obstruct implementation of the applicable air quality plan.
2. Result in a violation of any air quality standard or contribute substantially to an existing or projected air quality violation.
3. Expose sensitive receptors to substantial pollutant concentrations.
4. Create objectionable odors affecting a substantial number of people.
5. Result in exceeding 100 pounds per day of Particulate Matter (PM)(dust).
6. Result in substantial alteration of air movement in the area of the project.

The SDAPCD does not provide specific numeric thresholds for determining the significance of air quality impacts under CEQA. However, the SDAPCD does specify Air Quality Impact Analysis trigger levels for new or modified stationary sources (SDAPCD Rules 20.1, 20.2, and 20.3). The SDAPCD does not consider these trigger levels to represent adverse air quality impacts, rather, if these trigger levels are exceeded by a project, the SDAPCD requires an air quality analysis to determine if a significant air quality impact would occur. While, these trigger levels do not generally apply to mobile sources or general land development projects, for comparative purposes these levels are used to evaluate the increased emissions that would be discharged to the SDAB if the project were approved.

The SDAPCD trigger levels are also utilized by the City Significance Determination Thresholds (City of San Diego 2016) as one of the considerations when determining the potential significance of air quality impacts for projects within the city. The air quality impact screening criteria used in this analysis are shown in Table 3.

Table 3
Air Quality Impact Screening Criteria

Pollutant	Emission Rate		
	Pounds/Hour	Pounds/Day	Tons/Year
NO_X	25	250	40
SO_X	25	250	40
CO	100	550	100
PM_{10}	--	100	15
Lead	--	3.2	0.6
VOC, ROG	--	137	15
$PM_{2.5}$[a]	--	67[a]	10

SOURCE: City of San Diego 2016.
[a] SDAPCD Resolution 16-041 was adopted on April 27, 2016. It amended Rules 20.1, 20.2, and 20.3. City significance thresholds have not been updated to reflect this amendment.

6.0 Air Quality Assessment

Construction impacts are short term and result from fugitive dust, equipment exhaust, and indirect effects associated with construction workers and deliveries. Air emissions were calculated using California Emissions Estimator Model (CalEEMod) 2016.3.1 (California Air Pollution Control Officers 2016). The CalEEMod program is a tool used to estimate air emissions resulting from land development projects based on California-specific emission factors. The model estimates mass emissions from two basics sources: construction sources and operational sources (i.e., area and mobile sources).

Inputs to CalEEMod include such items as the air basin containing the project, land uses, trip generation rates, trip lengths, vehicle fleet mix (percentage of autos, medium truck, etc.), trip destination (i.e., percent of trips from home to work, etc.), duration of construction phases, construction equipment usage, grading areas, season, and ambient temperature, as well as other parameters. The CalEEMod output files contained in Attachment 1 indicate the specific outputs for each model run. Emissions of NO_X, CO, SO_X, PM_{10}, $PM_{2.5}$, and ROG are calculated. Emission factors are not available for lead, and consequently, lead emissions are not calculated. The SDAB is currently in attainment of the state and federal lead standards. Furthermore, fuel used in construction equipment and most other vehicles is not leaded.

6.1 Construction Emissions

Construction-related pollutants result from dust raised during demolition and grading, emissions from construction vehicles, and chemicals used during construction. Fugitive dust emissions vary greatly during construction and are dependent on the amount and type of activity, silt content of the soil, and the weather. Vehicles moving over paved and unpaved surfaces, demolition, excavation, earth movement, grading, and wind erosion from exposed surfaces are all sources of fugitive dust.

Heavy-duty construction equipment is usually diesel powered. In general, emissions from diesel-powered equipment contain more NO_X, SO_X, and particulate matter than gasoline-powered engines. However, diesel-powered engines generally produce less CO and less ROG than do gasoline-powered engines. Standard construction equipment includes backhoe loaders, rubber-tired dozers, excavators, graders, cranes, forklifts, rollers, paving equipment, generator sets, welders, cement and mortar mixers, and air compressors.

Construction emissions were modeled assuming construction would begin in January 2018 and last for approximately 13 months. Primary inputs are the numbers of each piece of equipment and the length of each construction stage. Specific construction phasing and equipment parameters are not available at this time. However, CalEEMod can estimate the required construction equipment when project-specific information is unavailable. The estimates are based on surveys, performed by the South Coast Air Quality Management District and the Sacramento Metropolitan Air Quality Management District, of typical construction projects, which provide a basis for scaling equipment needs and schedule with a project's size. Air emission estimates in CalEEMod are based on the duration of construction phases; construction equipment type, quantity, and usage; grading area; season; and ambient temperature, among other parameters. Project construction would occur in five stages: demolition, site preparation, grading/excavation, building construction, paving, and architectural coatings.

Architectural coatings would comply with SDAPCD Rule 67, which limits the VOC content of paints sold within San Diego County. An architectural coating volatile organic compounds (VOC) limit of 100 grams per liter was modeled for interior coatings and 150 grams per liter for exterior coatings was used to reflect the requirements of SDAPCD Rule 67. Architectural coatings were assumed to be applied concurrently with the last three months of building construction.

Table 4 shows the total projected construction maximum daily emission levels for each criteria pollutant. The CalEEMod output files for construction emissions are contained in Attachment 1.

Table 4
Summary of Worst-case Construction Emissions
(pounds per day)

	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
2017	7	149	42	>1	21	13
2018	20	29	22	>1	2	2
Maximum Daily Emissions	**20**	**149**	**42**	**>1**	**21**	**13**
Significance Threshold	*137*	*250*	*550*	*250*	*100*	*67*

For assessing the significance of the air quality emissions resulting during construction of the project, the construction emissions were compared to the significance thresholds shown in Table 4. As shown, maximum daily construction emissions are projected to be less than the applicable thresholds for all criteria pollutants.

6.2 Operation Emissions

6.2.1 Mobile Sources

Mobile source emissions would originate from traffic generated by the project. Area source emissions would result from the use of natural gas consumer products, and landscaping activities, as well as applying architectural coatings.

According to the traffic impact analysis, the proposed use would generate approximately 658 trips per day (Urban Systems Associates, Inc. 2017). Net trip generation would be much less (74 trips) when considering the removal of existing land uses and associated trips; air emissions associated with gross project-generated traffic were assessed. An average regional trip length of 5.8 miles for urban areas was used to determine vehicle miles traveled (VMT) based on SANDAG regional data (SANDAG 2014).

6.2.2 Area Sources

Area source emissions associated with the project include consumer products, natural gas used in space and water heating, architectural coatings, and landscaping equipment. Hearths (fireplaces) and woodstoves are also a source of area emissions; however, the project would not include hearths or woodstoves.

Consumer products are chemically formulated products used by household and institutional consumers, including, but not limited to, detergents, cleaning compounds, polishes, floor finishes, disinfectants, sanitizers, and aerosol paints but not including other paint products, furniture coatings, or architectural coatings. Emissions due to consumer products are calculated using total building area and product emission factors.

For architectural coatings, emissions result from evaporation of solvents contained in surface coatings such as in paints and primers. Emissions are based on the building surface area, architectural coating emission factors, and a reapplication rate of 10 percent of area per year.

Landscaping maintenance includes fuel combustion emission from equipment such as lawn mowers, rototillers, shredders/grinders, blowers, trimmers, chain saws, and hedge trimmers as well as air compressors, generators, and pumps. Emission calculations take into account building area, equipment emission factors, and the number of operational days (summer days).

6.2.3 Energy Use

Emissions are generated from energy use such as the combustion of natural gas used in space and water heating. Natural gas demand was based on the California Energy Commission-sponsored California Commercial End Use Survey, which identifies energy use by building type and climate zone.

6.2.4 Mechanical Equipment

As discussed previously, the project would include the installation of new mechanical equipment. The analysis of potential air quality impacts presented here addresses those pieces of equipment that would generate substantial air emissions, which are the boilers and an emergency generator. The cooling tower and air handlers would generate minimal criteria pollutant emissions.

The project is anticipated to include three Raypak Xtherm™-Type H Heating Boilers Model 1505A boilers each rated at 1.5 million British Thermal Units per hour. Emissions due to the boilers were calculated using U.S. EPA's AP 42 emission factors (U.S. EPA 1998). Emissions were calculated based on a worst-case scenario of full operation of all three boilers 24 hours per day.

The project is anticipated to include a Kohler® Model 1250REOZMD standby diesel generator. Standby generators are typically operated under two conditions: loss of main electrical supply or preventive maintenance and testing. For the purposes of estimating emissions due to monthly testing, emissions were calculated using U.S. EPA AP 42 emission factors and assuming 15 minutes of operation per day (U.S. EPA 2009). It should also be noted that the boilers, cooling tower, and emergency generator would be subject to SDAPCD New Source Review and permit requirements. Applicable SDAPCD rules include:

Rule 20.1 – New Source Review – General Provisions
Rule 20.2 – New Source Review – Non-Major Stationary Sources
Rule 69.2 – Industrial and Commercial Boilers, Process Heaters and Steam Generators
Rule 69.3 – Stationary Gas Turbine Engines – Reasonably Available Control Technology
Rule 69.3.1 – Stationary Gas Turbine Engines – Best Available Retrofit Control Technology
Rule 69.4.1 – Stationary Reciprocating Internal Combustion Engines – Best Available Retrofit Control Technology
Rule 1200 – Toxic Air Contaminants – New Source Review

Table 5 summarizes the total daily emissions due to the boilers and emergency generator as well as the project's other operational emissions. Emission calculations are contained in Attachment 1.

Table 5
Summary of Project Operational Emissions
(pounds per day)

	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Mobile Sources	1	6	14	>1	3	1
Energy Sources	>1	>1	>1	>1	>1	>1
Area Sources	3	>1	>1	>1	>1	>1
Boilers	1	5	9	>1	1	1
Emergency Generator	1	11	2	1	1	1
Total	**5**	**22**	**26**	**1**	**5**	**2**
Significance Threshold	*137*	*250*	*550*	*250*	*100*	*67*
Exceeds Threshold?	No	No	No	No	No	No

For assessing the significance of the air quality emissions resulting during operation of the project, the operations emissions were compared to the significance thresholds shown in Table 5. As shown, maximum daily operations emissions are projected to be less than the applicable thresholds for all criteria pollutants.

6.3 Impact Analysis

1. *Would the project result in a conflict with or obstruct implementation of the applicable air quality plan?*

The CAA and CCAA require areas that are designated as non-attainment areas of ambient air quality standards for ozone, CO, SO_2, and NO_2 to prepare and implement plans to attain the standards. The SDAB is designated as a non-attainment area for the state ozone standard. Accordingly, the RAQS was developed to identify feasible emission control measures and provide expeditious progress toward attaining the state standards for ozone. The two pollutants addressed in the RAQS are ROG and NO_X, which are precursors to the formation of ozone. Projected increases in motor vehicle usage, population, and growth create challenges in controlling emissions and, by extension, to maintaining and improving air quality. The RAQS, in conjunction with the transportation control measures, were most recently adopted in 2016 as the air quality plan for the region. The RAQS emissions budgets and reductions are based on emissions information from CARB and population growth and vehicle miles traveled (VMT) projections prepared by SANDAG.

SANDAG growth projections are based on land use plans developed by local jurisdictions. These are used to develop population growth projections and increase in regional VMT. As such, projects that propose development that is consistent with the growth anticipated by the local land use plan would be consistent with the SANDAG's growth projections and the RAQS emissions estimates. In the event that a project would result in development that is less dense than anticipated by the growth projections, the project would likewise be consistent with the RAQS. In the event a project would result in development that is greater than anticipated in the growth projections, further analysis would be warranted to determine if the project would exceed the growth projections used in the RAQS for the specific subregional area.

The project site has an industrial land use designation as established by the University Community Plan. The project would develop industrial uses that are consistent with the land use designation. As the project would develop industrial uses that are consistent with the land use designation, the project would be consistent with growth anticipated by the City's General Plan and thus SANDAG's population growth and VMT projections. As RAQS emissions forecasts are based on land use assumptions from the City General Plan and SANDAG growth projections, the project is also accounted for in the RAQS emissions estimates. Therefore, the project would not obstruct or conflict with implementation of the San Diego RAQS. Impacts related to the San Diego RAQS would be less than significant.

2. *Would the project result in a violation of any air quality standard or contribute substantially to an existing or projected air quality violation?*

The region is classified as attainment for all criteria pollutants except ozone under both the CAA and CCAA. The region is also classified as non-attainment under the CCAA for PM_{10}, and $PM_{2.5}$. Ozone is not emitted directly, but is a result of atmospheric activity on precursors. NO_X and ROG are known as the chief "precursors" of ozone. These compounds react in the presence of sunlight to produce ozone. The majority of sources of PM_{10} and $PM_{2.5}$ emissions include crushing or grinding operations, dust stirred up by vehicle traffic, and combustion sources such as motor vehicles, power plants, wood burning, forest fires, agricultural burning, and industrial processes.

As shown in Tables 4 and 5, air emissions associated with project construction and operation would not exceed the applicable City significance thresholds including significance thresholds for ozone precursors (ROG and NO_X), PM_{10}, and $PM_{2.5}$. The City's significance thresholds reflect the SDAPCD's Air Quality Impact Analysis trigger levels. The SDAPCD developed Air Quality Impact Analysis trigger levels to identify sources with emissions that are too small to cause or substantially contribute to violations of NAAQS or CAAQS and therefore do not warrant further air quality analysis or permitting. Because project emissions would not exceed SDAPCD Air Quality Impact Analysis trigger levels, the project would not generate emissions in quantities that would substantially contribute to a cumulatively considerable net increase of ozone, PM_{10}, or $PM_{2.5}$. Impacts to regional attainment of air quality standards would be less than significant.

3. *Would the project result in exposing sensitive receptors to substantial pollutant concentrations?*

The term "sensitive receptor" refers to a person in the population who is more susceptible to health effects due to exposure to an air contaminant than the population at large or to a land use that may reasonably be associated with such a person. Examples include residences, schools, childcare centers, retirement homes, long-term health care facilities, and outdoor recreation areas, such as athletic fields.

The nearest sensitive receptor to the project site is the Prebys Cardiovascular Institute building of the Scripps Memorial Hospital La Jolla, which is approximately 320 feet west of the project site. Other sensitive receptors in the project vicinity include other Scripps Memorial Hospital La Jolla buildings to the west of the project site and the Preuss Performative High School and associated athletic fields to the south of the project site. The nearest residence, 9873 Leeds Street in the La Jolla Vista Townhouses Community, is approximately 1,015 feet southeast of the project site.

Construction

Construction of the project would result in the generation of DPM emissions from the use of off-road diesel equipment required for site grading and excavation, paving, and other construction activities and on-road diesel equipment used to bring materials to and from the project site.

Generation of DPM from construction projects typically occurs in a single area for a short period. Construction of the project would occur over an approximate 13-month period. The dose to which the receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the extent of exposure that person has with the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for the Maximally Exposed Individual. The risks estimated for a Maximally Exposed

Individual are higher if a fixed exposure occurs over a longer period of time. According to the Office of Environmental Health Hazard Assessment, health risk assessments, which determine the exposure of sensitive receptors to toxic emissions, should be based on a 30-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project (Office of Environmental Health Hazard Assessment 2015). Thus, if the duration of proposed construction activities near any specific sensitive receptor was 13-months, the exposure would be three to four percent of the total exposure period used for health risk calculation.

SDAPCD permits would be subject to annual reviews and would require the preparation of health risk assessments demonstrating that impacts are less than 1 in a million excess cancer risk without use of Toxics Best Available Control Technology, or less than 10 in a million excess cancer risk with Toxics Best Available Control Technology. DPM generated by project construction is not expected to create conditions where the probability is greater than 10 in 1 million of contracting cancer for the Maximally Exposed Individual or to generate ground-level concentrations of noncarcinogenic TACs that exceed a Hazard Index greater than 1 for the Maximally Exposed Individual. Therefore, project construction would not expose sensitive receptors to substantial pollutant concentration.

Operation

The project would include the installation of new mechanical equipment including boilers, a cooling tower, and an emergency generator. These sources would generate various air toxics; however, these sources would be subject to the requirements of SDAPCD Rule 1200. Under SDACPD Rule 1200 the project would be required to prepare a health risk assessment to demonstrate that impacts are less than 1 in a million excess cancer risk without use of Toxics Best Available Control Technology, or less than 10 in a million excess cancer risk with Toxics Best Available Control Technology. TAC emission sources are also be required to obtain a permit to construct and operate from the SDAPCD. The health risk assessment demonstrating the risk associated with the new sources would be required prior to issuance of these permits. Thus, with implementation of applicable SDAPCD permit requirements, TAC impacts associated with project operation would be less than significant.

CO Hot Spots

Localized CO concentrations are a direct function of motor vehicle activity at signalized intersections (e.g., idling time and traffic flow conditions), particularly during peak commute hours and meteorological conditions. Under specific meteorological conditions (e.g., stable conditions that result in poor dispersion), CO concentrations may reach unhealthy levels with respect to local sensitive land uses. Guidance for the evaluation of CO hot spots is provided in the *Transportation Project-level Carbon Monoxide Protocol* (CO protocol) (University of California, Davis 1997) prepared for the Environmental Program of the California Department of Transportation by the Institute of Transportation Studies, University of California Davis.

The SDAB is a CO maintenance area under the CAA. According to the CO Protocol, in maintenance areas, only projects that are likely to worsen air quality necessitate further analysis. The CO protocol indicates projects may worsen air quality if they significantly increase traffic volumes or otherwise worsen traffic flow. Increases in traffic volumes in excess of 5 percent are considered potentially significant. Otherwise worsening traffic flow is defined as increasing average delay at signalized intersections operating at or below Level of Service (LOS) E or causing an intersection that would operate at LOS D or better without the project to operate at LOS E or F. Unsignalized intersections are not evaluated, as they are typically signalized as volumes increase and delays increase. Traffic volumes at unsignalized intersections are typically much lower than at signalized intersections.

Based on the project traffic impact analysis, the project would generate up to 658 gross trips per day, including 105 trips during the AM peak traffic hour and 92 trips during the PM peak traffic hour (Urban Systems Associates 2017). As identified in the project traffic impact analysis, the intersection of Campus Point Drive and Genesee Avenue currently operates at LOS D or better and would continue to operate at LOS D or better with project-generate traffic. The project traffic impact analysis did not assess intersections beyond Campus Point Drive, however, the Campus Pointe Master Plan Transportation Impact Analysis, which was prepared in September 2016, estimated the LOS of nearby intersections under existing, near-term, and horizon year (2035) conditions (Urban Systems Associates 2016). Table 6 summarizes LOS of nearby intersections along Genesee Avenue and at the intersection of Campus Point Drive and Campus Point Court as identified in the Campus Pointe Master Plan Transportation Impact Analysis (Urban Systems Associates 2016).

Table 6
Intersection Level of Service

Intersection	Intersection Level of Service (LOS AM/PM)[1]					
	Existing	Existing plus Project[2]	Near Term	Near Term with Project[2]	Horizon	Horizon plus Project[2]
Genesee Avenue						
I-5 Southbound Ramps	**C/F**	**D/F**	**D/E**	**E/E**	**E/C**	**E/D**
I-5 Northbound Ramps	C/C	C/D	D/D	D/D	D/D	D/D
Scripps Hospital Driveway	B/B	B/B	C/C	C/C	B/C	C/C
Campus Point Drive	D/D	D/D	D/D	D/D	D/D	D/D
Regents Road	C/B	C/B	B/B	B/B	B/B	B/B
Eastgate Mall	D/D	D/D	D/D	D/D	D/D	D/D
Executive Drive	B/C	C/C	C/C	C/D	C/D	C/C
La Jolla Village Drive	**E/D**	**E/D**	**E/D**	**F/D**	**F/E**	**F/E**
Campus Point Drive						
Campus Point Court	B/B	**E/C**	B/B	**E/C**	**C/F**	**F/F**

Source: Urban Systems Associates, Inc. 2016
I-5 = Interstate 5
1 Where intersection operation at LOS E or F is projected the LOS is bolded.
2 The "plus project" scenarios refer to forecasts with the Campus Point Master Plan Project rather than the 9880 Campus Point Project.

As shown in Table 6, intersections anticipated to operate at LOS E or F under all conditions include the intersection of Genesee Avenue and La Jolla Village Drive, the intersection of Genesee Avenue and Interstate 5 southbound ramps, and the intersection of Campus Point Drive and Campus Point Court.

Table 7 Volumes at Level of Service E or F Intersections					
	Intersection Volumes (AM/PM)				
Intersection	Horizon[1]	Project[2]	Horizon plus Project	Percent Increase	Substantial Increase?
Genesee Avenue					
I-5 Southbound Ramps	6,350/6,100	43/38	6,393/6,138	1%/1%	No/No
La Jolla Village Drive	6,980/7,806	105/92	7,085/7,898	1%/1%	No/No
Campus Point Drive					
Campus Point Court	1,475/1,974	0/0	1,475/1,974	0%/0%	No/No

SOURCE: Urban Systems Associates, Inc. 2016 and 2017

% = percent

[1] The "horizon" scenario in this table corresponds to the "horizon plus project" scenario from Table 6.

[2] Whereas the 9880 Campus Point Access Analysis Figure 3 estimates the trip distribution of the net increased in daily volume due to the project, this analysis assumes the same distribution would apply to the peak hourly traffic volumes.

As shown in Table 7, the project would contribute to a less than 5 percent increase in traffic volumes at intersections that operate at LOS E or F. Thus, the project is not anticipated to result in a worsening of air quality. The project would not result in or substantially contribute to a CO hotspot. Impacts to sensitive receptors would be less than significant.

4. Would the project result in creating objectionable odors affecting a substantial number of people?

The project would involve the use of diesel-powered construction equipment. Diesel exhaust odors may be noticeable temporarily at adjacent properties; however, construction activities would be temporary. Land uses primarily associated with operational odor impacts include wastewater treatment facilities, waste transfer stations, landfills, composting operations, refineries, and agricultural operations. The project does not propose these uses and would not include activities known to cause objectionable odors. Impacts would be less than significant.

5. Would the project result in exceeding 100 pounds per day of Particulate Matter (PM)(dust)?

As shown in Tables 4 and 5 and discussed under threshold 2, emissions of PM_{10} from construction and operation would be below the City's significance threshold of 100 pounds per day. Impacts of project-generated PM would be less than significant.

6. Would the project result in substantial alteration of air movement in the area of the project?

Local topographic variation such as that caused by the height and shape of a row of buildings can influence air movement in a given location (Boston Redevelopment Authority 1986). Alterations in the built environment may increase the dispersion of air pollutants or cause stagnation that may result in a harmful concentration of air pollutants. Urban canyons are places where the street is flanked by buildings on both sides creating a canyon-like environment. Where urban canyons are oriented perpendicular to the prevailing wind patterns, the likelihood of restricted air movement and associated pollutant accumulation may increase.

Roadways in the vicinity of the project include Campus Point Drive and Genesee Avenue. The eastern side of Campus Point Drive is an undeveloped downslope hillside. Thus, development along Campus Point Drive is not dense enough to form an urban canyon. Genesee Avenue is developed on both the eastern and western side. Development is characterized by substantial setbacks and low lot coverage ratios, and buildings do not form contiguous or near contiguous frontage. Thus, the ratios between the street width and development height and density along Genesee Avenue do not form an urban canyon.

The project would include the demolition of an existing approximately 73,000-square-foot building with two aboveground stories and the construction of a new 102,649 building with five aboveground stories. As compared to the existing building the proposed building would have a reduced footprint area and a higher profile. The project would not substantially increase contiguous building frontage along either Campus Point Drive or Genesee Avenue and therefore is not anticipated to contribute to a substantial alteration of air movement that would affect air quality, and impacts would be less than significant.

7.0 Conclusions

The project was evaluated for consistency with the RAQS. The project would be consistent with the industrial land use designation. Therefore, the project would not obstruct or conflict with implementation of the RAQS.

As shown in Tables 4 and 5, emissions associated with construction and operation of the project would not exceed the applicable City significance thresholds. These thresholds are designed to provide limits below which project emissions would not significantly change regional air quality. Therefore, as project emissions would be well below these limits, project construction would not result in regional emissions that would exceed NAAQS or CAAQS or contribute to existing violations. Impacts to regional air quality would be less than significant.

The project was evaluated to determine if it would expose sensitive receptors to substantial pollutant concentration including air toxics such as DPM or CO hot spots. The nearest sensitive receptor to the project site is the Prebys Cardiovascular Institute building of the Scripps Memorial Hospital La Jolla, which is approximately 320 feet west of the project site. Construction of the project would result in the generation of DPM emissions from the use of off-road diesel equipment. Due to the short-term nature of construction, cancer risk associated with DPM generated by project construction would not result in substantial cancer risk. Construction impacts to sensitive receptors would be less than significant.

The project would include the installation of new mechanical equipment including boilers, a cooling tower, and an emergency generator. These sources would generate various TAC emissions, however these sources would be subject to SDAPCD permitting requirements and thus, TAC impacts associated with the project itself would be less than significant. The project would not contribute to a substantial increase in traffic volumes at a failing intersection and thus would not result in or substantially contribute to a CO hotspot. Operations impacts to sensitive receptors would be less than significant.

The project does not include heavy industrial or agricultural uses that are typically associated with objectionable odors. Thus, once operational, the project would not be a significant source of odors. The project would involve the use of diesel-powered equipment during construction. Diesel exhaust may occasionally be noticeable at adjacent properties; however, construction activities would be temporary and the odors would dissipate quickly in an outdoor environment. Therefore, odor impacts would be less than significant.

Project particulate matter emissions were assessed and were found to be less than applicable City significance thresholds. Impacts from particulate matter would be less than significant.

The project was evaluated for potential to alter air movement and thereby worsen air quality. The project is not anticipated to restrict air movement or otherwise result in an accumulation of air pollutants. Impacts related to air movement would be less than significant.

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ATTACHMENT 1

Air Emissions Modeling

Summary Book

Air Quality

Air Quality Emissions Estimate		Pollutant (lbs/day)					
		ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Summer	Construction	20	148	41	0	21	13
	Area	3	0	0	0	0	0
	Energy	0	0	0	0	0	0
	Mobile	1	5	14	0	3	1
Winter	Construction	20	149	42	0	21	13
	Area	3	0	0	0	0	0
	Energy	0	0	0	0	0	0
	Mobile	1	6	14	0	3	1

Unmitigated Air Quality Emissions Estimate	Pollutant (lbs/day)					
	ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
2017 Construction	*7*	*149*	*42*	*0*	*21*	*13*
2018 Construction	*20*	*29*	*22*	*0*	*2*	*2*
Maximum Daily Construction Emissions	**20**	**149**	**42**	**0**	**21**	**13**
Area Source Emissions	*3*	*0*	*0*	*0*	*0*	*0*
Energy Use Emissions	*0*	*0*	*0*	*0*	*0*	*0*
Mobile Source Emissions	*1*	*6*	*14*	*0*	*3*	*1*
Boiler Emissions	*1*	*5*	*9*	*0*	*1*	*1*
Generator Emissions	*1*	*11*	*2*	*1*	*1*	*1*
Maximum Daily Operation Emissions	**5**	**22**	**26**	**1**	**5**	**2**

Mechanical Equipment Calculations

BOILERS

Raypak Xtherm - Type H 1505A

3 units, each at:
1,500,000 BTU per hour,
1,020 MMBTU to million scf

Pollutant	lb/million scf	Emission Rate Source	lb/MMBTU	lb/hr per boiler	lb/hr per 3 boilers	lb/day per boiler	lb/day per 3 boiler
VOC	5.5	AP-42, Table 1.4-1 and 1.4-2, Small Boiler, Low NOx Burners	0.005	0.01	0.02	0.19	1
NOx	50.0		0.049	0.07	0.22	1.76	5
CO	84.0		0.082	0.12	0.37	2.96	9
SO2	0.6		0.001	0.00	0.00	0.02	0
PM	7.6		0.007	0.01	0.03	0.27	1

GENERATORS

Kohler Diesel Generator 1250REOZMD

Size = 1,403 Hp, Large Generator
1 unit at:
15 minutes per hour;
15 minutes total per day

Pollutant	lb/hp-hr (power output)	Emission Rate Source	lb/hr	lb/15-minutes
VOC	0.0025	AP-42, Table 3.3-1, Diesel Fuel	3.53	1
NOx	0.0310		43.49	11
CO	0.0067		9.37	2
SO2	0.0021		2.88	1
PM	0.0022		3.09	1

9880 Campus Point Project

San Diego County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Research & Development	102.65	1000sqft	2.36	102,650.00	0
Parking Lot	0.99	Acre	0.89	43,124.40	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	40
Climate Zone	13			**Operational Year**	2019
Utility Company	San Diego Gas & Electric				
CO2 Intensity (lb/MWhr)	720.49	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Land Use - Proposed building. Remainder of the 3.25-acre development footprint modeled as parking lot.

Construction Phase - Architectural coatings applied during final three months of construction.

Demolition - Demolition of existing research and development building

Grading - 21,000 cubic yards of export.

Architectural Coating - SDAPCD Rule 67.0

Vehicle Trips - Weekday trip generation rate (8 trips/ksf) provided by Urban Systems Associates. Average regional trip length of 5.8 miles was used.

Area Coating - SDAPCD Rule 67.0

Stationary Sources - Emergency Generators and Fire Pumps - Boilers and standby generator modeled outside of CalEEMod.

Stationary Sources - Process Boilers - Boilers and standby generator modeled outside of CalEEMod.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	100.00
tblArchitecturalCoating	EF_Parking	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaCoating	Area_EF_Nonresidential_Interior	250	100
tblAreaCoating	Area_EF_Parking	250	150
tblConstructionPhase	NumDays	18.00	65.00
tblConstructionPhase	PhaseEndDate	7/31/2018	4/5/2018
tblConstructionPhase	PhaseStartDate	5/2/2018	1/5/2018
tblGrading	MaterialExported	0.00	21,000.00
tblLandUse	LotAcreage	0.99	0.89
tblProjectCharacteristics	OperationalYear	2018	2019
tblVehicleTrips	CC_TL	7.30	5.80
tblVehicleTrips	CNW_TL	7.30	5.80
tblVehicleTrips	CW_TL	9.50	5.80
tblVehicleTrips	WD_TR	8.11	8.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2017	6.6751	147.6228	40.5514	0.2981	18.2141	2.8797	21.0938	9.9699	2.6493	12.6192	0.0000	32,120.2071	32,120.2071	3.5065	0.0000	32,207.8693
2018	20.1077	28.7449	22.3602	0.0421	0.6636	1.6788	2.3423	0.1797	1.5875	1.7671	0.0000	4,165.3463	4,165.3463	0.7443	0.0000	4,183.9543

Maximum	**20.1077**	**147.6228**	**40.5514**	**0.2981**	**18.2141**	**2.8797**	**21.0938**	**9.9699**	**2.6493**	**12.6192**	**0.0000**	**32,120.2071**	**32,120.2071**	**3.5065**	**0.0000**	**32,207.8693**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2017	6.6751	147.6228	40.5514	0.2981	18.2141	2.8797	21.0938	9.9699	2.6493	12.6192	0.0000	32,120.2071	32,120.2071	3.5065	0.0000	32,207.8693
2018	20.1077	28.7449	22.3602	0.0421	0.6636	1.6788	2.3423	0.1797	1.5875	1.7671	0.0000	4,165.3463	4,165.3463	0.7443	0.0000	4,183.9543
Maximum	**20.1077**	**147.6228**	**40.5514**	**0.2981**	**18.2141**	**2.8797**	**21.0938**	**9.9699**	**2.6493**	**12.6192**	**0.0000**	**32,120.2071**	**32,120.2071**	**3.5065**	**0.0000**	**32,207.8693**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Energy	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Mobile	1.4462	5.3929	14.1016	0.0411	3.1549	0.0455	3.2004	0.8434	0.0428	0.8861		4,164.0116	4,164.0116	0.2431		4,170.0897
Total	**3.9925**	**5.7125**	**14.3807**	**0.0430**	**3.1549**	**0.0698**	**3.2247**	**0.8434**	**0.0671**	**0.9105**		**4,547.5036**	**4,547.5036**	**0.2505**	**7.0300e-003**	**4,555.8620**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Energy	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Mobile	1.4462	5.3929	14.1016	0.0411	3.1549	0.0455	3.2004	0.8434	0.0428	0.8861		4,164.0116	4,164.0116	0.2431		4,170.0897
Total	**3.9925**	**5.7125**	**14.3807**	**0.0430**	**3.1549**	**0.0698**	**3.2247**	**0.8434**	**0.0671**	**0.9105**		**4,547.5036**	**4,547.5036**	**0.2505**	**7.0300e-003**	**4,555.8620**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	4/4/2017	5/1/2017	5	20	
2	Site Preparation	Site Preparation	5/2/2017	5/8/2017	5	5	
3	Grading	Grading	5/9/2017	5/18/2017	5	8	
4	Building Construction	Building Construction	5/19/2017	4/5/2018	5	230	
5	Paving	Paving	4/6/2018	5/1/2018	5	18	
6	Architectural Coating	Architectural Coating	1/5/2018	4/5/2018	5	65	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 4

Acres of Paving: 0.89

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 153,975; Non-Residential Outdoor: 51,325; Striped Parking Area:

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Excavators	3	8.00	158	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	332.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	2,625.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	51.00	24.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.6377	0.0000	3.6377	0.5509	0.0000	0.5509			0.0000			0.0000
Off-Road	4.1031	42.7475	23.0122	0.0388		2.1935	2.1935		2.0425	2.0425		3,924.2833	3,924.2833	1.0730		3,951.1070
Total	**4.1031**	**42.7475**	**23.0122**	**0.0388**	**3.6377**	**2.1935**	**5.8312**	**0.5509**	**2.0425**	**2.5934**		**3,924.2833**	**3,924.2833**	**1.0730**		**3,951.1070**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1788	5.7513	1.1569	0.0135	0.2901	0.0324	0.3225	0.0795	0.0310	0.1105		1,464.2821	1,464.2821	0.1300		1,467.5332
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

Worker	0.0705	0.0520	0.5790	1.3900e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		138.4668	138.4668	5.1400e-003		138.5953
Total	**0.2493**	**5.8033**	**1.7359**	**0.0149**	**0.4133**	**0.0334**	**0.4467**	**0.1122**	**0.0319**	**0.1441**		**1,602.7490**	**1,602.7490**	**0.1352**		**1,606.1285**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.6377	0.0000	3.6377	0.5509	0.0000	0.5509			0.0000			0.0000
Off-Road	4.1031	42.7475	23.0122	0.0388		2.1935	2.1935		2.0425	2.0425	0.0000	3,924.2833	3,924.2833	1.0730		3,951.1070
Total	**4.1031**	**42.7475**	**23.0122**	**0.0388**	**3.6377**	**2.1935**	**5.8312**	**0.5509**	**2.0425**	**2.5934**	**0.0000**	**3,924.2833**	**3,924.2833**	**1.0730**		**3,951.1070**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1788	5.7513	1.1569	0.0135	0.2901	0.0324	0.3225	0.0795	0.0310	0.1105		1,464.2821	1,464.2821	0.1300		1,467.5332
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0705	0.0520	0.5790	1.3900e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		138.4668	138.4668	5.1400e-003		138.5953
Total	**0.2493**	**5.8033**	**1.7359**	**0.0149**	**0.4133**	**0.0334**	**0.4467**	**0.1122**	**0.0319**	**0.1441**		**1,602.7490**	**1,602.7490**	**0.1352**		**1,606.1285**

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	4.9608	52.2754	23.4554	0.0380		2.8786	2.8786		2.6483	2.6483		3,894.9500	3,894.9500	1.1934		3,924.7852
Total	**4.9608**	**52.2754**	**23.4554**	**0.0380**	**18.0663**	**2.8786**	**20.9448**	**9.9307**	**2.6483**	**12.5790**		**3,894.9500**	**3,894.9500**	**1.1934**		**3,924.7852**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0846	0.0624	0.6948	1.6700e-003	0.1479	1.0900e-003	0.1490	0.0392	1.0100e-003	0.0402		166.1602	166.1602	6.1700e-003		166.3144
Total	**0.0846**	**0.0624**	**0.6948**	**1.6700e-003**	**0.1479**	**1.0900e-003**	**0.1490**	**0.0392**	**1.0100e-003**	**0.0402**		**166.1602**	**166.1602**	**6.1700e-003**		**166.3144**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Fugitive Dust					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	4.9608	52.2754	23.4554	0.0380		2.8786	2.8786		2.6483	2.6483	0.0000	3,894.9500	3,894.9500	1.1934		3,924.7852
Total	**4.9608**	**52.2754**	**23.4554**	**0.0380**	**18.0663**	**2.8786**	**20.9448**	**9.9307**	**2.6483**	**12.5790**	**0.0000**	**3,894.9500**	**3,894.9500**	**1.1934**		**3,924.7852**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0846	0.0624	0.6948	1.6700e-003	0.1479	1.0900e-003	0.1490	0.0392	1.0100e-003	0.0402		166.1602	166.1602	6.1700e-003		166.3144
Total	**0.0846**	**0.0624**	**0.6948**	**1.6700e-003**	**0.1479**	**1.0900e-003**	**0.1490**	**0.0392**	**1.0100e-003**	**0.0402**		**166.1602**	**166.1602**	**6.1700e-003**		**166.3144**

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.9212	0.0000	6.9212	3.4233	0.0000	3.4233			0.0000			0.0000
Off-Road	3.0705	33.8868	17.1042	0.0297		1.7774	1.7774		1.6352	1.6352		3,037.9107	3,037.9107	0.9308		3,061.1809
Total	**3.0705**	**33.8868**	**17.1042**	**0.0297**	**6.9212**	**1.7774**	**8.6986**	**3.4233**	**1.6352**	**5.0586**		**3,037.9107**	**3,037.9107**	**0.9308**		**3,061.1809**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.5341	113.6840	22.8681	0.2670	5.7338	0.6413	6.3751	1.5714	0.6136	2.1850		28,943.8296	28,943.8296	2.5705		29,008.0931
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0705	0.0520	0.5790	1.3900e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		138.4668	138.4668	5.1400e-003		138.5953
Total	**3.6046**	**113.7360**	**23.4471**	**0.2684**	**5.8570**	**0.6422**	**6.4992**	**1.6041**	**0.6144**	**2.2185**		**29,082.2964**	**29,082.2964**	**2.5757**		**29,146.6884**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.9212	0.0000	6.9212	3.4233	0.0000	3.4233			0.0000			0.0000
Off-Road	3.0705	33.8868	17.1042	0.0297		1.7774	1.7774		1.6352	1.6352	0.0000	3,037.9107	3,037.9107	0.9308		3,061.1809
Total	**3.0705**	**33.8868**	**17.1042**	**0.0297**	**6.9212**	**1.7774**	**8.6986**	**3.4233**	**1.6352**	**5.0586**	**0.0000**	**3,037.9107**	**3,037.9107**	**0.9308**		**3,061.1809**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Hauling	3.5341	113.6840	22.8681	0.2670	5.7338	0.6413	6.3751	1.5714	0.6136	2.1850		28,943.8296	28,943.8296	2.5705		29,008.0931
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0705	0.0520	0.5790	1.3900e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		138.4668	138.4668	5.1400e-003		138.5953
Total	**3.6046**	**113.7360**	**23.4471**	**0.2684**	**5.8570**	**0.6422**	**6.4992**	**1.6041**	**0.6144**	**2.2185**		**29,082.2964**	**29,082.2964**	**2.5757**		**29,146.6884**

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.1149	26.5546	18.1825	0.0269		1.7879	1.7879		1.6791	1.6791		2,650.9797	2,650.9797	0.6531		2,667.3078
Total	**3.1149**	**26.5546**	**18.1825**	**0.0269**		**1.7879**	**1.7879**		**1.6791**	**1.6791**		**2,650.9797**	**2,650.9797**	**0.6531**		**2,667.3078**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1430	3.3879	0.9297	6.7200e-003	0.1625	0.0316	0.1941	0.0468	0.0302	0.0770		717.8471	717.8471	0.0594		719.3319
Worker	0.2397	0.1768	1.9686	4.7300e-003	0.4190	3.0900e-003	0.4220	0.1111	2.8500e-003	0.1140		470.7873	470.7873	0.0175		471.2240

Total	0.3827	3.5648	2.8983	0.0115	0.5814	0.0347	0.6161	0.1579	0.0331	0.1910		1,188.634 3	1,188.6343	0.0769		1,190.555 9

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.1149	26.5546	18.1825	0.0269		1.7879	1.7879		1.6791	1.6791	0.0000	2,650.979 7	2,650.9797	0.6531		2,667.307 8
Total	**3.1149**	**26.5546**	**18.1825**	**0.0269**		**1.7879**	**1.7879**		**1.6791**	**1.6791**	**0.0000**	**2,650.979 7**	**2,650.9797**	**0.6531**		**2,667.307 8**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1430	3.3879	0.9297	6.7200e-003	0.1625	0.0316	0.1941	0.0468	0.0302	0.0770		717.8471	717.8471	0.0594		719.3319
Worker	0.2397	0.1768	1.9686	4.7300e-003	0.4190	3.0900e-003	0.4220	0.1111	2.8500e-003	0.1140		470.7873	470.7873	0.0175		471.2240
Total	**0.3827**	**3.5648**	**2.8983**	**0.0115**	**0.5814**	**0.0347**	**0.6161**	**0.1579**	**0.0331**	**0.1910**		**1,188.634 3**	**1,188.6343**	**0.0769**		**1,190.555 9**

3.5 Building Construction - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.6795	23.3900	17.5804	0.0269		1.4999	1.4999		1.4099	1.4099		2,620.935 1	2,620.9351	0.6421		2,636.988 3
Total	**2.6795**	**23.3900**	**17.5804**	**0.0269**		**1.4999**	**1.4999**		**1.4099**	**1.4099**		**2,620.935 1**	**2,620.9351**	**0.6421**		**2,636.988 3**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1238	3.1621	0.8373	6.6900e-003	0.1625	0.0247	0.1872	0.0468	0.0237	0.0704		715.6557	715.6557	0.0567		717.0737
Worker	0.2171	0.1563	1.7459	4.6000e-003	0.4190	3.0200e-003	0.4220	0.1111	2.7800e-003	0.1139		457.5845	457.5845	0.0157		457.9760
Total	**0.3409**	**3.3184**	**2.5832**	**0.0113**	**0.5814**	**0.0278**	**0.6092**	**0.1579**	**0.0264**	**0.1843**		**1,173.240 2**	**1,173.2402**	**0.0724**		**1,175.049 7**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	2.6795	23.3900	17.5804	0.0269		1.4999	1.4999		1.4099	1.4099	0.0000	2,620.9351	2,620.9351	0.6421		2,636.9883
Total	**2.6795**	**23.3900**	**17.5804**	**0.0269**		**1.4999**	**1.4999**		**1.4099**	**1.4099**	**0.0000**	**2,620.9351**	**2,620.9351**	**0.6421**		**2,636.9883**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1238	3.1621	0.8373	6.6900e-003	0.1625	0.0247	0.1872	0.0468	0.0237	0.0704		715.6557	715.6557	0.0567		717.0737
Worker	0.2171	0.1563	1.7459	4.6000e-003	0.4190	3.0200e-003	0.4220	0.1111	2.7800e-003	0.1139		457.5845	457.5845	0.0157		457.9760
Total	**0.3409**	**3.3184**	**2.5832**	**0.0113**	**0.5814**	**0.0278**	**0.6092**	**0.1579**	**0.0264**	**0.1843**		**1,173.2402**	**1,173.2402**	**0.0724**		**1,175.0497**

3.6 Paving - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4239	14.5184	12.4333	0.0189		0.8370	0.8370		0.7718	0.7718		1,872.5505	1,872.5505	0.5672		1,886.7312
Paving	0.1295					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.5535**	**14.5184**	**12.4333**	**0.0189**		**0.8370**	**0.8370**		**0.7718**	**0.7718**		**1,872.5505**	**1,872.5505**	**0.5672**		**1,886.7312**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0851	0.0613	0.6847	1.8000e-003	0.1643	1.1800e-003	0.1655	0.0436	1.0900e-003	0.0447		179.4449	179.4449	6.1400e-003		179.5984
Total	**0.0851**	**0.0613**	**0.6847**	**1.8000e-003**	**0.1643**	**1.1800e-003**	**0.1655**	**0.0436**	**1.0900e-003**	**0.0447**		**179.4449**	**179.4449**	**6.1400e-003**		**179.5984**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4239	14.5184	12.4333	0.0189		0.8370	0.8370		0.7718	0.7718	0.0000	1,872.5505	1,872.5505	0.5672		1,886.7312
Paving	0.1295					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.5535**	**14.5184**	**12.4333**	**0.0189**		**0.8370**	**0.8370**		**0.7718**	**0.7718**	**0.0000**	**1,872.5505**	**1,872.5505**	**0.5672**		**1,886.7312**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0851	0.0613	0.6847	1.8000e-003	0.1643	1.1800e-003	0.1655	0.0436	1.0900e-003	0.0447		179.4449	179.4449	6.1400e-003		179.5984
Total	**0.0851**	**0.0613**	**0.6847**	**1.8000e-003**	**0.1643**	**1.1800e-003**	**0.1655**	**0.0436**	**1.0900e-003**	**0.0447**		**179.4449**	**179.4449**	**6.1400e-003**		**179.5984**

3.7 Architectural Coating - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	16.7461					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2986	2.0058	1.8542	2.9700e-003		0.1506	0.1506		0.1506	0.1506		281.4485	281.4485	0.0267		282.1171
Total	**17.0447**	**2.0058**	**1.8542**	**2.9700e-003**		**0.1506**	**0.1506**		**0.1506**	**0.1506**		**281.4485**	**281.4485**	**0.0267**		**282.1171**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0426	0.0307	0.3423	9.0000e-004	0.0822	5.9000e-004	0.0827	0.0218	5.5000e-004	0.0223		89.7225	89.7225	3.0700e-003		89.7992

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Total	**0.0426**	**0.0307**	**0.3423**	**9.0000e-004**	**0.0822**	**5.9000e-004**	**0.0827**	**0.0218**	**5.5000e-004**	**0.0223**		**89.7225**	**89.7225**	**3.0700e-003**		**89.7992**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	16.7461					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2986	2.0058	1.8542	2.9700e-003		0.1506	0.1506		0.1506	0.1506	0.0000	281.4485	281.4485	0.0267		282.1171
Total	**17.0447**	**2.0058**	**1.8542**	**2.9700e-003**		**0.1506**	**0.1506**		**0.1506**	**0.1506**	**0.0000**	**281.4485**	**281.4485**	**0.0267**		**282.1171**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0426	0.0307	0.3423	9.0000e-004	0.0822	5.9000e-004	0.0827	0.0218	5.5000e-004	0.0223		89.7225	89.7225	3.0700e-003		89.7992
Total	**0.0426**	**0.0307**	**0.3423**	**9.0000e-004**	**0.0822**	**5.9000e-004**	**0.0827**	**0.0218**	**5.5000e-004**	**0.0223**		**89.7225**	**89.7225**	**3.0700e-003**		**89.7992**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.4462	5.3929	14.1016	0.0411	3.1549	0.0455	3.2004	0.8434	0.0428	0.8861		4,164.0116	4,164.0116	0.2431		4,170.0897
Unmitigated	1.4462	5.3929	14.1016	0.0411	3.1549	0.0455	3.2004	0.8434	0.0428	0.8861		4,164.0116	4,164.0116	0.2431		4,170.0897

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Parking Lot	0.00	0.00	0.00		
Research & Development	821.20	195.04	113.94	1,142,499	1,142,499
Total	821.20	195.04	113.94	1,142,499	1,142,499

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0
Research & Development	5.80	5.80	5.80	33.00	48.00	19.00	82	15	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Research & Development	0.581689	0.044135	0.186694	0.113515	0.018244	0.005600	0.015197	0.022573	0.001888	0.002088	0.006279	0.000742	0.001357
Parking Lot	0.581689	0.044135	0.186694	0.113515	0.018244	0.005600	0.015197	0.022573	0.001888	0.002088	0.006279	0.000742	0.001357

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
NaturalGas Unmitigated	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Research & Development	3259.49	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Total		**0.0352**	**0.3196**	**0.2684**	**1.9200e-003**		**0.0243**	**0.0243**		**0.0243**	**0.0243**		**383.4693**	**383.4693**	**7.3500e-003**	**7.0300e-003**	**385.7481**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Research & Development	3.25949	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Total		**0.0352**	**0.3196**	**0.2684**	**1.9200e-003**		**0.0243**	**0.0243**		**0.0243**	**0.0243**		**383.4693**	**383.4693**	**7.3500e-003**	**7.0300e-003**	**385.7481**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Unmitigated	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

SubCategory	lb/day										lb/day					
Architectural Coating	0.2982					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.2120					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0100e-003	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Total	**2.5112**	**1.0000e-004**	**0.0107**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0227**	**0.0227**	**6.0000e-005**		**0.0242**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2982					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.2120					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0100e-003	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Total	**2.5112**	**1.0000e-004**	**0.0107**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0227**	**0.0227**	**6.0000e-005**		**0.0242**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

9880 Campus Point Project

San Diego County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Research & Development	102.65	1000sqft	2.36	102,650.00	0
Parking Lot	0.99	Acre	0.89	43,124.40	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	40
Climate Zone	13			**Operational Year**	2019
Utility Company	San Diego Gas & Electric				
CO2 Intensity (lb/MWhr)	720.49	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Land Use - Proposed building. Remainder of the 3.25-acre development footprint modeled as parking lot.

Construction Phase - Architectural coatings applied during final three months of construction.

Demolition - Demolition of existing research and development building

Grading - 21,000 cubic yards of export.

Architectural Coating - SDAPCD Rule 67.0

Vehicle Trips - Weekday trip generation rate (8 trips/ksf) provided by Urban Systems Associates. Average regional trip length of 5.8 miles was used.

Area Coating - SDAPCD Rule 67.0

Stationary Sources - Emergency Generators and Fire Pumps - Boilers and standby generator modeled outside of CalEEMod.

Stationary Sources - Process Boilers - Boilers and standby generator modeled outside of CalEEMod.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	100.00
tblArchitecturalCoating	EF_Parking	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaCoating	Area_EF_Nonresidential_Interior	250	100
tblAreaCoating	Area_EF_Parking	250	150
tblConstructionPhase	NumDays	18.00	65.00
tblConstructionPhase	PhaseEndDate	7/31/2018	4/5/2018
tblConstructionPhase	PhaseStartDate	5/2/2018	1/5/2018
tblGrading	MaterialExported	0.00	21,000.00
tblLandUse	LotAcreage	0.99	0.89
tblProjectCharacteristics	OperationalYear	2018	2019
tblVehicleTrips	CC_TL	7.30	5.80
tblVehicleTrips	CNW_TL	7.30	5.80
tblVehicleTrips	CW_TL	9.50	5.80
tblVehicleTrips	WD_TR	8.11	8.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2017	6.7768	148.9924	42.2593	0.2937	18.2141	2.8797	21.0938	9.9699	2.6493	12.6192	0.0000	31,649.8596	31,649.8596	3.6055	0.0000	31,739.9974
2018	20.1465	28.7733	22.3419	0.0416	0.6636	1.6792	2.3428	0.1797	1.5879	1.7675	0.0000	4,113.8784	4,113.8784	0.7471	0.0000	4,132.5545

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Maximum	**20.1465**	**148.9924**	**42.2593**	**0.2937**	**18.2141**	**2.8797**	**21.0938**	**9.9699**	**2.6493**	**12.6192**	**0.0000**	**31,649.8596**	**31,649.8596**	**3.6055**	**0.0000**	**31,739.9974**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2017	6.7768	148.9924	42.2593	0.2937	18.2141	2.8797	21.0938	9.9699	2.6493	12.6192	0.0000	31,649.8596	31,649.8596	3.6055	0.0000	31,739.9974
2018	20.1465	28.7733	22.3419	0.0416	0.6636	1.6792	2.3428	0.1797	1.5879	1.7675	0.0000	4,113.8784	4,113.8784	0.7471	0.0000	4,132.5545
Maximum	**20.1465**	**148.9924**	**42.2593**	**0.2937**	**18.2141**	**2.8797**	**21.0938**	**9.9699**	**2.6493**	**12.6192**	**0.0000**	**31,649.8596**	**31,649.8596**	**3.6055**	**0.0000**	**31,739.9974**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Energy	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Mobile	1.4093	5.5241	14.3157	0.0389	3.1549	0.0460	3.2009	0.8434	0.0433	0.8867		3,944.3255	3,944.3255	0.2472		3,950.5051
Total	**3.9556**	**5.8438**	**14.5948**	**0.0408**	**3.1549**	**0.0703**	**3.2253**	**0.8434**	**0.0676**	**0.9110**		**4,327.8175**	**4,327.8175**	**0.2546**	**7.0300e-003**	**4,336.2774**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Energy	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Mobile	1.4093	5.5241	14.3157	0.0389	3.1549	0.0460	3.2009	0.8434	0.0433	0.8867		3,944.3255	3,944.3255	0.2472		3,950.5051
Total	**3.9556**	**5.8438**	**14.5948**	**0.0408**	**3.1549**	**0.0703**	**3.2253**	**0.8434**	**0.0676**	**0.9110**		**4,327.8175**	**4,327.8175**	**0.2546**	**7.0300e-003**	**4,336.2774**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	4/4/2017	5/1/2017	5	20	
2	Site Preparation	Site Preparation	5/2/2017	5/8/2017	5	5	
3	Grading	Grading	5/9/2017	5/18/2017	5	8	
4	Building Construction	Building Construction	5/19/2017	4/5/2018	5	230	
5	Paving	Paving	4/6/2018	5/1/2018	5	18	
6	Architectural Coating	Architectural Coating	1/5/2018	4/5/2018	5	65	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 4

Acres of Paving: 0.89

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 153,975; Non-Residential Outdoor: 51,325; Striped Parking Area:

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Excavators	3	8.00	158	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	332.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	2,625.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	51.00	24.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.6377	0.0000	3.6377	0.5509	0.0000	0.5509			0.0000			0.0000
Off-Road	4.1031	42.7475	23.0122	0.0388		2.1935	2.1935		2.0425	2.0425		3,924.2833	3,924.2833	1.0730		3,951.1070
Total	**4.1031**	**42.7475**	**23.0122**	**0.0388**	**3.6377**	**2.1935**	**5.8312**	**0.5509**	**2.0425**	**2.5934**		**3,924.2833**	**3,924.2833**	**1.0730**		**3,951.1070**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1835	5.8203	1.2447	0.0133	0.2901	0.0330	0.3231	0.0795	0.0316	0.1111		1,440.9150	1,440.9150	0.1351		1,444.2916
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

Worker	0.0796	0.0584	0.5525	1.3100e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		130.0077	130.0077	4.9000e-003		130.1303
Total	**0.2631**	**5.8787**	**1.7971**	**0.0146**	**0.4133**	**0.0340**	**0.4472**	**0.1122**	**0.0325**	**0.1446**		**1,570.9227**	**1,570.9227**	**0.1400**		**1,574.4220**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.6377	0.0000	3.6377	0.5509	0.0000	0.5509			0.0000			0.0000
Off-Road	4.1031	42.7475	23.0122	0.0388		2.1935	2.1935		2.0425	2.0425	0.0000	3,924.2833	3,924.2833	1.0730		3,951.1070
Total	**4.1031**	**42.7475**	**23.0122**	**0.0388**	**3.6377**	**2.1935**	**5.8312**	**0.5509**	**2.0425**	**2.5934**	**0.0000**	**3,924.2833**	**3,924.2833**	**1.0730**		**3,951.1070**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1835	5.8203	1.2447	0.0133	0.2901	0.0330	0.3231	0.0795	0.0316	0.1111		1,440.9150	1,440.9150	0.1351		1,444.2916
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0796	0.0584	0.5525	1.3100e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		130.0077	130.0077	4.9000e-003		130.1303
Total	**0.2631**	**5.8787**	**1.7971**	**0.0146**	**0.4133**	**0.0340**	**0.4472**	**0.1122**	**0.0325**	**0.1446**		**1,570.9227**	**1,570.9227**	**0.1400**		**1,574.4220**

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	4.9608	52.2754	23.4554	0.0380		2.8786	2.8786		2.6483	2.6483		3,894.9500	3,894.9500	1.1934		3,924.7852
Total	**4.9608**	**52.2754**	**23.4554**	**0.0380**	**18.0663**	**2.8786**	**20.9448**	**9.9307**	**2.6483**	**12.5790**		**3,894.9500**	**3,894.9500**	**1.1934**		**3,924.7852**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0955	0.0701	0.6630	1.5700e-003	0.1479	1.0900e-003	0.1490	0.0392	1.0100e-003	0.0402		156.0093	156.0093	5.8800e-003		156.1564
Total	**0.0955**	**0.0701**	**0.6630**	**1.5700e-003**	**0.1479**	**1.0900e-003**	**0.1490**	**0.0392**	**1.0100e-003**	**0.0402**		**156.0093**	**156.0093**	**5.8800e-003**		**156.1564**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Fugitive Dust					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	4.9608	52.2754	23.4554	0.0380		2.8786	2.8786		2.6483	2.6483	0.0000	3,894.950 0	3,894.9500	1.1934		3,924.785 2
Total	**4.9608**	**52.2754**	**23.4554**	**0.0380**	**18.0663**	**2.8786**	**20.9448**	**9.9307**	**2.6483**	**12.5790**	**0.0000**	**3,894.950 0**	**3,894.9500**	**1.1934**		**3,924.785 2**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0955	0.0701	0.6630	1.5700e-003	0.1479	1.0900e-003	0.1490	0.0392	1.0100e-003	0.0402		156.0093	156.0093	5.8800e-003		156.1564
Total	**0.0955**	**0.0701**	**0.6630**	**1.5700e-003**	**0.1479**	**1.0900e-003**	**0.1490**	**0.0392**	**1.0100e-003**	**0.0402**		**156.0093**	**156.0093**	**5.8800e-003**		**156.1564**

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.9212	0.0000	6.9212	3.4233	0.0000	3.4233			0.0000			0.0000
Off-Road	3.0705	33.8868	17.1042	0.0297		1.7774	1.7774		1.6352	1.6352		3,037.910 7	3,037.9107	0.9308		3,061.180 9
Total	**3.0705**	**33.8868**	**17.1042**	**0.0297**	**6.9212**	**1.7774**	**8.6986**	**3.4233**	**1.6352**	**5.0586**		**3,037.910 7**	**3,037.9107**	**0.9308**		**3,061.180 9**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.6267	115.0471	24.6026	0.2627	5.7338	0.6530	6.3868	1.5714	0.6248	2.1962		28,481.9412	28,481.9412	2.6698		28,548.6861
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0796	0.0584	0.5525	1.3100e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		130.0077	130.0077	4.9000e-003		130.1303
Total	**3.7063**	**115.1055**	**25.1551**	**0.2641**	**5.8570**	**0.6539**	**6.5109**	**1.6041**	**0.6256**	**2.2297**		**28,611.9489**	**28,611.9489**	**2.6747**		**28,678.8165**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.9212	0.0000	6.9212	3.4233	0.0000	3.4233			0.0000			0.0000
Off-Road	3.0705	33.8868	17.1042	0.0297		1.7774	1.7774		1.6352	1.6352	0.0000	3,037.9107	3,037.9107	0.9308		3,061.1809
Total	**3.0705**	**33.8868**	**17.1042**	**0.0297**	**6.9212**	**1.7774**	**8.6986**	**3.4233**	**1.6352**	**5.0586**	**0.0000**	**3,037.9107**	**3,037.9107**	**0.9308**		**3,061.1809**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Hauling	3.6267	115.0471	24.6026	0.2627	5.7338	0.6530	6.3868	1.5714	0.6248	2.1962		28,481.9412	28,481.9412	2.6698		28,548.6861
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0796	0.0584	0.5525	1.3100e-003	0.1232	9.1000e-004	0.1241	0.0327	8.4000e-004	0.0335		130.0077	130.0077	4.9000e-003		130.1303
Total	**3.7063**	**115.1055**	**25.1551**	**0.2641**	**5.8570**	**0.6539**	**6.5109**	**1.6041**	**0.6256**	**2.2297**		**28,611.9489**	**28,611.9489**	**2.6747**		**28,678.8165**

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.1149	26.5546	18.1825	0.0269		1.7879	1.7879		1.6791	1.6791		2,650.9797	2,650.9797	0.6531		2,667.3078
Total	**3.1149**	**26.5546**	**18.1825**	**0.0269**		**1.7879**	**1.7879**		**1.6791**	**1.6791**		**2,650.9797**	**2,650.9797**	**0.6531**		**2,667.3078**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1488	3.3985	1.0256	6.5600e-003	0.1625	0.0321	0.1945	0.0468	0.0307	0.0775		700.3958	700.3958	0.0632		701.9764
Worker	0.2706	0.1986	1.8784	4.4400e-003	0.4190	3.0900e-003	0.4220	0.1111	2.8500e-003	0.1140		442.0263	442.0263	0.0167		442.4431

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Total	**0.4194**	**3.5971**	**2.9040**	**0.0110**	**0.5814**	**0.0352**	**0.6166**	**0.1579**	**0.0335**	**0.1914**		**1,142.4221**	**1,142.4221**	**0.0799**		**1,144.4195**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.1149	26.5546	18.1825	0.0269		1.7879	1.7879		1.6791	1.6791	0.0000	2,650.9797	2,650.9797	0.6531		2,667.3078
Total	**3.1149**	**26.5546**	**18.1825**	**0.0269**		**1.7879**	**1.7879**		**1.6791**	**1.6791**	**0.0000**	**2,650.9797**	**2,650.9797**	**0.6531**		**2,667.3078**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1488	3.3985	1.0256	6.5600e-003	0.1625	0.0321	0.1945	0.0468	0.0307	0.0775		700.3958	700.3958	0.0632		701.9764
Worker	0.2706	0.1986	1.8784	4.4400e-003	0.4190	3.0900e-003	0.4220	0.1111	2.8500e-003	0.1140		442.0263	442.0263	0.0167		442.4431
Total	**0.4194**	**3.5971**	**2.9040**	**0.0110**	**0.5814**	**0.0352**	**0.6166**	**0.1579**	**0.0335**	**0.1914**		**1,142.4221**	**1,142.4221**	**0.0799**		**1,144.4195**

3.5 Building Construction - 2018

Unmitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Off-Road	2.6795	23.3900	17.5804	0.0269		1.4999	1.4999		1.4099	1.4099		2,620.935 1	2,620.9351	0.6421		2,636.988 3
Total	**2.6795**	**23.3900**	**17.5804**	**0.0269**		**1.4999**	**1.4999**		**1.4099**	**1.4099**		**2,620.935 1**	**2,620.9351**	**0.6421**		**2,636.988 3**

Unmitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1290	3.1675	0.9264	6.5200e-003	0.1625	0.0251	0.1876	0.0468	0.0241	0.0708		697.6751	697.6751	0.0604		699.1843
Worker	0.2452	0.1756	1.6561	4.3200e-003	0.4190	3.0200e-003	0.4220	0.1111	2.7800e-003	0.1139		429.5869	429.5869	0.0149		429.9591
Total	**0.3742**	**3.3431**	**2.5825**	**0.0108**	**0.5814**	**0.0282**	**0.6096**	**0.1579**	**0.0268**	**0.1847**		**1,127.262 0**	**1,127.2620**	**0.0753**		**1,129.143 4**

Mitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					

Off-Road	2.6795	23.3900	17.5804	0.0269		1.4999	1.4999		1.4099	1.4099	0.0000	2,620.9351	2,620.9351	0.6421		2,636.9883
Total	**2.6795**	**23.3900**	**17.5804**	**0.0269**		**1.4999**	**1.4999**		**1.4099**	**1.4099**	**0.0000**	**2,620.9351**	**2,620.9351**	**0.6421**		**2,636.9883**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1290	3.1675	0.9264	6.5200e-003	0.1625	0.0251	0.1876	0.0468	0.0241	0.0708		697.6751	697.6751	0.0604		699.1843
Worker	0.2452	0.1756	1.6561	4.3200e-003	0.4190	3.0200e-003	0.4220	0.1111	2.7800e-003	0.1139		429.5869	429.5869	0.0149		429.9591
Total	**0.3742**	**3.3431**	**2.5825**	**0.0108**	**0.5814**	**0.0282**	**0.6096**	**0.1579**	**0.0268**	**0.1847**		**1,127.2620**	**1,127.2620**	**0.0753**		**1,129.1434**

3.6 Paving - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4239	14.5184	12.4333	0.0189		0.8370	0.8370		0.7718	0.7718		1,872.5505	1,872.5505	0.5672		1,886.7312
Paving	0.1295					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.5535**	**14.5184**	**12.4333**	**0.0189**		**0.8370**	**0.8370**		**0.7718**	**0.7718**		**1,872.5505**	**1,872.5505**	**0.5672**		**1,886.7312**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0962	0.0689	0.6495	1.6900e-003	0.1643	1.1800e-003	0.1655	0.0436	1.0900e-003	0.0447		168.4655	168.4655	5.8400e-003		168.6114
Total	**0.0962**	**0.0689**	**0.6495**	**1.6900e-003**	**0.1643**	**1.1800e-003**	**0.1655**	**0.0436**	**1.0900e-003**	**0.0447**		**168.4655**	**168.4655**	**5.8400e-003**		**168.6114**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4239	14.5184	12.4333	0.0189		0.8370	0.8370		0.7718	0.7718	0.0000	1,872.5505	1,872.5505	0.5672		1,886.7312
Paving	0.1295					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.5535**	**14.5184**	**12.4333**	**0.0189**		**0.8370**	**0.8370**		**0.7718**	**0.7718**	**0.0000**	**1,872.5505**	**1,872.5505**	**0.5672**		**1,886.7312**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0962	0.0689	0.6495	1.6900e-003	0.1643	1.1800e-003	0.1655	0.0436	1.0900e-003	0.0447		168.4655	168.4655	5.8400e-003		168.6114
Total	**0.0962**	**0.0689**	**0.6495**	**1.6900e-003**	**0.1643**	**1.1800e-003**	**0.1655**	**0.0436**	**1.0900e-003**	**0.0447**		**168.4655**	**168.4655**	**5.8400e-003**		**168.6114**

3.7 Architectural Coating - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	16.7461					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2986	2.0058	1.8542	2.9700e-003		0.1506	0.1506		0.1506	0.1506		281.4485	281.4485	0.0267		282.1171
Total	**17.0447**	**2.0058**	**1.8542**	**2.9700e-003**		**0.1506**	**0.1506**		**0.1506**	**0.1506**		**281.4485**	**281.4485**	**0.0267**		**282.1171**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0481	0.0344	0.3247	8.5000e-004	0.0822	5.9000e-004	0.0827	0.0218	5.5000e-004	0.0223		84.2327	84.2327	2.9200e-003		84.3057

Total	0.0481	0.0344	0.3247	8.5000e-004	0.0822	5.9000e-004	0.0827	0.0218	5.5000e-004	0.0223		84.2327	84.2327	2.9200e-003		84.3057

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	16.7461					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2986	2.0058	1.8542	2.9700e-003		0.1506	0.1506		0.1506	0.1506	0.0000	281.4485	281.4485	0.0267		282.1171
Total	**17.0447**	**2.0058**	**1.8542**	**2.9700e-003**		**0.1506**	**0.1506**		**0.1506**	**0.1506**	**0.0000**	**281.4485**	**281.4485**	**0.0267**		**282.1171**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0481	0.0344	0.3247	8.5000e-004	0.0822	5.9000e-004	0.0827	0.0218	5.5000e-004	0.0223		84.2327	84.2327	2.9200e-003		84.3057
Total	**0.0481**	**0.0344**	**0.3247**	**8.5000e-004**	**0.0822**	**5.9000e-004**	**0.0827**	**0.0218**	**5.5000e-004**	**0.0223**		**84.2327**	**84.2327**	**2.9200e-003**		**84.3057**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.4093	5.5241	14.3157	0.0389	3.1549	0.0460	3.2009	0.8434	0.0433	0.8867		3,944.3255	3,944.3255	0.2472		3,950.5051
Unmitigated	1.4093	5.5241	14.3157	0.0389	3.1549	0.0460	3.2009	0.8434	0.0433	0.8867		3,944.3255	3,944.3255	0.2472		3,950.5051

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Parking Lot	0.00	0.00	0.00		
Research & Development	821.20	195.04	113.94	1,142,499	1,142,499
Total	821.20	195.04	113.94	1,142,499	1,142,499

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0
Research & Development	5.80	5.80	5.80	33.00	48.00	19.00	82	15	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Research & Development	0.581689	0.044135	0.186694	0.113515	0.018244	0.005600	0.015197	0.022573	0.001888	0.002088	0.006279	0.000742	0.001357
Parking Lot	0.581689	0.044135	0.186694	0.113515	0.018244	0.005600	0.015197	0.022573	0.001888	0.002088	0.006279	0.000742	0.001357

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
NaturalGas Unmitigated	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Research & Development	3259.49	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Total		**0.0352**	**0.3196**	**0.2684**	**1.9200e-003**		**0.0243**	**0.0243**		**0.0243**	**0.0243**		**383.4693**	**383.4693**	**7.3500e-003**	**7.0300e-003**	**385.7481**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Research & Development	3.25949	0.0352	0.3196	0.2684	1.9200e-003		0.0243	0.0243		0.0243	0.0243		383.4693	383.4693	7.3500e-003	7.0300e-003	385.7481
Total		**0.0352**	**0.3196**	**0.2684**	**1.9200e-003**		**0.0243**	**0.0243**		**0.0243**	**0.0243**		**383.4693**	**383.4693**	**7.3500e-003**	**7.0300e-003**	**385.7481**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Unmitigated	2.5112	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

SubCategory	lb/day										lb/day					
Architectural Coating	0.2982					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.2120					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0100e-003	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Total	**2.5112**	**1.0000e-004**	**0.0107**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0227**	**0.0227**	**6.0000e-005**		**0.0242**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2982					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.2120					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0100e-003	1.0000e-004	0.0107	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0227	0.0227	6.0000e-005		0.0242
Total	**2.5112**	**1.0000e-004**	**0.0107**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0227**	**0.0227**	**6.0000e-005**		**0.0242**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

GEOCON
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GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

PREPARED FOR

**ALEXANDRIA REAL ESTATE EQUITIES
INCORPORATED
SAN DIEGO, CALIFORNIA**

**APRIL 18, 2017
PROJECT NO. G2099-52-01**

Project No. G2099-52-01
April 18, 2017

Alexandria Real Estate Equities
10996 Torreyana Road, Suite 250
San Diego, California 92121

Attention: Mr. Mike Barbera

Subject: GEOTECHNICAL INVESTIGATION
9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

Dear Mr. Barbera:

In accordance with your authorization of our Proposal No. LG-17062, we herein submit the results of our geotechnical investigation for the subject site. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed science building project. The site is considered suitable for development provided the recommendations of this report are followed.

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

Very truly yours,

GEOCON INCORPORATED

Lilian E. Rodriguez
RCE 83227

Shawn Foy Weedon
GE 2714

John Hoobs
CEG 1524

REGISTERED PROFESSIONAL ENGINEER ★ LILIAN E. RODRIGUEZ No.83227 CIVIL ★ STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ★ SHAWN WEEDON No. 2714 GEOTECHNICAL ★ STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST ★ JOHN HOOBS No. 1524 CERTIFIED ENGINEERING GEOLOGIST ★ STATE OF CALIFORNIA

LER:SFW:JH:ejc

(e-mail) Addressee

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the planned science building project located at 9880 Campus Point Drive in the City of San Diego, California (see Vicinity Map, Figure 1). The purpose of the geotechnical investigation is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may impact development of the property including faulting, liquefaction and seismic shaking based on the 2016 CBC seismic design criteria. In addition, we provided recommendations for remedial grading, shallow foundations, concrete slab-on-grade, concrete flatwork, preliminary pavement, and retaining walls. The scope of this investigation also included a review of readily available published and unpublished geologic literature (see *List of References*).

The scope of this investigation included performing a site reconnaissance, field exploration, engineering analyses and the preparing this report. We performed our field investigation on March 20 and 21, 2017 by advancing 13 small-diameter borings to a maximum depth of approximately 45½ feet below the existing ground surface. The Geologic Map, Figure 2, presents the approximate locations of the borings. Appendix A provides a detailed discussion of the field investigation including logs of the borings. Details of the laboratory tests and a summary of the test results are presented on the boring logs in Appendix A and in Appendix B. Appendix C present the results of the storm water investigation to help evaluate proposed storm water management devices.

Recommendations presented herein are based on analyses of data obtained from our site investigation and our understanding of proposed site development. References reviewed to prepare this report are provided in the List of References. If project details vary significantly from those described herein, Geocon should be contacted to evaluate the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located to the east of Genesee Avenue, west of Campus Point Drive and about 800 feet south of Campus Point Court in the City of San Diego, California. Commercial buildings exist to the north and south of the subject site. A 2-story building is located in the center of the property surrounded by surface, asphalt concrete parking areas and landscaping. Access to the property is on the southwest corner. Slopes on the south and west ascend to a neighboring property and Genesee Avenue, respectively, with heights ranging from about 15 to 35 feet. Slopes on the north and east descend to the neighboring property and Campus Pointe Drive, respectively, with heights of 5 to 15 feet. In addition, an existing nature canyon slope with heights up to approximately 150 feet existing directly east of the adjacent Campus Point Drive. The existing grades adjacent to the existing building ranges from approximate elevation 308 to 312 feet above Mean Sea Level (MSL).

We understand the proposed project consists of demolishing the existing office building and constructing a new 5-story science building with a subterranean level. The new building will possess laboratory stations, building amenities and utility areas. The proposed finished floor elevation of the science building at-grade and at the subterranean level will be 311.35 and 296.85 feet MSL, respectively. Maximum cuts and fills are expected to be less than 15 feet to achieve proposed finished grades. Retaining walls are proposed along the north, northwest and northeast perimeters of the site to accommodate for the proposed grading. We understand surface drainage will be directed to a storm water biofiltration within the southeast corner of the site. In addition, improvements consisting of accommodating landscaping, utilities, surface parking and driveways are proposed.

The site descriptions and proposed development are based on a site reconnaissance, review of published geologic literature, our field investigation, a review of preliminary architectural and grading plans, and discussions with you. If development plans differ from those described herein, Geocon should be contacted for review of the plans and possible revisions to this report.

3. GEOLOGIC SETTING

The site is located in a coastal plain environment within the southern portion of the Peninsular Ranges Geomorphic Province of southern California. The Peninsular Ranges is a geologic and geomorphic province that extends from the Imperial Valley to the Pacific Ocean and from the Transverse Ranges to the north and into Baja California to the south. The coastal plain of San Diego County is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary rocks that thicken to the west and range in age from Upper Cretaceous through the Pleistocene with intermittent deposition. The sedimentary units are deposited on bedrock, Cretaceous to Jurassic age igneous and metavolcanic rocks. Geomorphically, the coastal plain is characterized by a series of 21 stair-stepped, marine terraces which are younger to the west and have been dissected by west flowing rivers that drain the Peninsular Ranges to the east. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault Zone and the active Rose Canyon Fault Zone. The Peninsular Ranges Province is also dissected by the Elsinore Fault Zone that is associated with and sub-parallel to the San Andreas Fault Zone, which is the plate boundary between the Pacific and North American Plates.

The site is located within the western portion of the coastal plain geologic province on a ridge that has been dissected by drainages that are located to the east along Interstate 805 and to the west along Interstate 5. The drainages flow to the north within Carroll Canyon drainage channel and enters the Pacific Ocean at Los Penasquitos Lagoon west of State Route 56. Shallow to deep fill soils are present across the site underlain by Eocene-age Scripps Formation. The geologic maps have that area mapped as undifferentiated Scripps Formation and Ardath Shale. However, based on our boring information the material is more typical of the Scripps Formation These materials were deposited in a marine environment where sandstones and siltstones where formed. Pleistocene-age Very Old Paralic

Deposits were deposited in the area but have either been removed by erosion or by former grading activities. The Scripps Formation is typically overconsolidated and can be very dense and slightly to moderately cemented.

4. SOIL AND GEOLOGIC CONDITIONS

We encountered one surficial soil (consisting of previously placed fill) and one geologic unit (consisting of Scripps Formation) during our field investigation. The occurrence, distribution and description of each unit encountered are shown on the Geologic Map, Figure 2 and the boring logs in Appendix A. Figure 3 presents Geologic Cross-Sections showing the approximate underlying geologic conditions. We prepared the geologic cross-sections using interpolation between exploratory trenches and previous observations; therefore, actual geotechnical conditions may vary from those illustrated and should be considered approximate. The surficial soils and geologic units are described herein in order of increasing age.

4.1 Previously Placed Fill (Qpf)

We encountered previously placed fill to depths ranging from about 1½ to 45 feet from existing grade in the exploratory borings. The fill is generally less than 5 feet in depth within the southern and eastern portions of the site, and deepens within the northwest portion of the site. The fill is likely associated with the previous grading operations performed during the original development of the property. We expect a canyon fill exists within the northwest portion of the site. The fill is generally composed of medium dense to dense, silty sand and sandy silt. Based on the laboratory test results, the fill material at the location tested possesses a "medium" expansion potential (expansion index of 51 to 90). The upper portion of the previously placed fill is considered unsuitable for additional fill or structural loads. Remedial grading of the upper portion of the previously placed fill will be required as discussed herein.

4.2 Scripps Formation (Tsc)

We encountered Eocene-age Scripps Formation underlying the previously placed fill. The Scripps Formation generally consists of dense to very dense, silty sandstone and hard, sandy siltstone. Scripps Formation also typically contains localized areas of highly cemented concretionary beds. Previous experience indicates that such concretionary beds can be difficult to excavate and may result in the production of oversize materials that will likely require export. The Scripps Formation materials possess a "very low" to "high" expansion potential (Expansion Index of 130 or less). Gypsum crystals are commonly the formational materials that cause the soil to possess elevated water-soluble sulfate contents. The Scripps Formation is considered suitable to support additional loads from fill and the planned development.

5. GROUNDWATER

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades. However, it is not uncommon for seepage conditions to develop where none previously existed. Groundwater and seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Faulting

The *City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Sheet 34* defines the site with a geologic hazard Category 25: *Slide-Prone Formations, Ardath: neutral or favorable geologic structure*, a geologic hazard Category 51: *Other Terrain: Level mesas – underlain by terrace deposits and bedrock, nominal risk*, and a geologic hazard Category 53: *Other Terrain: Other level areas, gently sloping to steep terrain, favorable geologic structure, low risk.* Based on a review of geologic literature and our experience with the soil and geologic conditions in the general area, it is our opinion that known active, potentially active, or inactive faults are not located at the site. The site is not located within the Downtown Special Studies Fault Zone or State of California (Alquist-Priolo) Earthquake Fault Zone. The Salk Fault and an unnamed fault, both east-west trending and defined as *Potentially Active, Inactive, Presumed Inactive, or Activity Unknown*, are located approximately 2,000 and 1,000 feet north, respectively. The unnamed fault bends to the southeast, and the site is located approximately 1,200 feet from the southeast trending section of the fault.

6.2 Seismicity

According to the computer program *EZ-FRISK* (Version 7.65), 6 known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the nearest known active faults are the Newport-Inglewood/Rose Canyon Fault system, located approximately 3 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on this fault system or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.48g, respectively. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Rose Canyon Fault are 6.9 and 0.42g, respectively. Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for these and other faults in relationship to the site location. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-

Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS2008 acceleration-attenuation relationships in our analysis.

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Approximate Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood	3	7.5	0.38	0.39	0.48
Rose Canyon	3	6.9	0.34	0.38	0.42
Coronado Bank	17	7.4	0.18	0.14	0.16
Palos Verdes Connected	17	7.7	0.20	0.15	0.19
Elsinore	34	7.9	0.13	0.09	0.11
Earthquake Valley	42	6.8	0.06	0.05	0.04

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in our analysis in the analysis. Table 6.2.2 presents the probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
2% in a 50 Year Period	0.47	0.50	0.56
5% in a 50 Year Period	0.31	0.32	0.35
10% in a 50 Year Period	0.22	0.22	0.23

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the 2016 California Building Code (CBC) or other applicable guidelines.

It is our opinion the site could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed on Table 6.2.1 or other faults in the southern California/ northern Baja California region. We do not consider the site to possess a greater risk than that of the surrounding developments.

6.3 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects that earth surface. The potential for ground rupture is considered to be very low due to the absence of active or potentially active faults at the subject site.

6.4 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. Due to the lack of a permanent, near-surface groundwater table and the very dense nature of the underlying fill and formational materials, liquefaction potential for the site is considered very low.

6.5 Seiches and Tsunamis

Seiches are caused by the movement of an inland body of water due to the movement from seismic forces. The site is not located near an inland body of water. Therefore, the risk of a seiche from flooding within the river valley is considered low.

A tsunami is a series of long-period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The site is located approximately 1¾ miles from the Pacific Ocean at an elevation of at least approximately 295 feet above Mean Sea Level. Therefore, the risk of tsunamis affecting the site is negligible.

6.6 Landslides

According to the *City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Sheet 34*, the site is located approximately 330 feet east of a landslide defined as *Confirmed, known, or highly suspected*. The site is also approximately a horizontal distance of 150 feet east of the top of the natural landslide slope. In addition, the same landslide is mapped on the USGS *Geologic Map of the San Diego 30'x60' Quadrangle* by Kennedy, M. P., and S. S. Tan, 2008. Due to the relatively large distance to the top of the natural landslide slope, and the relatively level topography at the site, it is our opinion landslides are not present at the property or at a location that could impact the subject site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for construction of the proposed new science building project provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 The site is located approximately 3 miles from the nearest active fault. Based on our background research, it is our opinion active, potentially active, or inactive faults do not extend across the site. Risks associated with seismic activity consist of the potential for moderate to strong seismic shaking.

7.1.3 Our field investigation indicates the site is underlain by previously placed fill overlying the Scripps Formation. The thickness of the previously placed fill encountered at the site during the investigation ranges from approximately 1½ to 45 feet. The fill is generally less than 5 feet within the southern and eastern portions of the site and deepens within the northwest portion of the site where a canyon was previously filled in. The upper portion of the previously placed fill is considered unsuitable for the support of additional fill and/or settlement-sensitive building structures in its current state and will require remedial grading if encountered at the base of the removal for the planned subterranean level. The Scripps Formation is considered suitable for the support of compacted fill and settlement-sensitive structures.

7.1.4 We expect grading for the basement levels of the structure will require cuts ranging from approximately 10 to 15 feet to achieve planned finish grades exposing the Scripps Formation. Therefore, the planned structure can be supported on a shallow foundation system. If fill materials exist below the planned structure, the foundation should be extended into the formational materials or drilled piers should be installed.

7.1.5 We did not encounter groundwater during our investigation and do not expect groundwater would impact site improvements. However, wet conditions and seepage could affect proposed construction if grading and improvement operations occur during or shortly after a rain event.

7.1.6 Based on our review of the project plans, we opine the planned development can be constructed in accordance with our recommendations provided herein. We do not expect the planned development will destabilize or result in settlement of adjacent properties or impact public right-a-ways.

7.1.7 Proper drainage should be maintained in order to preserve the engineering properties of the fill in the sheet-graded pad and slope areas.

7.1.8 Surface settlement monuments and canyon subdrains will not be required prior to or during site grading or improvements. However, monitoring of the temporary shoring may be required by the project shoring engineer.

7.1.9 Final grading or foundation plans have not been provided for our review. Geocon Incorporated should review the plans prior to the submittal to regulatory agencies for approval. Additional analyses may be required once the plans have been provided.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. We expect that some cemented zones within the existing materials may be encountered during grading and trenching operations requiring very heavy effort. In addition, raveling and sidewall instability may occur within the on-site soil due to the existence of cohesionless sand encountered during the drilling operations. Also, we encountered refusal in Borings B-1 and B-3 during the drilling operations within the Scripps Formation at depths of about 10½ and 13½ feet, respectively, in possible concretions.

7.2.2 The soil encountered in the field investigation is considered to be "expansive" (expansion index [EI] of greater than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 7.2.1 presents soil classifications based on the expansion index. We expect a majority of the soil encountered possess a "very low" to "high" expansion potential (EI of 130 or less).

TABLE 7.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the locations tested possess "S0" to "S2" sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. Table 7.2.2 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 7.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0	SO_4<0.10	No Type Restriction	n/a	2,500
S1	$0.10 \leq SO_4 < 0.20$	II	0.50	4,000
S2	$0.20 \leq SO_4 \leq 2.00$	V	0.45	4,500
S3	SO_4>2.00	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements susceptible to corrosion are planned.

7.3 Slope Stability

7.3.1 We performed slope stability analyses utilizing average drained direct shear strength parameters obtained from our laboratory testing and our experience with similar soil conditions. These analyses indicate the existing approximately 2:1 (horizontal to vertical) ascending slope located along the west perimeter of the site possess calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions as required by current City of San Diego guidelines. If the slopes are not properly maintained, localized sloughing may occur due to heavy rain fall, over-irrigation and allowing water flowing from the top of the slope. These surficial instabilities, if they occur, should be immediately repaired and fixed to reduce the potential for progressive failure. In addition, these slopes should not have an adverse effect on the performance of the building pads or existing improvements. Figure 4 presents the slope stability calculations for deep-seated and surficial fill slope stability.

7.4 Seismic Design Criteria

7.4.1 We used the computer program *U.S. Seismic Design Maps,* provided by the USGS to evaluate the seismic design criteria. Table 7.4.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements as currently proposed should be designed using a Site Class C in accordance with ASCE 7-10 Section 20.3.1. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10 using blow count data presented on the boring logs in Appendix A and the unconfined compressive strength results of the samples collected during the investigation presented in Appendix B. The values presented in Table 7.4.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.4.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	C	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.139g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.440g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.000	Table 1613.3.3(1)
Site Coefficient, F_V	1.360	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.139g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.598g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.759g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.399g	Section 1613.3.4 (Eqn 16-40)

7.4.2 Table 7.4.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.4.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Site Class	C	Section 1613.3.2
Mapped MCE_G Peak Ground Acceleration, PGA	0.487g	Figure 22-7
Site Coefficient, F_{PGA}	1.000	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.487g	Section 11.8.3 (Eqn 11.8-1)

7.4.3 Conformance to the criteria in Tables 7.4.1 and 7.4.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.5 Excavation Slopes

7.5.1 The recommendations included herein are provided for stable temporary excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

7.5.2 Temporary excavations should be made in conformance with OSHA requirements. The previously placed fill should be considered a Type C soil, properly compacted fill can be considered a Type B soil (Type C soil if seepage or groundwater is encountered), and the Very Old Paralic Deposits and San Diego Formation can be considered a Type A soil (Type B soil if seepage or groundwater is encountered) in accordance with OSHA requirements. In general, special shoring requirements will not be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be sloped back at an appropriate inclination. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.6 Grading

7.6.1 Grading should be performed in accordance with the recommendations provided in this report, the *Recommended Grading Specifications* contained in Appendix D and the City of San Diego Grading Ordinance.

7.6.2 Prior to commencing grading, a pre-construction conference should be held at the site with the owner/developer, city inspector, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling requirements can be discussed at that time.

7.6.3 Grading of the site should commence with the demolition of existing structures, improvements, vegetation, and deleterious debris from the area to be graded. Deleterious debris should be exported from the site and should not be mixed with the fill. Existing underground improvements within the proposed development area should be removed and the resulting depressions properly backfilled in accordance with the procedures described herein.

7.6.4 We expect the base of the removal for the planned structure will expose the Scripps Formation. If fill materials are exposed at the base of the removal for the subterranean level, the upper 2 feet of the fill should be removed and replaced with properly compacted fill. The removals can be limited to expose the top of the Scripps Formation. Remedial grading will not be required where the formational materials are exposed at planned grade unless disturbed during basement level excavations.

7.6.5 The upper 1 to 2 feet of fill materials in areas outside of the planned structure and within the planned improvements should be removed and replaced with properly compacted fill prior to the placement of flatwork and pavement. The removals can be limited to the formational materials.

7.6.6 Some areas of overly wet and saturated soil should be expected due to the existing pavement and landscape areas. The saturated soil would require additional effort prior to placement of compacted fill or additional improvements. Stabilization of the soil would include scarifying and air-drying, removing and replacement with drier soil, use of stabilization fabric (e.g. Tensar TX7 or other approved fabric), or chemical treating (i.e. cement or lime treatment) may be required within proposed new pavement areas.

7.6.7 The site should then be brought to final subgrade elevations with fill compacted in layers, where necessary. In general, soil native to the site is suitable for use as fill if relatively free from vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content, as determined in accordance with ASTM Test Procedure D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations.

7.6.8 Import fill soil (if necessary) should consist of granular materials with a “very low” to “medium” expansion potential (EI of 90 or less) free of deleterious material and stones larger than 3 inches and should be compacted as recommended herein. Geocon

Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

7.7 Shallow Foundations

7.7.1 The proposed structures can be supported on a shallow foundation system bearing in the formational materials. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 12 inches wide and extend at least 24 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 2 feet and should also extend at least 24 inches below lowest adjacent pad grade. Figure 5 presents a wall/column footing dimension detail.

7.7.2 Steel reinforcement for continuous footings should consist of at least four No. 5 steel reinforcing bars placed horizontally in the footings, two near the top and two near the bottom. Steel reinforcement for the spread footings should be designed by the project structural engineer.

7.7.3 The recommendations presented herein are based on soil characteristics only (EI of 130 or less) and are not intended to replace steel reinforcement required for structural considerations.

7.7.4 We expect foundations will be founded in the underlying formational materials. Foundations may be designed for an allowable soil bearing pressure of 6,000 pounds per square foot (psf) (dead plus live load) for footings founded in Scripps Formation. This soil bearing pressure may be increased by 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil pressure of 10,000 psf in formational materials. The values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

7.7.5 Overexcavation of the footings and replacement with slurry can be performed in areas where the formational materials are not encountered at the bottom of the footing excavations. Minimum two-sack slurry can be placed in the excavations for the conventional foundations to the bottom of proposed footing elevation.

7.7.6 We estimate the total and differential settlements under the imposed allowable loads to be about ½ inch based on a 6-foot square footing. The total and differential settlement for a 12-foot square footing is 1 inch and ½ inch in 40 feet, respectively.

7.7.7 We should observe the foundation excavations prior to the placement of reinforcing steel and concrete to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

7.7.8 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

7.7.9 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.8 Concrete Slabs-On-Grade

7.8.1 Concrete floor slabs should possess a thickness of at least 5 inches and reinforced with a minimum of No. 4 steel reinforcing bars at 18 inches on center in both horizontal directions. The structural engineer should design the steel required for the planned loading conditions.

7.8.2 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.8.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common to have 3 to 4 inches of sand in the southern California region. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.8.4 Concrete slabs should be provided with adequate construction joints and/or expansion joints to control unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed concrete finished floors are planned.

7.8.5 Consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

7.8.6 The foundation and concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting expected loads.

7.8.7 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.9 Concrete Flatwork

7.9.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with 4 x 4 – W4.0/W4.0 (4 x 4 – 4/4) welded wire mesh or No. 4 reinforcing bars spaced 18 inches on center in each direction to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete.

7.9.2 Even with the incorporation of the recommendations within this report, the exterior concrete flatwork has a likelihood of experiencing some movement due to swelling or settlement; therefore, the steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork. It is generally not economical to mitigate liquefaction for flatwork. Therefore, some repairs to flatwork will likely be required following a liquefaction event.

7.9.3 Where exterior flatwork abuts structures at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.9.4 The recommendations presented herein are intended to reduce the potential for cracking as a result of differential movement. However, even with the incorporation of the recommendations presented herein, concrete will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.10 Retaining Walls

7.10.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 40 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal to vertical), we recommend an active soil pressure of 55 pcf. Soil with an expansion index (EI) of greater than 90 should not be used as backfill material behind retaining walls.

7.10.2 Retaining walls shall be designed to ensure stability against overturning sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

7.10.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure of 7H psf should be added to the active soil pressure for walls 8 feet or less. For walls greater than 8 feet tall, an additional uniform pressure of 13H psf should be applied to the wall starting at 8 feet from the base of the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

7.10.4 The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. Figure 6 presents a typical retaining wall drain detail. If conditions different than those described are expected or walls are planned that will extend below the water elevation, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.10.5 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2016 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 16H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.487g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.3.

7.10.6 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

7.10.7 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.11 Lateral Loading

7.11.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid density of 350 pounds per cubic foot (pcf) should be used for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

7.11.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design. The friction coefficient may be reduced depending on the vapor barrier or waterproofing material used for construction in accordance with the manufacturer's recommendations.

7.11.3 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

7.12 Preliminary Pavement Recommendations

7.12.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck and fire truck traffic areas, respectively. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections for the pavement should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have assumed an R-Value of 8 and 78 for the subgrade soil and base materials, respectively, for the purposes of this preliminary analysis. Table 7.12.1 presents the preliminary flexible pavement sections.

TABLE 7.12.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Parking stalls for automobiles and light-duty vehicles	5.0	8	3	10
Driveways for automobiles and light-duty vehicles	5.5	8	3	11
Medium truck traffic areas	6.0	8	3.5	12
Driveways for heavy truck and fire truck traffic	7.0	8	4	15

7.12.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

7.12.3 Base materials should conform to Section 26-1.028 of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a ¾-inch maximum size aggregate. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook).*

7.12.4 The base thickness can be reduced if a reinforcement geogrid is used during the installation of the pavement. Geocon should be contact for additional recommendations, if required.

7.12.5 A rigid Portland cement concrete (PCC) pavement section should be placed in driveway entrance aprons and trash bin loading/storage areas. The concrete pad for trash truck areas should be large enough such that the truck wheels will be positioned on the concrete during loading. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 *Guide for Design and Construction of Concrete Parking Lots* using the parameters presented in Table 7.12.2.

TABLE 7.12.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	50 pci
Modulus of rupture for concrete, M_R	500 psi
Traffic Category, TC	A and C
Average daily truck traffic, ADTT	10 and 100

7.12.6 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 7.12.3.

TABLE 7.12.3
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Automobile Parking Stalls (TC=A)	6.0
Heavy Truck and Fire Lane Areas (TC=C)	7.5

7.12.7 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch).

7.12.8 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., 6-inch and 7.5-inch-thick slabs would have an 8- and 9.5-inch-thick edge, respectively). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

7.12.9 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 15 feet for the 6.0-inch and thicker slabs and should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report. The depth of the crack-control joints should be at least ¼ of the slab thickness when using a conventional saw, or at least 1 inch when using early-entry saws on slabs 9 inches or less in thickness, as determined by the referenced ACI report discussed in the pavement section herein. Cuts at least ¼ inch wide are required for sealed joints, and a ⅜ inch wide cut is commonly recommended. A narrow joint width of 1/10- to 1/8-inch wide is common for unsealed joints.

7.12.10 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed at the as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

7.12.11 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, cross-gutters, or sidewalk so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

7.13 Site Drainage and Moisture Protection

7.13.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.13.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.13.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.13.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

7.14 Grading and Foundation Plan Review

7.14.1 Geocon Incorporated should review the project grading and foundation plans prior to final design submittal to check if additional analyses and/or recommendations are required.

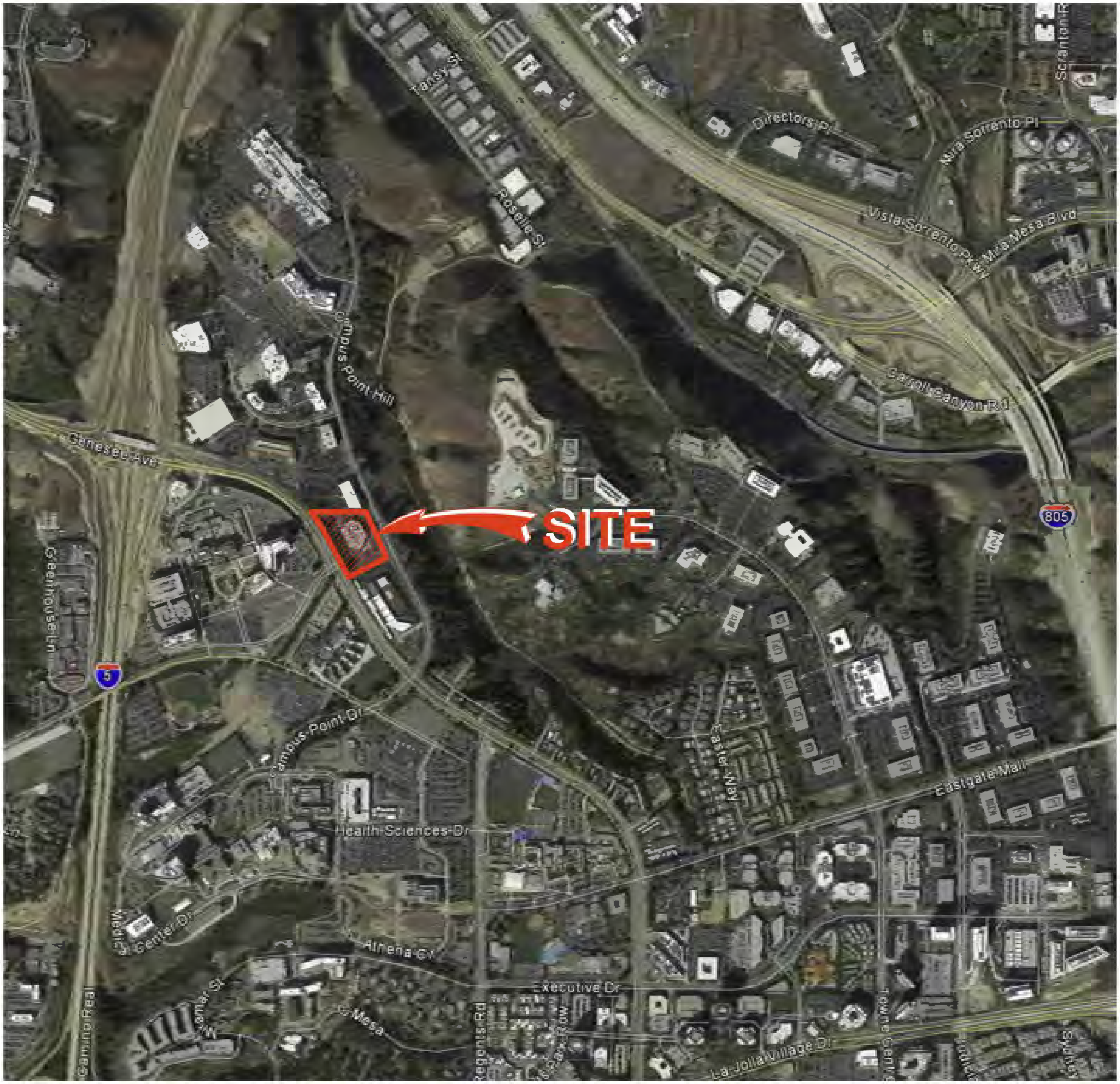
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

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

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



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N

NO SCALE

VICINITY MAP

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9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

LR / CW		DSK/GTYPD	DATE 04 - 18 - 2017	PROJECT NO. G2099 - 52 - 01	FIG. 1

Plotted:04/18/2017 10:06AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\DETAILS\G2099-52-01_Vicinity Map.dwg

GEOCON LEGEND

Qpf ....PREVIOUSLY PLACED FILL

Tsc ....SCRIPP FORMATION (Dotted Where Buried)

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

B-9 ....APPROX. LOCATION OF BORING

P-4 ....APPROX. LOCATION OF PERMEAMETER TEST

(45') ....APPROX. DEPTH TO SCRIPPS FORMATION (In Feet)

B B' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

GEOLOGIC MAP

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

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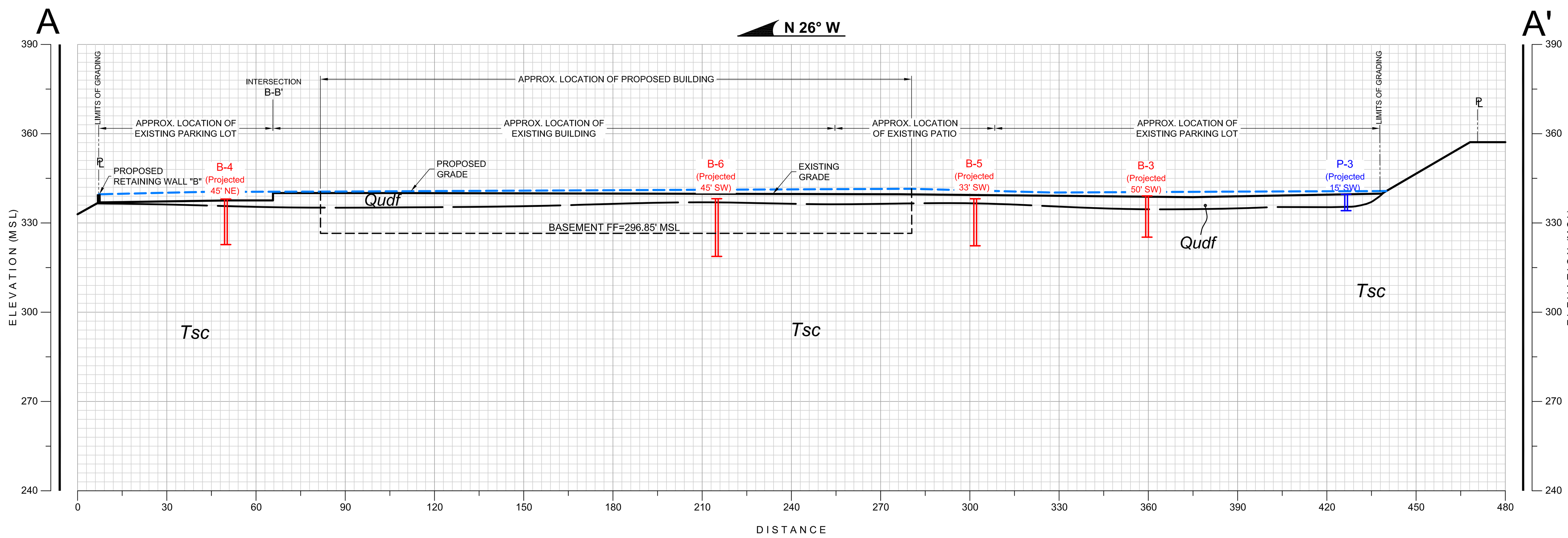
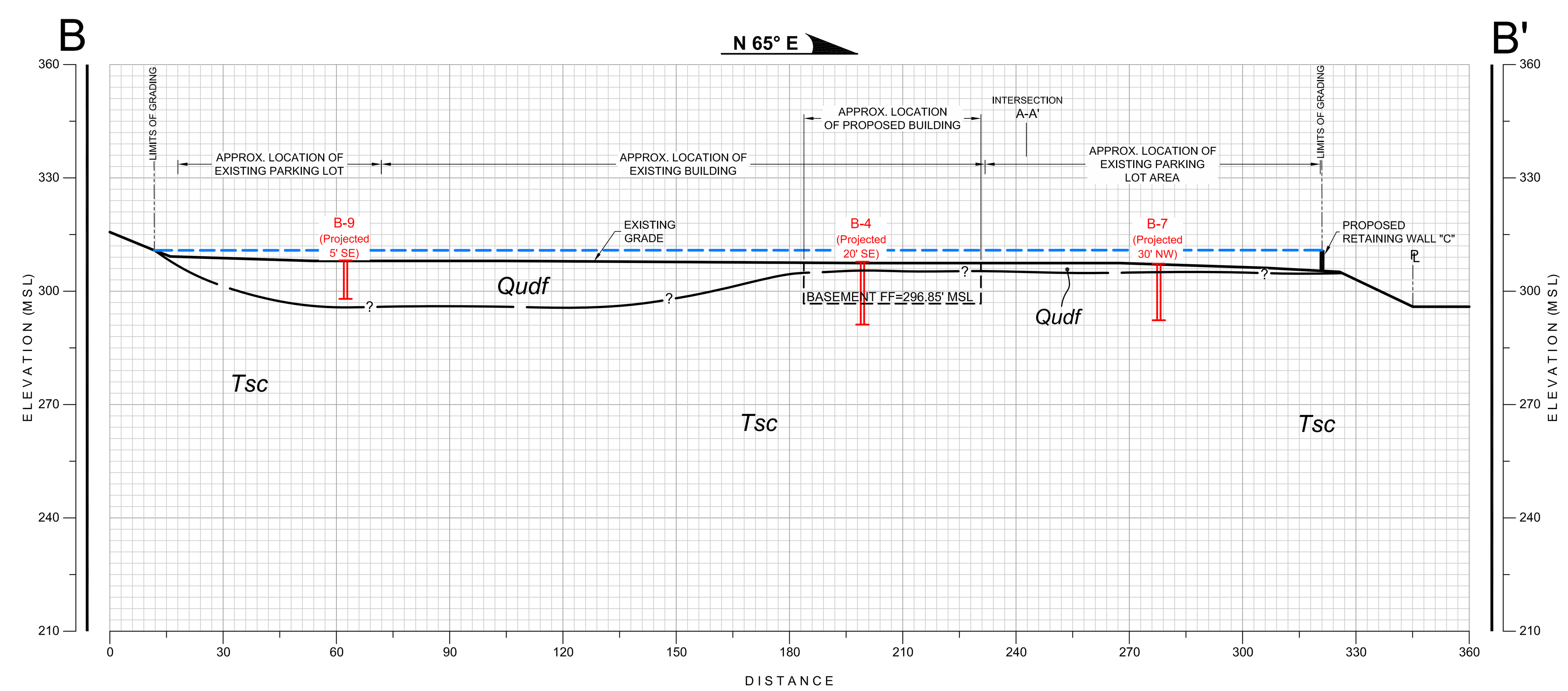
SCALE 1" = 30'	DATE 04 - 18 - 2017	
PROJECT NO. G2099 - 52 - 01		FIGURE 2
SHEET 1 OF 1		

Plotted:04/24/2017 3:49PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\SHEETS\G2099-52-01 Geo Map.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 30' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 30' (Vert. = Horiz.)

GEOCON LEGEND

Qudf ........UNDOCUMENTED FILL

Tsc ....SCRIPP FORMATION

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

B-9 ....APPROX. LOCATION OF BORING

P-3 ....APPROX. LOCATION OF BORING (Infiltration Test)

GEOLOGIC CROSS SECTION

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

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SCALE 1" = 30'	DATE 04 - 18 - 2017
PROJECT NO. G2099 - 52 - 01	FIGURE 3
SHEET 1 OF 1	

Surficial Slope Stability Evaluation

Slope Height, H (feet)	∞	
Vertical Depth of Stauration, Z (feet)	3	
Slope Inclination	2.00	:1
Slope Inclination, I (degrees)	26.6	
Unit Weight of Water, γW (pcf)	62.4	
Total Unit Weight of Soil, γ_T (pcf)	125	
Friction Angle, ϕ (degrees)	30	
Cohesion, C (psf)	300	
Factor of Safety = $(C+(\gamma_T-\gamma_W)Z \cos^2 i \tan\phi)/(\gamma_T Z \sin i \cos i)$	2.58	

References: (1) Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage* , Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62.

(2) Skempton, A. W., and F. A. Delory, *Stability of Natural Slopes in London Clay* , Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81.

Slope Stability Evaluation

Slope Height, H (feet)	35	
Slope Inclination	2.0	:1
Total Unit Weight of Soil, γ_T (pcf)	125	
Friction Angle, ϕ (degrees)	30	
Cohesion, C (psf)	300	
$\gamma_{C\phi} = (\gamma H \tan\phi)/C$	8.4	
N_{Cf} (from Chart)	28	
Factor of Safety = $(N_{Cf}C)/(\gamma H)$	1.92	

References: (1) Janbu, N. *Stability Analysis of Slopes with Dimensionless Parameters,* Harvard Soil Mechanics, Series No. 46, 1954.

(2) Janbu, N. *Discussion of J.M. Bell, DimensionlessParameters for Homogeneous Earth Slopes,* Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

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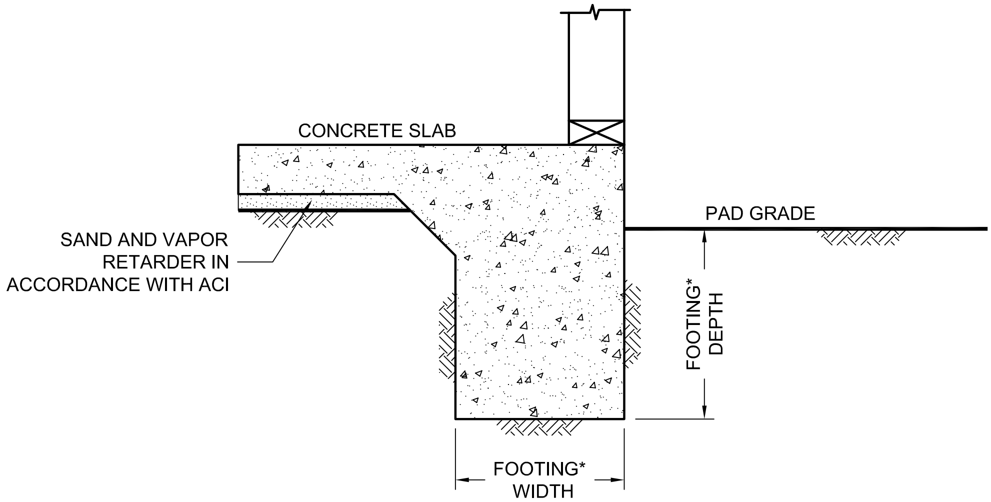
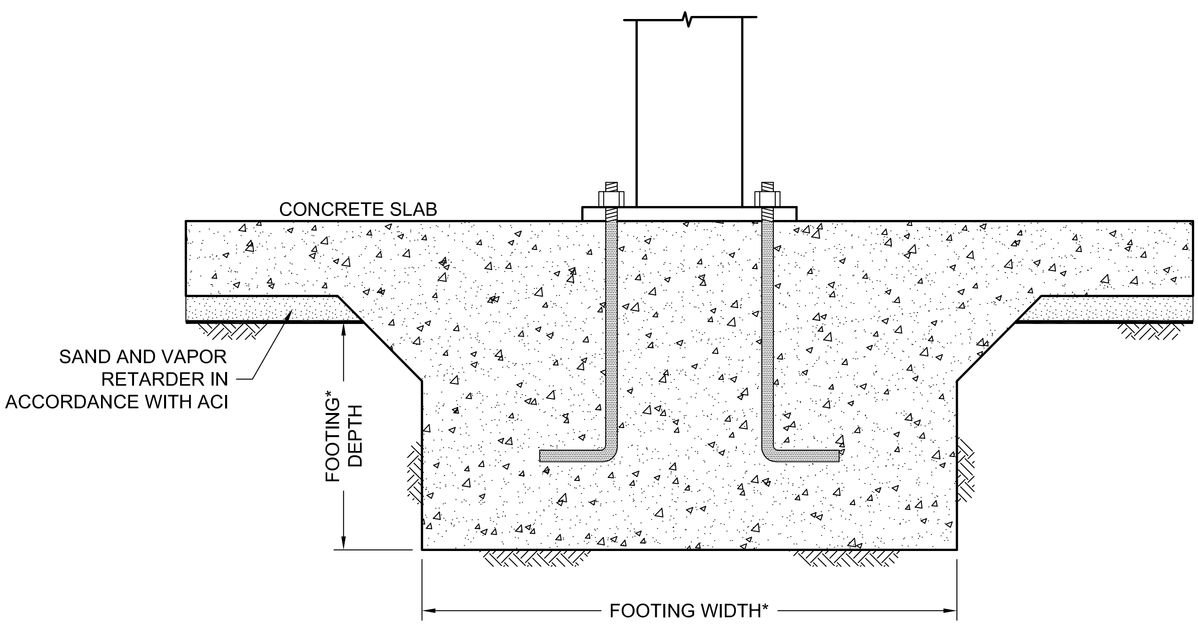
SW / SW

SLOPE STABILITY ANALYSIS

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

DATE 04-18-2017 | PROJECT NO. G2099-52-01 | FIG. 4





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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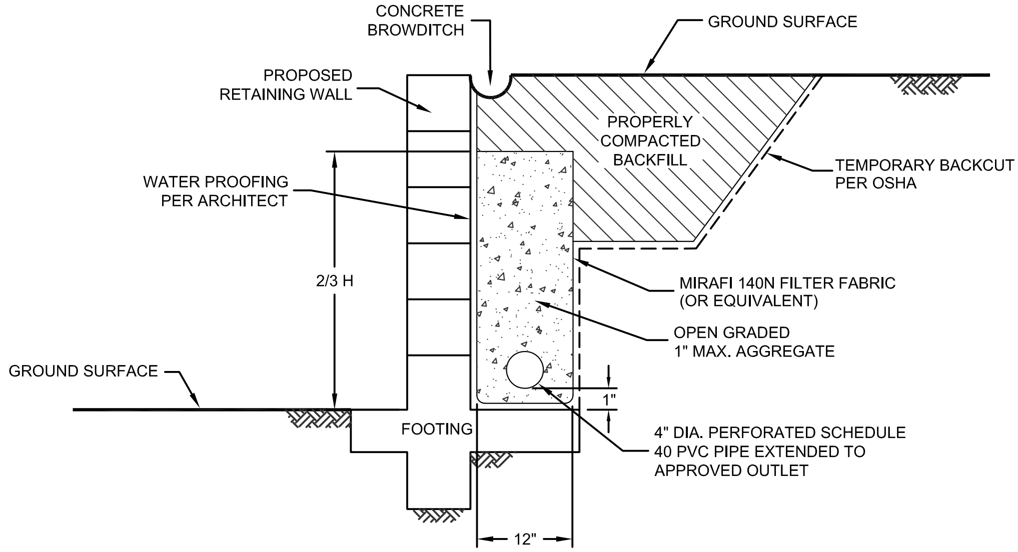
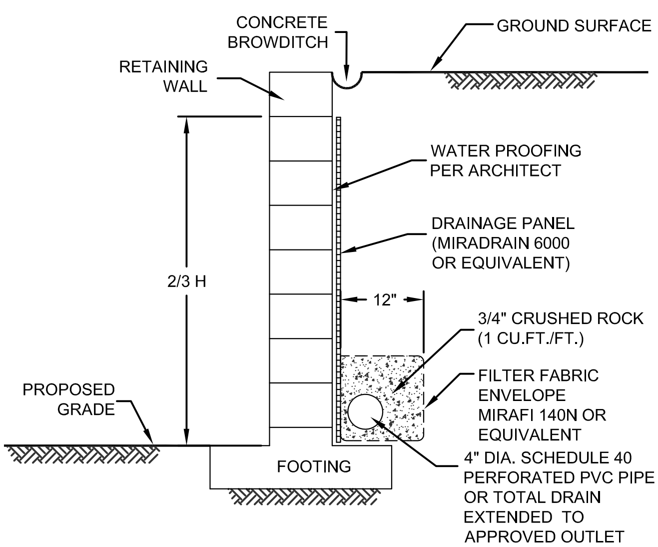
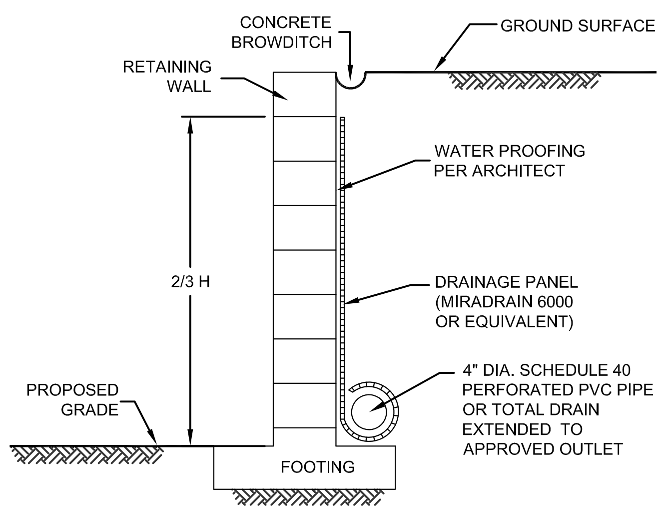
LR / CW		DSK/GTYPD	DATE 04 - 18 - 2017	PROJECT NO. G2099 - 52 - 01	FIG. 5





NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING



NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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LR / CW		DSK/GTYPD	DATE 04 - 18 - 2017	PROJECT NO. G2099 - 52 - 01	FIG. 6

Plotted:04/18/2017 10:08AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

Fieldwork for our investigation included a subsurface exploration and soil sampling. The Geologic Map, Figure 2 presents the locations of the exploratory borings. Boring logs and an explanation of the geologic units encountered are presented in figures following the text in this appendix. We located the borings in the field using a measuring tape and existing reference points. Therefore, actual boring locations may deviate slightly. We performed a field investigation on March 20 and 21, 2017 which consisted of drilling 13 exploratory borings to a maximum depth of approximately 45½ feet below existing grade with an Ingersoll Rand A-300 drill rig equipped with 8-inch-diameter hollow-stem auger with Scott's Drilling Company. We obtained bulk and ring samples from the exploratory borings for laboratory testing.

We obtained samples during our boring excavations using a California split-spoon sampler. The sampler is composed of steel and is driven to obtain the soil samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 2.875 inches. Up to 18 rings are placed inside the sampler that is 2.4 inches in diameter and 1 inch in height. Ring samples at appropriate intervals were retained in moisture-tight containers and transported to the laboratory for testing. We also retained bulk samples from the borings for laboratory testing. The type of sample is noted on the exploratory boring logs.

The samplers were driven 12 using the California into the bottom of the excavations with the use of a Cathead hammer and the use of A rods. The sampler is connected to the A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler if driven 18 inches. If the sampler was not driven for 18 inches, an approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values, adjustments have not been applied. We estimated elevations shown on the boring logs from a topographic map.

We visually examined the soil conditions encountered within the borings, classified, and logged in general accordance with the Unified Soil Classification System (USCS). Logs of the borings are presented on Figures A-1 through A-13. The logs depict the general soil and geologic conditions encountered and the depth at which we obtained the samples. A copy of the County of San Diego Department of Environmental Health Geotechnical Boring Construction Permit has been included.

BORING B 1

ELEV. (MSL.) **309'** DATE COMPLETED **03-21-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 6-INCH BASE**			
	B1-1			SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish brown, Silty, fine to coarse SAND			
2								
4								
	B1-2							
6				SM/ML	**SCRIPPS FORMATION (**SCRIPPS FORMATION (Tsc)**)** Very dense/hard, yellowish brown to gray, Silty, fine-grained SANDSTONE, to Sandy SILTSTONE; moderately cemented	76/11.5	112.9	16.5
8								
10					-Grinding on possible concretion	50/3"		

REFUSAL AT 10.25 FEET
No groundwater encountered

Figure A-1,
Log of Boring B 1, Page 1 of 1

G2099-52-01.GPJ

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

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

BORING B 2

ELEV. (MSL.) **308.5'** DATE COMPLETED **03-21-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 6-INCH BASE**			
	B2-1			SM/ML	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense/very stiff, moist, yellowish to grayish brown, Silty, fine to coarse SAND to Sandy SILT			
2								
4								
	B2-2				-Becomes dense/hard	55	106.0	19.5
6								
8								
10	B2-3					59	111.2	14.0
12								
14								
	B2-4					65	110.0	19.4
16								
18								
20	B2-5					71	107.4	20.7
22								
24								
	B2-6					59	108.4	20.6
26								
28								

Figure A-2,
Log of Boring B 2, Page 1 of 2

G2099-52-01.GPJ

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

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

BORING B 2

ELEV. (MSL.) 308.5' DATE COMPLETED 03-21-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-7			SM/ML		49	107.1	19.6
32								
34								
	B2-8				-Becomes medium dense/very stiff	45	102.2	22.1
36								
38								
40								
42								
44								
	B2-9			SM/ML	**SCRIPPS FORMATION (Tsc)** Very dense/hard, damp, yellowish brown to gray, Silty, fine grained SANDSTONE to Sandy SILTSTONE	50/5"		

BORING TERMINATED AT 45.5 FEET
No groundwater encountered
Backfilled with 15.9 cu.ft. bentonite grout slurry.

Figure A-2,
Log of Boring B 2, Page 2 of 2

G2099-52-01.GPJ

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

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

GEOCON

BORING B 3

ELEV. (MSL.) **309.5'** DATE COMPLETED **03-21-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**4-INCH ASPHALT OVER 5-INCH BASE**			
	B3-1			SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish brown, Silty, fine to medium SAND; trace cobble/gravel			
2								
4								
	B3-2			SW/SM	**SCRIPPS FORMATION (Tsc)** Very dense, damp, light yellowish to grayish brown, well-graded, fine to medium grained SANDSTONE to Silty, fine to medium grained SANDSTONE	50/5.5"	99.0	8.0
6								
8								
10	B3-3					50/5.5"	97.3	8.5
12					-Possible concretion, very difficult drilling			
						50/1"		

REFUSAL AT 13.5 FEET
No groundwater encountered

Figure A-3,
Log of Boring B 3, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING B 4

ELEV. (MSL.) 308.5' DATE COMPLETED 03-20-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3.5-INCH ASPHALT OVER 5.5-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, damp, brown, Silty, fine to coarse SAND; trace gravel			
2				ML/SM	**SCRIPPS FORMATION (Tsc)** Very dense/hard, damp, yellowish brown to gray, Sandy SILTSTONE to Silty, fine-grained SANDSTONE; weakly to medium cemented			
	B4-1					50/6"	105.2	20.0
4								
	B4-2					50/5.5"	100.6	18.2
6								
8								
10	B4-3					50/4"	103.1	20.2
12								
14								
	B4-4					50/5.5"	99.7	15.3

BORING TERMINATED AT 15.5 FEET
No groundwater encountered

Figure A-4,
Log of Boring B 4, Page 1 of 1

G2099-52-01.GPJ

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

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GEOCON

PROJECT NO. G2099-52-01

BORING B 5

ELEV. (MSL.) 308' DATE COMPLETED 03-20-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**5-INCH ASPHALT OVER 7-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, light yellowish brown, Silty, fine to medium SAND			
2				SM/SW	**SCRIPPS FORMATION (Tsc)** Very dense, damp, light yellowish to grayish brown, Silty, fine- to medium-grained, SANDSTONE to well graded, fine- to medium-grained SANDSTONE; weakly cemented			
	B5-1					76/11"	101.3	7.2
4								
	B5-2					50/5.5	98.0	8.0
6								
8								
10								
	B5-3					50/6"	99.3	9.6
	B5-4							
12								
14								
	B5-5					50/5.5"	99.1	10.5
					BORING TERMINATED AT 15.5 FEET No groundwater encountered			

Figure A-5,
Log of Boring B 5, Page 1 of 1

G2099-52-01.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G2099-52-01

BORING B 6

ELEV. (MSL.) 308' DATE COMPLETED 03-20-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 6-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish brown, Silty, fine to medium SAND; trace gravel			
2				ML				
	B6-1				**SCRIPPS FORMATION (Tsc)** Hard, damp, gray, Sandy SILTSTONE; moderately cemented	85/9"	98.8	17.8
4								
	B6-2					50/5"	105.4	16.6
6					-Drilling becomes difficult from 6-6.5 feet; possible concretion			
8								
10	B6-3				-Becomes yellowish brown	50/4.5"	104.4	20.7
	B6-4							
12								
14								
	B6-5				-Becomes gray	79/8"	107.5	19.4
16								
18								
	B6-6					50/4.5"		
					BORING TERMINATED AT 19.5 FEET No groundwater encountered			

Figure A-6,
Log of Boring B 6, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

PROJECT NO. G2099-52-01

BORING B 7

ELEV. (MSL.) **307.5'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B7-1				**4-INCH ASPHALT OVER 6-INCH BASE**			
				ML	**PREVIOUSLY PLACED FILL (Qpf)** Stiff, damp, light yellowish to grayish brown, Sandy SILT			
2				ML	**SCRIPPS FORMATION (Tsc)** Hard, damp, yellowish brown, Sandy SILTSTONE			
	B7-2					90/9.5"	102.8	22.0
4								
	B7-3					50/6"	103.7	21.0
6								
8								
10	B7-4					50/5.5"		
12					-Very difficult drilling (possible concretion)			
14					-No recovery	50/1"		

BORING TERMINATED AT 15 FEET
No groundwater encountered

Figure A-7,
Log of Boring B 7, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

PROJECT NO. G2099-52-01

BORING B 8

ELEV. (MSL.) 308' DATE COMPLETED 03-21-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**5-INCH ASPHALT OVER 7-INCH BASE**			
				SM/ML	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense/very stiff, moist, yellowish to grayish brown, Silty, fine SAND to Sandy SILT			
4	B8-1					31	103.4	20.8
8	B8-2				-Becomes dense/hard	70	109.5	16.7
10	B8-3				-Becomes very dense/hard	85	109.0	14.0
15	B8-4				-Becomes medium dense/very stiff	47	108.8	19.3
20	B8-5					40	105.7	19.2
25	B8-6			SM/ML	**SCRIPPS FORMATION (Tsc)** Very dense/hard, damp, yellowish brown to gray, Silty, fine-grained SANDSTONE to Sandy SILTSTONE; moderately cemented	50/6"		
28	B8-7					50/5"		

BORING TERMINATED AT 28 FEET
No groundwater encountered
Backfilled with 9.8 cu.ft. bentonite grout slurry

Figure A-8,
Log of Boring B 8, Page 1 of 1

G2099-52-01.GPJ

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

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BORING B 9

ELEV. (MSL.) 308' DATE COMPLETED 03-21-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3.5-INCH ASPHALT OVER 3.5-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish brown, Silty, fine to coarse SAND; trace gravel			
2								
4	B9-1			SM/ML	Medium dense/very stiff, yellowish to grayish brown, Silty, fine SAND to Sandy SILT	46	106.8	19.7
6	B9-2				-Trace gravel	75/8.5"	96.5	11.1
8								
	B9-3				-Becomes very dense/hard	77	109.0	16.8
10					BORING TERMINATED AT 10 FEET No groundwater encountered			

Figure A-9,
Log of Boring B 9, Page 1 of 1

G2099-52-01.GPJ

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

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PROJECT NO. G2099-52-01

BORING P 1

ELEV. (MSL.) **312'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 5-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, olive brown, Silty, fine to medium SAND			
2				SM	**SCRIPPS FORMATION (Tsc)** Very dense, damp, yellowish to grayish brown, Silty, fine to medium grained SANDSTONE; weakly cemented			
4	P1-1					50/5"	96.1	8.9

BORING TERMINATED AT 4.5 FEET
No groundwater encountered

Figure A-10,
Log of Boring P 1, Page 1 of 1

G2099-52-01.GPJ

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

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GEOCON

PROJECT NO. G2099-52-01

BORING P 2

ELEV. (MSL.) **311'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 5-INCH BASE**			
2				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish to grayish brown, Silty, fine to medium SAND			
4	P2-1			SM/SW	**SCRIPPS FORMATION (Tsc)** Medium dense, damp, yellowish to grayish brown, Silty, fine- to medium-grained SANDSTONE to well-graded, fine- to medium-grained SANDSTONE; weakly cemented	28		
6								
8	P2-2				-Becomes very dense	50/5"	96.3	8.7

BORING TERMINATED AT 8.5 FEET
No groundwater encountered

Figure A-11,
Log of Boring P 2, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING P 3

ELEV. (MSL.) **309'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 5-INCH BASE**			
2				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, olive brown, Silty, fine to medium SAND			
4	P3-1							
				SM	**SCRIPPS FORMATION (Tsc)** Very dense, damp, gray, Silty, fine- to medium-grained SANDSTONE; weakly cemented	78	103.7	9.6

BORING TERMINATED AT 5.5 FEET
No groundwater encountered

Figure A-12,
Log of Boring P 3, Page 1 of 1

G2099-52-01.GPJ

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

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

PROJECT NO. G2099-52-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING P 4** ELEV. (MSL.) **308'** DATE COMPLETED **03-20-2017** EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**3.5-INCH ASPHALT OVER 5-INCH BASE**			
2				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, olive brown, Silty, fine to medium SAND; trace concrete debris			
4	P4-1			SM	**SCRIPPS FORMATION (Tsc)** Medium dense, damp, grayish brown, Silty, fine- to medium-grained SANDSTONE to well-graded, fine- to medium-grained SANDSTONE; weakly cemented	41	103.9	8.1
6					BORING TERMINATED AT 6 FEET No groundwater encountered			

Figure A-13,
Log of Boring P 4, Page 1 of 1

G2099-52-01.GPJ

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

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GEOCON

PERMIT #: LMWP-002777
A.P.N.: 343-230-44
EST #: None

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION
MONITORING WELL PROGRAM

GEOTECHNICAL BORING CONSTRUCTION PERMIT

SITE NAME: 9880 CAMPUS POINT LLC

SITE ADDRESS: 9880 CAMPUS POINT DRIVE, SAN DIEGO 92121

PERMIT FOR: **GEOTECHNICAL BORINGS (4)**

PERMIT APPROVAL DATE: 3/13/2017

PERMIT EXPIRES ON: 7/13/2017

RESPONSIBLE PARTY: ALEXANDRIA REAL ESTATE EQUITIES (Michael Barbera)

PERMIT CONDITIONS:

1. All borings must be sealed from the bottom of the boring to the ground surface with an approved sealing material as specified in California Well Standards Bulletin 74-90, Part III, Section 19.D. **Drill cuttings are not an acceptable fill material.**

2. All borings must be properly destroyed within 24 hours of drilling.

3. Placement of any sealing material at a depth greater than 30 feet must be done using the tremie method.

4. This work is not connected to any known unauthorized release of hazardous substances. Any contamination found in the course of drilling and sampling must be reported to DEH. All water and soil resulting from the activities covered by this permit must be managed, stored and disposed of as specified in the SAM Manual in Section 5, II, D-4. (http://www.sdcounty.ca.gov/deh/lwq/sam/manual_guidelines.html) In addition, drill cuttings must be properly handled and disposed in compliance with the Stormwater Best Management Practices of the local jurisdiction.

5. Within 60 days of completing work, submit a well/boring construction report, including all well and/or boring logs and laboratory data to the Well Permit Desk. This report must include all items required by the SAM Manual, Section 5, Pages 6 & 7.

6. This office must be given 24-hour notice of any drilling activity on this site and advanced notification of drilling cancellation. Please contact the Well Permit Desk at (858) 505-6688.

Jon Senaha
Digitally signed by Senaha, Jon
Date: 2017.03.13 09:40:38 -07'00'

APPROVED BY: ______________________ DATE: 3/13/2017

Jon Senaha

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with generally currently accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for in-place density and moisture content, maximum dry density and optimum moisture content, direct shear strength, expansion index, water-soluble sulfate content, resistance value (R-Value), unconfined compressive strength, gradation and consolidation. Tables B-I through B-VI and Figures B-1 through B-3 present the results of our laboratory tests. In addition, the in-place dry density and moisture content test results are presented on the boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B2-1	Yellowish to grayish brown, Sandy SILT to Silty, fine to coarse SAND (Qudf)	122.1	12.7

TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Depth (feet)	Geologic Unit	Dry Density (pcf)	Moisture Content (%)		Peak [Ultimate[1]] Cohesion (psf)	Peak [Ultimate[1]] Angle of Shear Resistance (degrees)
				Initial	Final		
B5-5	15	Tsc	99.1	10.5	21.8	275 [275]	34 [30]
B6-5	15	Tsc	107.5	19.4	24.2	320 [270]	36 [31]

[1] Ultimate measured at 0.2-inch deflection.

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Depth (feet)	Geologic Unit	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification	2016 CBC Expansion Classification
			Before Test	After Test				
B2-1	¾-5	Qudf	11.1	21.5	106.1	51	Medium	Expansive
B6-4	10-15	Tsc	12.2	31.0	100.3	113	High	Expansive

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	Sulfate Exposure Class
B2-1	1-5	Qudf	0.004	S0
B6-4	10-15	Tsc	0.235	S2

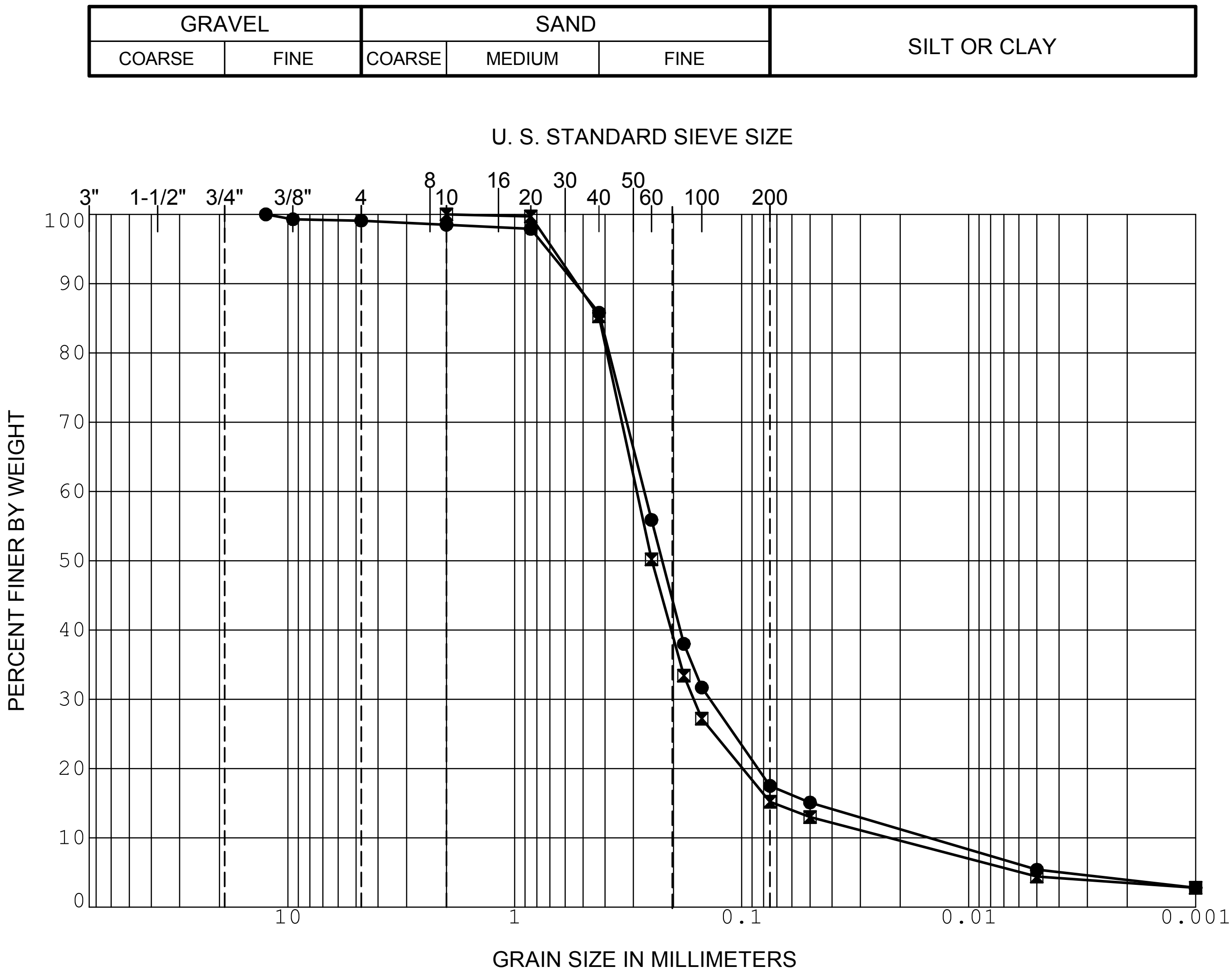
TABLE B-V
SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844

Sample No.	Depth (feet)	Description (Geologic Unit)	R-Value
B2-1	0-5	Yellowish to grayish brown, Silty, fine to coarse SAND to Sandy SILT	8

TABLE B-VI
SUMMARY OF LABORATORY UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS
ASTM D 1558

Sample No.	Depth (feet)	Geologic Unit	Hand Penetrometer Reading, Unconfined Compression Strength (tsf)	Undrained Shear Strength (ksf)
B1-2	5	Tsc	4.5+	4.5+
B2-2	5	Qudf	4.5+	4.5+
B2-3	10	Qudf	4.5+	4.5+
B2-4	15	Qudf	4.5+	4.5+
B2-5	20	Qudf	4.5+	4.5+
B2-6	25	Qudf	4.5+	4.5+
B2-7	30	Qudf	4.5+	4.5+
B2-8	35	Qudf	4.5+	4.5+
B2-9	45	Tsc	4.5+	4.5+
B4-1	2.5	Tsc	4.5+	4.5+
B4-2	5	Tsc	4.5+	4.5+
B4-3	10	Tsc	4.5+	4.5+
B4-4	15	Tsc	4.5+	4.5+
B6-1	2.5	Tsc	4.5+	4.5+
B6-2	5	Tsc	4.5+	4.5+
B6-3	10	Tsc	4.5+	4.5+
B6-5	15	Tsc	4.5+	4.5+
B6-6	19.5	Tsc	4.5+	4.5+
B7-2	2.5	Tsc	4.5+	4.5+
B7-3	5	Tsc	4.5+	4.5+
B7-4	10	Tsc	4.5+	4.5+
B8-1	4	Qudf	4.5+	4.5+
B8-2	7.5	Qudf	4.5+	4.5+
B8-3	10	Qudf	4.5+	4.5+
B8-4	15	Qudf	4.5+	4.5+
B8-5	20	Qudf	4.5+	4.5+
B8-6	25	Tsc	4.5+	4.5+
B8-7	27.5	Tsc	4.5+	4.5+
B9-1	4	Qudf	4.5+	4.5+
B9-2	6	Qudf	4.5+	4.5+
B9-3	9	Qudf	4.5+	4.5+

PROJECT NO. G2099-52-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	P1-1	4.0	SM - Silty SAND				
⊠	P3-1	4.0	SM - Silty SAND				
▲							

GRADATION CURVE

9880 CAMPUS POINT DRIVE

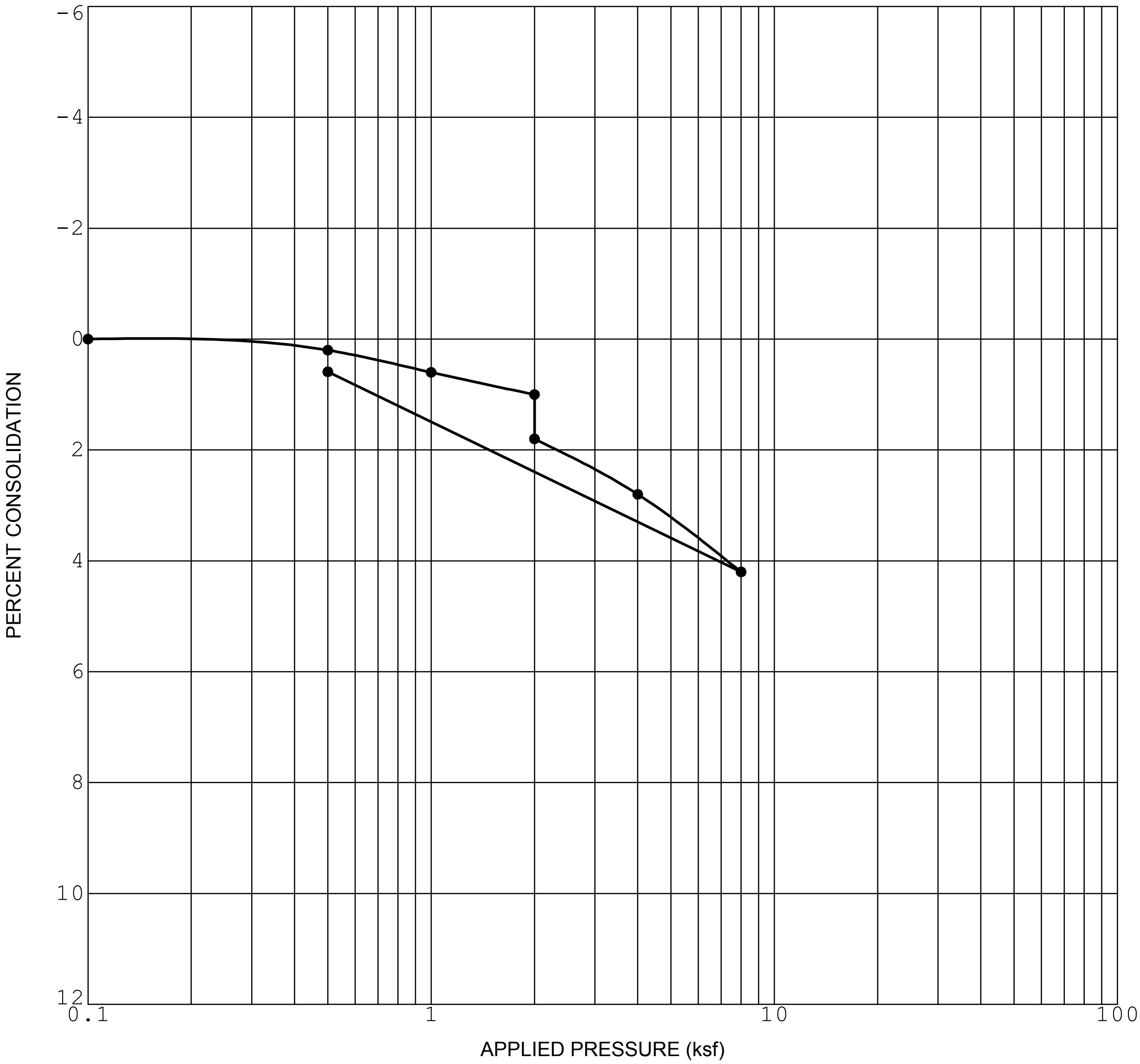
SAN DIEGO, CALIFORNIA

G2099-52-01.GPJ

Figure B-1

GEOCON

SAMPLE NO. P1-1



Initial Dry Density (pcf)	96.1	**Initial Saturation (%)**	35.6
Initial Water Content (%)	8.9	**Sample Saturated at (ksf)**	2.0

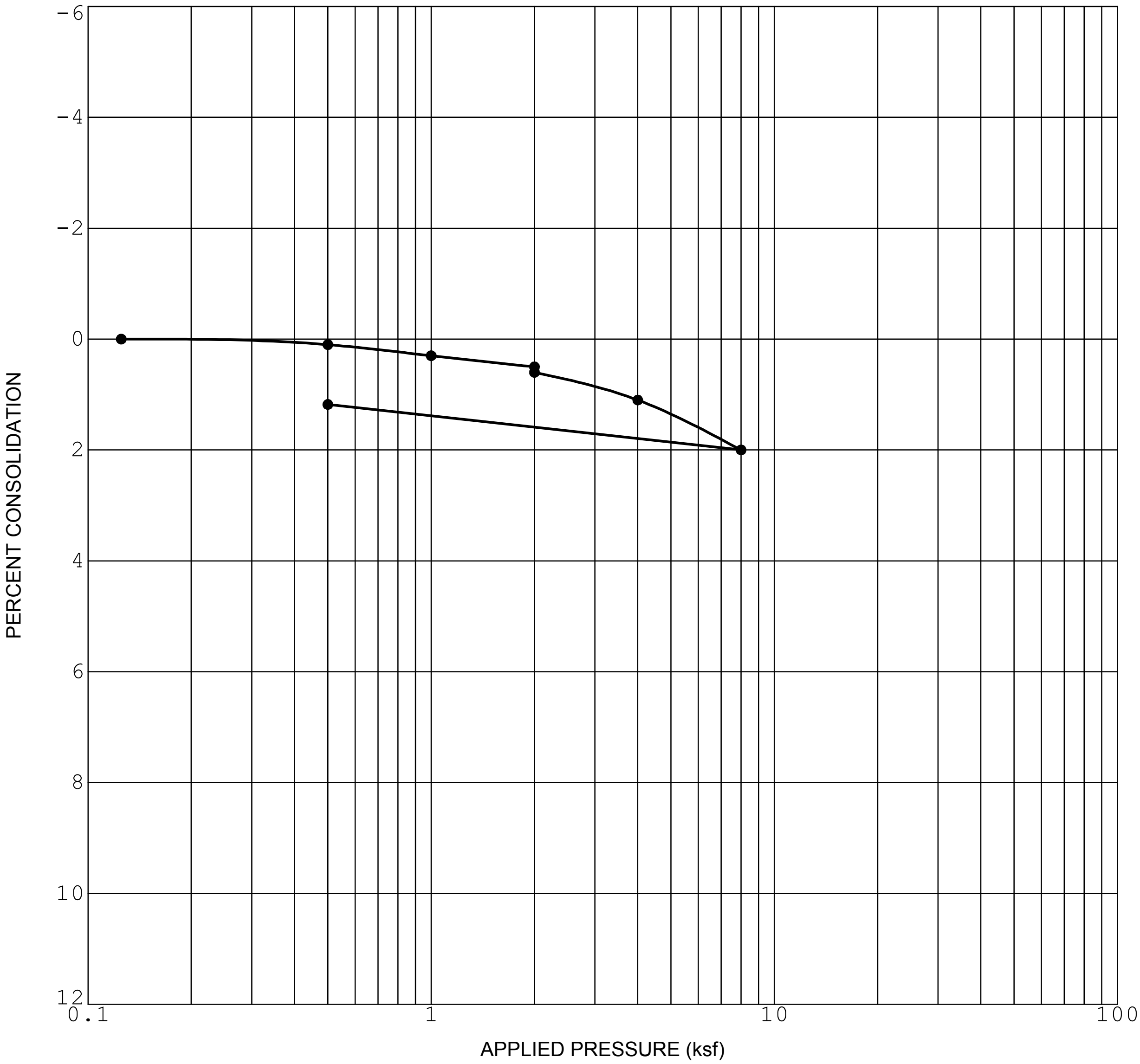
CONSOLIDATION CURVE

9880 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

PROJECT NO. G2099-52-01

SAMPLE NO. P3-1



Initial Dry Density (pcf)	103.7
Initial Water Content (%)	9.6

Initial Saturation (%)	42.3
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

9880 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

G2099-52-01.GPJ

Figure B-3

GEOCON

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices will be used in accordance with the *2016 City of San Diego BMP Design Manual*. If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

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

TABLE C-I
HYDROLOGIC SOIL GROUP DEFINITIONS

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

The property is underlain by man-made previously placed fill and should be classified as Soil Group D. Table C-II presents the information from the USDA website for the subject property. The Hydrologic Soil Group Map, provided at the end of this appendix, presents output from the USDA website showing the limits of the soil units.

TABLE C-II
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Altamont clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	AtF	17	C	0.06 – 0.20
Chesterton fine sandy loam, 2 to 5 percent slopes	CfB	72	D	0.00 – 0.06
Terrace escarpments	TeF	11	NA	NA

In-Situ Testing

The infiltration rate, percolation rates and saturated hydraulic conductivity are different and have different meanings. Percolation rates tend to overestimate infiltration rates and saturated hydraulic conductivities by a factor of 10 or more. Table C-III describes the differences in the definitions.

TABLE C-III
SOIL PERMEABILITY DEFINITIONS

Term	Definition
Infiltration Rate	The observation of the flow of water through a material into the ground downward into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Percolation Rate	The observation of the flow of water through a material into the ground downward and laterally into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Saturated Hydraulic Conductivity (k_{SAT}, Permeability)	The volume of water that will move in a porous medium under a hydraulic gradient through a unit area. This is a function of density, structure, stratification, fines content and discontinuities. It is also a function of the properties of the liquid as well as of the porous medium.

The degree of soil compaction or in-situ density has a significant impact on soil permeability and infiltration. Based on our experience and other studies we performed, an increase in compaction results in a decrease in soil permeability.

We performed 4 Aardvark Permeameter tests at locations shown on the attached Geologic Map, Figure 2. The test borings were 8 inches in diameter. The results of the tests provide parameters regarding the saturated hydraulic conductivity and infiltration characteristics of on-site soil and geologic units. Table C-IV presents the results of the estimated field saturated hydraulic conductivity and estimated infiltration rates obtained from the Aardvark Permeameter tests. The field sheets are also attached herein. We used a factor of safety applied to the test results on the worksheet values. The designer of storm water devices should apply an appropriate factor of safety. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil. Based on a discussion in the County of Riverside *Design Handbook for Low Impact Development Best Management Practices*, the infiltration rate should be considered equal to the saturated hydraulic conductivity rate.

TABLE C-IV
FIELD PERMEAMETER INFILTRATION TEST RESULTS

Test Location	Test Depth (feet, below grade)	Geologic Unit	Field-Saturated Infiltration Rate, k_{sat} (inch/hour)	C.4-1 Worksheet Infiltration Rate[1], k_{sat} (inch/hour)
P-1	5.1	Tsc	0.249	0.125
P-2	6.8	Tsc	0.527	0.264
P-3	5.1	Tsc	0.712	0.356
P-4	5.7	Tsc	1.161	0.581
		Average:	0.662	0.332

[1] Using a factor of safety of 2.

STORM WATER MANAGEMENT CONCLUSIONS

The Geologic Map, Figure 2, depicts the existing property and the locations of the field excavations and the in-situ infiltration test locations.

Soil Types

Previously Placed Fill – We encountered previously placed fill to depths ranging from about 1½ to 45 feet from existing grade in the exploratory borings. The fill is generally less than 5 feet in depth within the southern and eastern portions of the site, and deepens within the northwest portion of the site. The fill is associated with the previous grading operations performed for the site. We expect a canyon fill exists within the northwest portion of the site. The fill is generally composed of medium dense to dense, silty sand and sandy silt. Based on the laboratory test results, the fill material at the location tested possesses a “low” to “medium” expansion potential (expansion index of 21 to 90). The previously placed fill should be considered to be highly variable on the property and within adjacent properties and right-of-ways. Previously placed fill should also be considered to possess relatively high hydroconsolidation characteristics. Water that is allowed to migrate within the previously placed fill soil cannot be controlled, would destabilize support for the existing improvements, and would shrink and swell. Therefore, full and partial infiltration should not be allowed within the previously placed fill.

Scripps Formation – We encountered Eocene-age Friars Formation underlying the previously placed fill. The Scripps Formation generally consists of dense to very dense, silty sandstone within the southern portion of the site and hard, sandy siltstone within the northern portion of the site. Scripps Formation also typically contains localized areas of highly cemented concretionary beds. The Scripps Formation materials possess a "very low" to "high" expansion potential (Expansion Index of 130 or less). The siltstone portion of the Scripps Formation is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the silty and cemented nature of the material. Therefore, full and partial infiltration should be considered infeasible within the siltstone portion of the Scripps Formation. However, partial infiltration into the sandy portions of the Scripps Formation within the southern portion of the site can be considered feasible.

Proposed Compacted Fill – Some compacted fills will be placed on the property during site improvements. The compacted fill will be comprised of on-site materials that are considered fine-grained soil. In addition, the fill will be compacted to a dry density of at least 90 percent of the laboratory maximum dry density and used to support the planned improvements. In our experience, compacted fill does not possess infiltration rates appropriate with infiltration. Compacted fill will possess swelling (expansion) potential and will support planned improvements. Therefore, full and partial infiltration should be considered infeasible.

Infiltration Rates

We performed 4 Aardvark Permeameter tests at depths ranging from approximately 5.1 to 6.8 feet within the sandy layer of the Scripps Formation within the southern portion of the site. The test results indicate the approximate infiltration rates range from approximately 0.249 to 1.161 inches per hour (0.125 to 0.581 inches per hour with an applied factor of safety of 2). The average infiltration rate with an applied factor of safety of 2 is 0.332 inches per hour. Full infiltration should be considered infeasible at the site because the average infiltration rate is less than 0.50 inches per hour. Partial infiltration is considered feasible within the southern portion of the site where sandy layers of the Scripps Formation exist near existing elevations.

Groundwater Elevations

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

New or Existing Utilities

Utilities are present on the existing property boundaries and within the existing Campus Point Drive. Full or partial infiltration should not be allowed in the areas of the utilities to help prevent potential damage/distress to improvements. Mitigation measures to prevent water from infiltrating the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners.

Existing and Planned Structures

Existing structures exist to the north and south of the site. Water should not be allowed to infiltrate in areas where it could affect the existing and neighboring properties and existing and adjacent structures, improvements and roadways. Mitigation for existing structures consists of not allowing water infiltration within a 1:1 plane from existing foundations and extending the infiltration areas at least 10 feet below the existing foundations and into formational materials.

Slopes and Other Geologic Hazards

Slopes on the north and east descend to the neighboring property and Campus Pointe Drive, respectively, with heights of 5 to 15 feet. In addition, an existing nature canyon slope with heights up to approximately 150 feet exists directly east of the adjacent Campus Point Drive. The State of California Department of Conservation Landslide Inventory (Beta) shows a single feature landslide exists approximately 300 feet of the site near the tow of the canyon slope to the east of Campus Point Drive. Table C.5-1 pf the 2016 Storm Water Standards (SWS) states *BMPs (particularly infiltration BMPs) must not be sited in areas with high potential for liquefaction or landslides to minimize earthquake/landslide risks*.

Storm Water Management Devices

Liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

Liners should be installed on the side walls of the proposed basins located at the south side of the property where geologic hazards do not exist. Liners should be installed on the sides and the bottoms of the planned storm water devices on the remaining portion of the property due to the existence of the fill materials and the dense siltstone and sloping conditions. We understand the storm water for the property will be directed to the southern basins to allow partial infiltration.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-V describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-V
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., Infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Based on our geotechnical investigation and the previous table, Table C-VI presents the estimated factor values for the evaluation of the factor of safety. This table only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

TABLE C-VI
FACTOR OF SAFETY WORKSHEET DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	2	0.50
Predominant Soil Texture	0.25	2	0.50
Site Soil Variability	0.25	3	0.75
Depth to Groundwater/ Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.00

[1] The project civil engineer should complete Worksheet D.5-1 or Form I-9 using the data on this table. Additional information is required to evaluate the design factor of safety.

Categorization of Infiltration Feasibility Condition			Worksheet C.4-1
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: We performed 4 Aardvark Permeameter tests at the site within the sandy portion of the Scripps Formation within the southern end of the site. The following presents the results of our field infiltration tests: P-1 at 5.1 feet: 0.249 inches/hour (0.125 inches/hour with FOS=2) P-2 at 6.8 feet: 0.527 inches/hour (0.264 inches/hour with FOS=2) P-3 at 5.1 feet: 0.712 inches/hour (0.356 inches/hour with FOS=2) P-4 at 5.7 feet: 1.161 inches/hour (0.581 inches/hour with FOS=2) These tests result in an average of 0.774 inches/hour (0.385 inches/hour with an applied factor of safety of 2). Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The average infiltration rate within the sandy portion of the Scripps Formation in the southern portion of the site is less than 0.5 inches/hour (with an applied factor of safety of 2), therefore, full infiltration is considered infeasible. The northwest portion of the site is underlain by greater than 5 feet of fill; therefore, full infiltration should be considered infeasible. The northern portion of the site is underlain by a cemented siltstone portion of the Scripps Formation. Cemented siltstone is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the high fine content and cemented nature of the material, therefore, full infiltration should be considered infeasible. Therefore, full infiltration should be considered infeasible at the site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We do not expect infiltration will cause water balance issues such as seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td>No Full Infiltration</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis:

We performed 4 Aardvark Permeameter tests at the site within the sandy portion of the Scripps Formation within the southern end of the site. The following presents the results of our field infiltration tests:

P-1 at 5.1 feet: 0.249 inches/hour (0.125 inches/hour with FOS=2)
P-2 at 6.8 feet: 0.527 inches/hour (0.264 inches/hour with FOS=2)
P-3 at 5.1 feet: 0.712 inches/hour (0.356 inches/hour with FOS=2)
P-4 at 5.7 feet: 1.161 inches/hour (0.581 inches/hour with FOS=2)

These tests result in an average of 0.774 inches/hour (0.385 inches/hour with an applied factor of safety of 2).

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

The average infiltration rate within the sandy portion of the Scripps Formation in the southern portion of the site is greater than 0.05 inches/hour (with an applied factor of safety of 2), therefore, partial infiltration is considered feasible.

The northwest portion of the site is underlain by greater than 5 feet of fill, therefore, partial infiltration should be considered infeasible. The northern portion of the site is underlain by a cemented siltstone portion of the Scripps Formation. Cemented siltstone is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the high fine content and cemented nature of the material, therefore, full and partial infiltration should be considered infeasible.

Therefore, partial infiltration should be considered feasible only within the southern end of the site underlain by the sandy portion of the Scripps Formation.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not provide a study regarding water rights. However, these rights are not typical in the San Diego County area.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.

If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td>Partial Infiltration</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

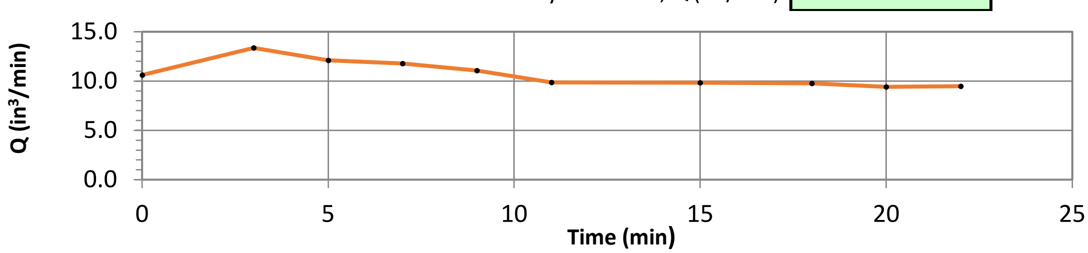
Aardvark Permeameter Data Analysis

Project Name:	9880 Campus Point Dr.	Date:	3/20/2017
Project Number:	G2099-52-01	By:	JML
Test Number:	P-1		

Borehole Diameter, d (in.):	8.00	Ref. EL (feet, MSL):	312.0
Borehole Depth, **H** (in):	61.00	Bottom EL (feet, MSL):	306.9
Distance Between Reservoir & Top of Borehole (in.):	31.00		
Estimated Depth to Water Table, **S** (feet):	100.00		
Height APM Raised from Bottom (in.):	1.00		
Pressure Reducer Used:	No		

Distance Between Resevoir and APM Float, **D** (in.):	83.75
Head Height Calculated, **h** (in.):	4.78
Head Height Measured, **h** (in.):	4.00
Distance Between Constant Head and Water Table, **L** (in.):	1143.00

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.000	0.00
2	3.00	1.150	31.846	10.615
3	2.00	0.965	26.723	13.362
4	2.00	0.875	24.231	12.115
5	2.00	0.850	23.538	11.769
6	2.00	0.800	22.154	11.077
7	4.00	1.425	39.462	9.865
8	3.00	1.065	29.492	9.831
9	2.00	0.705	19.523	9.762
10	2.00	0.680	18.831	9.415
11	3.00	1.025	28.385	9.462
12	2.00	0.675	18.692	9.346
13	2.00	0.660	18.277	9.138
14	2.00	0.000	0.000	0.000
15	2.00	0.645	17.862	8.931
16	2.00	0.645	17.862	8.931
17	2.00	0.635	17.585	8.792
18	2.00	0.675	18.692	9.346
19	3.00	0.965	26.723	8.908
20	2.00	0.635	17.585	8.792
21	2.00	0.645	17.862	8.931
22	2.00	0.630	17.446	8.723
23	2.00	0.630	17.446	8.723
24	2.00	0.625	17.308	8.654
25	2.00	0.635	17.585	8.792
26	2.00	0.620	17.169	8.585
27	2.00	0.620	17.169	8.585
28	2.00	0.235	6.508	3.254
			Steady Flow Rate, Q (in^3/min):	7.902



Soil Matric Flux Potential, Φ_m

Φ_m = 0.163 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 4.15E-03 in/min | 0.249 in/hr

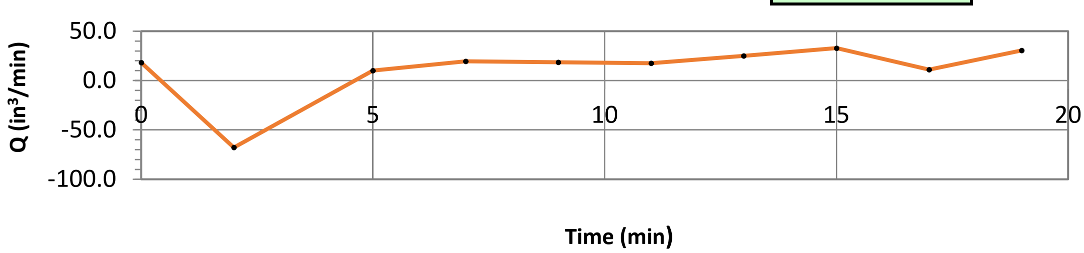
GEOCON

Aardvark Permeameter Data Analysis

Project Name:	9880 Campus Point Dr.	Date:	3/20/2017
Project Number:	G2099-52-01	By:	JML
Test Number:	P-2	Ref. EL (feet, MSL):	311.0
		Bottom EL (feet, MSL):	304.2

Borehole Diameter, d (in.):	8.00
Borehole Depth, **H** (in):	82.00
Distance Between Reservoir & Top of Borehole (in.):	31.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	1.00
Pressure Reducer Used:	No
Distance Between Resevoir and APM Float, **D** (in.):	104.75
Head Height Calculated, **h** (in.):	4.85
Head Height Measured, **h** (in.):	4.75
Distance Between Constant Head and Water Table, **L** (in.):	1122.75

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	2.00	2.410	66.74	33.369
3	3.00	3.365	93.18	31.062
4	2.00	2.080	57.60	28.800
5	2.00	0.000	0.00	0.000
6	2.00	1.845	51.09	25.546
7	2.00	1.930	53.45	26.723
8	2.00	1.835	50.82	25.408
9	2.00	1.510	41.82	20.908
10	2.00	1.490	41.26	20.631
11	3.00	-16.535	-457.89	-152.631
12	2.00	1.780	49.29	24.646
13	2.00	1.845	51.09	25.546
14	2.00	1.895	52.48	26.238
15	2.00	1.890	52.34	26.169
16	2.00	-8.000	-221.54	-110.769
17	2.00	0.970	26.86	13.431
18	2.00	1.420	39.32	19.662
19	1.00	1.355	37.52	37.523
20	3.00	1.270	35.17	11.723
21	2.00	1.315	36.42	18.208
22	3.00	-7.350	-203.54	-67.846
23	1.00	0.360	9.97	9.969
24	2.00	1.400	38.77	19.385
25	2.00	1.335	36.97	18.485
26	2.00	1.275	35.31	17.654
27	2.00	1.805	49.98	24.992
28	2.00	2.375	65.77	32.885
29	2.00	0.795	22.02	11.008
30	2.00	2.210	61.20	30.600
			Steady Flow Rate, Q (in^3/min):	18.069



Soil Matric Flux Potential, Φ_m

Φ_m= 0.346 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 8.78E-03 in/min 0.527 in/hr

GEOCON

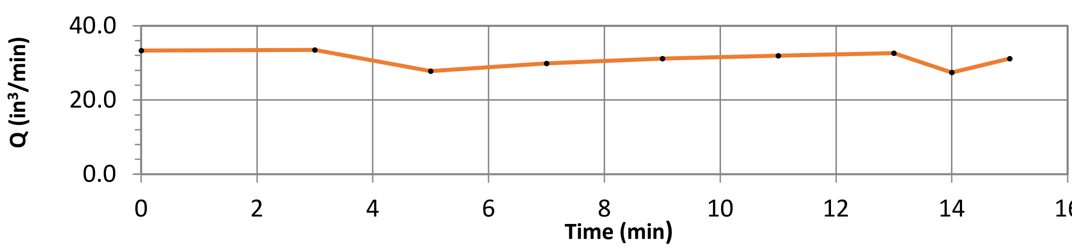
Aardvark Permeameter Data Analysis

Project Name:	9880 Campus Point Dr.	Date:	3/20/2017
Project Number:	G2099-52-01	By:	JML
Test Number:	P-3	Ref. EL (feet, MSL):	309.0
		Bottom EL (feet, MSL):	303.9

Borehole Diameter, d (in.):	8.00
Borehole Depth, **H** (in):	61.00
Distance Between Reservoir & Top of Borehole (in.):	31.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	3.00
Pressure Reducer Used:	No

Distance Between Resevoir and APM Float, **D** (in.):	81.75
Head Height Calculated, **h** (in.):	6.77
Head Height Measured, **h** (in.):	7.00
Distance Between Constant Head and Water Table, **L** (in.):	1146.00

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	3.00	6.475	179.31	59.769
3	2.00	-7.670	-212.40	-106.200
4	2.00	2.290	63.42	31.708
5	2.00	3.365	93.18	46.592
6	2.00	3.355	92.91	46.454
7	2.00	-10.240	-283.57	-141.785
8	1.00	0.985	27.28	27.277
9	1.00	0.830	22.98	22.985
10	3.00	3.690	102.18	34.062
11	2.00	2.580	71.45	35.723
12	2.00	2.750	76.15	38.077
13	2.00	-6.430	-178.06	-89.031
14	2.00	2.395	66.32	33.162
15	2.00	2.555	70.75	35.377
16	1.00	1.245	34.48	34.477
17	1.00	-7.810	-216.28	-216.277
18	2.00	1.690	46.80	23.400
19	2.00	2.300	63.69	31.846
20	2.00	2.410	66.74	33.369
21	1.00	1.210	33.51	33.508
23	2.00	2.005	55.52	27.762
24	2.00	2.160	59.82	29.908
25	1.00	1.125	31.15	31.154
26	1.00	1.155	31.98	31.985
27	1.00	1.180	32.68	32.677
29	2.00	1.980	54.83	27.415
30	3.00	3.375	93.46	31.154
			Steady Flow Rate, Q (in^3/min):	29.608



Soil Matric Flux Potential, Φ_m

Φ_m= 0.467 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 1.19E-02 in/min 0.712 in/hr

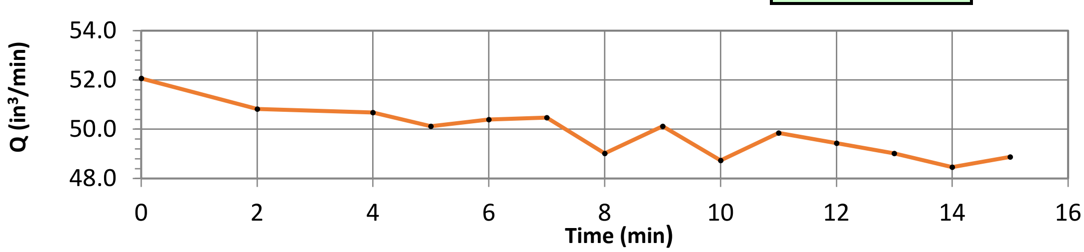
Aardvark Permeameter Data Analysis

Project Name:	9880 Campus Point Dr.	Date:	3/20/2017
Project Number:	G2099-52-01	By:	JML
Test Number:	P-4	Ref. EL (feet, MSL):	308.0
		Bottom EL (feet, MSL):	302.3

Borehole Diameter, d (in.):	8.00
Borehole Depth, **H** (in):	68.00
Distance Between Reservoir & Top of Borehole (in.):	30.50
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	3.00
Pressure Reducer Used:	No

Distance Between Resevoir and APM Float, **D** (in.):	88.25
Head Height Calculated, **h** (in.):	6.79
Head Height Measured, **h** (in.):	7.25
Distance Between Constant Head and Water Table, **L** (in.):	1139.25

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	2.00	4.755	131.68	65.838
3	2.00	3.930	108.83	54.415
4	1.00	1.955	54.14	54.138
5	1.00	1.985	54.97	54.969
6	1.00	2.025	56.08	56.077
7	1.00	-8.840	-244.80	-244.800
8	1.00	1.935	53.58	53.585
9	1.00	1.900	52.62	52.615
10	1.00	1.905	52.75	52.754
11	1.00	1.870	51.78	51.785
12	1.00	-8.780	-243.14	-243.138
13	1.00	1.880	52.06	52.062
14	1.00	1.835	50.82	50.815
15	1.00	1.830	50.68	50.677
16	1.00	1.810	50.12	50.123
17	1.00	1.820	50.40	50.400
19	2.00	3.645	100.94	50.469
20	1.00	1.770	49.02	49.015
21	1.00	1.810	50.12	50.123
22	1.00	1.760	48.74	48.738
24	1.00	1.800	49.85	49.846
25	1.00	1.785	49.43	49.431
26	2.00	3.540	98.03	49.015
27	1.00	1.750	48.46	48.462
29	1.00	1.765	48.88	48.877
30	1.00	1.700	47.08	47.077
			Steady Flow Rate, Q (in^3/min):	49.188



Soil Matric Flux Potential, ϕ_m

ϕ_m= 0.762 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 1.93E-02 in/min 1.161 in/hr

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2099-52-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

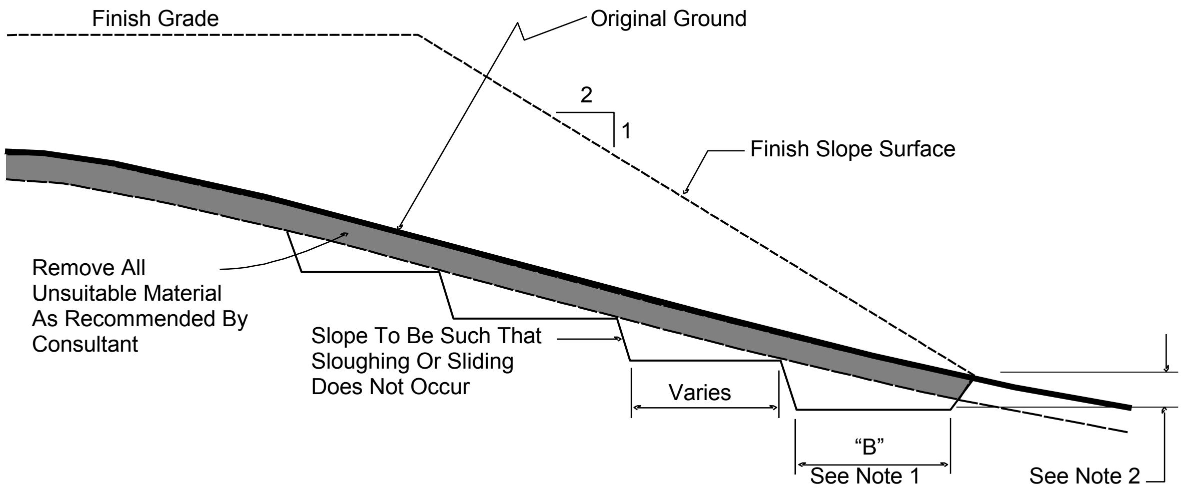
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

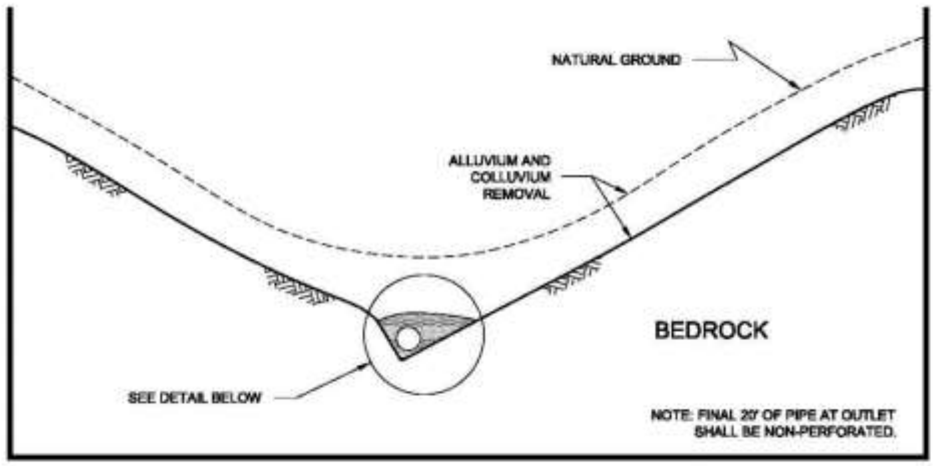
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

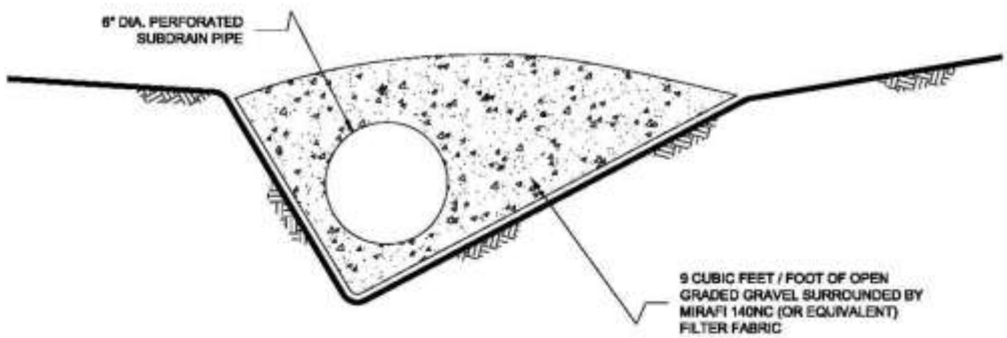
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

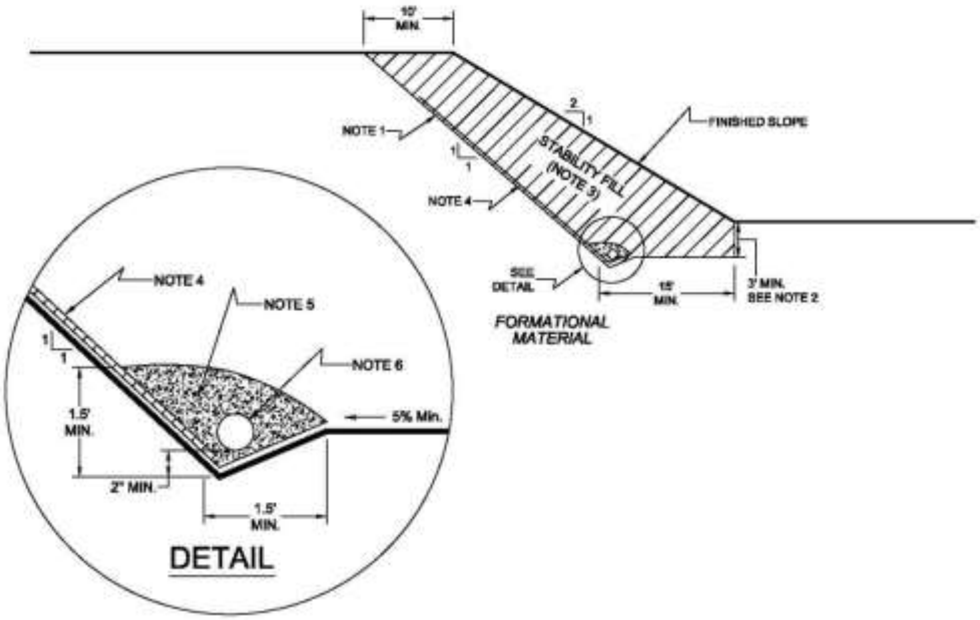
1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

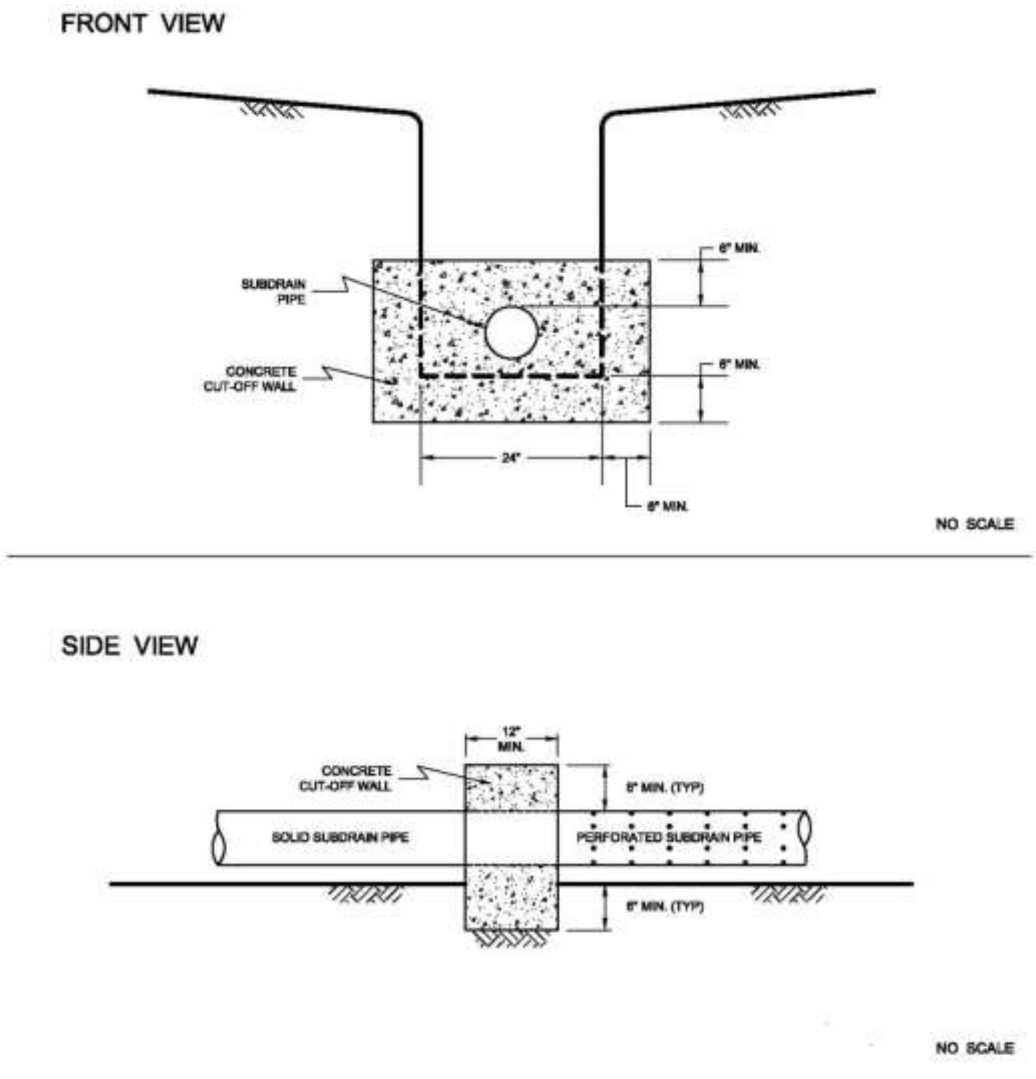
NO SCALE

7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

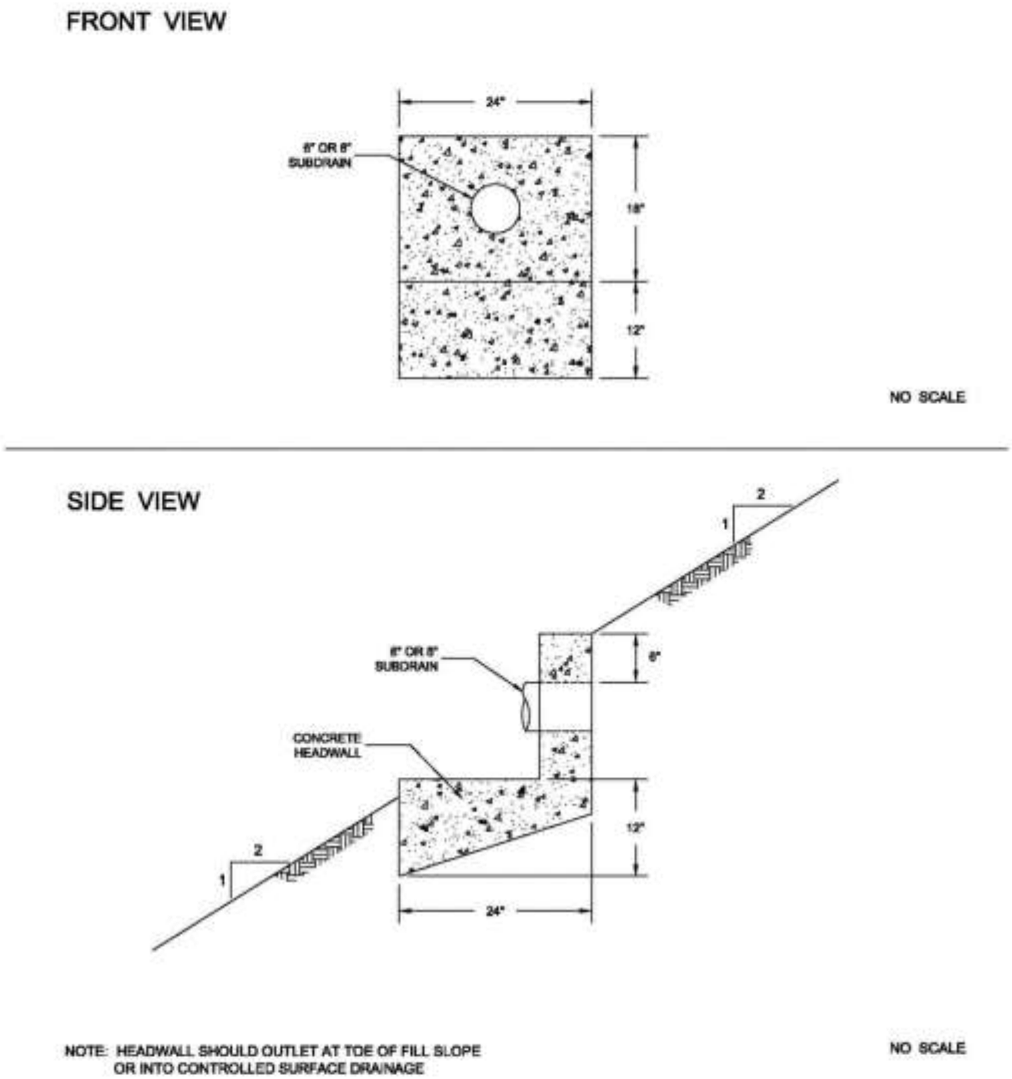
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL



7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL



7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. *2016 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2015 International Building Code,* prepared by California Building Standards Commission, dated July, 2016.

2. *ACI 318-14, Building Code Requirements for Structural Concrete* and *Commentary on Building Code Requirements for Structural Concrete,* prepared by the American Concrete Institute, dated September, 2014.

3. *ACI 330-08, Guide for the Design and Construction of Concrete Parking Lots,* American Concrete Institute, June 2008.

4. Anderson, J. G., T. K. Rockwell, and D. C. Agnew, *Past and Possible Future Earthquakes of Significance to the San Diego Region*: Earthquake Spectra, v.5, no. 2, p.299-333, 1989.

5. ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures,* Second Printing, April 6, 2011.

6. Boore, D. M., and G. M Atkinson (2008), *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 S,* Earthquake Spectra, Volume 24, Issue 1, pp. 99-138, February 2008.

7. BWE, *Preliminary Grading and Drainage Plan, 9880 Campus Point Drive, San Diego, Californi*a, Project No. 17024, undated.

8. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

9. California Emergency Management Agency, California Geological Survey, University of Southern California (2009). *Tsunami Inundation Map for Emergency Planning, State of California, County of San Diego, Point Loma Triangle, Scale 1:24,000,* dated June 1.

10. California Geological Survey, *Seismic Shaking Hazards in California*, Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years. http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

11. California Geologic Survey, State of California Earthquake Fault Zones, Point Loma Quadrangle, May 1, 2003.

12. California Geologic Survey (2008), Special Publication 117, *Guidelines For Evaluating and Mitigating Seismic Hazards in California*, Revised and Re-adopted September 11.

13. Campbell, K. W., and Y. Bozorgnia, *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s,* Preprint of version submitted for publication

in the NGA Special Volume of Earthquake Spectra, Volume 24, Issue 1, pages 139-171, February 2008.

14. Chiou, Brian S. J., and Robert R. Youngs, *A NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra*, preprint for article to be published in NGA Special Edition for Earthquake Spectra, Spring 2008.

15. *City of San Diego Seismic Safety Study, Geologic Hazards and Faults*, 2008 edition, Tile Map Sheet 34.

16. County of San Diego, *San Diego County Multi-Jurisdictional Hazard Mitigation Plan, San Diego, California – Final Draft*, July 2010.

17. Jennings, C. W., 1994, California Division of Mines and Geology, *Fault Activity Map of California and Adjacent Areas*, California Geologic Data Map Series Map No. 6.

18. Kennedy, M. P., and S. S. Tan, 2008, *Geologic Map of the San Diego 30'x60' Quadrangle, California*, USGS Regional Map Series Map No. 3, Scale 1:100,000.

19. Risk Engineering, *EZFRISK*, 2015.

20. United States Geological Survey, *2008 Interactive Deaggregations*, http://geohazards.usgs.gov/deaggint/2008/.

21. Unpublished Geotechnical Reports and Information, Geocon Incorporated.

RESPONSE TO REVIEW COMMENTS

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ALEXANDRIA REAL ESTATE EQUITIES
SAN DIEGO, CALIFORNIA

JUNE 2, 2017
PROJECT NO. G2099-52-01

Project No. G2099-52-01
June 2, 2017

Alexandria Real Estate Equities
10996 Torreyana Road, Suite 250
San Diego, California 92121

Attention: Mr. Mike Barbera

Subject: RESPONSE TO REVIEW COMMENTS
9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

References:

1. *Geotechnical Investigation, 9880 Campus Point Drive, San Diego, California,* prepared by Geocon Incorporated, dated April 18, 2017 (Project No. G2099-52-01).

2. *Preliminary Grading & Drainage Plan, 9880 Campus Point Drive, San Diego, California,* prepared by BWE, undated (Project No. 17024).

3. *LDR – Geology, Cycle Type: 3 Preliminary Review, Review Comments for 9880 Campus Point – SDP,* prepared by City of San Diego, dated May 24, 2017 (Project No. 549731).

Dear Mr. Barbera:

In accordance with the request of Mr. Jon Ohlson with DGA, we prepared this letter to address review comments provided by the City of San Diego LDR-Geology dated May 24, 2017, regarding development of the subject site. The city's comments are listed herein with the Geocon response immediately following.

Comment 3: *The project's geotechnical should delineate on the geologic map (Figure No. 2) the area(s) where partial infiltration is feasible and where storm water infiltration is considered non-feasible based on their site-specific investigation.*

Response: We updated the Geologic Map, Figure 1, that depicts the area where partial infiltration is feasible based on our findings presented in the referenced geotechnical investigation report. The areas outside this delineated area is considered an area where infiltration is non-feasible.

Comment 15: *Storm Water Requirements for the proposed conceptual development will be evaluated by LDR-Engineering review. Priority Development Projects (PDPs) may require investigation of storm water infiltration feasibility in accordance with the Storm Water Standards (including Appendix C and D). Check with your LDR-*

Engineering reviewer on requirements. LDR-Engineer may determine that LDR-Geology review of a storm water infiltration evaluation is required.

Response: Acknowledged. We performed a storm water investigation for the subject project and the results of the investigation are presented in Appendix C of the referenced geotechnical investigation report.

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

Very truly yours,

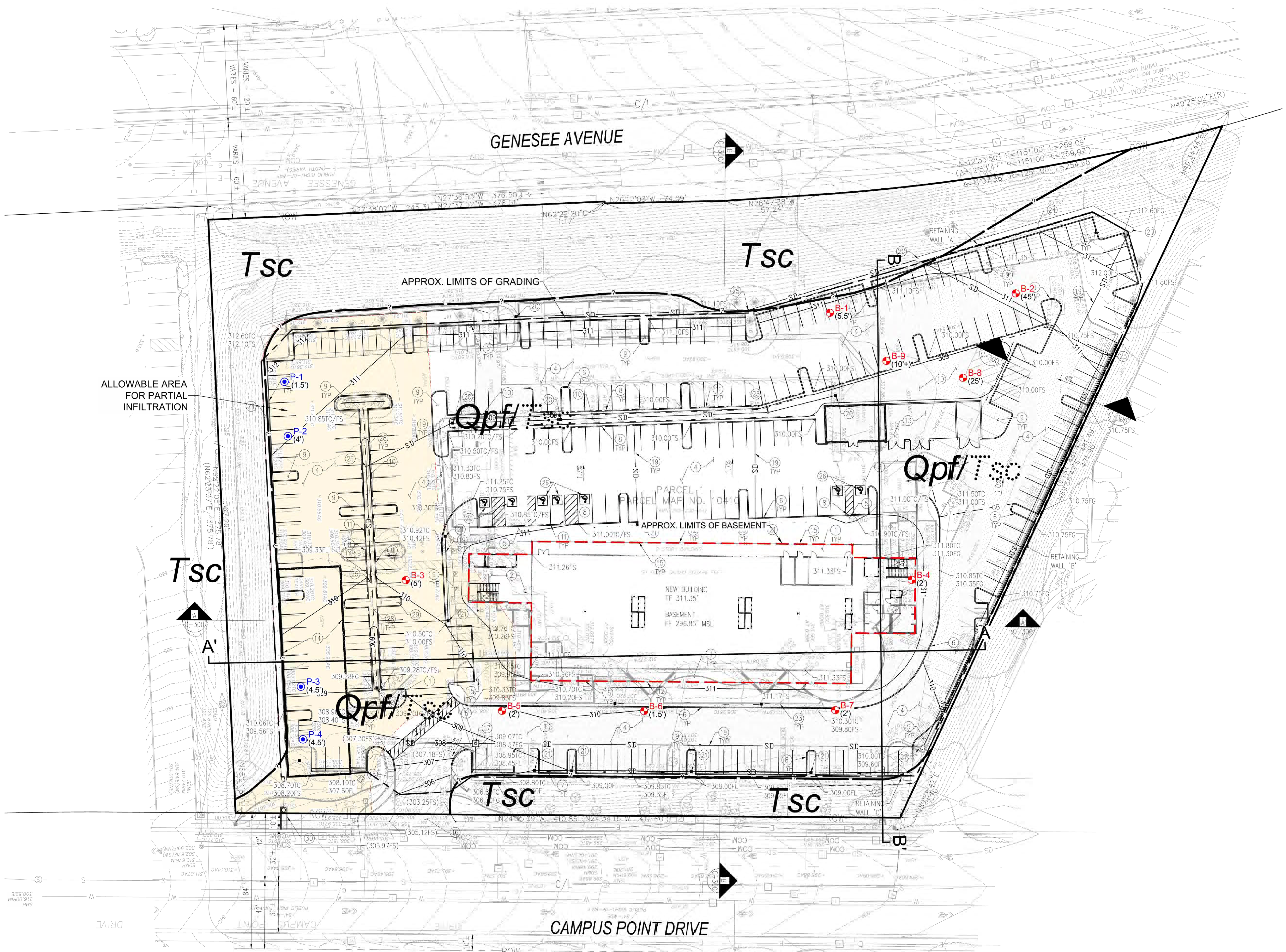
GEOCON INCORPORATED

Lilian E. Rodriguez
RCE 83227

Shawn Foy Weedon
GE 2714

LER:SFW:dmc

(e-mail) Addressee
(e-mail) BWE
Attention: Mr. Brian Saltzman



GRAPHIC SCALE

0' 15' 30' 45' 60' 90' 120'

SCALE 1"=30' (on 36x24)

GEOCON LEGEND

- Qpf ....PREVIOUSLY PLACED FILL
- Tsc ....SCRIPP FORMATION (Dotted Where Buried)
- ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- B-9 ....APPROX. LOCATION OF BORING
- P-4 ....APPROX. LOCATION OF PERMEAMETER TEST
- (45') ....APPROX. DEPTH TO SCRIPPS FORMATION (In Feet)
- B B' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION
- ....APPROX. ALLOWABLE AREA FOR PARTIAL INFILTRATION

GEOLOGIC MAP

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

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

SCALE 1" = 30'	DATE 06 - 02 - 2017		
PROJECT NO. G2099 - 52 - 01		FIGURE 1	
SHEET 1 OF 1			

Plotted:06/02/2017 2:01PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\SHEETS\G2099-52-01 Updated Geo Map.dwg

CLIMATE ACTION PLAN
CONSISTENCY CHECKLIST INTRODUCTION

In December 2015, the City adopted a Climate Action Plan (CAP) that outlines the actions that City will undertake to achieve its proportional share of State greenhouse gas (GHG) emission reductions. The purpose of the Climate Action Plan Consistency Checklist (Checklist) is to, in conjunction with the CAP, provide a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).[1]

Analysis of GHG emissions and potential climate change impacts from new development is required under CEQA. The CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the CAP.

This Checklist is part of the CAP and contains measures that are required to be implemented on a project-by-project basis to ensure that the specified emissions targets identified in the CAP are achieved. Implementation of these measures would ensure that new development is consistent with the CAP's assumptions for relevant CAP strategies toward achieving the identified GHG reduction targets. Projects that are consistent with the CAP as determined through the use of this Checklist may rely on the CAP for the cumulative impacts analysis of GHG emissions. Projects that are not consistent with the CAP must prepare a comprehensive project-specific analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in this Checklist to the extent feasible. Cumulative GHG impacts would be significant for any project that is not consistent with the CAP.

The Checklist may be updated to incorporate new GHG reduction techniques or to comply with later amendments to the CAP or local, State, or federal law.

[1] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

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CAP CONSISTENCY CHECKLIST SUBMITTAL APPLICATION

- The Checklist is required only for projects subject to CEQA review.[2]
- If required, the Checklist must be included in the project submittal package. Application submittal procedures can be found in Chapter 11: Land Development Procedures of the City's Municipal Code.
- The requirements in the Checklist will be included in the project's conditions of approval.
- The applicant must provide an explanation of how the proposed project will implement the requirements described herein to the satisfaction of the Planning Department.

Application Information

Contact Information

Project No./Name: ARE 9880 Campus Point Drive

Property Address: 9880 Campus Point Drive

Applicant Name/Co.: Jon Ohlson - DGA Architects

Contact Phone: 619.685.3990 Contact Email: johlson@dga-MV.com

Was a consultant retained to complete this checklist? ☐ Yes ☐ No If Yes, complete the following

Consultant Name: ______ Contact Phone: ______

Company Name: ______ Contact Email: ______

Project Information

1. What is the size of the project (acres)? 4.642 Acres
2. Identify all applicable proposed land uses:
   - ☐ Residential (indicate # of single-family units):
   - ☐ Residential (indicate # of multi-family units):
   - ☐ Commercial (total square footage):
   - ■ Industrial (total square footage): 82,190 Gross Square Feet, 102,649 S.F. w/ Basem't
   - ☐ Other (describe):
3. Is the project or a portion of the project located in a Transit Priority Area? ☐ Yes ☐ No
4. Provide a brief description of the project proposed:

The proposed project involves the demolition of an existing Class B, 72,818 gross square foot, two story, concrete tilt up building that was constructed in 1986 prior to the implementation of the University Community Plan and has not been upgraded. The new building will be a 5-story over basement, Class A, 82,190 gross square foot, steel framed building, designed to meet the needs of current research and development facilities, be energy efficient, conform to current Green Building Standards and Climate Action Plan requirements of the City of San Diego.

[2] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

CAP CONSISTENCY CHECKLIST QUESTIONS

Step 1: Land Use Consistency

The first step in determining CAP consistency for discretionary development projects is to assess the project's consistency with the growth projections used in the development of the CAP. This section allows the City to determine a project's consistency with the land use assumptions used in the CAP.

Step 1: Land Use Consistency		
Checklist Item (Check the appropriate box and provide explanation and supporting documentation for your answer)	Yes	No
A. Is the proposed project consistent with the existing General Plan and Community Plan land use and zoning designations?;[3] OR, B. If the proposed project is not consistent with the existing land use plan and zoning designations, and includes a land use plan and/or zoning designation amendment, would the proposed amendment result in an increased density within a Transit Priority Area (TPA)[4] and implement CAP Strategy 3 actions, as determined in Step 3 to the satisfaction of the Development Services Department?; OR, C. If the proposed project is not consistent with the existing land use plan and zoning designations, does the project include a land use plan and/or zoning designation amendment that would result in an equivalent or less GHG-intensive project when compared to the existing designations?	☑	☐

If "***Yes***," proceed to Step 2 of the Checklist. For question B above, complete Step 3. For question C above, provide estimated project emissions under both existing and proposed designation(s) for comparison. Compare the maximum buildout of the existing designation and the maximum buildout of the proposed designation.

If "***No***," in accordance with the City's Significance Determination Thresholds, the project's GHG impact is significant. The project must nonetheless incorporate each of the measures identified in Step 2 to mitigate cumulative GHG emissions impacts unless the decision maker finds that a measure is infeasible in accordance with CEQA Guidelines Section 15091. Proceed and complete Step 2 of the Checklist.

The proposed re-development of the subject property, and it's use is consistent with the requirements of the University Community Plan and City of San Diego Municipal Code for the proposed Research and Development use. The propsed use is located in the IP-1-1 Industrial Zone, Subarea 10 of the University Community Plan.

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[3] This question may also be answered in the affirmative if the project is consistent with SANDAG Series 12 growth projections, which were used to determine the CAP projections, as determined by the Planning Department.

[4] This category applies to all projects that answered in the affirmative to question 3 on the previous page: Is the project or a portion of the project located in a transit priority area.

Step 2: CAP Strategies Consistency

The second step of the CAP consistency review is to review and evaluate a project's consistency with the applicable strategies and actions of the CAP. Step 2 only applies to development projects that involve permits that would require a certificate of occupancy from the Building Official or projects comprised of one and two family dwellings or townhouses as defined in the California Residential Code and their accessory structures.[5] All other development projects that would not require a certificate of occupancy from the Building Official shall implement Best Management Practices for construction activities as set forth in the Greenbook (for public projects).

Step 2: CAP Strategies Consistency			
Checklist Item (Check the appropriate box and provide explanation for your answer)	Yes	No	N/A
Strategy 1: Energy & Water Efficient Buildings			
1. *Cool/Green Roofs*. • Would the project include roofing materials with a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under California Green Building Standards Code (Attachment A)?; OR • Would the project roof construction have a thermal mass over the roof membrane, including areas of vegetated (green) roofs, weighing at least 25 pounds per square foot as specified in the voluntary measures under California Green Building Standards Code?; OR • Would the project include a combination of the above two options? Check "N/A" only if the project does not include a roof component. The project will include roofing materials having a minimum 3 year solar reflectance of 0.63 or better, thermal emittance of 0.75 or better or solar reflectance Index of 75 or better per Table 1.	☑	☐	☐

[5] Actions that are not subject to Step 2 would include, for example: 1) discretionary map actions that do not propose specific development, 2) permits allowing wireless communication facilities, 3) special events permits, 4) use permits or other permits that do not result in the expansion or enlargement of a building (e.g., decks, garages, etc.), and 5) non-building infrastructure projects such as roads and pipelines. Because such actions would not result in new occupancy buildings from which GHG emissions reductions could be achieved, the items contained in Step 2 would not be applicable.

2. *Plumbing fixtures and fittings* With respect to plumbing fixtures or fittings provided as part of the project, would those low-flow fixtures/appliances be consistent with each of the following: Residential buildings: • Kitchen faucets: maximum flow rate not to exceed 1.5 gallons per minute at 60 psi; • Standard dishwashers: 4.25 gallons per cycle; • Compact dishwashers: 3.5 gallons per cycle; and • Clothes washers: water factor of 6 gallons per cubic feet of drum capacity? Nonresidential buildings: • Plumbing fixtures and fittings that do not exceed the maximum flow rate specified in Table A5.303.2.3.1 (voluntary measures) of the California Green Building Standards Code (See Attachment A); and • Appliances and fixtures for commercial applications that meet the provisions of Section A5.303.3 (voluntary measures) of the California Green Building Standards Code (See Attachment A)? Check "N/A" only if the project does not include any plumbing fixtures or fittings. The plumbing fixtures for this project will meet the maximum flow rates: Shower Heads 1.8 gpm @ 80 psi, Lavatory Faucets 0.35 gpm @ 60 psi, Kitchen Faucets 1.6 gpm @ 60 psi, Flushometer Valve Water Closets 1.12 gal / flush, Wall Mounted Urinals 0.11 gal / flush, Undercounter Dishwashers 0.86 gal / rack (high temp.) and 1.19 gal / rack (low temp.) per Table 2.	☑	☐	☐

Strategy 3: Bicycling, Walking, Transit & Land Use			
3. *Electric Vehicle Charging* • Multiple-family projects of 17 dwelling units or less: Would 3% of the total parking spaces required, or a minimum of one space, whichever is greater, be provided with a listed cabinet, box or enclosure connected to a conduit linking the parking spaces with the electrical service, in a manner approved by the building and safety official, to allow for the future installation of electric vehicle supply equipment to provide electric vehicle charging stations at such time as it is needed for use by residents? • Multiple-family projects of more than 17 dwelling units: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use by residents? • Non-residential projects: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use? Check "N/A" only if the project is a single-family project or would not require the provision of listed cabinets, boxes, or enclosures connected to a conduit linking the parking spaces with electrical service, e.g., projects requiring fewer than 10 parking spaces. This industrial type building (Research and Development), is below the CAP threshold since, it will have fewer than 1000 employees, is less than 40 acres of land and is less than 650,000 s.f of gross floor area, per the trigger level requirements of Table 4. However, the project will provide 16 (6% of total parking) with Electrical Vehicle capable charging station spaces and will provide 8 (3% of total parking) with installed Electrical Vehicle Charging Stations. Rough-in for future charging stations will meet the California Green Building Code mandatory requirements.	☑	☐	☐

Strategy 3: Bicycling, Walking, Transit & Land Use (Complete this section if project includes non-residential or mixed uses)			
4. *Bicycle Parking Spaces* Would the project provide more short- and long-term bicycle parking spaces than required in the City's Municipal Code (Chapter 14, Article 2, Division 5)?[6] Check "N/A" only if the project is a residential project. The proposed project will provide 16 long term and 14 short term bicycle parking on-site per the requirements of the Municipal Code and the California Green Building Standards. The project will also offer a Bikeshare Program to employees of the new building to encourage biking for short commutes within the community.	☑	☐	☐

[6] Non-portable bicycle corrals within 600 feet of project frontage can be counted towards the project's bicycle parking requirements.

5. *Shower facilities*

If the project includes nonresidential development that would accommodate over 10 tenant occupants (employees), would the project include changing/shower facilities in accordance with the voluntary measures under the California Green Building Standards Code as shown in the table below?

Number of Tenant Occupants (Employees)	Shower/Changing Facilities Required	Two-Tier (12" X 15" X 72") Personal Effects Lockers Required
0-10	0	0
11-50	1 shower stall	2
51-100	1 shower stall	3
101-200	1 shower stall	4
Over 200	1 shower stall plus 1 additional shower stall for each 200 additional tenant-occupants	1 two-tier locker plus 1 two-tier locker for each 50 additional tenant-occupants

Check "N/A" only if the project is a residential project, or if it does not include nonresidential development that would accommodate over 10 tenant occupants (employees).

☑	☐	☐

The project will comply with the California Green Building Standards Code as well as the Municipal code in providing shower facilities. The project will supply 2 showers/changing facilities. The project will have fewer than 400 occupants.

6. *Designated Parking Spaces*

If the project includes a nonresidential use in a TPA, would the project provide designated parking for a combination of low-emitting, fuel-efficient, and carpool/vanpool vehicles in accordance with the following table?

Number of Required Parking Spaces	Number of Designated Parking Spaces
0-9	0
10-25	2
26-50	4
51-75	6
76-100	9
101-150	11
151-200	18
201 and over	At least 10% of total

This measure does not cover electric vehicles. See Question 4 for electric vehicle parking requirements.

☑ ☐ ☐

Note: Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces. The required designated parking spaces are to be provided within the overall minimum parking requirement, not in addition to it.

Check "N/A" only if the project is a residential project, or if it does not include nonresidential use in a TPA.

Designated Parking: The proposed project will provide and designate 28 (10.3% of the total parking)as a combination of low-emitting, fuel efficient, and carpool/vanpool, as priority parking spaces.

7. *Transportation Demand Management Program* If the project would accommodate over 50 tenant-occupants (employees), would it include a transportation demand management program that would be applicable to existing tenants and future tenants that includes: At least one of the following components: • Parking cash out program • Parking management plan that includes charging employees market-rate for single-occupancy vehicle parking and providing reserved, discounted, or free spaces for registered carpools or vanpools • Unbundled parking whereby parking spaces would be leased or sold separately from the rental or purchase fees for the development for the life of the development And at least three of the following components: • Commitment to maintaining an employer network in the SANDAG iCommute program and promoting its RideMatcher service to tenants/employees • On-site carsharing vehicle(s) or bikesharing • Flexible or alternative work hours • Telework program • Transit, carpool, and vanpool subsidies • Pre-tax deduction for transit or vanpool fares and bicycle commute costs • Access to services that reduce the need to drive, such as cafes, commercial stores, banks, post offices, restaurants, gyms, or childcare, either onsite or within 1,320 feet (1/4 mile) of the structure/use? Check "N/A" only if the project is a residential project or if it would not accommodate over 50 tenant-occupants (employees). The proposed project proposes to implement the following components: 1. A parking management plan charging employees market rate for single occupancy vehicles will be requested of the future tenants. 2. Bulletin boards in central locations, which encourage alternative transportation programs. 3. Request tenants implement telecommute and staggered work hours to avoid peak hour traffic. 4. Bike Lockers and bike parking will be provided onsite. 5. Offer transit passes for employees who don't use parking at a 25% discount. 6. Offer a bikeshare program to employees of tenants as a short commute alternative for activities such as going out for lunch, gyms, stores, cafes, etc. 7. Encourage participation in the SANDAG iCommute program or equivalent.	☑	☐	☐

Step 3: Project CAP Conformance Evaluation (if applicable)

The third step of the CAP consistency review only applies if Step 1 is answered in the affirmative under option B. The purpose of this step is to determine whether a project that is located in a TPA but that includes a land use plan and/or zoning designation amendment is nevertheless consistent with the assumptions in the CAP because it would implement CAP Strategy 3 actions. In general, a project that would result in a reduction in density inside a TPA would not be consistent with Strategy 3.The following questions must each be answered in the affirmative and fully explained.

1. **Would the proposed project implement the General Plan's City of Villages strategy in an identified Transit Priority Area (TPA) that will result in an increase in the capacity for transit-supportive residential and/or employment densities?**

   Considerations for this question:
   - Does the proposed land use and zoning designation associated with the project provide capacity for transit-supportive residential densities within the TPA?
   - Is the project site suitable to accommodate mixed-use village development, as defined in the General Plan, within the TPA?
   - Does the land use and zoning associated with the project increase the capacity for transit-supportive employment intensities within the TPA?

2. **Would the proposed project implement the General Plan's Mobility Element in Transit Priority Areas to increase the use of transit?**

   Considerations for this question:
   - Does the proposed project support/incorporate identified transit routes and stops/stations?
   - Does the project include transit priority measures?

3. **Would the proposed project implement pedestrian improvements in Transit Priority Areas to increase walking opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system provide multiple and direct pedestrian connections and accessibility to local activity centers (such as transit stations, schools, shopping centers, and libraries)?
   - Does the proposed project urban design include features for walkability to promote a transit supportive environment?

4. **Would the proposed project implement the City of San Diego's Bicycle Master Plan to increase bicycling opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system include bicycle improvements consistent with the Bicycle Master Plan?
   - Does the overall project circulation system provide a balanced, multimodal, "complete streets" approach to accommodate mobility needs of all users?

5. **Would the proposed project incorporate implementation mechanisms that support Transit Oriented Development?**

   Considerations for this question:
   - Does the proposed project include new or expanded urban public spaces such as plazas, pocket parks, or urban greens in the TPA?
   - Does the land use and zoning associated with the proposed project increase the potential for jobs within the TPA?
   - Do the zoning/implementing regulations associated with the proposed project support the efficient use of parking through mechanisms such as: shared parking, parking districts, unbundled parking, reduced parking, paid or time-limited parking, etc.?

6. **Would the proposed project implement the Urban Forest Management Plan to increase urban tree canopy coverage?**

   Considerations for this question:
   - Does the proposed project provide at least three different species for the primary, secondary and accent trees in order to accommodate varying parkway widths?
   - Does the proposed project include policies or strategies for preserving existing trees?
   - Does the proposed project incorporate tree planting that will contribute to the City's 20% urban canopy tree coverage goal?

CLIMATE ACTION PLAN CONSISTENCY CHECKLIST
ATTACHMENT A

This attachment provides performance standards for applicable Climate Action Pan (CAP) Consistency Checklist measures.

Table 1 Roof Design Values for Question 1: Cool/Green Roofs supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan

Land Use Type	Roof Slope	Minimum 3-Year Aged Solar Reflectance	Thermal Emittance	Solar Reflective Index
Low-Rise Residential	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
High-Rise Residential Buildings, Hotels and Motels	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
Non-Residential	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 residential and non-residential voluntary measures shown in Tables A4.106.5.1 and A5.106.11.2.2, respectively. Roof installation and verification shall occur in accordance with the CALGreen Code.

CALGreen does not include recommended values for low-rise residential buildings with roof slopes of ≤ 2:12 for San Diego's climate zones (7 and 10). Therefore, the values for climate zone 15 that covers Imperial County are adapted here.

Solar Reflectance Index (SRI) equal to or greater than the values specified in this table may be used as an alternative to compliance with the aged solar reflectance values and thermal emittance.

Table 2	Fixture Flow Rates for Non-Residential Buildings related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan
Fixture Type	**Maximum Flow Rate**
Showerheads	1.8 gpm @ 80 psi
Lavatory Faucets	0.35 gpm @60 psi
Kitchen Faucets	1.6 gpm @ 60 psi
Wash Fountains	1.6 [rim space(in.)/20 gpm @ 60 psi]
Metering Faucets	0.18 gallons/cycle
Metering Faucets for Wash Fountains	0.18 [rim space(in.)/20 gpm @ 60 psi]
Gravity Tank-type Water Closets	1.12 gallons/flush
Flushometer Tank Water Closets	1.12 gallons/flush
Flushometer Valve Water Closets	1.12 gallons/flush
Electromechanical Hydraulic Water Closets	1.12 gallons/flush
Urinals	0.5 gallons/flush

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Tables A5.303.2.3.1 and A5.106.11.2.2, respectively. See the California Plumbing Code for definitions of each fixture type.

Where complying faucets are unavailable, aerators rated at 0.35 gpm or other means may be used to achieve reduction.

Acronyms:
gpm = gallons per minute
psi = pounds per square inch (unit of pressure)
in. = inch

Table 3	**Standards for Appliances and Fixtures for Commercial Application related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan**	
Appliance/Fixture Type	**Standard**	
Clothes Washers	Maximum Water Factor (WF) that will reduce the use of water by 10 percent below the California Energy Commissions' WF standards for commercial clothes washers located in Title 20 of the *California Code of Regulations.*	
Conveyor-type Dishwashers	0.70 maximum gallons per rack (2.6 L) (High-Temperature)	0.62 maximum gallons per rack (4.4 L) (Chemical)
Door-type Dishwashers	0.95 maximum gallons per rack (3.6 L) (High-Temperature)	1.16 maximum gallons per rack (2.6 L) (Chemical)
Undercounter-type Dishwashers	0.90 maximum gallons per rack (3.4 L) (High-Temperature)	0.98 maximum gallons per rack (3.7 L) (Chemical)
Combination Ovens	Consume no more than 10 gallons per hour (38 L/h) in the full operational mode.	
Commercial Pre-rinse Spray Valves (manufactured on or after January 1, 2006)	Function at equal to or less than 1.6 gallons per minute (0.10 L/s) at 60 psi (414 kPa) and • Be capable of cleaning 60 plates in an average time of not more than 30 seconds per plate. • Be equipped with an integral automatic shutoff. • Operate at static pressure of at least 30 psi (207 kPa) when designed for a flow rate of 1.3 gallons per minute (0.08 L/s) or less.	

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Section A5.303.3. See the California Plumbing Code for definitions of each appliance/fixture type.

Acronyms:
L = liter
L/h = liters per hour
L/s = liters per second
psi = pounds per square inch (unit of pressure)
kPa = kilopascal (unit of pressure)

The City of San Diego

PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR

9880 Campus Point Drive

ENGINEER OF WORK:

REGISTERED PROFESSIONAL ENGINEER
THOMAS R EAGLING
No. C75897
CIVIL
STATE OF CALIFORNIA

Thomas R. Eagling, P.E. #75897
Provide Wet Signature and Stamp Above Line

PREPARED FOR:

Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, CA 92121
858.368.4158

PREPARED BY:

BWE

BWE Inc.
9449 Balboa Avenue, Suite 270
San Diego, CA 92123
619.299.5550

DATE:

July 31, 2017

Approved by: City of San Diego Date

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TABLE OF CONTENTS

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ACRONYMS

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

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CERTIFICATION PAGE

Project Name: 9880 Campus Point Drive
Permit Application Number:

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

____
Engineer of Work's Signature, PE Number & Expiration Date

Thomas R. Eagling, P.E. #75897
Print Name

BWE Inc
Company

July 31, 2017
Date

REGISTERED PROFESSIONAL ENGINEER
THOMAS R EAGLING
No. C75897
CIVIL
STATE OF CALIFORNIA

Engineer's Stamp

BWE

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Project Name: 9880 Campus Point Drive

SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Changes
1	4/14/17	◉ Preliminary Design/Planning/CEQA ○ Final Design	Initial Submittal
2	6/5/17	◉ Preliminary Design/Planning/CEQA ○ Final Design	Re-Submittal per plan check commentsl
3	7/31/17	◉ Preliminary Design/Planning/CEQA ○ Final Design	Third Submittal
4		◉ Preliminary Design/Planning/CEQA ○ Final Design	

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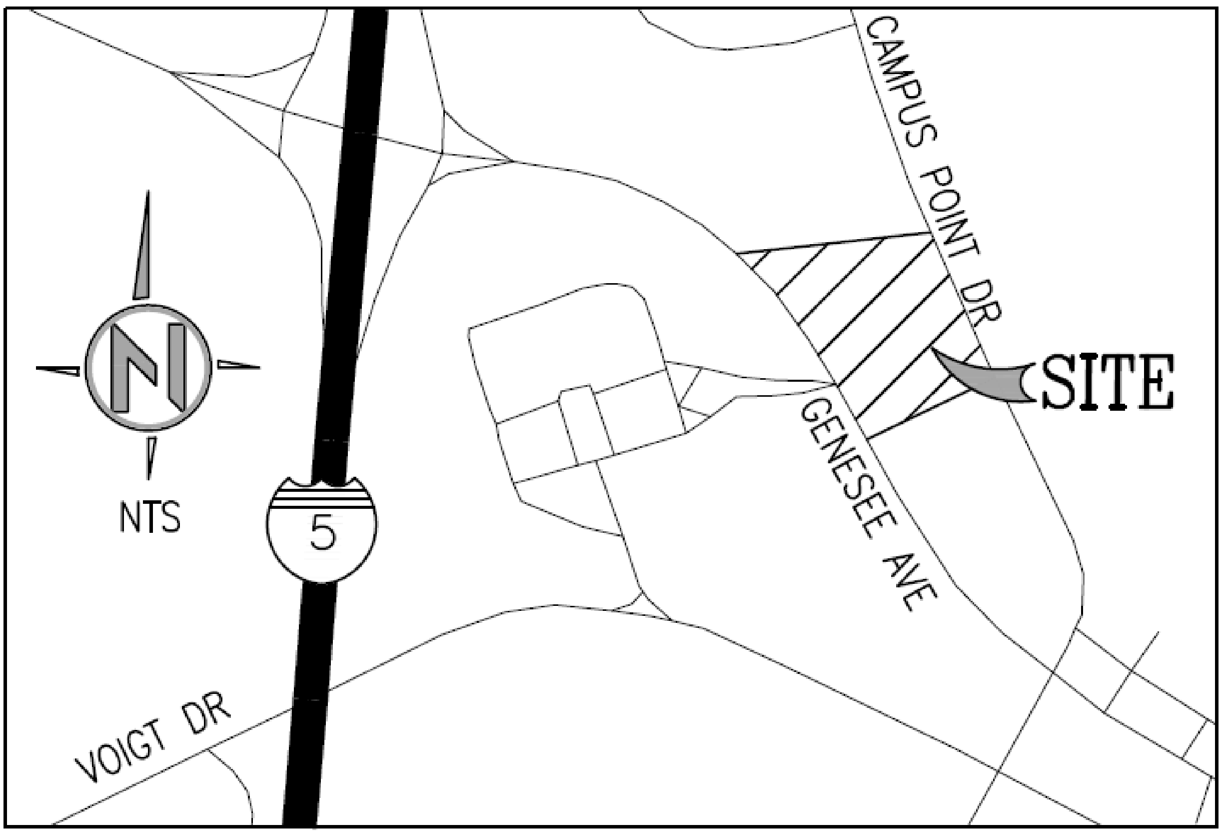
PROJECT VICINITY MAP

Project Name: 9880 Campus Point Drive
Permit Application Number:



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City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM DS-560
OCTOBER 2016

Project Address: 9880 Campus Point Dr., San Diego, CA 92121	Project Number *(for City Use Only)*:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runoff?

   ☐ Yes; WPCP required, skip 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

   ☐ Yes; WPCP required, skip 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?

   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☒ If you checked "Yes" for question 1, **a SWPPP is REQUIRED. Continue to PART B**

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3, **a WPCP is REQUIRED.** If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all questions 1-3, and checked "Yes" for question 4 PART B **does not apply and no document is required. Continue to Section 2.**

1. More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**

a. Projects located in the ASBS watershed.

2. ☐ **High Priority**

a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.

b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ **Medium Priority**

a. Projects 1 acre or more but not subject to an ASBS or high priority designation.

b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**

a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes ☐ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes ☐ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes ☐ No

Clear Page 2

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If “yes” was checked for any questions in Part D, continue to Part F and check the box labeled “PDP Exempt.”

If “no” was checked for all questions in Part D, continue to Part E.

1. **Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**
   - **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
   - **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
   - **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

   ☐ Yes; PDP exempt requirements apply ☐ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ☐ Yes; PDP exempt requirements apply ☐ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If “yes” is checked for any number in PART E, continue to PART F and check the box labeled “Priority Development Project”.

If “no” is checked for every number in PART E, continue to PART F and check the box labeled “Standard Development Project”.

1.	**New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☐ Yes ☒ No
2.	**Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☒ Yes ☐ No
3.	**New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface.	☐ Yes ☒ No
4.	**New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater.	☒ Yes ☐ No
5.	**New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	☒ Yes ☐ No
6.	**New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☐ Yes ☒ No

Clear Page 3

7.	**New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).	☒ Yes ☐ No
8.	**New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	☐ Yes ☐ No
9.	**New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	☐ Yes ☐ No
10.	**Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces.	☐ Yes ☐ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1.	The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**.	☐
2.	The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
3.	The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
4.	The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management	☐

Tom Eagling — Name of Owner or Agent *(Please Print)*

Principal Associate — Title

[signature] — Signature

06/05/2017 — Date

Clear Page 4

Clear Form

<table>
<tr><td colspan="2">Applicability of Permanent, Post-Construction Storm Water BMP Requirements
(Storm Water Intake Form for all Development Permit Applications)</td><td>**Form I-1**</td></tr>
<tr><td colspan="3">Project Identification</td></tr>
<tr><td colspan="3">Project Name: 9880 Campus Point Drive</td></tr>
<tr><td colspan="2">Permit Application Number:</td><td>Date: 7/31/17</td></tr>
<tr><td colspan="3">Determination of Requirements</td></tr>
<tr><td colspan="3">The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short <u>summary</u> of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop".
Refer to Part 1 of Storm Water Standards sections and/or separate forms referenced in each step below.</td></tr>
<tr><td>Step</td><td>Answer</td><td>Progression</td></tr>
<tr><td rowspan="2">Step 1: Is the project a "development project"?
See Section 1.3 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</td><td>☑ Yes</td><td>Go to Step 2.</td></tr>
<tr><td>☐ No</td><td>Stop.
Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.</td></tr>
<tr><td colspan="3">Discussion / justification if the project is <u>not</u> a "development project" (e.g., the project includes <u>only</u> interior remodels within an existing building):</td></tr>
<tr><td rowspan="3">Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions?
To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) <u>in its entirety</u> for guidance, AND complete Storm Water Requirements Applicability Checklist.</td><td>☐ Standard Project</td><td>Stop.
Standard Project requirements apply.</td></tr>
<tr><td>☑ PDP</td><td>PDP requirements apply, including PDP SWQMP.
Go to Step 3.</td></tr>
<tr><td>☐ PDP Exempt</td><td>Stop.
Standard Project requirements apply.
Provide discussion and list any additional requirements below.</td></tr>
<tr><td colspan="3">Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:</td></tr>
</table>

Project Name: 9880 Campus Point Drive

Form I-1 Page 2		
Step	**Answer**	**Progression**
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	○ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	◉ No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	○ No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	○ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply:		

Project Name: 9880 Campus Point Drive

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	9880 Campus Point Drive
Project Address	9880 Campus Point Drive, San Diego, CA 92093
Assessor's Parcel Number(s) (APN(s))	343-230-44
Permit Application Number	
Project Watershed	Select One: ○ San Dieguito River ◉ Penasquitos ○ Mission Bay ○ San Diego River ○ San Diego Bay ○ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal paces (9XX.XX)	Miramar Reservoir - 906.10
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	4.50 Acres (195,845 Square Feet)
Area to be disturbed by the project (Project Footprint)	4.50 Acres (195,845 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	2.64 Acres (116,597 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	1.86 Acres (79,248 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition.	-8.9 %

Form I-3B Page 2 of 11
Description of Existing Site Condition and Drainage Patterns
Current Status of the Site (select all that apply): ☒ Existing development ☐ Previously graded but not built out ☐ Agricultural or other non-impervious use ☐ Vacant, undeveloped/natural Description / Additional Information: The site contains an existing building and parking areas surrounded by landscaped slopes.
Existing Land Cover Includes (select all that apply): ☒ Vegetative Cover ☐ Non-Vegetated Pervious Areas ☒ Impervious Areas Description / Additional Information: Existing land cover includes vegetated slopes, landscaped parking islands, a building, and parking areas.
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐ NRCS Type A ☐ NRCS Type B ☒ NRCS Type C ☒ NRCS Type D
Approximate Depth to Groundwater (GW): ○ GW Depth < 5 feet ○ 5 feet < GW Depth < 10 feet ○ 10 feet < GW Depth < 20 feet ◉ GW Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☐ Watercourses ☐ Seeps ☐ Springs ☐ Wetlands ☒ None Description / Additional Information: There are no existing natural hydrologic features on site.

Form I-3B Page 3 of 11
Description of Existing Site Topography and Drainage:
How is storm water runoff conveyed from the site? At a minimum, this description should answer: 1. Whether existing drainage conveyance is natural or urban; 2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site; 3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels; 4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.
Description / Additional Information:
1. The existing drainage conveyance is urban. 2. No offsite runoff is conveyed through the project site. 3. The existing site contains a building and parking areas surrounded by vegetated slopes. The site generally drains to the north. The western half of the site flows to a ribbon-gutter which flows north through the parking area before entering a storm drain. The southern portion of the site flows through the driveway to the east, along the Campus Drive gutter, and into a storm drain. The northern and eastern portions of the site flow via gutters to the northeastern corner of the site, where they enter a storm drain system. The storm drains discharge to an unnamed canyon and flow to the Pacific Ocean by way of Soledad Canyon, and Los Penasquitos Lagoon. 4. The existing site discharges at two Points of Compliance (POCs). POC #1 is at the northeastern corner of the site, and POC #2 is at the northern edge of the driveway on campus Point Drive.

Project Name: 9880 Campus Point Drive

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The proposed development includes a building, landscaped areas, asphalt parking areas, concrete sidewalks, and a loading dock.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Proposed impervious features include asphalt and concrete parking areas, sidewalks, and a loading dock.
List/describe proposed pervious features of the project (e.g., landscape areas): Proposed pervious features include landscaped areas around the building and parking areas, and two biofiltration basins.
Does the project include grading and changes to site topography? ◉ Yes ○ No Description / Additional Information: The project will include changes to grading, but the Points of Compliance will remain the same as in the existing condition.

Project Name: 9880 Campus Point Drive

Form I-3B Page 5 of 11

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

◉ Yes

○ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Description / Additional Information:

DMA #1 contains northwestern portion of the parking areas. This DMA drains to a biofiltration basin for pollutant control (BMP #1) and then to an underground vault (BMP #6) for hydromodification control.

DMA #2 contains the western portion of the parking area and flows to a biofiltration basin (BMP #2) for pollutant control. The underground vault (BMP #6) provides hydromodification control.

DMA #3 contains parking areas and the western half of the proposed building. This DMA drains to the Biofiltration Basin (BMP #3) for pollutant control and then the underground vault (BMP #6) for hydromodification control.

DMA #4 is the southern parking area. This area drains to a Biofiltration with Partial Retention Basin (BMP #4) for pollutant and hydromodification control, and then to BMP #6 for additional hydromodification control.

DMA #5 is a parking area south of the proposed building, and DMA#6 contrain the eatern portion of the building. These DMAs drains to a Modular Wetland System (BMP #5) for pollutant control and the underground vault (BMP #6) for hydromodification control.

DMA #8 is a steep, ramp portion of the parking area. This DMA drains to Campus Point Drive. Pollutant and hydromodification control are accounted for and offset by the BMP #4.

DMAs #7, #9, #10, #11 consist of the vegetated slopes surrounding the disturbed project area. These DMAs contain less than 5% impervious cover, are hydraulically disconnected from other areas, and will be planted with native or drought tolerant species. Therefore, these areas are considered self-mitigating per Section 5.2.1 of the BMP Manual.

DMA #12 the portion of the site's driveway adjacent to Campus Point Drive. This DMA is 250 SF and considered a De Minimis Area for pollutant and hydromodification control purposes.

	Drainage Area (acres)		50 Yr Flow (cfs)			
	Existing Condition	Proposed Condition	Existing Condition	Proposed Condition	Mitigated Condition	% Change
POC #1	3.77	0.95	9.42	2.34	2.34	-75.2
POC #2	0.72	3.54	1.97	8.10	5.45	176.6
Total	4.49	4.49	11.39	10.44	7.79	-31.6

Form I-3B Page 6 of 11

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

☒ On-site storm drain inlets
☒ Interior floor drains and elevator shaft sump pumps
☐ Interior parking garages
☐ Need for future indoor & structural pest control
☒ Landscape/Outdoor Pesticide Use
☐ Pools, spas, ponds, decorative fountains, and other water features
☐ Food service
☐ Refuse areas
☐ Industrial processes
☐ Outdoor storage of equipment or materials
☐ Vehicle and Equipment Cleaning
☐ Vehicle/Equipment Repair and Maintenance
☐ Fuel Dispensing Areas
☒ Loading Docks
☐ Fire Sprinkler Test Water
☒ Miscellaneous Drain or Wash Water
☒ Plazas, sidewalks, and parking lots
☐ Large Trash Generating Facilities
☐ Animal Facilities
☐ Plant Nurseries and Garden Centers
☐ Automotive-related Uses

Description / Additional Information:

Project Name: 9880 Campus Point Drive

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) The project discharges to an unnamed which flows to Soledad Canyon. The canyon converges with Los Penasquitos Lagoon and then the Pacific Ocean.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations. Soledad Canyon: AGR, COLD, IND, REC1, REC2, WARM, WILD Los Penasquitos Lagoon: BIOL, EST, MAR, MIGR, RARE, REC1, REC2, SHELL, WILD Pacific Ocean: AQUA, BIOL, COMM, IND, MAR, MIGR, NAV, RARE, REC1, REC2, SHELL, SPWN, WILD
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations. There are no ASBS receiving water bodies downstream of the project.
Provide distance from project outfall location to impaired or sensitive receiving waters. Soledad Canyon is 0.8 Miles north (impaired for Sediment Toxicity and Selenium)
Sumarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands The project's post-construction BMPs are approximately 100 feet west of a Multi-Habitat Planning Area (MHPA).

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs/ WQIP Highest Priority Pollutant
Soledad Canyon	Sediment Toxicity, Selenium	Total Coliform
Los Penasquitos Lagoon	Sedimentation/Siltation	Total Coliform
Pacific Ocean Shoreline	Total Coliform	Total Coliform

Identification of Project Site Pollutants*

*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6):

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	○	○	◉
Nutrients	○	◉	○
Heavy Metals	○	○	◉
Organic Compounds	◉	○	○
Trash & Debris	○	◉	○
Oxygen Demanding Substances	○	◉	○
Oil & Grease	○	◉	○
Bacteria & Viruses	○	○	◉
Pesticides	◉	○	○

Form I-3B Page 9 of 11
Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)? ◉ Yes, hydromodification management flow control structural BMPs required. ○ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. ○ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. ○ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides. Description / Additional Information (to be provided if a 'No' answer has been selected above):
Critical Coarse Sediment Yield Areas* *This Section only required if hydromodification management requirements apply
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint? ○ Yes ◉ No, No critical coarse sediment yield areas to be protected based on WMAA maps Discussion / Additional Information: No CCSYAs are located on the project site.

Form I-3B Page 10 of 11
Flow Control for Post-Project Runoff* *This Section only required if hydromodification management requirements apply
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit. The project drains to two Points of Compliance (POCs) in both the existing and proposed conditions. POC #1 is at the northeastern corner of the site, and POC #2 is at the northern edge of the driveway on campus Point Drive.
Has a geomorphic assessment been performed for the receiving channel(s)? ◉ No, the low flow threshold is 0.1Q2 (default low flow threshold) ○ Yes, the result is the low flow threshold is 0.1Q2 ○ Yes, the result is the low flow threshold is 0.3Q2 ○ Yes, the result is the low flow threshold is 0.5Q2 If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11
Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

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Project Name: 9880 Campus Point Drive

Source Control BMP Checklist for All Development Projects			Form I-4
Source Control BMPs			
All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.			
Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	◉ Yes	○ No	○ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	◉ Yes	○ No	○ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	○ Yes	○ No	◉ N/A
Discussion / justification if SC-3 not implemented: No outdoor material storage areas are proposed.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	○ Yes	○ No	◉ N/A
Discussion / justification if SC-4 not implemented: No outdoor work areas are proposed.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	◉ Yes	○ No	○ N/A
Discussion / justification if SC-5 not implemented:			

Project Name: 9880 Campus Point Drive

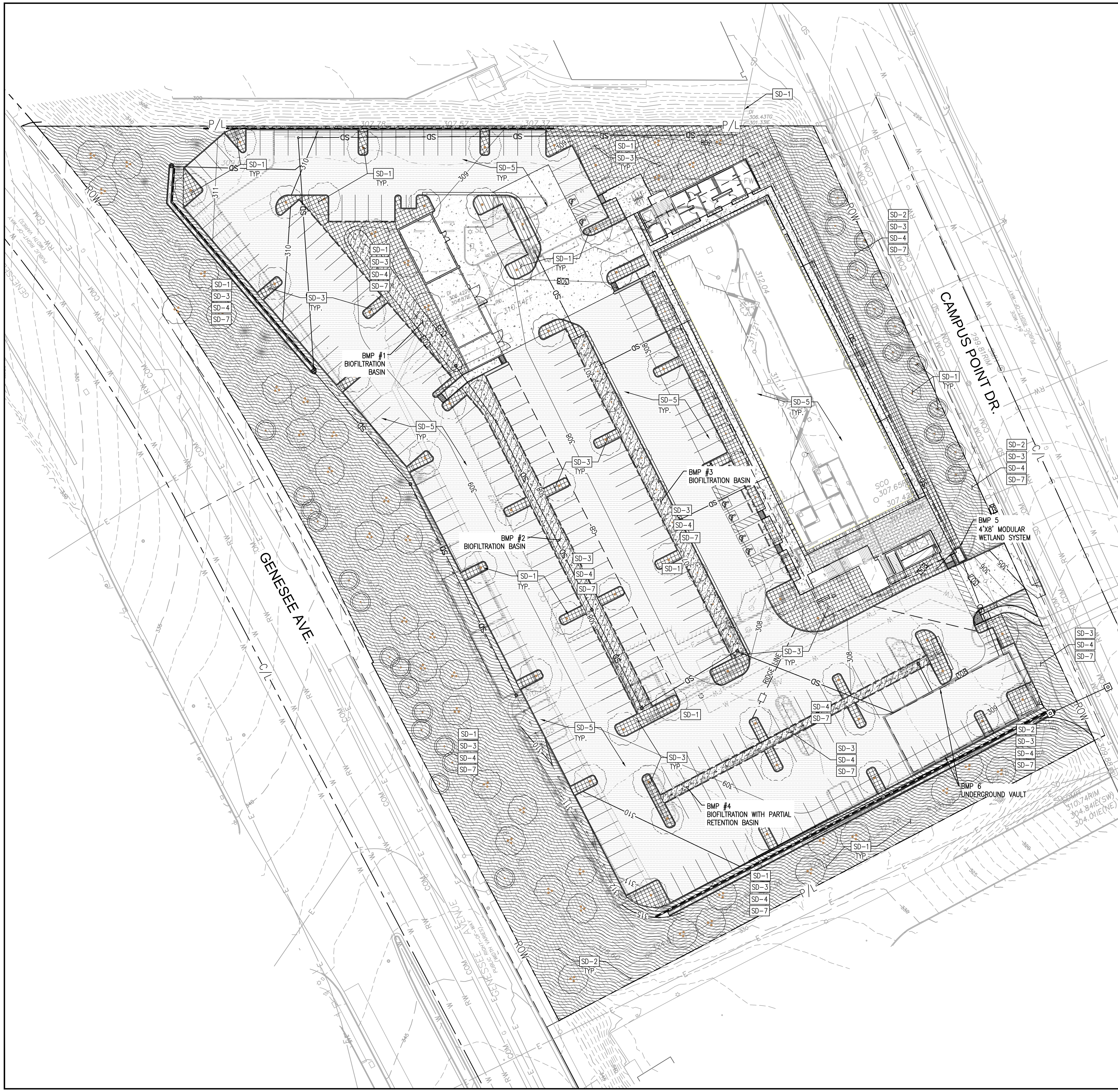
Form I-4 Page 2 of 2			
Source Control Requirement	Applied?		
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	◉ Yes	○ No	○ N/A
Interior floor drains and elevator shaft sump pumps	◉ Yes	○ No	○ N/A
Interior parking garages	○ Yes	○ No	◉ N/A
Need for future indoor & structural pest control	○ Yes	○ No	◉ N/A
Landscape/Outdoor Pesticide Use	◉ Yes	○ No	○ N/A
Pools, spas, ponds, decorative fountains, and other water features	○ Yes	○ No	◉ N/A
Food service	○ Yes	○ No	◉ N/A
Refuse areas	○ Yes	○ No	◉ N/A
Industrial processes	○ Yes	○ No	◉ N/A
Outdoor storage of equipment or materials	○ Yes	○ No	◉ N/A
Vehicle/Equipment Repair and Maintenance	○ Yes	○ No	◉ N/A
Fuel Dispensing Areas	○ Yes	○ No	◉ N/A
Loading Docks	○ Yes	○ No	◉ N/A
Fire Sprinkler Test Water	○ Yes	○ No	◉ N/A
Miscellaneous Drain or Wash Water	◉ Yes	○ No	○ N/A
Plazas, sidewalks, and parking lots	◉ Yes	○ No	○ N/A
SC-6A: Large Trash Generating Facilities	○ Yes	○ No	◉ N/A
SC-6B: Animal Facilities	○ Yes	○ No	◉ N/A
SC-6C: Plant Nurseries and Garden Centers	○ Yes	○ No	◉ N/A
SC-6D: Automotive-related Uses	○ Yes	○ No	◉ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

Site Design BMP Checklist for All Development Projects	Form I-5		
Site Design BMPs			
All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided. A site map with implemented site design BMPs must be included at the end of this checklist.			
Site Design Requirement	Applied?		
SD-1 Maintain Natural Draiange Pathways and Hydrologic Features	○ Yes	○ No	◉ N/A
Discussion / justification if SD-1 not implemented: No natural hydrologic features exist on site. Existing discharge locations will be maintained in the proposed condition.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	○ Yes	○ No	◉ N/A
1-2 Are street trees implemented? If yes, are they shown on the site map?	◉ Yes	○ No	○ N/A
1-3 Implemented street trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	○ Yes	◉ No	○ N/A
1-4 Is street tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	○ Yes	◉ No	○ N/A
SD-2 Have natural areas, soils and vegetation been conserved?	◉ Yes	○ No	○ N/A
Discussion / justification if SD-2 not implemented: The surrounding slopes will be hydroseeded with trees and drought tolerant plants.			

Form I-5 Page 2 of 4			
Site Design Requirement	Applied?		
SD-3 Minimize Impervious Area	◉ Yes	○ No	○ N/A
Discussion / justification if SD-3 not implemented: Landscaped parking islands were incorporated to minimize the parking lot's impervious area.			
SD-4 Minimize Soil Compaction	◉ Yes	○ No	○ N/A
Discussion / justification if SD-4 not implemented: Soil compaction will be restricted near structural BMPs.			
SD-5 Impervious Area Dispersion	◉ Yes	○ No	○ N/A
Discussion / justification if SD-5 not implemented: A ~15ft landscape strip separated the proposed building and sidewalk from the northeastern parking area.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	○ Yes	◉ No	
5-2 Does the pervious area satisfy the design criteria in SD-5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	◉ Yes	○ No	
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and SD-5 Fact Sheet in Appendix E?	○ Yes	◉ No	

Form I-5 Page 3 of 4			
Site Design Requirement	Applied?		
SD-6 Runoff Collection	○ Yes	◉ No	○ N/A
Discussion / justification if SD-6 not implemented: Storm water management is integrated with landscape design to promote runoff collection, infiltration, and minimize the transport of runoff & pollutants from the source. Roof downspouts as well as other impervious areas are disconnected and directed into adjacent landscape area for this purpose. Permeable pavement option for runoff collection is not implemented in the current design.			
6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	○ Yes	○ No	◉ N/A
6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	○ Yes	○ No	◉ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map?	○ Yes	○ No	◉ N/A
6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	○ Yes	○ No	◉ N/A
SD-7 Landscaping with Native or Drought Tolerant Species	◉ Yes	○ No	○ N/A
Discussion / justification if SD-7 not implemented: Landscaped areas will be planted with native or drought tolerant species.			
SD-8 Harvesting and Using Precipitation	○ Yes	○ No	◉ N/A
Discussion / justification if SD-8 not implemented: The site's DCV is significantly lower than the 36-hour demand from toilet and irrigation use, and therefore harvest and use is not feasible.			
8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	○ Yes	○ No	◉ N/A
8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	○ Yes	○ No	◉ N/A

Form I-5 Page 4 of 4
Insert Site Map with all site design BMPs identified:
The Site Map is shown on the next page



15 0 30 60
SCALE IN FEET
1 inch = 30 ft.

LEGEND

AC PAVEMENT	
CONCRETE PAVEMENT	
CONC UNIT PAVERS	
TRUNCATED DOMES	
LANDSCAPE AREA	
BIORETENTION AREA	
HYDROSEED SLOPE PER LANDSCAPE PLANTING PLAN	
PROPOSED TREE PER LANDSCAPE PLANTING PLAN	
CONC BROW DITCH	

SITE DESIGN BMPs

- SD-1 MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES, IMPLEMENT STREET TREES
- SD-2 CONSERVE NATURAL AREAS INCLUDING EXISTING TREES, OTHER VEGETATION, AND SOILS
- SD-3 MINIMIZE IMPERVIOUS AREA
- SD-4 MINIMIZE SOIL COMPACTION
- SD-5 IMPERVIOUS AREA DISPERSION
- SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

NOTES

1. SITE DESIGN BMPs SD-6 AND SD-8 DO NOT APPLY TO THIS PROJECT AS DESCRIBED IN FORM I-5 OF THE SWQMP.

BWE
WWW.BWESD.COM
619.299.5550

SYM	DESCRIPTION	DATE	APPR

ISSUE DATE: 07/31/2017
DRAWN BY: MDS
CHECKED BY: MGC
BWE JOB NUMBER: 12836U.1.00
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

SHEET TITLE
SITE MAP
SHEET 1 OF 1

PROJECT
9880 CAMPUS POINT DRIVE
SAN DIEGO, CA

SITE ADDRESS
9880 CAMPUS POINT DRIVE
SAN DIEGO, CA 92093

PLOT: M:\PROJECTS\12500\12836U.1.00 9880 CAMPUS POINT DRIVE\DWGS\EXHIBITS\SWQMP\12836U.1.00-SITE-STRM.DWG Malcolm D. Smith 7/31/2017 9:09 AM

Project Name: 9880 Campus Point Drive

Summary of PDP Structural BMPs	Form I-6
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual). Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).	
Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate. Storm Water Pollutant Control BMP Selection Flow Charts (Figure 5-1 and 5-2) of the City of San Diego BMP Design Manual are utilized to select and size the pollutant control BMPs for this project. A feasibility study of all retention based BMPs (harvest and use, full and/or partial infiltration) is performed prior to selecting the biofiltration BMP to comply with the pollutant control requirements. It is determined that the harvest and use of precipitation is infeasible because the site has a low water demand for toilet use and irrigation (>25% DCV). A Design Capture Volume (DCV) of 4500 cubic-feet is calculated considering the 85th percentile, 24-hr rainfall depth of 0.51" for this site. Biofiltration Basins (BF-1) are proposed to provide pollutant control for DMAs #1-#3. These BMPs are lined, and the required retention volume is provided in the underground vault (BMP #6) Biofiltration with Partial Retention BMP (PR-1): BMP #4 provides pollutant and hydromodification control for DMA #4. This BMP is unlined and the underdrain is raised 3" above the bottom of aggregate to provide retention. A Proprietary Biofiltration BMP (BMP #5) is proposed to treat DMAs #5 and #6 due to space constraints. BMP 3 is a 4'X8' Modular Wetland System unit. An Underground Vault (BMP #6) is proposed to provide hydromodification control for the entire site. This BMP's outlet is raised 0.5' from the vault bottom, to incorporate the retention volume not provided in BMPs #1-#3. (Continue on page 2 as necessary.)	

Form I-6 Page 2 of X
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1) Click or tap here to enter text.

<table>
<tr><th colspan="2">Form I-6 Page 3 of 14</th></tr>
<tr><th colspan="2">Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)</th></tr>
<tr><td colspan="2">Structural BMP ID No. 1</td></tr>
<tr><td colspan="2">Construction Plan Sheet No. C-100, C-300</td></tr>
<tr><td colspan="2">Type of structural BMP:
☐Retention by harvest and use (HU-1)
☐Retention by infiltration basin (INF-1)
☐Retention by bioretention (INF-2)
☐Retention by permeable pavement (INF-3)
☐Partial retention by biofiltration with partial retention (PR-1)
☒Biofiltration (BF-1)
☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐Detention pond or vault for hydromodification management
☐Other (describe in discussion section below)</td></tr>
<tr><td colspan="2">Purpose:
☒Pollutant control only
☐Hydromodification control only
☐Combined pollutant control and hydromodification control
☐Pre-treatment/forebay for another structural BMP
☐Other (describe in discussion section below)</td></tr>
<tr><td>Who will certify construction of this BMP?
Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the manual)</td><td>BWE/Tom Eagling
9449 Balboa Avenue, Suite 270
San Diego, CA 92123
619-299-5550</td></tr>
<tr><td>Who will be the final owner of this BMP?</td><td>Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, CA 92121</td></tr>
<tr><td>Who will maintain this BMP into perpetuity?</td><td>Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, CA 92121</td></tr>
<tr><td>What is the funding mechanism for maintenance?</td><td>To be determined</td></tr>
<tr><td colspan="2">Discussion (as needed):

BMP #1 is a Biofiltration Basin (BF-1). The required retention volume is provided in BMP #6.

Provided Treatment Area=1000 SF
Ponding Depth=6 IN</td></tr>
</table>

Form I-6 Page 4 of 14
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**
Structural BMP ID No. 1
Construction Plan Sheet No. C-100, C-300
Discussion (as needed):

Project Name: 9880 Campus Point Drive

Form I-6 Page 3 of 14	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. 2	
Construction Plan Sheet No. C-100, C-300	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☒Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☒Pollutant control only ☐Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the manual)	BWE/Tom Eagling 9449 Balboa Avenue, Suite 270 San Diego, CA 92123 619-299-5550
Who will be the final owner of this BMP?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
Who will maintain this BMP into perpetuity?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
What is the funding mechanism for maintenance?	To be determined
Discussion (as needed): BMP #2 is a Biofiltration Basin (BF-1). The required retention volume is provided in BMP #6. Provided Treatment Area=1870 SF Ponding Depth=6 IN	

Form I-6 Page 4 of 14
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**
Structural BMP ID No. 2
Construction Plan Sheet No. C-100, C-300
Discussion (as needed):

<table>
<tr><th colspan="2">Form I-6 Page 3 of 14</th></tr>
<tr><th colspan="2">Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)</th></tr>
<tr><td colspan="2">Structural BMP ID No. 3</td></tr>
<tr><td colspan="2">Construction Plan Sheet No. C-100, C-300</td></tr>
<tr><td colspan="2">Type of structural BMP:
☐Retention by harvest and use (HU-1)
☐Retention by infiltration basin (INF-1)
☐Retention by bioretention (INF-2)
☐Retention by permeable pavement (INF-3)
☐Partial retention by biofiltration with partial retention (PR-1)
☒Biofiltration (BF-1)
☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐Detention pond or vault for hydromodification management
☐Other (describe in discussion section below)</td></tr>
<tr><td colspan="2">Purpose:
☒Pollutant control only
☐Hydromodification control only
☐Combined pollutant control and hydromodification control
☐Pre-treatment/forebay for another structural BMP
☐Other (describe in discussion section below)</td></tr>
<tr><td>Who will certify construction of this BMP?
Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the manual)</td><td>BWE/Tom Eagling
9449 Balboa Avenue, Suite 270
San Diego, CA 92123
619-299-5550</td></tr>
<tr><td>Who will be the final owner of this BMP?</td><td>Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, CA 92121</td></tr>
<tr><td>Who will maintain this BMP into perpetuity?</td><td>Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, CA 92121</td></tr>
<tr><td>What is the funding mechanism for maintenance?</td><td>To be determined</td></tr>
<tr><td colspan="2">Discussion (as needed):

BMP #1 is a Biofiltration Basin (BF-1). The required retention volume is provided in BMP #6.

Provided Treatment Area=1500 SF
Ponding Depth=6 IN</td></tr>
</table>

Form I-6 Page 4 of 14
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**
Structural BMP ID No. 3
Construction Plan Sheet No. C-100, C-300
Discussion (as needed):

Form I-6 Page 3 of 14	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. 4	
Construction Plan Sheet No. C-100, C-300	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☒Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☒Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the manual)	BWE/Tom Eagling 9449 Balboa Avenue, Suite 270 San Diego, CA 92123 619-299-5550
Who will be the final owner of this BMP?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
Who will maintain this BMP into perpetuity?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
What is the funding mechanism for maintenance?	To be determined
Discussion (as needed): BMP #4 is a Biofiltration with Partial Retention Basin. Volume= 890 CF Ponding Depth=6 IN Orifice Diameter=1.0 IN Orifice Height=3 IN	

Form I-6 Page 4 of 14
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**
Structural BMP ID No. 4
Construction Plan Sheet No. C-100, C-300
Discussion (as needed):

Form I-6 Page 3 of 14	
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. 5	
Construction Plan Sheet No. C-100, C-300	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☒Other (describe in discussion section below)	
Purpose: ☒Pollutant control only ☐Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the manual)	BWE/Tom Eagling 9449 Balboa Avenue, Suite 270 San Diego, CA 92123 619-299-5550
Who will be the final owner of this BMP?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
Who will maintain this BMP into perpetuity?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
What is the funding mechanism for maintenance?	To be determined
Discussion (as needed): BMP #4 is a 4'x8' proprietary Modular Wetland System Unit which provides pollutant control. The required retention volume is provided in BMP #6.	

Form I-6 Page 4 of 14
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**
Structural BMP ID No. 5
Construction Plan Sheet No. C-100, C-300
Discussion (as needed):

Form I-6 Page 3 of 14	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. 6	
Construction Plan Sheet No. C-100, C-300	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☒Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the manual)	BWE/Tom Eagling 9449 Balboa Avenue, Suite 270 San Diego, CA 92123 619-299-5550
Who will be the final owner of this BMP?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
Who will maintain this BMP into perpetuity?	Alexandria Real Estate Equities, Inc. 10996 Torreyana Road, Suite 250 San Diego, CA 92121
What is the funding mechanism for maintenance?	To be determined
Discussion (as needed): BMP #4 is an underground retention vault. The low-flow orifice is raised 0.5' above the vault bottom to ensure the minimum required volume is retained. Volume = 11150 CF. Orifice size=1.15 IN Orifice Height = 6 IN	

Form I-6 Page 4 of 14
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**
Structural BMP ID No. 6
Construction Plan Sheet No. C-100, C-300
Discussion (as needed):

City of San Diego
Development Services
1222 First Ave., MS-501
San Diego, CA 92101

Permanent BMP Construction
Self Certification Form

FORM DS-563
December 2016

Date Prepared:	Project No./Drawing No.:
Project Applicant:	Phone:
Project Address: 9880 Campus Point Dr., San Diego, CA 92121	
Project Name:	

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Standards Manual documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for Priority Development Projects in order to comply with the City's Storm Water ordinances and applicable San Diego Regional MS4 Permit. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

Certification:
As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control, hydromodification, and treatment control BMP's required per the Storm Water Standards Manual; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and San Diego Regional MS4 Permit.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: ______________________

Date of Signature: ______________________

Printed Name: ______________________

Title: Principal Associate

Phone No. ______________________

Engineer's Stamp

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ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

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Project Name: **9880 Campus Point Drive**

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	◉ Included on DMA Exhibit in Attachment 1a ○ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	◉ Included ○ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	◉ Included ○ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☒ Included

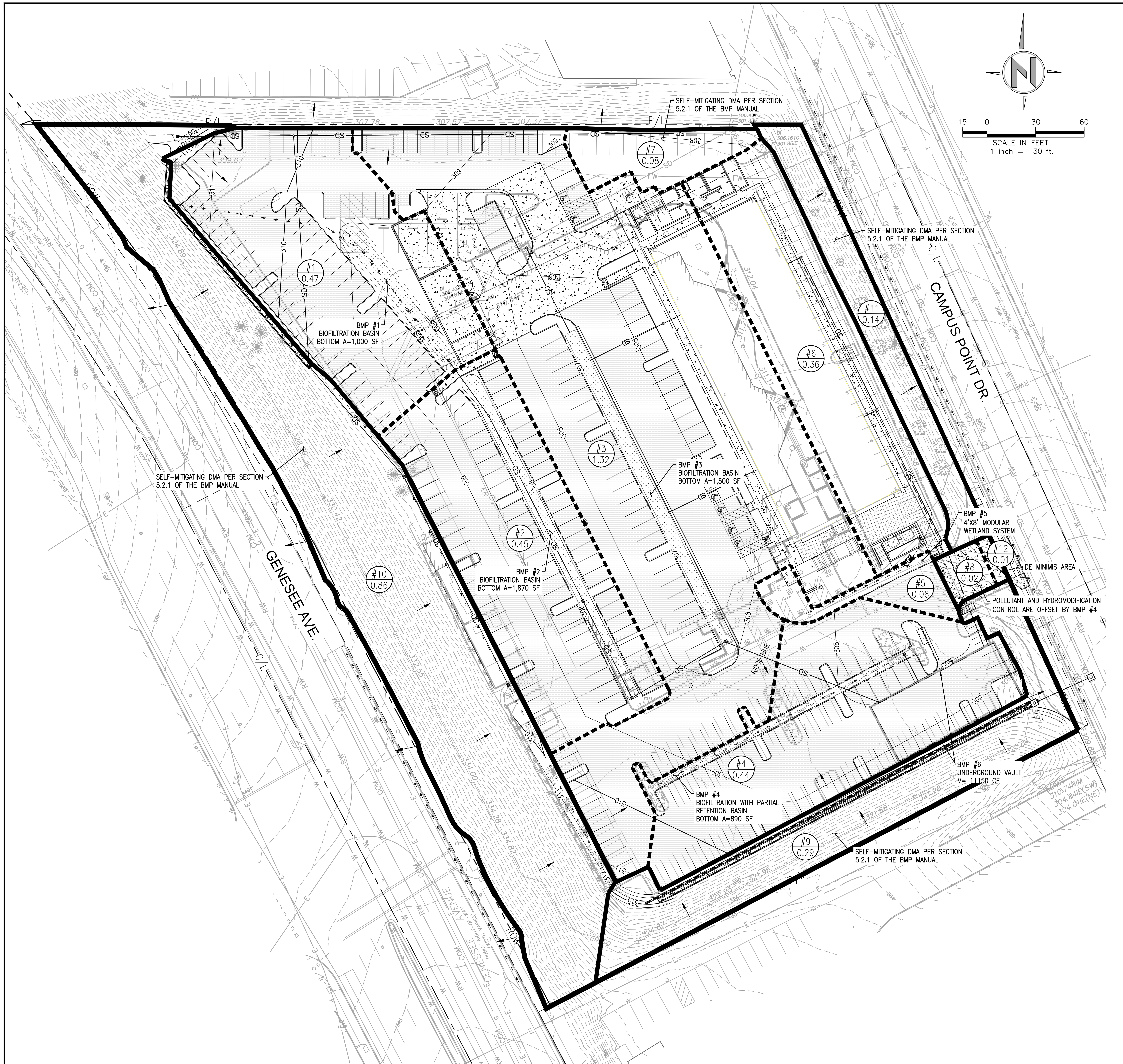
Project Name: 9880 Campus Point Drive

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography and impervious areas
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☐ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
☒ Structural BMPs (identify location, type of BMP, and size/detail)

ATTACHMENT 1a:
DMA EXHIBIT



LEGEND

DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY

DMA DESIGNATION & AREA (AC) — #1 X.X

PROPERTY BOUNDARY — P/L

FLOW DIRECTION

EXISTING STORM DRAIN — SD

NEW STORM DRAIN — SD

AC PAVEMENT

CONCRETE PAVEMENT

CONC UNIT PAVERS

TRUNCATED DOMES

LANDSCAPE AREA

STORMWATER TREATMENT AREA

HYDROSEED SLOPE PER LANDSCAPE PLANTING PLAN

PROPOSED TREE PER LANDSCAPE PLANTING PLAN

CONC BROW DITCH

NOTES

1 SOIL UNDERLYING THE SITE IS COMPRISED OF HYDROLOGIC SOIL GROUPS C & D.
2 DEPTH TO GROUNDWATER IS BELIEVED TO BE >100' PER GEOTECHNICAL REPORT
3 NO NATURAL HYDROLOGIC FEATURES EXIST ON SITE.
4 NO CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYAS) ARE LOCATED ON THE PROJECT SITE.
5 SEE DRAINAGE STUDY FOR FLOW RATE CALCULATIONS
6 SEE ATTACHMENT 4 FOR DETAILS OF PERMANENT STORMWATER BMPs

SUMMARY OF DMAs AND DCVs

DMA	TOTAL AREA (SF)	TOTAL AREA (AC)	LANDSCAPE (SF)	CONCRETE/AC (SF)	% IMPERVIOUS	DCV (CF)	NOTES
1	20,665	0.47	4,260	16,405	79.4%	646	–
2	19,690	0.45	3,364	16,326	82.9%	639	–
3	57,593	1.32	6,000	51,593	89.6%	1999	–
4	19,058	0.44	2,246	16,812	88.2%	653	–
5	2,428	0.06	1,285	1,143	47.1%	49	–
6	15,687	0.36	3,520	12,167	77.6%	480	–
7	3,321	0.08	3,321	0	0.0%	N/A	SELF-MITIGATING AREA
8	881	0.02	0	881	100.0%	34	OFFSET BY BMP #4
9	12,728	0.29	12,109	619	4.8%	N/A	SELF-MITIGATING AREA
10	37,625	0.86	37,224	401	1.1%	N/A	SELF-MITIGATING AREA
11	5,919	0.14	5,919	0	0.0%	N/A	SELF-MITIGATING AREA
12	250	0.01	0	250	100%	N/A	DE MINIMIS AREA
TOTAL	195845	4.50	79248	116597	59.5%	4500	–

BWE
WWW.BWESD.COM
619.299.5550

SYM | DESCRIPTION | DATE | APPR

ISSUE DATE: 07/28/2017
DRAWN BY: MDS
CHECKED BY: MGC
BWE JOB NUMBER: 12836U.1.00
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

SHEET TITLE: DMA EXHIBIT

SHEET 1 OF 1

PROJECT: 9880 CAMPUS POINT DRIVE
SAN DIEGO, CA

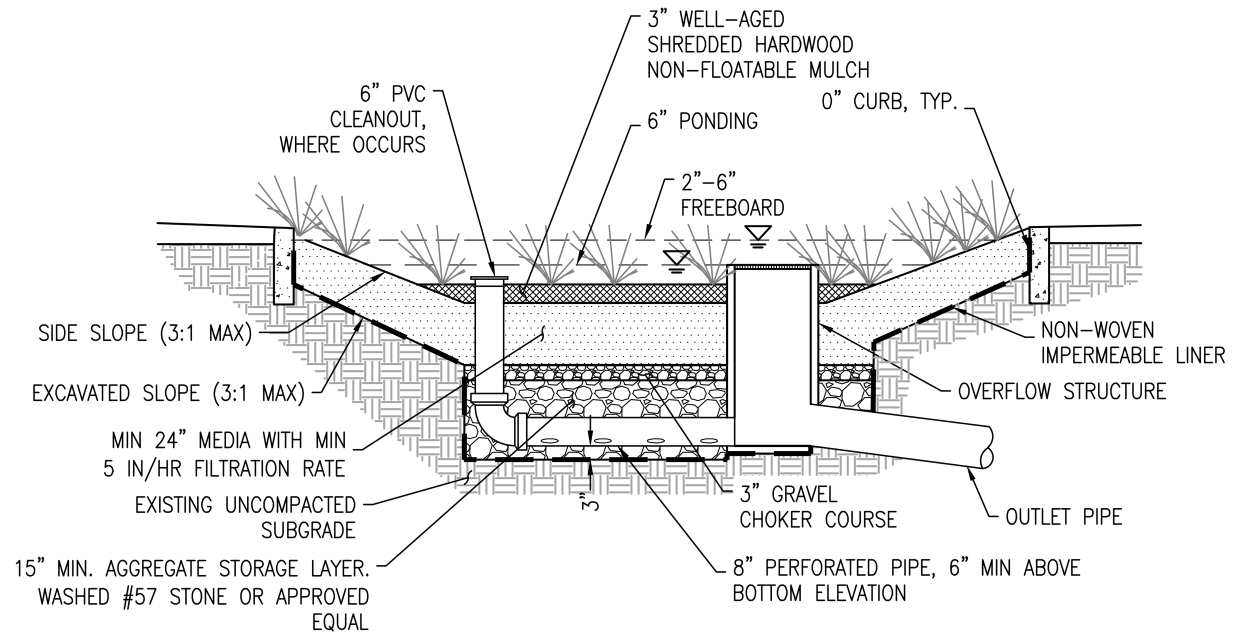
SITE ADDRESS: 9880 CAMPUS POINT DRIVE
SAN DIEGO, CA 92093

LEGEND

18" MIN SOIL MIX

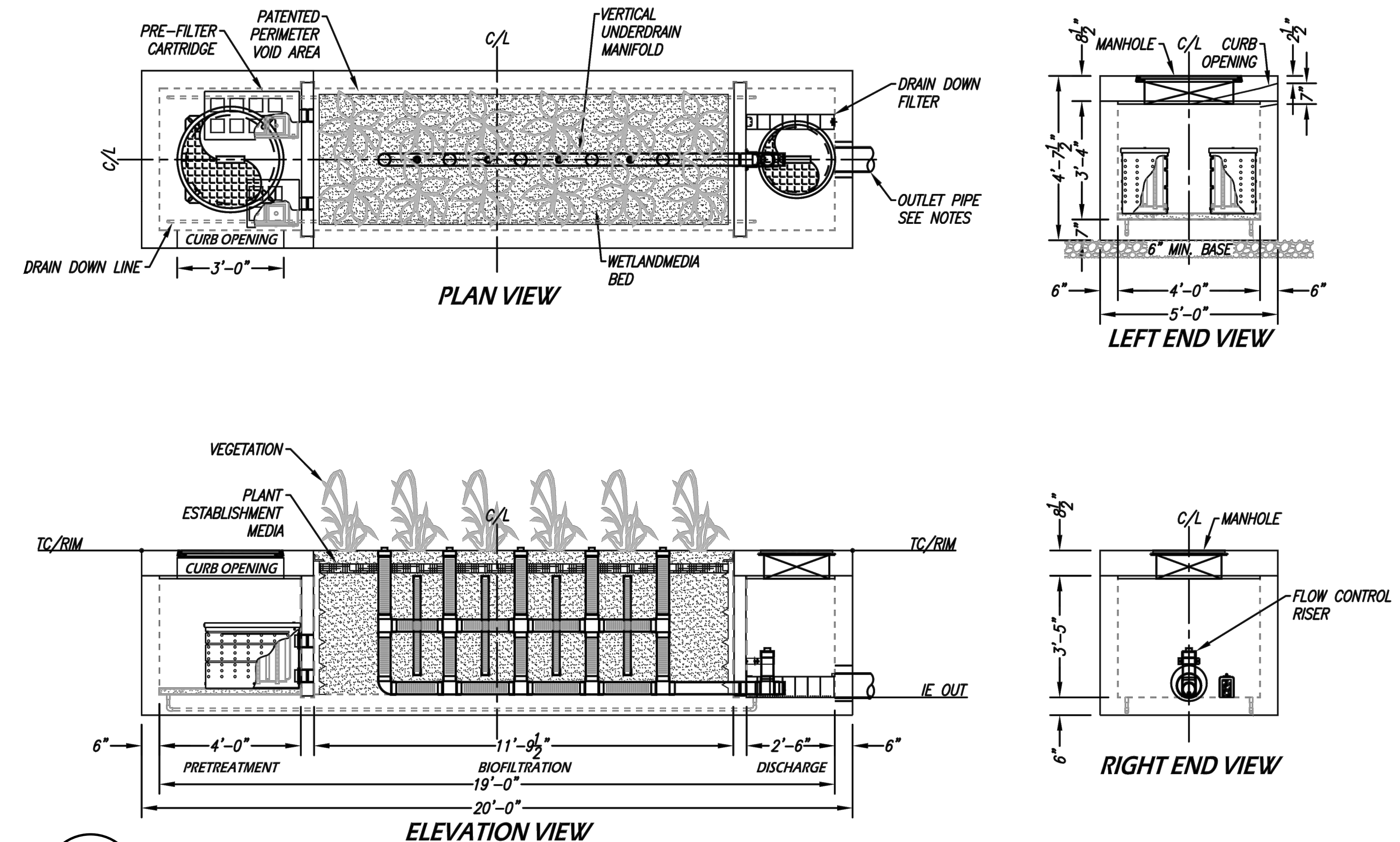
15" AGGREGATE STORAGE LAYER

3" MULCH



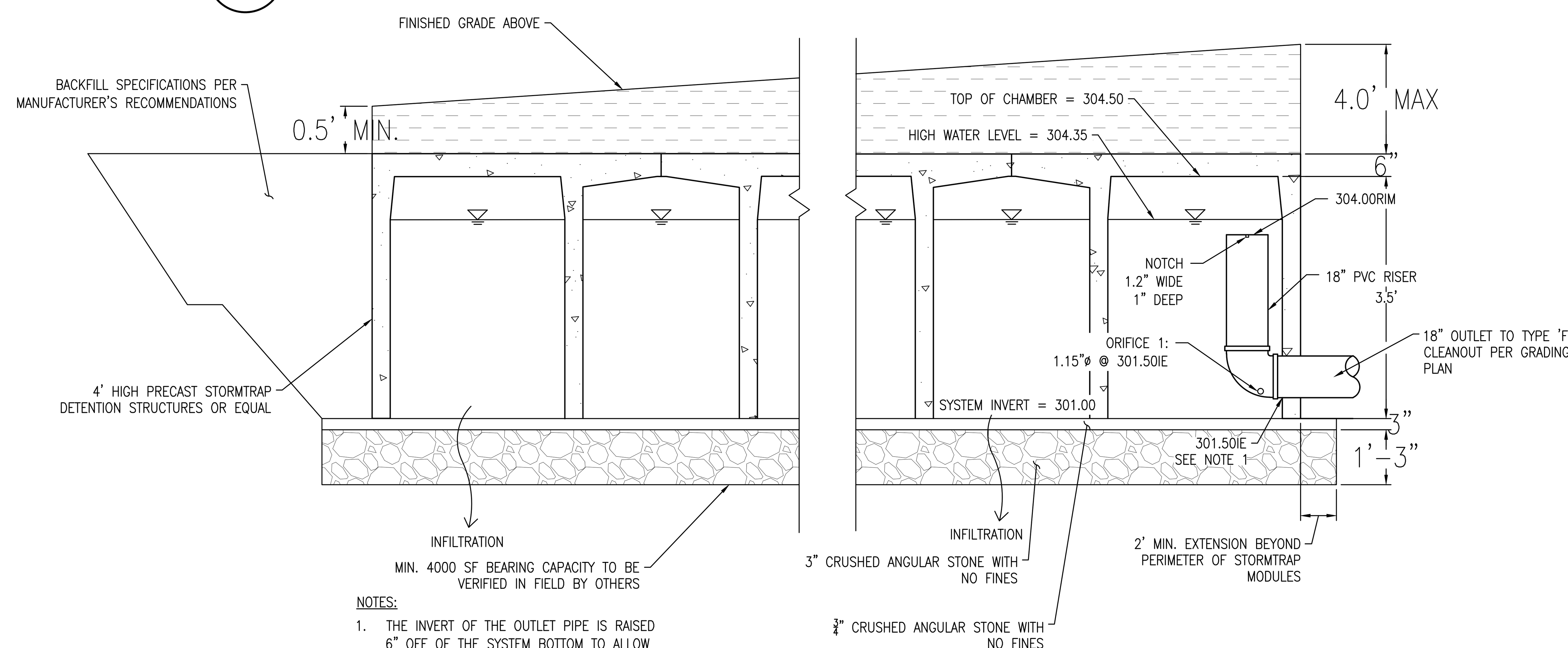
A TYPICAL BIOFILTRATION AREA

NO SCALE



B MODULAR WETLAND STORMWATER TREATMENT SYSTEM

NO SCALE



NOTES:

1. THE INVERT OF THE OUTLET PIPE IS RAISED 6" OFF OF THE SYSTEM BOTTOM TO ALLOW FOR STORAGE & INFILTRATION OF THE DCV.

C STORMWATER DETENTION STRUCTURE

NO SCALE

BWE

WWW.BWESD.COM 619.299.5550

ISSUE DATE:	07/28/2017
DRAWN BY:	MDS
CHECKED BY:	MGC
BWE JOB NUMBER:	12836U.1.00
CLIENT JOB NUMBER:	
MUNICIPALITY PROJECT NUMBER:	

SYM | DESCRIPTION | DATE | APPR

SHEET TITLE

BMP DETAILS

SHEET 1 OF 1

PROJECT

9880 CAMPUS POINT DRIVE

SAN DIEGO, CA

SITE ADDRESS

9880 CAMPUS POINT DRIVE SAN DIEGO, CA 92093

PLOT: M:\PROJECTS\12500\12836U.1.00 9880 CAMPUS POINT DRIVE\DWGS\EXHIBITS\SWQMP\12836U.1.00-DMAS-EXB.DWG Malcolm D. Smith 7/31/2017 7:43 AM

ATTACHMENT 1b:
TABULAR SUMMARY OF DMAs AND DCV CALCULATIONS

Summary of DMAs

DMA	Total Area (SF)	Total Area (AC)	Landscape (SF)	Concrete/ Asphalt (SF)	% Impervious	DCV (CF)	Notes
1	20,665	0.47	4,260	16,405	79.4%	646	-
2	19,690	0.45	3,364	16,326	82.9%	639	-
3	57,593	1.32	6,000	51,593	89.6%	1999	-
4	19,058	0.44	2,246	16,812	88.2%	653	-
5	2,428	0.06	1,285	1,143	47.1%	49	-
6	15,687	0.36	3,520	12,167	77.6%	480	-
7	3,321	0.08	3,321	0	0.0%	N/A	Self-Mitigating Area
8	881	0.02	0	881	100.0%	34	Offset by BMP #4
9	12,728	0.29	12,109	619	4.8%	N/A	Self-Mitigating Area
10	37,625	0.86	37,224	401	1.1%	N/A	Self-Mitigating Area
11	5,919	0.14	5,919	0	0.0%	N/A	Self-Mitigating Area
12	250	0.01	0	250	100.0%	N/A	De Minimis Area
Total	**195845**	**4.50**	**79248**	**116597**	**59.5%**	**4500**	**-**

ATTACHMENT 1c:
HARVEST & USE FEASIBILITY SCREENING

Harvest and Use Feasibility Checklist	Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☒ Toilet and urinal flushing
☒ Landscape irrigation
☐ Other:_______________

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

The estimated 36-hour demand for landscaping and toilet flushing is 137 CF.

3. Calculate the DCV using worksheet B-2.1.

DCV = __4500__ (cubic feet)

3a. Is the 36 hour demand greater than or equal to the DCV? ☐ Yes / ☒ No ⇨ ⇩	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV? ☐ Yes / ☒ No ⇨ ⇩	3c. Is the 36 hour demand less than 0.25DCV? ☒ Yes ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.

☒ No, select alternate BMPs.

Toilet & Urinal Water Usage Calculation

Land Use Type: Commercial

Description	Volume (gallons/flush)	Total Use gal/day/user	Users Count	Daily Water Use gal/day
Toilet Flushing	1.28	2.6	50.0	130
			Total Daily Volume	**130**

Toilet 36 hr Demand =	**195**	**gal**
	26	**cf**

Per table B.3-1 the total use per resident per day is 7 based on 3.45 gpf which equals 2.03 flush/day.
Using 1.28 gpf *2.03 flush/day we obtain 2.60 gpd per employee.

gpf= gallon per flush
gpd= gallon per day

Modified Estimated Total Water Use Calculation

Modified ETWU = $(ET0_{wet})$ x [[∑(PF x HA)/IE] + SLA] x 0.015

where:

Modified ETWU	=	Estimated daily average water usage during wet season
ETo_{Wet}	=	Average reference evapotranspiration from November through April (use 2.7 inches per month, using CIMS Zone 4 from Table G.1-1)
PF	=	Plant Factor
HA	=	Hydrozone Area (sq-ft); A section or zone of the landscaped area having plants with similar water needs. Σ(PF x HA) = The sum of PF x HA for each individual Hydrozone (accounts for different landscaping zones).
IE	=	Irrigation Efficiency (assume 90 percent for demand calculations)
SLA	=	Special Landscape Area (sq-ft); Areas used for active and passive recreation areas, areas solely dedicated to the production of fruits and vegetables, and areas irrigated with reclaimed water.

Enter Irrigation Efficiency (IE)	0.90

Plant Water Use Type		Plant Factor
Low		0.1 - 0.2
Moderate		0.3 - 0.7
High		0.80
SLA		1.00

Hydrozone	Plant Water Use Type (s) (low, medium, high)	Plant Factor (PF)	Hydrozone Area (HA) (ft^2)	PF x HA (ft^2)
1	Low	0.10	59,441	5,944
2	Moderate	0.30	17,302	5,191
3	High	0.80	1,386	1,109
				12,244
	SLA	1		
		Sum		**12,244**

Results

	Modified ETWU=	551	**gal**
		74	**cf**
	36 hr Demand=	**110**	**cf**
Combined Toilet and Landscaping 36 hour demand		**137**	**cf**

ATTACHMENT 1d:
CATEGORIZATION OF INFILTRATION FEASIBILITY CONDITION

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	**Yes**	**No**
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: We performed 4 Aardvark Permeameter tests at the site within the sandy portion of the Scripps Formation within the southern end of the site. The following presents the results of our field infiltration tests: P-1 at 5.1 feet: 0.249 inches/hour (0.125 inches/hour with FOS=2) P-2 at 6.8 feet: 0.527 inches/hour (0.264 inches/hour with FOS=2) P-3 at 5.1 feet: 0.712 inches/hour (0.356 inches/hour with FOS=2) P-4 at 5.7 feet: 1.161 inches/hour (0.581 inches/hour with FOS=2) These tests result in an average of 0.774 inches/hour (0.385 inches/hour with an applied factor of safety of 2). *See Attachment 6 for Geotechnical Report and infiltration test locations*			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The average infiltration rate within the sandy portion of the Scripps Formation in the southern portion of the site is less than 0.5 inches/hour (with an applied factor of safety of 2), therefore, full infiltration is considered infeasible. The northwest portion of the site is underlain by greater than 5 feet of fill; therefore, full infiltration should be considered infeasible. The northern portion of the site is underlain by a cemented siltstone portion of the Scripps Formation. Cemented siltstone is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the high fine content and cemented nature of the material, therefore, full infiltration should be considered infeasible. Therefore, full infiltration should be considered infeasible at the site.			

<table>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We do not expect infiltration will cause water balance issues such as seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td>No Full Infiltration</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

<u>Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria</u>

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis:

We performed 4 Aardvark Permeameter tests at the site within the sandy portion of the Scripps Formation within the southern end of the site. The following presents the results of our field infiltration tests:

P-1 at 5.1 feet: 0.249 inches/hour (0.125 inches/hour with FOS=2)
P-2 at 6.8 feet: 0.527 inches/hour (0.264 inches/hour with FOS=2)
P-3 at 5.1 feet: 0.712 inches/hour (0.356 inches/hour with FOS=2)
P-4 at 5.7 feet: 1.161 inches/hour (0.581 inches/hour with FOS=2)

These tests result in an average of 0.774 inches/hour (0.385 inches/hour with an applied factor of safety of 2).

See Attachment 6 for Geotechnical Report and infiltration test locations

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

The average infiltration rate within the sandy portion of the Scripps Formation in the southern portion of the site is greater than 0.05 inches/hour (with an applied factor of safety of 2), therefore, partial infiltration is considered feasible.

The northwest portion of the site is underlain by greater than 5 feet of fill, therefore, partial infiltration should be considered infeasible. The northern portion of the site is underlain by a cemented siltstone portion of the Scripps Formation. Cemented siltstone is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the high fine content and cemented nature of the material, therefore, full and partial infiltration should be considered infeasible.

Therefore, partial infiltration should be considered feasible only within the southern end of the site underlain by the sandy portion of the Scripps Formation.

<table>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not provide a study regarding water rights. However, these rights are not typical in the San Diego County area.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 5-8 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.

If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td>Partial Infiltration</td></tr>
</table>

<table>
<tr><th colspan="4">Factor of Safety and Design Infiltration Rate Worksheet</th><th colspan="2">Form I-9</th></tr>
<tr><th colspan="2">Factor Category</th><th>Factor Description</th><th>Assigned Weight (w)</th><th>Factor Value (v)</th><th>Product (p)
p = w x v</th></tr>
<tr><td rowspan="5">A</td><td rowspan="5">Suitability Assessment</td><td>Soil assessment methods</td><td>0.25</td><td>2</td><td>0.5</td></tr>
<tr><td>Predominant soil texture</td><td>0.25</td><td>2</td><td>0.5</td></tr>
<tr><td>Site soil variability</td><td>0.25</td><td>2</td><td>0.5</td></tr>
<tr><td>Depth to groundwater / impervious layer</td><td>0.25</td><td>2</td><td>0.5</td></tr>
<tr><td colspan="3">Suitability Assessment Safety Factor, $S_A = \Sigma p$</td><td>2.0</td></tr>
<tr><td rowspan="4">B</td><td rowspan="4">Design</td><td>Level of pretreatment/ expected sediment loads</td><td>0.5</td><td>1</td><td>0.5</td></tr>
<tr><td>Redundancy/resiliency</td><td>0.25</td><td>1</td><td>0.25</td></tr>
<tr><td>Compaction during construction</td><td>0.25</td><td>1</td><td>0.25</td></tr>
<tr><td colspan="3">Design Safety Factor, $S_B = \Sigma p$</td><td>1.0</td></tr>
<tr><td colspan="4">Combined Safety Factor, $S_{total} = S_A \times S_B$</td><td colspan="2">2.0</td></tr>
<tr><td colspan="4">Observed Infiltration Rate, inch/hr, $K_{observed}$
(corrected for test-specific bias)</td><td colspan="2">0.937 (Average of borings P-3 and P-4)</td></tr>
<tr><td colspan="4">Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$</td><td colspan="2">0.469</td></tr>
<tr><th colspan="6">Supporting Data</th></tr>
<tr><td colspan="6">Briefly describe infiltration test and provide reference to test forms:

Four Aardvark Permeameter tests were performed at the site within the sandy portion of the Scripps Formation within the southern end of the site. See the Geotechnical Report in Attachment 6 for details.</td></tr>
</table>

ATTACHMENT 1e:
POLLUTANT CONTROL BMP DESIGN WORKSHEETS/CALCULATIONS

Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
(Worksheet B.2.1. DCV)

Area Weighted Runoff Factor (C)

Surface Type	Area - A (sf)	C - Factor	C X A	Factor
Landscape	4,260.00	0.1	426.0	
Concrete/Asphalt	16,405.00	0.9	14,764.5	
Total	**20,665**		**15,190.5**	**0.74**

DMA #1

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.51	inches
2	Area tributary to BMP (s)	A=	0.47	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.74	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	**646**	cubic-feet

Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
(Worksheet B.2.1. DCV)

Area Weighted Runoff Factor (C)

Surface Type	**Area - A (sf)**	**C - Factor**	**C X A**	**Factor**
Landscape	3,364.00	0.1	336.4	
Concrete/Asphalt	16,326.00	0.9	14,693.4	
Total	**19,690**		**15,029.8**	**0.76**

DMA #2

Design Capture Volume		**Worksheet B-2.1**		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.51	inches
2	Area tributary to BMP (s)	A=	0.45	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.76	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	**639**	cubic-feet

Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
(Worksheet B.2.1. DCV)

Area Weighted Runoff Factor (C)

Surface Type	**Area - A (sf)**	**C - Factor**	**C X A**	**Factor**
Landscape	6,000.00	0.1	600.0	
Concrete/Asphalt	51,593.00	0.9	46,433.7	
Total	**57,593**		**47,033.7**	**0.82**

DMA #3

Design Capture Volume		**Worksheet B-2.1**		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.51	inches
2	Area tributary to BMP (s)	A=	1.32	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.82	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	**1,999**	cubic-feet

Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
(Worksheet B.2.1. DCV)

Area Weighted Runoff Factor (C)

Surface Type	Area - A (sf)	C - Factor	C X A	Factor
Landscape	2,246.00	0.1	224.6	
Concrete/Asphalt	16,812.00	0.9	15,130.8	
Total	**19,058**		**15,355.4**	**0.81**

DMA #4

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.51	inches
2	Area tributary to BMP (s)	A=	0.44	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.81	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	**653**	cubic-feet

Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
(Worksheet B.2.1. DCV)

Area Weighted Runoff Factor (C)

Surface Type	Area - A (sf)	C - Factor	C X A	Factor
Landscape	1,285.00	0.1	128.5	
Concrete/Asphalt	1,143.00	0.9	1,028.7	
Total	**2,428**		**1,157.2**	**0.48**

DMA #5

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.51	inches
2	Area tributary to BMP (s)	A=	0.06	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.48	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	**49**	cubic-feet

Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
(Worksheet B.2.1. DCV)

Area Weighted Runoff Factor (C)

Surface Type	**Area - A (sf)**	**C - Factor**	**C X A**	**Factor**
Landscape	3,520.00	0.1	352.0	
Concrete/Asphalt	12,167.00	0.9	10,950.3	
Total	**15,687**		**11,302.3**	**0.72**

DMA #6

Design Capture Volume		**Worksheet B-2.1**		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.51	inches
2	Area tributary to BMP (s)	A=	0.36	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.72	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	**480**	cubic-feet

Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
(Worksheet B.2.1. DCV)

Area Weighted Runoff Factor (C)

Surface Type	**Area - A (sf)**	**C - Factor**	**C X A**	**Factor**
Landscape	-	0.1	-	
Concrete/Asphalt	881.00	0.9	792.9	
Total	**881**		**792.9**	**0.90**

DMA #8

Design Capture Volume		**Worksheet B-2.1**		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.51	inches
2	Area tributary to BMP (s)	A=	0.02	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.90	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	**34**	cubic-feet

Note:

The runoff from DMA #8 is offset by BMP #4 for pollutant and hydromodification control purposes.

Table B.1-1: Runoff factors for surfaces draining to BMPs – Pollutant Control BMPs

Surface	Runoff Factor
Roofs[1]	0.90
Concrete or Asphalt[1]	0.90
Unit Pavers (grouted)[1]	0.90
Decomposed Granite	0.30
Cobbles or Crushed Aggregate	0.30
Amended, Mulched Soils or Landscape	0.10
Compacted Soil (e.g., unpaved parking)	0.30
Natural (A Soil)	0.10
Natural (B Soil)	0.14
Natural (C Soil)	0.23
Natural (D Soil)	0.30

[1]Surface is considered impervious and could benefit from use of Site Design BMPs and adjustment of the runoff factor per Section B.2.1.

Table B.2-1: Impervious area adjustment factors that accounts for dispersion

Pervious area hydrologic soil group	Ratio = Impervious area/Pervious area			
	<=1	2	3	4
A	0.00	0.00	0.23	0.36
B	0.00	0.27	0.42	0.53
C	0.34	0.56	0.67	0.74
D	0.86	0.93	0.97	1.00

Table B.2-2: Allowable Reduction in DCV

Mature Tree Canopy Diameter (ft)	Tree Credit Volume (ft^3/tree)
5	10
10	40
15	100
20	180
25	290
30	420

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs
BMP #1

	Simple Sizing Method for Biofiltration BMPs	Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs (from sheet 1)	646	cubic-feet
Partial Retention (If Applicable)			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0.00	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	3	inches
7	Assumed surface area of the biofiltration BMP	1,000	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	225	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	**421**	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	27	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	3.21	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	19	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	16	inches
19	Total Depth Treated [Line 17 + Line 18]	35	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	631	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**214**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume = [0.75 x Line 10]	315	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**234**	sq-ft
Footprint of the BMP (3% Rule)			
24	Area draining to the BMP	20,665	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.74	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	**456**	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	**456**	sq-ft

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (Continued)

BMP #1

Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	0.349	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.[5]	No	

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.
5. If 3% BMP is provided and the aggregate thickness that will drain in 36 hrs is included below the pipe invert, no additional volume reduction is required per item 30 on the worksheet.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs
BMP #2

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs (from sheet 1)	639	cubic-feet
Partial Retention (If Applicable)			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0.00	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	3	inches
7	Assumed surface area of the biofiltration BMP	1,870	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	421	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	**218**	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	27	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	1.01	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	6	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	16	inches
19	Total Depth Treated [Line 17 + Line 18]	22	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	327	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**176**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume = [0.75 x Line 10]	164	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**121**	sq-ft
Footprint of the BMP (3% Rule)			
24	Area draining to the BMP	19,690	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.76	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	**451**	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	**451**	sq-ft

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (Continued)

BMP #2

Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	0.659	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.[5]	Yes	

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.
5. If 3% BMP is provided and the aggregate thickness that will drain in 36 hrs is included below the pipe invert, no additional volume reduction is required per item 30 on the worksheet.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs
BMP #3

	Simple Sizing Method for Biofiltration BMPs	Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs (from sheet 1)	1,999	cubic-feet
Partial Retention (If Applicable)			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0.00	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	3	inches
7	Assumed surface area of the biofiltration BMP	1,500	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	338	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	**1,661**	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	27	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	2.14	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	13	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	16	inches
19	Total Depth Treated [Line 17 + Line 18]	29	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	2,492	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**1,030**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume = [0.75 x Line 10]	1,246	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**923**	sq-ft
Footprint of the BMP (3% Rule)			
24	Area draining to the BMP	57,593	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.82	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	**1,411**	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	**1,411**	sq-ft

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (Continued)

BMP #3

Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	0.169	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.[5]	No	

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.
5. If 3% BMP is provided and the aggregate thickness that will drain in 36 hrs is included below the pipe invert, no additional volume reduction is required per item 30 on the worksheet.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs
BMP #4

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs (from sheet 1)	686	cubic-feet
Partial Retention (If Applicable)			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.469	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	16.88	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	42	inches
7	Assumed surface area of the biofiltration BMP	897	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	1,464	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	**0**	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	27	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	1.26	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	8	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	16	inches
19	Total Depth Treated [Line 17 + Line 18]	24	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	0	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**0**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume = [0.75 x Line 10]	0	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**0**	sq-ft
Footprint of the BMP (3% Rule)			
24	Area draining to the BMP	19,939	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.85	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	**510**	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	**510**	sq-ft

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (Continued)

BMP #4

Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	2.133	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.[5]	Yes	

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.
5. If 3% BMP is provided and the aggregate thickness that will drain in 36 hrs is included below the pipe invert, no additional volume reduction is required per item 30 on the worksheet.

Onsite Proprietary Biofiltration BMP Checklist	Form I-10

A proprietary biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA and the performance certification/data of the proprietary biofiltration BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite alternative compliance program to meet its pollutant control obligations.
An applicant using a proprietary biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Complete and attach Worksheet C.4-1: Categorization of Infiltration Feasibility Condition to support the feasibility determination.	☐ Full Infiltration Condition	**Stop**. Proprietary biofiltration BMP is not allowed.
	☒ Partial Infiltration Condition	Proprietary biofiltration BMP is only allowed, if 40% (average annual capture) volume reduction is achieved within the BMP or downstream of the BMP. If the BMP is sized appropriately and the aggregate thickness will drain in 36 hrs, no additional volume reduction (40% or 0.375*DCV) is required. See Note below. If the 40% volume reduction is achieved from within the BMP or downstream of the BMP **proceed to Criteria 2**. If the 40% of the volume reduction is not achieved, proprietary biofiltration BMP is not allowed. **Stop**.
	☐ No Infiltration Condition	Proprietary biofiltration BMP is allowed if one of the two criteria listed below are met: ☐ Documentation is provided to the satisfaction of the City Engineer that a larger footprint biofiltration BMP (i.e. minimum sizing factor calculated using worksheet B.5.2) is not feasible onsite; or ☐ Documentation is provided that volume reduction achieved by the larger footprint biofiltration BMP can be achieved through other measures (e.g., downstream site design BMPs, evapotranspiration from proprietary BMP, etc.) If one of the two criteria listed above is met **proceed to Criteria 2.** If neither criteria are met, proprietary biofiltration BMP is not allowed. **Stop.**

Notes:

1. Per conversations with the Project Clean Water's Stormwater Help Desk, if the BMP is sized appropriately and the aggregate thickness will drain in 36 hrs, no additional volume reduction (40% or 0.375*DCV) is required.
2. Due to site constraints, a proprietary Modular Wetland BMP is selected. The required partial retention is provided in the Detention Vault (BMP #4), downstream of the Modular Wetland.

Onsite Proprietary Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:
Summarize findings and attach Worksheet C.4-1

<u>If Partial Infiltration Condition:</u>
Provide documentation that 40% (average annual capture; or 0.375*DCV when using a 36-hour drawdown BMP) volume reduction is achieved within the BMP or downstream of the BMP. This could be achieved through downstream site design BMPs, downstream infiltration BMP, incidental retention by having an open bottom in the proprietary BMP or other similar measures. See Note 1 below.

<u>If No Infiltration Condition:</u>
Provide documentation that the alternative minimum sizing factor (attach Worksheet B.5-2) BMP is not feasible onsite or the volume reduction achieved by a non-proprietary BMP sized to the alternative minimum sizing factor can be achieved through downstream site design BMPs, downstream evapotranspiration BMPs, incidental evapotranspiration from the proprietary BMP or other similar measures.

Criteria	Answer	Progression
Criteria 2: Is the proprietary biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Criteria 2:	☒ Meets Flow based Criteria	Use guidance from Appendix F.2 to size the proprietary BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft cannot be designed using a loading rate of 1.5 gpm/sq. ft) **Proceed to Criteria 4**.
	☐ Meets Volume based Criteria	Provide documentation that the proprietary biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4**.
	☐ Does not Meet either criteria	**Stop**. Proprietary biofiltration BMP is not allowed.

1. Per conversations with the Project Clean Water's Stormwater Help Desk, if the BMP is sized appropriately and the aggregate thickness will drain in 36 hrs, no additional volume reduction (40% or 0.375*DCV) is required.
2. Due to site constraints, a proprietary Modular Wetland BMP is selected. The required partial retention is provided in the Detention Vault (BMP #4), downstream of the Modular Wetland.

Onsite Proprietary Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

MWS Linear BMPs are designed by utilizing the treatment flow sizing table given in the manufacturer's guidelines. These proprietary BMPs are designed as flow based BMPs according to the section F.2.2 of the storm water standards as follows;

- The treatment runoff rate is determined by using 0.2 in/hr uniform intensity precipitation event.
- The calculated flow rate is multiplied by 1.5 to compute the design flow rate for the BMP.
- Appropriate size is selected from the sizing table to treat the design flow rate.

Criteria	Answer	Progression
Criteria 4: Does the proprietary biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes, meets the TAPE certification.	Provide documentation that the proprietary BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	☐ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a proprietary biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the proprietary biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

Refer to the attached performance summary and TAPE certification for details.

Onsite Proprietary Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 5: Is the proprietary biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes	Provide documentation that the proprietary biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.
Provide basis for Criteria 5: Provide documentation that appropriate biological activity is supported by the proprietary biofiltration BMP to maintain treatment process. Refer to TAPE certification for details.		
Criteria	**Answer**	**Progression**
Criteria 6: Is the proprietary biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	☒ Yes	Provide documentation that the proprietary biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7**.
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.
Provide basis for Criteria 6: Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable). Refer to loading Rates in TAPE certification. Rates are given based on a per gallon flow rate. It is a self-contained bio filter that has a controlled discharge thus there is no scouring and channeling within the BMP. Refer to basis for criteria 2 for design guidelines.		

Onsite Proprietary Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the proprietary biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	☒ Yes, and the proprietary BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The proprietary biofiltration BMP meets the required criteria.
	☐ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.
Provide basis for Criteria 7: Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. Attachment 3A of the PDP SWQMP must include a statement that the proprietary BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.		

Onsite Proprietary Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed proprietary BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	☐ Yes ☐ No, See explanation below
Explanation/reason if the proprietary BMP is not accepted by the City for onsite pollutant control compliance:	

MWS Flow Based BMP Sizing

C=	0.9		Runoff coefficient
I_{TREAT} =	0.2	in/hr	Intensity of rainfall
Q_{TREAT} =	C x I_{TREAT} x A	cfs	Treatment flow rate

Design Flow (cfs) = 1.5* Q_{Treat} per Section F.2.2 of Storm Water Standards

BMP #	DMA		Design Flow (cfs)	BMP Sizing	
	Identifier	Area (ac)		MWS Model	Selected BMP's Treatment Flow Rate (cfs)
5	5 & 6	0.42	0.113	MWS-L-4-8	0.115

Note: All selected modular wetlands treatment flow rates exceed the DMAs' design flow

Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Summary of DCVs and Retention Requirements

Infiltration Rate (i)=	0.469		in/hr	(Reliable Infiltration Rate)
Gravel Porosity (n)=	0.4			
Drawdown Time (T)=	36		hrs	
Required Gravel Depth (d)=	(i)* T /0.4 =	42.21	Inch	
Partial Retention Vol. =	A*d/12		cf	

BMPs #	DMAs	Infiltration rate, i (in/hr)	Req'd Gravel Depth, d (in)	Required Treatment Area (A)	Provided Treatment Area (A')	Retention Volume (cf)	
						Required (dxA)	Provided in Aggregate Storage (dxA')
1	A-1	0	3	456	1,000	114	250
2	A-2	0	3	451	1,870	113	468
3	A-3	0	3	1,411	1,500	353	375
4	A-4	0.469	42.21	461	897	1,622	224
5	A-5,6,7,8	0	3	380	NA	95	NA
Total						**2,296**	**1,317**

Additional Retention Volume Required	979.3	cf
Vault Area (85' x 37.5)	3,187.0	sf
Min. Retention Depth Below Outlet Invert =	**3.7**	**in**

From: SD BMP Help Desk <sdbmphelpdesk@Geosyntec.com>
Sent: Saturday, August 06, 2016 7:53 PM
To: Min GC; SD BMP Help Desk
Subject: RE: Discrepancy in the Design Manual

Min,

The Model BMP Design Manual does not currently define a lower threshold to differential between partial infiltration vs. no infiltration. Below is the responses for a similar question:

The cut offs for determining the infiltration condition of the DMA are:

- Full infiltration condition > 0.5 in/hr.
- Partial infiltration condition ≤ 0.5 in/hr.
- No infiltration condition – only when there are geotechnical and groundwater concerns (criteria 2, 3, 4, 6, 7 & 8 in Worksheet C.4-1); Impermeable liner is only allowed in no infiltration condition.

Having a small infiltration rate can't be the basis for assigning a no infiltration condition if there are no geotechnical and groundwater concerns. Basically, if there are no concerns with infiltration why include an impermeable liner? The reason the manual is structured this way is, not having an impermeable layer will promote infiltration that is feasible at the site and thereby maximizing retention and meeting the intent of the permit. The measured infiltration rate dictates the thickness of the gravel layer below the underdrain and how much water is retained at the site.

Up to an infiltration rate of 0.033 in/hr. the mandatory 3" aggregate below the underdrain governs. Once the infiltration rate is above 0.033 in/hr. then the aggregate depth below the effective elevation of the underdrain needs to be increased such that drawdown time is 36 hours. For example if the site has 0.1 in/hr. infiltration rate then the aggregate depth below the underdrain needs to be 9 inches instead of 3 inches to satisfy the drawdown time of 36 hours. So this is basically a sliding scale and gets capped once the average annual reduction reaches 40%.

There were some discussion to set this cut off at 0.01 in/hr., but nothing was finalized yet. Each agency has discretion on how the requirements are enforced within their jurisdiction, so we recommend contacting the agency plan checker for a jurisdiction specific response.

Note: This answer is intended to assist in interpretation and application of the Model BMP Design Manual. However, Copermittees are responsible for compliance with the Development Planning (Provision E.3) requirements in the MS4 Permit and have discretion on how the MS4 Permit is enforced within its jurisdiction. This answer is not intended to supersede any elements of the Model BMP Design Manual or Local Jurisdictional BMP Design Manual.

Regards,
SD BMP HELP DESK

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

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Project Name: 9880 Campus Point Drive

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	◉ Not Performed ○ Included ○ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	◉ Included ○ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	○ Included ◉ Not required because BMPs will drain in less than 96 hours

Project Name: 9880 Campus Point Drive

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Point(s) of Compliance (POC) for Hydromodification Management
☒ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☒ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

ATTACHMENT 2a:
HYDROMODIFICATION MANAGEMENT EXHIBIT

LEGEND / SYMBOL

- OUTER BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- EXISTING STORM DRAIN
- EXISTING CONTOUR
- POINT OF COMPLIANCE (POC)
- DRAINAGE BASIN MARKER & AREA (AC)

NOTES

1. SOIL UNDERLYING THE SITE IS COMPRISED OF HYDROLOGIC SOIL GROUPS C & D.
2. DEPTH TO GROUNDWATER IS BELIEVED TO BE >100' PER GEOTECHNICAL REPORT
3. NO NATURAL HYDROLOGIC FEATURES EXIST ON SITE.
4. NO CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYAS) ARE LOCATED ON THE PROJECT SITE.
5. SEE DRAINAGE STUDY FOR FLOW RATE CALCULATIONS

SUMMARY OF POCS

POC 1: ON-SITE INLET WHICH DISCHARGES TO EXISTING CURB INLET ON CAMPUS POINT DR.

POC 2: CAMPUS POINT DR. GUTTER

BWE
WWW.BWESD.COM
619.299.5550

ISSUE DATE: 07/31/2017
DRAWN BY: MDS
CHECKED BY: MGC
BWE JOB NUMBER: 12836U.1.00
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

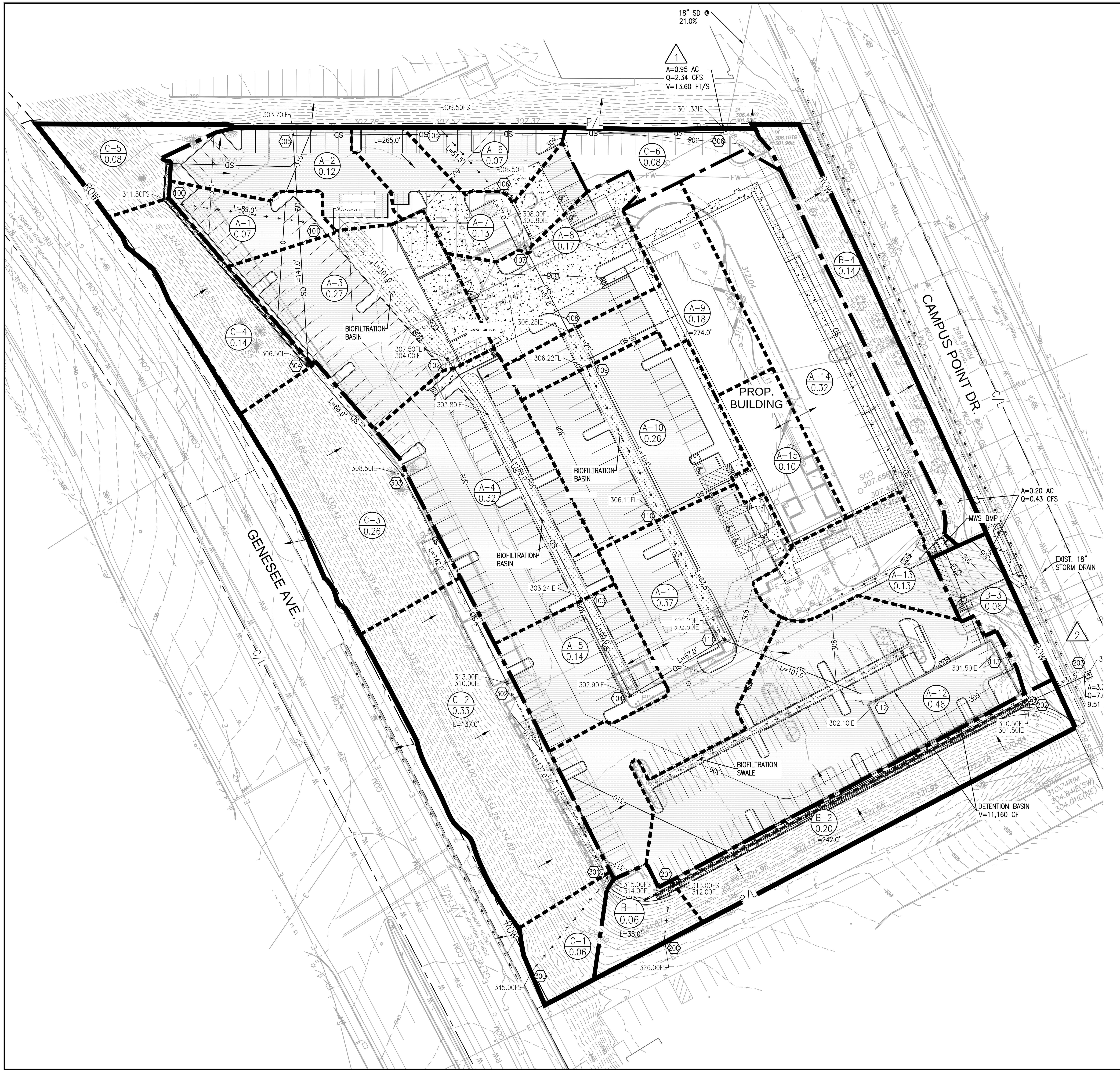
SHEET TITLE: HMP EXHIBIT EXISTING CONDITIONS

SHEET 1 OF 2

PROJECT: 9880 CAMPUS POINT DRIVE
SAN DIEGO, CA

SITE ADDRESS: 9880 CAMPUS POINT DRIVE
SAN DIEGO, CA 92093

PLOT: M:\PROJECTS\12500\12836U.1.00 9880 CAMPUS POINT DRIVE\DWGS\EXHIBITS\SWQMP\12836U.1.00-HMP-EXST.DWG Malcolm D. Smith 7/31/2017 7:34 AM



LEGEND — SYMBOL

OUTER BASIN BOUNDARY
MAJOR BASIN BOUNDARY
MINOR BASIN BOUNDARY
EXISTING STORM DRAIN
NEW STORM DRAIN
EXISTING CONTOUR
NEW CONTOUR
POINT OF COMPLIANCE (POC)
DRAINAGE BASIN MARKER & AREA (AC)
PROPERTY BOUNDARY
FLOW DIRECTION
EXISTING STORM DRAIN
NEW STORM DRAIN
AC PAVEMENT
CONCRETE PAVEMENT
CONC UNIT PAVERS
TRUNCATED DOMES
LANDSCAPE AREA
STORMWATER TREATMENT AREA
HYDROSEED SLOPE PER LANDSCAPE PLANTING PLAN
PROPOSED TREE PER LANDSCAPE PLANTING PLAN
CONC BROW DITCH

NOTES

1 SOIL UNDERLYING THE SITE IS COMPRISED OF HYDROLOGIC SOIL GROUPS C & D.
2 DEPTH TO GROUNDWATER IS BELIEVED TO BE >100' PER GEOTECHNICAL REPORT
3 NO NATURAL HYDROLOGIC FEATURES EXIST ON SITE.
4 NO CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYAS) ARE LOCATED ON THE PROJECT SITE.
5 SEE DRAINAGE STUDY FOR FLOW RATE CALCULATIONS
6 SEE ATTACHMENT 4 FOR DETAILS OF PERMANENT STORMWATER BMPs

SUMMARY OF POCS

POC 1: ON-SITE NLET WHICH DISCHARGES TO EXISTING CURB INLET ON CAMPUS POINT DR.

POC 2: OCAMPUS POINT DR. GUTTER

15 0 30 60
SCALE IN FEET
1 inch = 30 ft.

BWE
WWW.BWESD.COM
619.299.5550

ISSUE DATE: 07/31/2017
DRAWN BY: MDS
CHECKED BY: MGC
BWE JOB NUMBER: 12836U.1.00
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

SYM | DESCRIPTION | DATE | APPR

SHEET TITLE: HMP EXHIBIT PROPOSED CONDITIONS
SHEET 1 OF 2

PROJECT: 9880 CAMPUS POINT DRIVE SAN DIEGO, CA

SITE ADDRESS: 9880 CAMPUS POINT DRIVE SAN DIEGO, CA 92093

PLOT: M:\PROJECTS\12500\12836U.1.00 9880 CAMPUS POINT DRIVE\DWGS\EXHIBITS\SWQMP\12836U.1.00-HMP-PROP.DWG Malcolm D. Smith 7/31/2017 7:41 AM

ATTACHMENT 2b:
MANAGEMENT OF CRITICAL COARSE SEDIMENT YIELD AREAS

No Critical Coarse Sediment Yield Areas (CCSYAs) exist within the project footprint.

9880 Campus Point Drive - CCSYAs

Critical Coarse Sediment Yield Areas (CCSYAs)

ATTACHMENT 2c:
GEOMORPHIC ASSESSMENT OF RECEIVING CHANNELS

(NOT APPLICABLE)

ATTACHMENT 2d:
FLOW CONTROL FACILITY DESIGN

SDHM CALCULATIONS

DETERMINATION OF LOWER AND UPPER FLOW THRESHOLDS FOR HMP

2012 USGS Regression Equations

Project: 9880 Campus Point Drive

Q-2 yr (cfs) = **$3.60\ (A)^{0.672} \times (P)^{0.753}$** ......(1)

Q-10 yr (cfs) = **$6.56\ (A)^{0.783} \times (P)^{1.07}$** ......(2)

Where,

A = Drainage Area (Sq miles)

P = Mean Annual Precipitation (inches) = **11.1** (Kearny Mesa Rainfall Station)

(Per SDHM User Manual)

1 Ac = 0.00156 Sq. Miles

POC #	Area (Ac)	Area (Sq. Miles)	Peak Flow Runoff (cfs)		
			Q-2 yr	Q-10 yr	Low Flow (0.1Q-2yr)
1	3.2	0.005	0.6268	**1.3605**	**0.062681**
		0	0.0000	**0.0000**	**0.000000**
Total	**3.20**				

SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Bio_Vault_Option rev 2
Site Name:	9880 Campus Point Dr.
Site Address:	San Diego
City:	
Report Date:	7/28/2017
Gage:	KEARNY M
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2017/05/17

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Flat	3.25
Pervious Total	3.25
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.25

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA #1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.064
Pervious Total	0.064
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.37
Impervious Total	0.37
Basin Total	0.434

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP #1	Surface BMP #1	

DMA #2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.03
Pervious Total	0.03
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.39
Impervious Total	0.39
Basin Total	0.42

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP #2	Surface BMP #2	

DMA #3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.13
Pervious Total	0.13
Impervious Land Use	acre
IMPERVIOUS-FLAT	1.12
Impervious Total	1.12
Basin Total	1.25

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP #3	Surface BMP #3	

DMAs #5, 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.13
Pervious Total	0.13
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.31
Impervious Total	0.31
Basin Total	0.44

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

DMA #4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.01
Pervious Total	0.01
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.39
Impervious Total	0.39
Basin Total	0.4

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP #4	Surface BMP #4	

DMA #7, 8

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.08
Pervious Total	0.08
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.03
Impervious Total	0.03
Basin Total	0.11

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

BMP #1

Bottom Length:	100.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	ESM
Material thickness of third layer:	1.25
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.67
Orifice Diameter (in.):	1.7
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	10.23
Total Outflow (ac-ft.):	10.532
Percent Through Underdrain:	97.13

Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2
Vault 1

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0230	0.0000	0.0000	0.0000
0.0476	0.0230	0.0003	0.0000	0.0000
0.0952	0.0230	0.0007	0.0000	0.0000
0.1427	0.0230	0.0010	0.0000	0.0000
0.1903	0.0230	0.0013	0.0000	0.0000
0.2379	0.0230	0.0016	0.0000	0.0000
0.2855	0.0230	0.0020	0.0000	0.0000
0.3331	0.0230	0.0023	0.0000	0.0000
0.3807	0.0230	0.0026	0.0000	0.0000
0.4282	0.0230	0.0029	0.0000	0.0000
0.4758	0.0230	0.0033	0.0000	0.0000
0.5234	0.0230	0.0036	0.0000	0.0000
0.5710	0.0230	0.0039	0.0000	0.0000
0.6186	0.0230	0.0043	0.0000	0.0000
0.6662	0.0230	0.0046	0.0000	0.0000
0.7137	0.0230	0.0049	0.0000	0.0000
0.7613	0.0230	0.0052	0.0000	0.0000
0.8089	0.0230	0.0056	0.0000	0.0000
0.8565	0.0230	0.0059	0.0000	0.0000
0.9041	0.0230	0.0062	0.0000	0.0000
0.9516	0.0230	0.0066	0.0000	0.0000
0.9992	0.0230	0.0069	0.0000	0.0000
1.0468	0.0230	0.0072	0.0000	0.0000
1.0944	0.0230	0.0075	0.0082	0.0000
1.1420	0.0230	0.0079	0.0085	0.0000
1.1896	0.0230	0.0082	0.0086	0.0000
1.2371	0.0230	0.0085	0.0114	0.0000
1.2847	0.0230	0.0088	0.0122	0.0000
1.3323	0.0230	0.0092	0.0140	0.0000

1.3799	0.0230	0.0095	0.0145	0.0000
1.4275	0.0230	0.0098	0.0148	0.0000
1.4751	0.0230	0.0102	0.0194	0.0000
1.5226	0.0230	0.0105	0.0194	0.0000
1.5702	0.0230	0.0108	0.0194	0.0000
1.6178	0.0230	0.0111	0.0211	0.0000
1.6654	0.0230	0.0115	0.0220	0.0000
1.7130	0.0230	0.0118	0.0240	0.0000
1.7605	0.0230	0.0121	0.0250	0.0000
1.8081	0.0230	0.0125	0.0268	0.0000
1.8557	0.0230	0.0128	0.0277	0.0000
1.9033	0.0230	0.0131	0.0295	0.0000
1.9509	0.0230	0.0134	0.0303	0.0000
1.9985	0.0230	0.0138	0.0319	0.0000
2.0460	0.0230	0.0141	0.0327	0.0000
2.0936	0.0230	0.0144	0.0341	0.0000
2.1412	0.0230	0.0147	0.0349	0.0000
2.1888	0.0230	0.0151	0.0363	0.0000
2.2364	0.0230	0.0154	0.0369	0.0000
2.2840	0.0230	0.0159	0.0383	0.0000
2.3315	0.0230	0.0163	0.0389	0.0000
2.3791	0.0230	0.0168	0.0402	0.0000
2.4267	0.0230	0.0172	0.0408	0.0000
2.4743	0.0230	0.0177	0.0420	0.0000
2.5219	0.0230	0.0181	0.0426	0.0000
2.5695	0.0230	0.0186	0.0437	0.0000
2.6170	0.0230	0.0190	0.0443	0.0000
2.6646	0.0230	0.0195	0.0454	0.0000
2.7122	0.0230	0.0199	0.0459	0.0000
2.7598	0.0230	0.0204	0.0470	0.0000
2.8074	0.0230	0.0208	0.0475	0.0000
2.8549	0.0230	0.0213	0.0485	0.0000
2.9025	0.0230	0.0217	0.0487	0.0000
2.9501	0.0230	0.0222	0.0494	0.0000
2.9977	0.0230	0.0227	0.0512	0.0000
3.0453	0.0230	0.0231	0.0535	0.0000
3.0929	0.0230	0.0236	0.0559	0.0000
3.1404	0.0230	0.0240	0.0584	0.0000
3.1880	0.0230	0.0245	0.0608	0.0000
3.2356	0.0230	0.0249	0.0632	0.0000
3.2832	0.0230	0.0254	0.0655	0.0000
3.3308	0.0230	0.0258	0.0677	0.0000
3.3784	0.0230	0.0263	0.0699	0.0000
3.4259	0.0230	0.0267	0.0720	0.0000
3.4735	0.0230	0.0272	0.0741	0.0000
3.5000	0.0230	0.0274	0.1157	0.0000

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
3.5000	0.0230	0.0274	0.0000	0.1182	0.0000
3.5476	0.0237	0.0286	0.0000	0.1182	0.0000
3.5952	0.0244	0.0297	0.0000	0.1206	0.0000
3.6427	0.0251	0.0309	0.0000	0.1231	0.0000
3.6903	0.0259	0.0321	0.0000	0.1255	0.0000
3.7379	0.0266	0.0333	0.0000	0.1280	0.0000
3.7855	0.0273	0.0346	0.0000	0.1304	0.0000
3.8331	0.0281	0.0359	0.0000	0.1329	0.0000
3.8807	0.0288	0.0373	0.0000	0.1353	0.0000

3.9282	0.0296	0.0387	0.0000	0.1378	0.0000
3.9758	0.0304	0.0401	0.0000	0.1402	0.0000
4.0234	0.0311	0.0416	0.0570	0.1427	0.0000
4.0710	0.0319	0.0431	0.3007	0.1451	0.0000
4.1186	0.0326	0.0446	0.6477	0.1476	0.0000
4.1662	0.0334	0.0462	1.0694	0.1500	0.0000
4.2137	0.0342	0.0478	1.5471	0.1525	0.0000
4.2613	0.0350	0.0494	2.0640	0.1549	0.0000
4.3089	0.0358	0.0511	2.6029	0.1574	0.0000
4.3300	0.0361	0.0519	3.1463	0.1584	0.0000

Surface BMP #1

Element Flows To:

Outlet 1	Outlet 2
Vault 1	BMP #1

BMP #2

Bottom Length: 233.75 ft.
Bottom Width: 8.00 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 2
Material type for second layer: ESM
Material thickness of third layer: 1.25
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.67
Orifice Diameter (in.): 1.3
Offset (in.): 3
Flow Through Underdrain (ac-ft.): 10.445
Total Outflow (ac-ft.): 10.6
Percent Through Underdrain: 98.54
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2
Vault 1

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0429	0.0000	0.0000	0.0000
0.0476	0.0429	0.0006	0.0000	0.0000
0.0952	0.0429	0.0012	0.0000	0.0000
0.1427	0.0429	0.0018	0.0000	0.0000
0.1903	0.0429	0.0025	0.0000	0.0000
0.2379	0.0429	0.0031	0.0000	0.0000
0.2855	0.0429	0.0037	0.0000	0.0000
0.3331	0.0429	0.0043	0.0000	0.0000
0.3807	0.0429	0.0049	0.0000	0.0000
0.4282	0.0429	0.0055	0.0000	0.0000
0.4758	0.0429	0.0061	0.0000	0.0000
0.5234	0.0429	0.0067	0.0000	0.0000
0.5710	0.0429	0.0074	0.0000	0.0000
0.6186	0.0429	0.0080	0.0000	0.0000
0.6662	0.0429	0.0086	0.0000	0.0000
0.7137	0.0429	0.0092	0.0000	0.0000
0.7613	0.0429	0.0098	0.0000	0.0000
0.8089	0.0429	0.0104	0.0000	0.0000
0.8565	0.0429	0.0110	0.0000	0.0000
0.9041	0.0429	0.0116	0.0000	0.0000
0.9516	0.0429	0.0123	0.0000	0.0000
0.9992	0.0429	0.0129	0.0000	0.0000
1.0468	0.0429	0.0135	0.0000	0.0000
1.0944	0.0429	0.0141	0.0026	0.0000
1.1420	0.0429	0.0147	0.0038	0.0000
1.1896	0.0429	0.0153	0.0063	0.0000
1.2371	0.0429	0.0159	0.0076	0.0000
1.2847	0.0429	0.0165	0.0094	0.0000
1.3323	0.0429	0.0172	0.0104	0.0000
1.3799	0.0429	0.0178	0.0119	0.0000
1.4275	0.0429	0.0184	0.0126	0.0000

1.4751	0.0429	0.0190	0.0139	0.0000
1.5226	0.0429	0.0196	0.0145	0.0000
1.5702	0.0429	0.0202	0.0157	0.0000
1.6178	0.0429	0.0208	0.0162	0.0000
1.6654	0.0429	0.0214	0.0172	0.0000
1.7130	0.0429	0.0221	0.0177	0.0000
1.7605	0.0429	0.0227	0.0186	0.0000
1.8081	0.0429	0.0233	0.0191	0.0000
1.8557	0.0429	0.0239	0.0200	0.0000
1.9033	0.0429	0.0245	0.0204	0.0000
1.9509	0.0429	0.0251	0.0212	0.0000
1.9985	0.0429	0.0257	0.0216	0.0000
2.0460	0.0429	0.0264	0.0224	0.0000
2.0936	0.0429	0.0270	0.0228	0.0000
2.1412	0.0429	0.0276	0.0235	0.0000
2.1888	0.0429	0.0282	0.0238	0.0000
2.2364	0.0429	0.0288	0.0245	0.0000
2.2840	0.0429	0.0296	0.0249	0.0000
2.3315	0.0429	0.0305	0.0256	0.0000
2.3791	0.0429	0.0313	0.0259	0.0000
2.4267	0.0429	0.0322	0.0265	0.0000
2.4743	0.0429	0.0330	0.0268	0.0000
2.5219	0.0429	0.0339	0.0275	0.0000
2.5695	0.0429	0.0347	0.0278	0.0000
2.6170	0.0429	0.0356	0.0284	0.0000
2.6646	0.0429	0.0364	0.0287	0.0000
2.7122	0.0429	0.0373	0.0293	0.0000
2.7598	0.0429	0.0381	0.0295	0.0000
2.8074	0.0429	0.0390	0.0301	0.0000
2.8549	0.0429	0.0398	0.0304	0.0000
2.9025	0.0429	0.0407	0.0309	0.0000
2.9501	0.0429	0.0415	0.0312	0.0000
2.9977	0.0429	0.0424	0.0316	0.0000
3.0453	0.0429	0.0432	0.0321	0.0000
3.0929	0.0429	0.0441	0.0331	0.0000
3.1404	0.0429	0.0449	0.0344	0.0000
3.1880	0.0429	0.0458	0.0357	0.0000
3.2356	0.0429	0.0466	0.0370	0.0000
3.2832	0.0429	0.0475	0.0383	0.0000
3.3308	0.0429	0.0483	0.0396	0.0000
3.3784	0.0429	0.0491	0.0409	0.0000
3.4259	0.0429	0.0500	0.0421	0.0000
3.4735	0.0429	0.0508	0.0434	0.0000
3.5000	0.0429	0.0513	0.0827	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.5000	0.0429	0.0513	0.0000	0.2210	0.0000
3.5476	0.0429	0.0534	0.0000	0.2210	0.0000
3.5952	0.0429	0.0554	0.0000	0.2256	0.0000
3.6427	0.0429	0.0574	0.0000	0.2302	0.0000
3.6903	0.0429	0.0595	0.0000	0.2347	0.0000
3.7379	0.0429	0.0615	0.0000	0.2393	0.0000
3.7855	0.0429	0.0636	0.0000	0.2439	0.0000
3.8331	0.0429	0.0656	0.0000	0.2485	0.0000
3.8807	0.0429	0.0677	0.0000	0.2531	0.0000
3.9282	0.0429	0.0697	0.0000	0.2576	0.0000
3.9758	0.0429	0.0717	0.0000	0.2622	0.0000

4.0234	0.0429	0.0738	0.0570	0.2668	0.0000
4.0710	0.0429	0.0758	0.3007	0.2714	0.0000
4.1186	0.0429	0.0779	0.6477	0.2759	0.0000
4.1662	0.0429	0.0799	1.0694	0.2805	0.0000
4.2137	0.0429	0.0820	1.5471	0.2851	0.0000
4.2613	0.0429	0.0840	2.0640	0.2897	0.0000
4.3089	0.0429	0.0860	2.6029	0.2942	0.0000
4.3300	0.0429	0.0869	3.1463	0.2963	0.0000

Surface BMP #2

Element Flows To:

Outlet 1	Outlet 2
Vault 1	BMP #2

BMP #3

Bottom Length:	213.30 ft.
Bottom Width:	6.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	Mulch
Material thickness of third layer:	1.5
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.31
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	9.938
Total Volume Through Riser (ac-ft.):	6.584
Total Volume Through Facility (ac-ft.):	32.691
Percent Infiltrated:	30.4
Total Precip Applied to Facility:	0.807
Total Evap From Facility:	0.828
Underdrain used	
Underdrain Diameter (feet):	0.67
Orifice Diameter (in.):	1.7
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	16.169
Total Outflow (ac-ft.):	32.691
Percent Through Underdrain:	49.46

Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2
Vault 1

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0294	0.0000	0.0000	0.0000
0.0489	0.0294	0.0004	0.0000	0.0000
0.0978	0.0294	0.0009	0.0000	0.0000
0.1467	0.0294	0.0013	0.0000	0.0000
0.1956	0.0294	0.0017	0.0000	0.0000
0.2445	0.0294	0.0022	0.0000	0.0001
0.2934	0.0294	0.0026	0.0000	0.0003
0.3423	0.0294	0.0030	0.0000	0.0004
0.3912	0.0294	0.0034	0.0000	0.0007
0.4401	0.0294	0.0039	0.0000	0.0009
0.4890	0.0294	0.0043	0.0000	0.0013
0.5379	0.0294	0.0047	0.0000	0.0016
0.5868	0.0294	0.0052	0.0000	0.0022
0.6357	0.0294	0.0056	0.0000	0.0026
0.6846	0.0294	0.0060	0.0000	0.0034
0.7335	0.0294	0.0065	0.0000	0.0035
0.7824	0.0294	0.0069	0.0000	0.0045
0.8313	0.0294	0.0073	0.0000	0.0092
0.8802	0.0294	0.0078	0.0000	0.0092
0.9291	0.0294	0.0082	0.0000	0.0092
0.9780	0.0294	0.0086	0.0000	0.0092
1.0269	0.0294	0.0091	0.0000	0.0092

1.0758	0.0294	0.0095	0.0000	0.0092
1.1247	0.0294	0.0099	0.0042	0.0092
1.1736	0.0294	0.0103	0.0060	0.0092
1.2225	0.0294	0.0108	0.0092	0.0092
1.2714	0.0294	0.0112	0.0100	0.0092
1.3203	0.0294	0.0116	0.0099	0.0092
1.3692	0.0294	0.0121	0.0114	0.0092
1.4181	0.0294	0.0125	0.0143	0.0092
1.4670	0.0294	0.0129	0.0154	0.0092
1.5159	0.0294	0.0134	0.0176	0.0092
1.5648	0.0294	0.0138	0.0196	0.0092
1.6137	0.0294	0.0142	0.0219	0.0092
1.6626	0.0294	0.0147	0.0243	0.0092
1.7115	0.0294	0.0151	0.0257	0.0092
1.7604	0.0294	0.0155	0.0278	0.0092
1.8093	0.0294	0.0159	0.0288	0.0092
1.8582	0.0294	0.0164	0.0305	0.0092
1.9071	0.0294	0.0168	0.0314	0.0092
1.9560	0.0294	0.0172	0.0330	0.0092
2.0049	0.0294	0.0177	0.0338	0.0092
2.0538	0.0294	0.0181	0.0352	0.0092
2.1027	0.0294	0.0185	0.0360	0.0092
2.1516	0.0294	0.0190	0.0373	0.0092
2.2005	0.0294	0.0194	0.0380	0.0092
2.2495	0.0294	0.0198	0.0393	0.0092
2.2984	0.0294	0.0204	0.0400	0.0092
2.3473	0.0294	0.0210	0.0412	0.0092
2.3962	0.0294	0.0216	0.0418	0.0092
2.4451	0.0294	0.0222	0.0430	0.0092
2.4940	0.0294	0.0228	0.0436	0.0092
2.5429	0.0294	0.0234	0.0448	0.0092
2.5918	0.0294	0.0240	0.0453	0.0092
2.6407	0.0294	0.0246	0.0464	0.0092
2.6896	0.0294	0.0252	0.0470	0.0092
2.7385	0.0294	0.0258	0.0481	0.0092
2.7874	0.0294	0.0264	0.0486	0.0092
2.8363	0.0294	0.0270	0.0496	0.0092
2.8852	0.0294	0.0276	0.0501	0.0092
2.9341	0.0294	0.0282	0.0511	0.0092
2.9830	0.0294	0.0288	0.0516	0.0092
3.0319	0.0294	0.0294	0.0533	0.0092
3.0808	0.0294	0.0300	0.0555	0.0092
3.1297	0.0294	0.0306	0.0578	0.0092
3.1786	0.0294	0.0312	0.0603	0.0092
3.2275	0.0294	0.0318	0.0627	0.0092
3.2764	0.0294	0.0323	0.0650	0.0092
3.3253	0.0294	0.0329	0.0673	0.0092
3.3742	0.0294	0.0335	0.0695	0.0092
3.4231	0.0294	0.0341	0.0717	0.0092
3.4720	0.0294	0.0347	0.0738	0.0092
3.5209	0.0294	0.0353	0.0758	0.0092
3.5698	0.0294	0.0359	0.0778	0.0092
3.6187	0.0294	0.0365	0.0798	0.0092
3.6676	0.0294	0.0371	0.0817	0.0092
3.7165	0.0294	0.0377	0.0836	0.0092
3.7500	0.0294	0.0381	0.1467	0.0092

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.7500	0.0294	0.0381	0.0000	0.1513	0.0000
3.7989	0.0294	0.0396	0.0000	0.1513	0.0000
3.8478	0.0294	0.0410	0.0000	0.1546	0.0000
3.8967	0.0294	0.0424	0.0000	0.1578	0.0000
3.9456	0.0294	0.0439	0.0000	0.1610	0.0000
3.9945	0.0294	0.0453	0.0000	0.1642	0.0000
4.0434	0.0294	0.0467	0.0000	0.1674	0.0000
4.0923	0.0294	0.0482	0.0000	0.1707	0.0000
4.1412	0.0294	0.0496	0.0000	0.1739	0.0000
4.1901	0.0294	0.0511	0.0000	0.1771	0.0000
4.2390	0.0294	0.0525	0.0000	0.1803	0.0000
4.2879	0.0294	0.0539	0.1175	0.1835	0.0000
4.3368	0.0294	0.0554	0.4064	0.1868	0.0000
4.3857	0.0294	0.0568	0.7921	0.1900	0.0000
4.4346	0.0294	0.0583	1.2490	0.1932	0.0000
4.4500	0.0295	0.0587	1.7582	0.1942	0.0000

Surface BMP #3

Element Flows To:

Outlet 1	Outlet 2
Vault 1	BMP #3

Vault 1

Width: 37.5 ft.
Length: 85 ft.
Depth: 3.5 ft.
Infiltration On
Infiltration rate: 0.469
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 39.445
Total Volume Through Riser (ac-ft.): 19.526
Total Volume Through Facility (ac-ft.): 58.97
Percent Infiltrated: 66.89
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 3 ft.
Riser Diameter: 24 in.
Notch Type: Rectangular
Notch Width: 0.083 ft.
Notch Height: 0.100 ft.
Orifice 1 Diameter: 1.15 in. Elevation:0.5 ft.
Element Flows To:
Outlet 1 Outlet 2

Vault Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.073	0.000	0.000	0.000
0.0389	0.073	0.002	0.000	0.034
0.0778	0.073	0.005	0.000	0.034
0.1167	0.073	0.008	0.000	0.034
0.1556	0.073	0.011	0.000	0.034
0.1944	0.073	0.014	0.000	0.034
0.2333	0.073	0.017	0.000	0.034
0.2722	0.073	0.019	0.000	0.034
0.3111	0.073	0.022	0.000	0.034
0.3500	0.073	0.025	0.000	0.034
0.3889	0.073	0.028	0.000	0.034
0.4278	0.073	0.031	0.000	0.034
0.4667	0.073	0.034	0.000	0.034
0.5056	0.073	0.037	0.000	0.034
0.5444	0.073	0.039	0.003	0.034
0.5833	0.073	0.042	0.009	0.034
0.6222	0.073	0.045	0.012	0.034
0.6611	0.073	0.048	0.014	0.034
0.7000	0.073	0.051	0.016	0.034
0.7389	0.073	0.054	0.017	0.034
0.7778	0.073	0.056	0.018	0.034
0.8167	0.073	0.059	0.020	0.034
0.8556	0.073	0.062	0.021	0.034
0.8944	0.073	0.065	0.022	0.034
0.9333	0.073	0.068	0.023	0.034
0.9722	0.073	0.071	0.024	0.034
1.0111	0.073	0.074	0.025	0.034
1.0500	0.073	0.076	0.026	0.034
1.0889	0.073	0.079	0.027	0.034
1.1278	0.073	0.082	0.028	0.034

1.1667	0.073	0.085	0.029	0.034
1.2056	0.073	0.088	0.030	0.034
1.2444	0.073	0.091	0.031	0.034
1.2833	0.073	0.093	0.031	0.034
1.3222	0.073	0.096	0.032	0.034
1.3611	0.073	0.099	0.033	0.034
1.4000	0.073	0.102	0.034	0.034
1.4389	0.073	0.105	0.034	0.034
1.4778	0.073	0.108	0.035	0.034
1.5167	0.073	0.111	0.036	0.034
1.5556	0.073	0.113	0.036	0.034
1.5944	0.073	0.116	0.037	0.034
1.6333	0.073	0.119	0.038	0.034
1.6722	0.073	0.122	0.038	0.034
1.7111	0.073	0.125	0.039	0.034
1.7500	0.073	0.128	0.040	0.034
1.7889	0.073	0.130	0.040	0.034
1.8278	0.073	0.133	0.041	0.034
1.8667	0.073	0.136	0.042	0.034
1.9056	0.073	0.139	0.042	0.034
1.9444	0.073	0.142	0.043	0.034
1.9833	0.073	0.145	0.043	0.034
2.0222	0.073	0.148	0.044	0.034
2.0611	0.073	0.150	0.044	0.034
2.1000	0.073	0.153	0.045	0.034
2.1389	0.073	0.156	0.045	0.034
2.1778	0.073	0.159	0.046	0.034
2.2167	0.073	0.162	0.047	0.034
2.2556	0.073	0.165	0.047	0.034
2.2944	0.073	0.167	0.048	0.034
2.3333	0.073	0.170	0.048	0.034
2.3722	0.073	0.173	0.049	0.034
2.4111	0.073	0.176	0.049	0.034
2.4500	0.073	0.179	0.050	0.034
2.4889	0.073	0.182	0.050	0.034
2.5278	0.073	0.185	0.051	0.034
2.5667	0.073	0.187	0.051	0.034
2.6056	0.073	0.190	0.052	0.034
2.6444	0.073	0.193	0.052	0.034
2.6833	0.073	0.196	0.053	0.034
2.7222	0.073	0.199	0.053	0.034
2.7611	0.073	0.202	0.054	0.034
2.8000	0.073	0.204	0.054	0.034
2.8389	0.073	0.207	0.054	0.034
2.8778	0.073	0.210	0.055	0.034
2.9167	0.073	0.213	0.056	0.034
2.9556	0.073	0.216	0.059	0.034
2.9944	0.073	0.219	0.064	0.034
3.0333	0.073	0.222	0.195	0.034
3.0722	0.073	0.224	0.477	0.034
3.1111	0.073	0.227	0.851	0.034
3.1500	0.073	0.230	1.296	0.034
3.1889	0.073	0.233	1.800	0.034
3.2278	0.073	0.236	2.355	0.034
3.2667	0.073	0.239	2.951	0.034
3.3056	0.073	0.241	3.581	0.034
3.3444	0.073	0.244	4.238	0.034
3.3833	0.073	0.247	4.912	0.034

3.4222	0.073	0.250	5.595	0.034
3.4611	0.073	0.253	6.280	0.034
3.5000	0.073	0.256	6.958	0.034
3.5389	0.073	0.259	7.620	0.034
3.5778	0.000	0.000	8.260	0.295

BMP #4

Bottom Length:	178.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	ESM
Material thickness of third layer:	1.25
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.31
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	5.801
Total Volume Through Riser (ac-ft.):	0.762
Total Volume Through Facility (ac-ft.):	11.152
Percent Infiltrated:	52.02
Total Precip Applied to Facility:	0.543
Total Evap From Facility:	0.525
Underdrain used	
Underdrain Diameter (feet):	0.67
Orifice Diameter (in.):	1
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	4.589
Total Outflow (ac-ft.):	11.152
Percent Through Underdrain:	41.15

Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Element Flows To:
Outlet 1 Outlet 2
Vault 1

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0204	0.0000	0.0000	0.0000
0.0476	0.0204	0.0003	0.0000	0.0000
0.0952	0.0204	0.0006	0.0000	0.0000
0.1427	0.0204	0.0009	0.0000	0.0000
0.1903	0.0204	0.0012	0.0000	0.0000
0.2379	0.0204	0.0015	0.0000	0.0001
0.2855	0.0204	0.0017	0.0000	0.0002
0.3331	0.0204	0.0020	0.0000	0.0003
0.3807	0.0204	0.0023	0.0000	0.0004
0.4282	0.0204	0.0026	0.0000	0.0006
0.4758	0.0204	0.0029	0.0000	0.0009
0.5234	0.0204	0.0032	0.0000	0.0010
0.5710	0.0204	0.0035	0.0000	0.0015
0.6186	0.0204	0.0038	0.0000	0.0017
0.6662	0.0204	0.0041	0.0000	0.0023
0.7137	0.0204	0.0044	0.0000	0.0023
0.7613	0.0204	0.0047	0.0000	0.0029
0.8089	0.0204	0.0050	0.0000	0.0064
0.8565	0.0204	0.0052	0.0000	0.0064
0.9041	0.0204	0.0055	0.0000	0.0064
0.9516	0.0204	0.0058	0.0000	0.0064
0.9992	0.0204	0.0061	0.0000	0.0064

1.0468	0.0204	0.0064	0.0000	0.0064
1.0944	0.0204	0.0067	0.0014	0.0064
1.1420	0.0204	0.0070	0.0022	0.0064
1.1896	0.0204	0.0073	0.0034	0.0064
1.2371	0.0204	0.0076	0.0041	0.0064
1.2847	0.0204	0.0079	0.0050	0.0064
1.3323	0.0204	0.0082	0.0058	0.0064
1.3799	0.0204	0.0085	0.0069	0.0064
1.4275	0.0204	0.0087	0.0074	0.0064
1.4751	0.0204	0.0090	0.0082	0.0064
1.5226	0.0204	0.0093	0.0086	0.0064
1.5702	0.0204	0.0096	0.0093	0.0064
1.6178	0.0204	0.0099	0.0096	0.0064
1.6654	0.0204	0.0102	0.0102	0.0064
1.7130	0.0204	0.0105	0.0105	0.0064
1.7605	0.0204	0.0108	0.0110	0.0064
1.8081	0.0204	0.0111	0.0113	0.0064
1.8557	0.0204	0.0114	0.0118	0.0064
1.9033	0.0204	0.0117	0.0121	0.0064
1.9509	0.0204	0.0120	0.0125	0.0064
1.9985	0.0204	0.0122	0.0128	0.0064
2.0460	0.0204	0.0125	0.0132	0.0064
2.0936	0.0204	0.0128	0.0135	0.0064
2.1412	0.0204	0.0131	0.0139	0.0064
2.1888	0.0204	0.0134	0.0141	0.0064
2.2364	0.0204	0.0137	0.0145	0.0064
2.2840	0.0204	0.0141	0.0147	0.0064
2.3315	0.0204	0.0145	0.0151	0.0064
2.3791	0.0204	0.0149	0.0153	0.0064
2.4267	0.0204	0.0153	0.0157	0.0064
2.4743	0.0204	0.0157	0.0159	0.0064
2.5219	0.0204	0.0161	0.0163	0.0064
2.5695	0.0204	0.0165	0.0164	0.0064
2.6170	0.0204	0.0169	0.0168	0.0064
2.6646	0.0204	0.0173	0.0170	0.0064
2.7122	0.0204	0.0177	0.0173	0.0064
2.7598	0.0204	0.0181	0.0175	0.0064
2.8074	0.0204	0.0185	0.0178	0.0064
2.8549	0.0204	0.0190	0.0180	0.0064
2.9025	0.0204	0.0194	0.0183	0.0064
2.9501	0.0204	0.0198	0.0185	0.0064
2.9977	0.0204	0.0202	0.0187	0.0064
3.0453	0.0204	0.0206	0.0190	0.0064
3.0929	0.0204	0.0210	0.0196	0.0064
3.1404	0.0204	0.0214	0.0203	0.0064
3.1880	0.0204	0.0218	0.0211	0.0064
3.2356	0.0204	0.0222	0.0219	0.0064
3.2832	0.0204	0.0226	0.0227	0.0064
3.3308	0.0204	0.0230	0.0234	0.0064
3.3784	0.0204	0.0234	0.0242	0.0064
3.4259	0.0204	0.0238	0.0249	0.0064
3.4735	0.0204	0.0242	0.0257	0.0064
3.5000	0.0204	0.0244	0.0489	0.0064

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
3.5000	0.0204	0.0244	0.0000	0.1052	0.0000
3.5476	0.0204	0.0254	0.0000	0.1052	0.0000

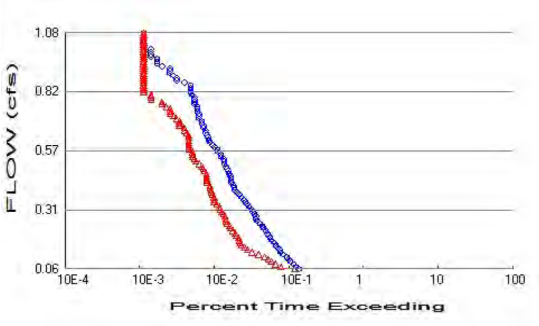
3.5952	0.0204	0.0264	0.0000	0.1074	0.0000
3.6427	0.0204	0.0273	0.0000	0.1095	0.0000
3.6903	0.0204	0.0283	0.0000	0.1117	0.0000
3.7379	0.0204	0.0293	0.0000	0.1139	0.0000
3.7855	0.0204	0.0303	0.0000	0.1161	0.0000
3.8331	0.0204	0.0312	0.0000	0.1183	0.0000
3.8807	0.0204	0.0322	0.0000	0.1204	0.0000
3.9282	0.0204	0.0332	0.0000	0.1226	0.0000
3.9758	0.0204	0.0341	0.0000	0.1248	0.0000
4.0234	0.0204	0.0351	0.0380	0.1270	0.0000
4.0710	0.0204	0.0361	0.2002	0.1292	0.0000
4.1186	0.0204	0.0371	0.4291	0.1313	0.0000
4.1662	0.0204	0.0380	0.7004	0.1335	0.0000
4.2137	0.0204	0.0390	0.9932	0.1357	0.0000
4.2613	0.0204	0.0400	1.2861	0.1379	0.0000
4.3089	0.0204	0.0409	1.5581	0.1400	0.0000
4.3300	0.0204	0.0414	1.7910	0.1410	0.0000

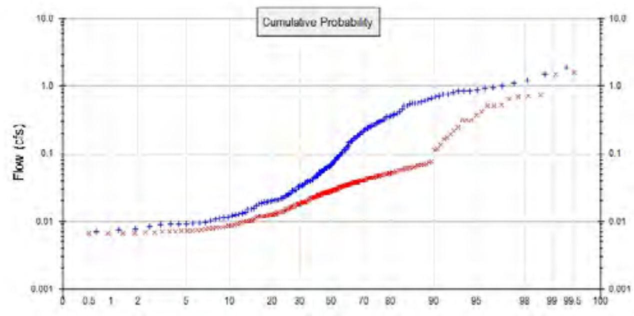
Surface BMP #4

Element Flows To:

Outlet 1	Outlet 2
Vault 1	BMP #4

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.25
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.444
Total Impervious Area: 2.61

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.57299
5 year	0.876757
10 year	1.075856
25 year	1.587745

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.125612
5 year	0.510388
10 year	0.715933
25 year	1.528022

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0573	486	423	87	Pass
0.0676	434	274	63	Pass
0.0779	406	234	57	Pass
0.0882	369	203	55	Pass
0.0985	350	186	53	Pass
0.1087	330	165	50	Pass
0.1190	291	139	47	Pass
0.1293	275	114	41	Pass
0.1396	262	98	37	Pass
0.1499	247	89	36	Pass
0.1602	234	81	34	Pass
0.1705	220	79	35	Pass
0.1808	209	76	36	Pass
0.1910	198	74	37	Pass
0.2013	188	69	36	Pass
0.2116	180	67	37	Pass
0.2219	172	63	36	Pass
0.2322	161	58	36	Pass
0.2425	154	56	36	Pass
0.2528	145	52	35	Pass
0.2631	134	51	38	Pass
0.2734	129	50	38	Pass
0.2836	128	49	38	Pass
0.2939	121	47	38	Pass
0.3042	115	44	38	Pass
0.3145	111	42	37	Pass
0.3248	104	41	39	Pass
0.3351	98	38	38	Pass
0.3454	92	35	38	Pass
0.3557	87	35	40	Pass
0.3660	82	35	42	Pass
0.3762	76	33	43	Pass
0.3865	72	32	44	Pass
0.3968	67	32	47	Pass
0.4071	65	31	47	Pass
0.4174	64	31	48	Pass
0.4277	60	28	46	Pass
0.4380	59	28	47	Pass
0.4483	59	28	47	Pass
0.4585	58	28	48	Pass
0.4688	56	28	50	Pass
0.4791	54	26	48	Pass
0.4894	52	25	48	Pass
0.4997	50	24	48	Pass
0.5100	48	22	45	Pass
0.5203	48	20	41	Pass
0.5306	47	19	40	Pass
0.5409	43	18	41	Pass
0.5511	43	18	41	Pass
0.5614	40	18	45	Pass
0.5717	39	16	41	Pass
0.5820	36	16	44	Pass
0.5923	33	16	48	Pass

0.6026	31	16	51	Pass
0.6129	30	16	53	Pass
0.6232	29	16	55	Pass
0.6335	28	16	57	Pass
0.6437	27	15	55	Pass
0.6540	27	14	51	Pass
0.6643	25	14	56	Pass
0.6746	25	12	48	Pass
0.6849	24	12	50	Pass
0.6952	24	12	50	Pass
0.7055	22	11	50	Pass
0.7158	22	10	45	Pass
0.7260	22	9	40	Pass
0.7363	21	9	42	Pass
0.7466	21	9	42	Pass
0.7569	21	8	38	Pass
0.7672	19	7	36	Pass
0.7775	19	7	36	Pass
0.7878	19	5	26	Pass
0.7981	19	5	26	Pass
0.8084	18	5	27	Pass
0.8186	17	4	23	Pass
0.8289	17	4	23	Pass
0.8392	17	4	23	Pass
0.8495	17	4	23	Pass
0.8598	14	4	28	Pass
0.8701	11	4	36	Pass
0.8804	11	4	36	Pass
0.8907	10	4	40	Pass
0.9010	9	4	44	Pass
0.9112	9	4	44	Pass
0.9215	9	4	44	Pass
0.9318	7	4	57	Pass
0.9421	6	4	66	Pass
0.9524	6	4	66	Pass
0.9627	6	4	66	Pass
0.9730	5	4	80	Pass
0.9833	5	4	80	Pass
0.9935	5	4	80	Pass
1.0038	5	4	80	Pass
1.0141	4	4	100	Pass
1.0244	4	4	100	Pass
1.0347	4	4	100	Pass
1.0450	4	4	100	Pass
1.0553	4	4	100	Pass
1.0656	4	4	100	Pass
1.0759	4	4	100	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

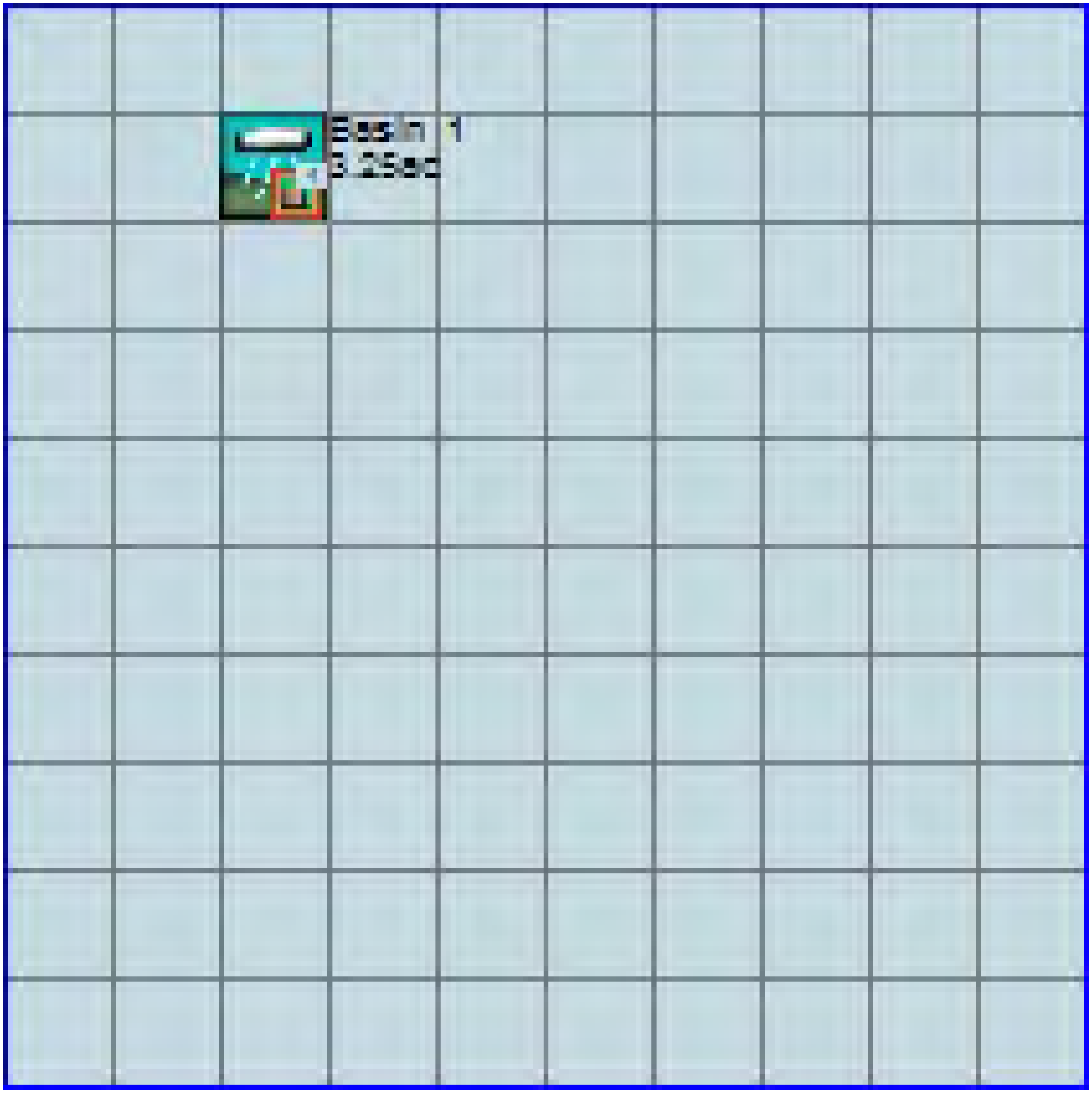
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Bio_Vault_Option rev 2.wdm
MESSU      25   PreBio_Vault_Option rev 2.MES
           27   PreBio_Vault_Option rev 2.L61
           28   PreBio_Vault_Option rev 2.L62
           30   POCBio_Vault_Option rev 21.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      28
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                      1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                            User  t-series Engl Metr ***
                                            in  out           ***
   28      D,NatVeg,Flat          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   28         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   28         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   28         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   28              0       3.3      0.03       100      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   28              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   28              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   28       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   28       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   28              0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  28                        3.25     COPY   501     12
PERLND  28                        3.25     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES
```

```
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>      <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>               <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY          INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY          INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Bio_Vault_Option rev 2.wdm
MESSU      25   MitBio_Vault_Option rev 2.MES
           27   MitBio_Vault_Option rev 2.L61
           28   MitBio_Vault_Option rev 2.L62
           30   POCBio_Vault_Option rev 21.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      IMPLND       1
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      GENER        6
      RCHRES       5
      RCHRES       6
      GENER        8
      RCHRES       7
      RCHRES       8
      RCHRES       9
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
    4        24
    6        24
    8        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
```

```
    6            0.
    8            0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                         in  out           ***
   46      D,Urban,Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   46         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   46         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   46             0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46             0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   46             0       0.6      0.03         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   46             0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
```

```
    # -  #                     User  t-series Engl Metr ***
                                    in  out           ***
    1      IMPERVIOUS-FLAT        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA #1***
PERLND  46                       0.064     RCHRES   1      2
PERLND  46                       0.064     RCHRES   1      3
IMPLND   1                        0.37     RCHRES   1      5
DMA #2***
PERLND  46                        0.03     RCHRES   3      2
PERLND  46                        0.03     RCHRES   3      3
IMPLND   1                        0.39     RCHRES   3      5
DMA #3***
PERLND  46                        0.13     RCHRES   5      2
PERLND  46                        0.13     RCHRES   5      3
IMPLND   1                        1.12     RCHRES   5      5
DMAs #5, 6***
PERLND  46                        0.13     RCHRES   9      2
PERLND  46                        0.13     RCHRES   9      3
IMPLND   1                        0.31     RCHRES   9      5
DMA #4***
PERLND  46                        0.01     RCHRES   7      2
PERLND  46                        0.01     RCHRES   7      3
IMPLND   1                        0.39     RCHRES   7      5
DMA #7, 8***
PERLND  46                        0.08     COPY   501     12
PERLND  46                        0.08     COPY   601     12
```

```
PERLND  46                      0.08     COPY   501     13
PERLND  46                      0.08     COPY   601     13
IMPLND   1                      0.03     COPY   501     15
IMPLND   1                      0.03     COPY   601     15

******Routing******
RCHRES   2                         1     RCHRES   9      6
RCHRES   2                               COPY     1     16
RCHRES   1                         1     RCHRES   9      7
RCHRES   1                               COPY     1     17
RCHRES   1                         1     RCHRES   2      8
RCHRES   4                         1     RCHRES   9      6
RCHRES   4                               COPY     1     16
RCHRES   3                         1     RCHRES   9      7
RCHRES   3                               COPY     1     17
RCHRES   3                         1     RCHRES   4      8
RCHRES   6                         1     RCHRES   9      7
RCHRES   6                               COPY     1     17
RCHRES   5                         1     RCHRES   9      7
RCHRES   5                               COPY     1     17
RCHRES   5                         1     RCHRES   6      8
PERLND  46                      0.13     COPY     1     12
IMPLND   1                      0.31     COPY     1     15
PERLND  46                      0.13     COPY     1     13
RCHRES   8                         1     RCHRES   9      7
RCHRES   8                               COPY     1     17
RCHRES   7                         1     RCHRES   9      7
RCHRES   7                               COPY     1     17
RCHRES   7                         1     RCHRES   8      8
RCHRES   9                         1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0002778     RCHRES   1     EXTNL  OUTDGT 1
GENER    4 OUTPUT TIMSER      .0002778     RCHRES   3     EXTNL  OUTDGT 1
GENER    6 OUTPUT TIMSER      .0002778     RCHRES   5     EXTNL  OUTDGT 1
GENER    8 OUTPUT TIMSER      .0002778     RCHRES   7     EXTNL  OUTDGT 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
    1     Surface BMP #1         3    1    1    1   28    0    1
    2     BMP #1                 1    1    1    1   28    0    1
    3     Surface BMP #2         3    1    1    1   28    0    1
    4     BMP #2                 1    1    1    1   28    0    1
    5     Surface BMP #3         3    1    1    1   28    0    1
    6     BMP #3                 2    1    1    1   28    0    1
    7     Surface BMP #4         3    1    1    1   28    0    1
    8     BMP #4                 2    1    1    1   28    0    1
    9     Vault  1               2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
```

```
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
    7         1    0    0    0    0    0    0    0    0    0
    8         1    0    0    0    0    0    0    0    0    0
    9         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
    7         4    0    0    0    0    0    0    0    0    0    1    9
    8         4    0    0    0    0    0    0    0    0    0    1    9
    9         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    3        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    4        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    5        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    6        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    7        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    8        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    9        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1             1      0.01       0.0       0.0       0.5       0.0
    2             2      0.02       0.0       0.0       0.5       0.0
    3             3      0.01       0.0       0.0       0.5       0.0
    4             4      0.04       0.0       0.0       0.5       0.0
    5             5      0.01       0.0       0.0       0.5       0.0
    6             6      0.04       0.0       0.0       0.5       0.0
    7             7      0.01       0.0       0.0       0.5       0.0
    8             8      0.03       0.0       0.0       0.5       0.0
    9             9      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3           0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5           0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    7           0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    8           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    9           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
```

```
***                           addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Variable Quantity Lines
***                           addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL              4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 K       1        3
*** User-Defined Variable Quantity Lines
***                           addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol6   RCHRES   6 VOL              4
  UVQUAN v2m6   GLOBAL     WORKSP  5        3
  UVQUAN vpo6   GLOBAL     WORKSP  6        3
  UVQUAN v2d6   GENER    6 K       1        3
*** User-Defined Variable Quantity Lines
***                           addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol8   RCHRES   8 VOL              4
  UVQUAN v2m8   GLOBAL     WORKSP  7        3
  UVQUAN vpo8   GLOBAL     WORKSP  8        3
  UVQUAN v2d8   GENER    8 K       1        3
*** User-Defined Target Variable Names
***                   addr or                        addr or
***                  <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                        addr or
***                  <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m4    1 WORKSP  3         1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4         1.0 QUAN
  UVNAME  v2d4    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                        addr or
***                  <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m6    1 WORKSP  5         1.0 QUAN
  UVNAME  vpo6    1 WORKSP  6         1.0 QUAN
  UVNAME  v2d6    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                        addr or
***                  <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m8    1 WORKSP  7         1.0 QUAN
  UVNAME  vpo8    1 WORKSP  8         1.0 QUAN
  UVNAME  v2d8    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  1125.
```

```
*** Compute remaining available pore space
  GENER   2                             vpo2            =  v2m2
  GENER   2                             vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                             vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                             v2d2            =  vpo2
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   4                             v2m4            =  2103.
*** Compute remaining available pore space
  GENER   4                             vpo4            =  v2m4
  GENER   4                             vpo4           -=  vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                             vpo4            =  0.0
END IF
*** Infiltration volume
  GENER   4                             v2d4            =  vpo4
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   6                             v2m6            =  1560.
*** Compute remaining available pore space
  GENER   6                             vpo6            =  v2m6
  GENER   6                             vpo6           -=  vol6
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo6 < 0.0) THEN
  GENER   6                             vpo6            =  0.0
END IF
*** Infiltration volume
  GENER   6                             v2d6            =  vpo6
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   8                             v2m8            =  1001.
*** Compute remaining available pore space
  GENER   8                             vpo8            =  v2m8
  GENER   8                             vpo8           -=  vol8
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo8 < 0.0) THEN
  GENER   8                             vpo8            =  0.0
END IF
*** Infiltration volume
  GENER   8                             v2d8            =  vpo8
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   75    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.022957  0.000000  0.000000
  0.047582  0.022957  0.000328  0.000000
  0.095165  0.022957  0.000655  0.000000
  0.142747  0.022957  0.000983  0.000000
  0.190330  0.022957  0.001311  0.000000
  0.237912  0.022957  0.001639  0.000000
  0.285495  0.022957  0.001966  0.000000
  0.333077  0.022957  0.002294  0.000000
  0.380659  0.022957  0.002622  0.000000
  0.428242  0.022957  0.002949  0.000000
  0.475824  0.022957  0.003277  0.000000
  0.523407  0.022957  0.003605  0.000000
  0.570989  0.022957  0.003932  0.000000
  0.618571  0.022957  0.004260  0.000000
  0.666154  0.022957  0.004588  0.000000
  0.713736  0.022957  0.004916  0.000000
  0.761319  0.022957  0.005243  0.000000
  0.808901  0.022957  0.005571  0.000000
  0.856484  0.022957  0.005899  0.000000
```

```
  0.904066  0.022957  0.006226  0.000000
  0.951648  0.022957  0.006554  0.000000
  0.999231  0.022957  0.006882  0.000000
  1.046813  0.022957  0.007209  0.000000
  1.094396  0.022957  0.007537  0.008216
  1.141978  0.022957  0.007865  0.008495
  1.189560  0.022957  0.008193  0.008635
  1.237143  0.022957  0.008520  0.011410
  1.284725  0.022957  0.008848  0.012177
  1.332308  0.022957  0.009176  0.014031
  1.379890  0.022957  0.009503  0.014538
  1.427473  0.022957  0.009831  0.014791
  1.475055  0.022957  0.010159  0.019375
  1.522637  0.022957  0.010486  0.019377
  1.570220  0.022957  0.010814  0.019378
  1.617802  0.022957  0.011142  0.021140
  1.665385  0.022957  0.011470  0.022022
  1.712967  0.022957  0.011797  0.023987
  1.760549  0.022957  0.012125  0.024969
  1.808132  0.022957  0.012453  0.026822
  1.855714  0.022957  0.012780  0.027749
  1.903297  0.022957  0.013108  0.029455
  1.950879  0.022957  0.013436  0.030308
  1.998462  0.022957  0.013764  0.031884
  2.046044  0.022957  0.014091  0.032673
  2.093626  0.022957  0.014419  0.034142
  2.141209  0.022957  0.014747  0.034877
  2.188791  0.022957  0.015074  0.036258
  2.236374  0.022957  0.015402  0.036949
  2.283956  0.022957  0.015855  0.038256
  2.331538  0.022957  0.016309  0.038909
  2.379121  0.022957  0.016762  0.040152
  2.426703  0.022957  0.017215  0.040774
  2.474286  0.022957  0.017669  0.041962
  2.521868  0.022957  0.018122  0.042557
  2.569451  0.022957  0.018575  0.043697
  2.617033  0.022957  0.019029  0.044267
  2.664615  0.022957  0.019482  0.045364
  2.712198  0.022957  0.019935  0.045913
  2.759780  0.022957  0.020389  0.046972
  2.807363  0.022957  0.020842  0.047502
  2.854945  0.022957  0.021295  0.048527
  2.902527  0.022957  0.021749  0.048656
  2.950110  0.022957  0.022202  0.049421
  2.997692  0.022957  0.022655  0.051241
  3.045275  0.022957  0.023108  0.053513
  3.092857  0.022957  0.023562  0.055949
  3.140440  0.022957  0.024015  0.058412
  3.188022  0.022957  0.024468  0.060841
  3.235604  0.022957  0.024922  0.063210
  3.283187  0.022957  0.025375  0.065512
  3.330769  0.022957  0.025828  0.067748
  3.378352  0.022957  0.026282  0.069923
  3.425934  0.022957  0.026735  0.072048
  3.473516  0.022957  0.027188  0.074148
  3.500000  0.022957  0.057625  0.115741
  END FTABLE  2
  FTABLE      1
   19    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.022957  0.000000  0.000000  0.000000  0.000000
  0.047582  0.023680  0.001110  0.000000  0.118188  0.000000
  0.095165  0.024406  0.002254  0.000000  0.120636  0.000000
  0.142747  0.025137  0.003432  0.000000  0.123084  0.000000
  0.190330  0.025871  0.004646  0.000000  0.125531  0.000000
  0.237912  0.026608  0.005894  0.000000  0.127979  0.000000
  0.285495  0.027350  0.007178  0.000000  0.130427  0.000000
```

```
0.333077  0.028095  0.008497  0.000000  0.132874  0.000000
0.380659  0.028844  0.009852  0.000000  0.135322  0.000000
0.428242  0.029597  0.011242  0.000000  0.137770  0.000000
0.475824  0.030353  0.012668  0.000000  0.140217  0.000000
0.523407  0.031114  0.014131  0.057007  0.142665  0.000000
0.570989  0.031878  0.015629  0.300701  0.145113  0.000000
0.618571  0.032645  0.017165  0.647684  0.147560  0.000000
0.666154  0.033417  0.018736  1.069389  0.150008  0.000000
0.713736  0.034192  0.020345  1.547144  0.152456  0.000000
0.761319  0.034971  0.021990  2.064030  0.154903  0.000000
0.808901  0.035754  0.023673  2.602948  0.157351  0.000000
0.830000  0.036102  0.024431  3.146332  0.158436  0.000000
END FTABLE  1
FTABLE      4
 75    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.042929  0.000000  0.000000
0.047582  0.042929  0.000613  0.000000
0.095165  0.042929  0.001226  0.000000
0.142747  0.042929  0.001838  0.000000
0.190330  0.042929  0.002451  0.000000
0.237912  0.042929  0.003064  0.000000
0.285495  0.042929  0.003677  0.000000
0.333077  0.042929  0.004290  0.000000
0.380659  0.042929  0.004902  0.000000
0.428242  0.042929  0.005515  0.000000
0.475824  0.042929  0.006128  0.000000
0.523407  0.042929  0.006741  0.000000
0.570989  0.042929  0.007354  0.000000
0.618571  0.042929  0.007966  0.000000
0.666154  0.042929  0.008579  0.000000
0.713736  0.042929  0.009192  0.000000
0.761319  0.042929  0.009805  0.000000
0.808901  0.042929  0.010418  0.000000
0.856484  0.042929  0.011030  0.000000
0.904066  0.042929  0.011643  0.000000
0.951648  0.042929  0.012256  0.000000
0.999231  0.042929  0.012869  0.000000
1.046813  0.042929  0.013482  0.000000
1.094396  0.042929  0.014094  0.002566
1.141978  0.042929  0.014707  0.003848
1.189560  0.042929  0.015320  0.006323
1.237143  0.042929  0.015933  0.007560
1.284725  0.042929  0.016546  0.009446
1.332308  0.042929  0.017159  0.010389
1.379890  0.042929  0.017771  0.011891
1.427473  0.042929  0.018384  0.012642
1.475055  0.042929  0.018997  0.013909
1.522637  0.042929  0.019610  0.014542
1.570220  0.042929  0.020223  0.015656
1.617802  0.042929  0.020835  0.016212
1.665385  0.042929  0.021448  0.017217
1.712967  0.042929  0.022061  0.017720
1.760549  0.042929  0.022674  0.018643
1.808132  0.042929  0.023287  0.019105
1.855714  0.042929  0.023899  0.019965
1.903297  0.042929  0.024512  0.020395
1.950879  0.042929  0.025125  0.021203
1.998462  0.042929  0.025738  0.021607
2.046044  0.042929  0.026351  0.022371
2.093626  0.042929  0.026963  0.022753
2.141209  0.042929  0.027576  0.023480
2.188791  0.042929  0.028189  0.023844
2.236374  0.042929  0.028802  0.024539
2.283956  0.042929  0.029649  0.024886
2.331538  0.042929  0.030497  0.025553
2.379121  0.042929  0.031345  0.025886
2.426703  0.042929  0.032193  0.026528
2.474286  0.042929  0.033040  0.026849
```

2.521868	0.042929	0.033888	0.027468
2.569451	0.042929	0.034736	0.027778
2.617033	0.042929	0.035583	0.028377
2.664615	0.042929	0.036431	0.028677
2.712198	0.042929	0.037279	0.029258
2.759780	0.042929	0.038127	0.029548
2.807363	0.042929	0.038974	0.030113
2.854945	0.042929	0.039822	0.030395
2.902527	0.042929	0.040670	0.030944
2.950110	0.042929	0.041517	0.031218
2.997692	0.042929	0.042365	0.031552
3.045275	0.042929	0.043213	0.032087
3.092857	0.042929	0.044061	0.033115
3.140440	0.042929	0.044908	0.034356
3.188022	0.042929	0.045756	0.035677
3.235604	0.042929	0.046604	0.037013
3.283187	0.042929	0.047451	0.038334
3.330769	0.042929	0.048299	0.039630
3.378352	0.042929	0.049147	0.040896
3.425934	0.042929	0.049995	0.042135
3.473516	0.042929	0.050842	0.043362
3.500000	0.042929	0.107760	0.082677

END FTABLE 4
FTABLE 3
19 6

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	outflow 3 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.042929	0.000000	0.000000	0.000000	0.000000		
0.047582	0.042929	0.002043	0.000000	0.221012	0.000000		
0.095165	0.042929	0.004085	0.000000	0.225590	0.000000		
0.142747	0.042929	0.006128	0.000000	0.230167	0.000000		
0.190330	0.042929	0.008171	0.000000	0.234744	0.000000		
0.237912	0.042929	0.010213	0.000000	0.239321	0.000000		
0.285495	0.042929	0.012256	0.000000	0.243898	0.000000		
0.333077	0.042929	0.014299	0.000000	0.248475	0.000000		
0.380659	0.042929	0.016341	0.000000	0.253052	0.000000		
0.428242	0.042929	0.018384	0.000000	0.257629	0.000000		
0.475824	0.042929	0.020427	0.000000	0.262207	0.000000		
0.523407	0.042929	0.022469	0.057007	0.266784	0.000000		
0.570989	0.042929	0.024512	0.300701	0.271361	0.000000		
0.618571	0.042929	0.026555	0.647684	0.275938	0.000000		
0.666154	0.042929	0.028598	1.069389	0.280515	0.000000		
0.713736	0.042929	0.030640	1.547144	0.285092	0.000000		
0.761319	0.042929	0.032683	2.064030	0.289669	0.000000		
0.808901	0.042929	0.034726	2.602948	0.294246	0.000000		
0.830000	0.042929	0.035631	3.146332	0.296276	0.000000		

END FTABLE 3
FTABLE 6
78 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.029380	0.000000	0.000000	0.000000		
0.048901	0.029380	0.000431	0.000000	0.000000		
0.097802	0.029380	0.000862	0.000000	0.000000		
0.146703	0.029380	0.001293	0.000000	0.000000		
0.195604	0.029380	0.001724	0.000000	0.000000		
0.244505	0.029380	0.002155	0.000000	0.000125		
0.293407	0.029380	0.002586	0.000000	0.000277		
0.342308	0.029380	0.003017	0.000000	0.000385		
0.391209	0.029380	0.003448	0.000000	0.000675		
0.440110	0.029380	0.003879	0.000000	0.000860		
0.489011	0.029380	0.004310	0.000000	0.001318		
0.537912	0.029380	0.004741	0.000000	0.001593		
0.586813	0.029380	0.005172	0.000000	0.002244		
0.635714	0.029380	0.005603	0.000000	0.002622		
0.684615	0.029380	0.006034	0.000000	0.003434		
0.733516	0.029380	0.006465	0.000000	0.003489		
0.782418	0.029380	0.006896	0.000000	0.004512		

0.831319	0.029380	0.007327	0.000000	0.009184
0.880220	0.029380	0.007758	0.000000	0.009184
0.929121	0.029380	0.008189	0.000000	0.009184
0.978022	0.029380	0.008620	0.000000	0.009184
1.026923	0.029380	0.009051	0.000000	0.009184
1.075824	0.029380	0.009482	0.000000	0.009184
1.124725	0.029380	0.009913	0.004241	0.009184
1.173626	0.029380	0.010344	0.006040	0.009184
1.222527	0.029380	0.010775	0.009247	0.009184
1.271429	0.029380	0.011206	0.010024	0.009184
1.320330	0.029380	0.011637	0.009874	0.009184
1.369231	0.029380	0.012068	0.011352	0.009184
1.418132	0.029380	0.012499	0.014254	0.009184
1.467033	0.029380	0.012931	0.015370	0.009184
1.515934	0.029380	0.013362	0.017590	0.009184
1.564835	0.029380	0.013793	0.019565	0.009184
1.613736	0.029380	0.014224	0.021855	0.009184
1.662637	0.029380	0.014655	0.024326	0.009184
1.711538	0.029380	0.015086	0.025727	0.009184
1.760440	0.029380	0.015517	0.027768	0.009184
1.809341	0.029380	0.015948	0.028789	0.009184
1.858242	0.029380	0.016379	0.030529	0.009184
1.907143	0.029380	0.016810	0.031399	0.009184
1.956044	0.029380	0.017241	0.032976	0.009184
2.004945	0.029380	0.017672	0.033764	0.009184
2.053846	0.029380	0.018103	0.035229	0.009184
2.102747	0.029380	0.018534	0.035961	0.009184
2.151648	0.029380	0.018965	0.037338	0.009184
2.200549	0.029380	0.019396	0.038026	0.009184
2.249451	0.029380	0.019827	0.039331	0.009184
2.298352	0.029380	0.020423	0.039983	0.009184
2.347253	0.029380	0.021019	0.041225	0.009184
2.396154	0.029380	0.021615	0.041847	0.009184
2.445055	0.029380	0.022212	0.043036	0.009184
2.493956	0.029380	0.022808	0.043630	0.009184
2.542857	0.029380	0.023404	0.044772	0.009184
2.591758	0.029380	0.024000	0.045343	0.009184
2.640659	0.029380	0.024597	0.046442	0.009184
2.689560	0.029380	0.025193	0.046992	0.009184
2.738462	0.029380	0.025789	0.048054	0.009184
2.787363	0.029380	0.026385	0.048585	0.009184
2.836264	0.029380	0.026982	0.049614	0.009184
2.885165	0.029380	0.027578	0.050128	0.009184
2.934066	0.029380	0.028174	0.051125	0.009184
2.982967	0.029380	0.028770	0.051623	0.009184
3.031868	0.029380	0.029367	0.053278	0.009184
3.080769	0.029380	0.029963	0.055456	0.009184
3.129670	0.029380	0.030559	0.057835	0.009184
3.178571	0.029380	0.031155	0.060263	0.009184
3.227473	0.029380	0.031752	0.062667	0.009184
3.276374	0.029380	0.032348	0.065018	0.009184
3.325275	0.029380	0.032944	0.067305	0.009184
3.374176	0.029380	0.033540	0.069527	0.009184
3.423077	0.029380	0.034137	0.071685	0.009184
3.471978	0.029380	0.034733	0.073783	0.009184
3.520879	0.029380	0.035329	0.075828	0.009184
3.569780	0.029380	0.035925	0.077822	0.009184
3.618681	0.029380	0.036521	0.079773	0.009184
3.667582	0.029380	0.037118	0.081688	0.009184
3.716484	0.029380	0.037714	0.083585	0.009184
3.750000	0.029380	0.080058	0.146720	0.009184

END FTABLE 6
FTABLE 5
16 6

Depth	Area	Volume	Outflow1	Outflow2	outflow 3	Velocity	Travel Time***
(ft)	(acres)	(acre-ft)	(cfs)	(cfs)	(cfs)	(ft/sec)	(Minutes)***
0.000000	0.029380	0.000000	0.000000	0.000000	0.000000		
0.048901	0.029385	0.001437	0.000000	0.151344	0.000000		

0.097802	0.029390	0.002874	0.000000	0.154564	0.000000
0.146703	0.029395	0.004311	0.000000	0.157783	0.000000
0.195604	0.029400	0.005749	0.000000	0.161002	0.000000
0.244505	0.029405	0.007187	0.000000	0.164222	0.000000
0.293407	0.029410	0.008625	0.000000	0.167441	0.000000
0.342308	0.029415	0.010063	0.000000	0.170660	0.000000
0.391209	0.029420	0.011501	0.000000	0.173880	0.000000
0.440110	0.029424	0.012940	0.000000	0.177099	0.000000
0.489011	0.029429	0.014379	0.000000	0.180318	0.000000
0.537912	0.029434	0.015819	0.117464	0.183538	0.000000
0.586813	0.029439	0.017258	0.406432	0.186757	0.000000
0.635714	0.029444	0.018698	0.792059	0.189976	0.000000
0.684615	0.029449	0.020138	1.249035	0.193196	0.000000
0.700000	0.029451	0.020591	1.758232	0.194208	0.000000

END FTABLE 5
FTABLE 9
92 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.073175	0.000000	0.000000	0.000000		
0.038889	0.073175	0.002846	0.000000	0.034605		
0.077778	0.073175	0.005691	0.000000	0.034605		
0.116667	0.073175	0.008537	0.000000	0.034605		
0.155556	0.073175	0.011383	0.000000	0.034605		
0.194444	0.073175	0.014228	0.000000	0.034605		
0.233333	0.073175	0.017074	0.000000	0.034605		
0.272222	0.073175	0.019920	0.000000	0.034605		
0.311111	0.073175	0.022766	0.000000	0.034605		
0.350000	0.073175	0.025611	0.000000	0.034605		
0.388889	0.073175	0.028457	0.000000	0.034605		
0.427778	0.073175	0.031303	0.000000	0.034605		
0.466667	0.073175	0.034148	0.000000	0.034605		
0.505556	0.073175	0.036994	0.000062	0.034605		
0.544444	0.073175	0.039840	0.003434	0.034605		
0.583333	0.073175	0.042685	0.009564	0.034605		
0.622222	0.073175	0.045531	0.012547	0.034605		
0.661111	0.073175	0.048377	0.014405	0.034605		
0.700000	0.073175	0.051222	0.016050	0.034605		
0.738889	0.073175	0.054068	0.017541	0.034605		
0.777778	0.073175	0.056914	0.018915	0.034605		
0.816667	0.073175	0.059760	0.020196	0.034605		
0.855556	0.073175	0.062605	0.021400	0.034605		
0.894444	0.073175	0.065451	0.022540	0.034605		
0.933333	0.073175	0.068297	0.023625	0.034605		
0.972222	0.073175	0.071142	0.024662	0.034605		
1.011111	0.073175	0.073988	0.025657	0.034605		
1.050000	0.073175	0.076834	0.026616	0.034605		
1.088889	0.073175	0.079679	0.027540	0.034605		
1.127778	0.073175	0.082525	0.028435	0.034605		
1.166667	0.073175	0.085371	0.029303	0.034605		
1.205556	0.073175	0.088216	0.030145	0.034605		
1.244444	0.073175	0.091062	0.030965	0.034605		
1.283333	0.073175	0.093908	0.031763	0.034605		
1.322222	0.073175	0.096754	0.032542	0.034605		
1.361111	0.073175	0.099599	0.033303	0.034605		
1.400000	0.073175	0.102445	0.034047	0.034605		
1.438889	0.073175	0.105291	0.034775	0.034605		
1.477778	0.073175	0.108136	0.035487	0.034605		
1.516667	0.073175	0.110982	0.036186	0.034605		
1.555556	0.073175	0.113828	0.036872	0.034605		
1.594444	0.073175	0.116673	0.037545	0.034605		
1.633333	0.073175	0.119519	0.038206	0.034605		
1.672222	0.073175	0.122365	0.038856	0.034605		
1.711111	0.073175	0.125210	0.039495	0.034605		
1.750000	0.073175	0.128056	0.040124	0.034605		
1.788889	0.073175	0.130902	0.040744	0.034605		
1.827778	0.073175	0.133748	0.041354	0.034605		
1.866667	0.073175	0.136593	0.041955	0.034605		
1.905556	0.073175	0.139439	0.042548	0.034605		
1.944444	0.073175	0.142285	0.043133	0.034605		

1.983333	0.073175	0.145130	0.043709	0.034605
2.022222	0.073175	0.147976	0.044279	0.034605
2.061111	0.073175	0.150822	0.044841	0.034605
2.100000	0.073175	0.153667	0.045396	0.034605
2.138889	0.073175	0.156513	0.045944	0.034605
2.177778	0.073175	0.159359	0.046486	0.034605
2.216667	0.073175	0.162204	0.047022	0.034605
2.255556	0.073175	0.165050	0.047551	0.034605
2.294444	0.073175	0.167896	0.048075	0.034605
2.333333	0.073175	0.170742	0.048593	0.034605
2.372222	0.073175	0.173587	0.049106	0.034605
2.411111	0.073175	0.176433	0.049613	0.034605
2.450000	0.073175	0.179279	0.050115	0.034605
2.488889	0.073175	0.182124	0.050613	0.034605
2.527778	0.073175	0.184970	0.051105	0.034605
2.566667	0.073175	0.187816	0.051593	0.034605
2.605556	0.073175	0.190661	0.052076	0.034605
2.644444	0.073175	0.193507	0.052555	0.034605
2.683333	0.073175	0.196353	0.053029	0.034605
2.722222	0.073175	0.199198	0.053499	0.034605
2.761111	0.073175	0.202044	0.053965	0.034605
2.800000	0.073175	0.204890	0.054427	0.034605
2.838889	0.073175	0.207735	0.054886	0.034605
2.877778	0.073175	0.210581	0.055340	0.034605
2.916667	0.073175	0.213427	0.056386	0.034605
2.955556	0.073175	0.216273	0.059857	0.034605
2.994444	0.073175	0.219118	0.064704	0.034605
3.033333	0.073175	0.221964	0.195030	0.034605
3.072222	0.073175	0.224810	0.477922	0.034605
3.111111	0.073175	0.227655	0.851501	0.034605
3.150000	0.073175	0.230501	1.296402	0.034605
3.188889	0.073175	0.233347	1.800716	0.034605
3.227778	0.073175	0.236192	2.355175	0.034605
3.266667	0.073175	0.239038	2.951520	0.034605
3.305556	0.073175	0.241884	3.581797	0.034605
3.344444	0.073175	0.244729	4.238038	0.034605
3.383333	0.073175	0.247575	4.912131	0.034605
3.422222	0.073175	0.250421	5.595807	0.034605
3.461111	0.073175	0.253267	6.280695	0.034605
3.500000	0.073175	0.256112	6.958433	0.034605
3.538889	0.073175	0.258958	7.620813	0.034605

END FTABLE 9
FTABLE 8
75 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.020432	0.000000	0.000000	0.000000		
0.047582	0.020432	0.000292	0.000000	0.000000		
0.095165	0.020432	0.000583	0.000000	0.000000		
0.142747	0.020432	0.000875	0.000000	0.000000		
0.190330	0.020432	0.001167	0.000000	0.000000		
0.237912	0.020432	0.001458	0.000000	0.000083		
0.285495	0.020432	0.001750	0.000000	0.000182		
0.333077	0.020432	0.002042	0.000000	0.000253		
0.380659	0.020432	0.002333	0.000000	0.000441		
0.428242	0.020432	0.002625	0.000000	0.000561		
0.475824	0.020432	0.002917	0.000000	0.000859		
0.523407	0.020432	0.003208	0.000000	0.001038		
0.570989	0.020432	0.003500	0.000000	0.001461		
0.618571	0.020432	0.003792	0.000000	0.001707		
0.666154	0.020432	0.004083	0.000000	0.002262		
0.713736	0.020432	0.004375	0.000000	0.002271		
0.761319	0.020432	0.004666	0.000000	0.002935		
0.808901	0.020432	0.004958	0.000000	0.006387		
0.856484	0.020432	0.005250	0.000000	0.006387		
0.904066	0.020432	0.005541	0.000000	0.006387		
0.951648	0.020432	0.005833	0.000000	0.006387		
0.999231	0.020432	0.006125	0.000000	0.006387		
1.046813	0.020432	0.006416	0.000000	0.006387		
1.094396	0.020432	0.006708	0.001404	0.006387		

1.141978	0.020432	0.007000	0.002220	0.006387
1.189560	0.020432	0.007291	0.003429	0.006387
1.237143	0.020432	0.007583	0.004096	0.006387
1.284725	0.020432	0.007875	0.004966	0.006387
1.332308	0.020432	0.008166	0.005835	0.006387
1.379890	0.020432	0.008458	0.006880	0.006387
1.427473	0.020432	0.008750	0.007403	0.006387
1.475055	0.020432	0.009041	0.008191	0.006387
1.522637	0.020432	0.009333	0.008585	0.006387
1.570220	0.020432	0.009625	0.009254	0.006387
1.617802	0.020432	0.009916	0.009588	0.006387
1.665385	0.020432	0.010208	0.010185	0.006387
1.712967	0.020432	0.010500	0.010484	0.006387
1.760549	0.020432	0.010791	0.011031	0.006387
1.808132	0.020432	0.011083	0.011305	0.006387
1.855714	0.020432	0.011375	0.011814	0.006387
1.903297	0.020432	0.011666	0.012068	0.006387
1.950879	0.020432	0.011958	0.012546	0.006387
1.998462	0.020432	0.012250	0.012785	0.006387
2.046044	0.020432	0.012541	0.013237	0.006387
2.093626	0.020432	0.012833	0.013463	0.006387
2.141209	0.020432	0.013124	0.013894	0.006387
2.188791	0.020432	0.013416	0.014109	0.006387
2.236374	0.020432	0.013708	0.014520	0.006387
2.283956	0.020432	0.014111	0.014725	0.006387
2.331538	0.020432	0.014515	0.015120	0.006387
2.379121	0.020432	0.014918	0.015317	0.006387
2.426703	0.020432	0.015322	0.015697	0.006387
2.474286	0.020432	0.015725	0.015887	0.006387
2.521868	0.020432	0.016129	0.016253	0.006387
2.569451	0.020432	0.016532	0.016437	0.006387
2.617033	0.020432	0.016935	0.016791	0.006387
2.664615	0.020432	0.017339	0.016969	0.006387
2.712198	0.020432	0.017742	0.017312	0.006387
2.759780	0.020432	0.018146	0.017484	0.006387
2.807363	0.020432	0.018549	0.017818	0.006387
2.854945	0.020432	0.018953	0.017985	0.006387
2.902527	0.020432	0.019356	0.018310	0.006387
2.950110	0.020432	0.019760	0.018472	0.006387
2.997692	0.020432	0.020163	0.018670	0.006387
3.045275	0.020432	0.020567	0.018986	0.006387
3.092857	0.020432	0.020970	0.019594	0.006387
3.140440	0.020432	0.021373	0.020329	0.006387
3.188022	0.020432	0.021777	0.021111	0.006387
3.235604	0.020432	0.022180	0.021901	0.006387
3.283187	0.020432	0.022584	0.022683	0.006387
3.330769	0.020432	0.022987	0.023449	0.006387
3.378352	0.020432	0.023391	0.024199	0.006387
3.425934	0.020432	0.023794	0.024932	0.006387
3.473516	0.020432	0.024198	0.025658	0.006387
3.500000	0.020432	0.051287	0.048922	0.006387

END FTABLE 8
FTABLE 7
19 6

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	outflow 3 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.020432	0.000000	0.000000	0.000000	0.000000		
0.047582	0.020432	0.000972	0.000000	0.105188	0.000000		
0.095165	0.020432	0.001944	0.000000	0.107366	0.000000		
0.142747	0.020432	0.002917	0.000000	0.109545	0.000000		
0.190330	0.020432	0.003889	0.000000	0.111723	0.000000		
0.237912	0.020432	0.004861	0.000000	0.113901	0.000000		
0.285495	0.020432	0.005833	0.000000	0.116080	0.000000		
0.333077	0.020432	0.006805	0.000000	0.118258	0.000000		
0.380659	0.020432	0.007777	0.000000	0.120437	0.000000		
0.428242	0.020432	0.008750	0.000000	0.122615	0.000000		
0.475824	0.020432	0.009722	0.000000	0.124793	0.000000		
0.523407	0.020432	0.010694	0.037992	0.126972	0.000000		

```
  0.570989  0.020432  0.011666  0.200174  0.129150  0.000000
  0.618571  0.020432  0.012638  0.429062  0.131329  0.000000
  0.666154  0.020432  0.013611  0.700353  0.133507  0.000000
  0.713736  0.020432  0.014583  0.993174  0.135686  0.000000
  0.761319  0.020432  0.015555  1.286095  0.137864  0.000000
  0.808901  0.020432  0.016527  1.558057  0.140042  0.000000
  0.830000  0.020432  0.016958  1.791012  0.141008  0.000000
  END FTABLE  7
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   5     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   7     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   6     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   7     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   8     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   9 HYDR   RO     1 1         1     WDM   1000 FLOW     ENGL      REPL
RCHRES   9 HYDR   O      1 1         1     WDM   1001 FLOW     ENGL      REPL
RCHRES   9 HYDR   O      2 1         1     WDM   1002 FLOW     ENGL      REPL
RCHRES   9 HYDR   STAGE  1 1         1     WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1      12.1     WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1      12.1     WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1      12.1     WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
```

```
  END MASS-LINK     8

  MASS-LINK        12
PERLND     PWATER SURO       0.083333      COPY            INPUT  MEAN
  END MASS-LINK    12

  MASS-LINK        13
PERLND     PWATER IFWO       0.083333      COPY            INPUT  MEAN
  END MASS-LINK    13

  MASS-LINK        15
IMPLND     IWATER SURO       0.083333      COPY            INPUT  MEAN
  END MASS-LINK    15

  MASS-LINK        16
RCHRES     ROFLOW                          COPY            INPUT  MEAN
  END MASS-LINK    16

  MASS-LINK        17
RCHRES     OFLOW  OVOL   1                 COPY            INPUT  MEAN
  END MASS-LINK    17

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

ERROR/WARNING ID: 341   6

DATE/TIME: 1974/12/ 4 9: 0

RCHRES: 5

The volume of water in this reach/mixed reservoir is greater than the value in the "volume" column of the last row of RCHTAB(). To continue the simulation the table has been extrapolated, based on information contained in the last two rows. This will usually result in some loss of accuracy. If depth is being calculated it will also cause an error condition. Relevant data are:

NROWS	V1	V2	VOL
16	8.7721E+02	896.94	921.87

ERROR/WARNING ID: 341   5

DATE/TIME: 1974/12/ 4 9: 0

RCHRES: 5

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
8.7158E-02	2565.6	-5.806E+03	2.2631	2.2630E+00	2

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1998/ 1/31 24: 0

RCHRES :   7

RELERR	STORS	STOR	MATIN	MATDIF
-1.695E-02	0.00000	0.0000E+00	0.00000	3.6452E-12

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1998/ 3/31 24: 0

RCHRES : 7

RELERR	STORS	STOR	MATIN	MATDIF
-2.259E-02	0.00000	0.0000E+00	0.00000	8.5128E-12

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1998/ 4/30 24: 0

RCHRES : 1

RELERR	STORS	STOR	MATIN	MATDIF
-3.194E-03	0.00000	0.0000E+00	0.00000	4.7797E-12

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1998/ 4/30 24: 0

RCHRES : 3

RELERR	STORS	STOR	MATIN	MATDIF
-1.374E-02	0.00000	0.0000E+00	0.00000	9.6351E-12

Where:

RELERR is the relative error (ERROR/REFVAL).

ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1998/ 4/30 24: 0

RCHRES :   7

RELERR	STORS	STOR	MATIN	MATDIF
-4.156E-02	0.00000	0.0000E+00	0.00000	9.7174E-12

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

ATTACHMENT 2e:
VECTOR CONTROL PLAN

(NOT APPLICABLE)

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

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Project Name: **9880 Campus Point Drive**

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☐ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Maintenance Agreement (Form DS-3247) (when applicable)	○ Included ◉ Not Applicable

Project Name: 9880 Campus Point Drive

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:
  - ☐ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual
- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐ When applicable, frequency of bioretention soil media replacement
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

☐ Vicinity map
☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
☐ BMP and HMP location and dimensions
☐ BMP and HMP specifications/cross section/model
☐ Maintenance recommendations and frequency
☐ LID features such as (permeable paver and LS location, dim, SF).

SITE DESIGN, SOURCE CONTROL AND POLLUTANT CONTROL BMP OPERATION + MAINTENANCE PROCEDURE

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO.: TBD

O&M RESPONSIBLE PARTY DESIGNEE: PROPERTY OWNER

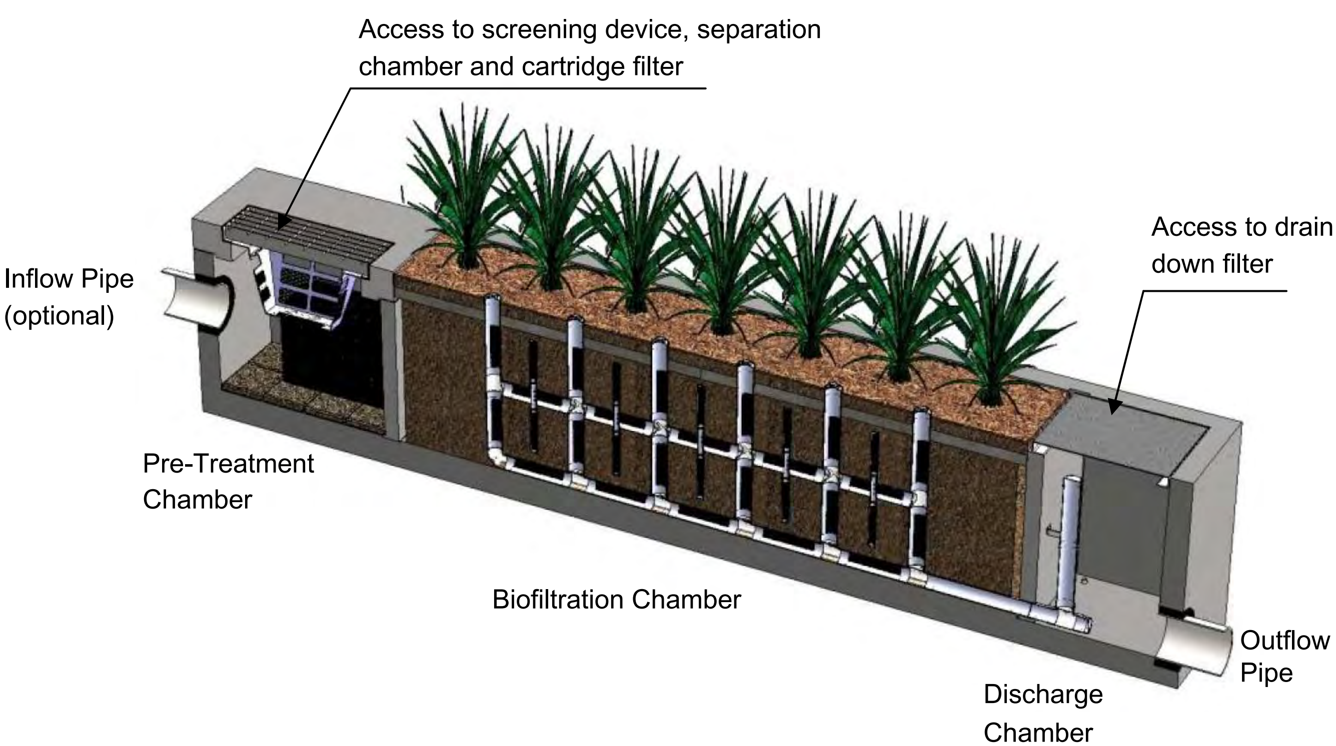
BMP DESCRIPTION	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY	MAINTENANCE METHOD	QUANTITY	INCLUDED IN O&M MANUAL		SHEET NUMBER(S)
SITE DESIGN ELEMENTS					YES	NO	
LANDSCAPING W/ NATIVE OR DROUGHT TOLERANT SPECIES (SD-7)	N/A	N/A	N/A	78,129 SF		X	C-100
SD-2, SD-3, SD-4, & SD-5 (NO MAINTENANCE REQUIRED)	N/A	N/A	N/A	N/A		X	C-100
SOURCE CONTROL ELEMENTS					YES	NO	
SC-1 & SC-6 (NO MAINTENANCE REQUIRED)	N/A	N/A	N/A	N/A		X	C-100
STORM DRAIN STENCILING OR SIGNAGE (SC-2)	N/A	AS NEEDED	REPLACE ILLEGIBLE SIGNAGE	N/A		X	C-100
POLLUTANT CONTROL BMP(S)					YES	NO	
BIOFILTRATION BASIN (BMP #1 , 2, 3, & 4*) (BMP #4 PROVIDES BOTH POLLUTANT AND HYDROMODIFICATION CONTROL)	SEMI-ANNUALLY	AS NEEDED	REMOVE OBSTRUCTIONS	4	X		C-100
	SEMI-ANNUALLY	AS NEEDED	REPLACE DEAD OR DISEASED PLANTS				
	SEMI-ANNUALLY	SEMI-ANNUALLY	ADD FRESH MULCH				
	SEMI-ANNUALLY	2-3 YEARS	REPLACE MULCH LAYER				
MWS LINEAR (BMP #5)	REFER TO MANUFACTURER GUIDELINES			1	X		C-100
HMP FACILITY (IF SEPARATE)					YES	NO	
VAULT (BMP #6)	AS NEEDED	AS NEEDED	REMOVE SILT ACCUMULATION	1		X	C-100
HMP EXEMPT							

Maintenance Guidelines for
Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

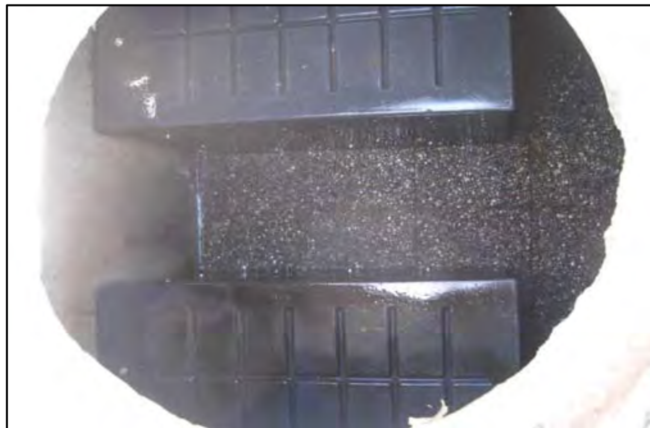
The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.

Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.



Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name ____________________

Project Address ____________________ (city) (Zip Code)

Owner / Management Company ____________________

Contact ____________________ Phone ( ) –

Inspector Name ____________________ Date ___/___/_____ Time ________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ____________________ Additional Notes ____________________

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): __________ Size (22', 14' or etc.): __________

Structural Integrity:	Yes	No	Comments
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: ____________________

Maintenance Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name ____________________

Project Address ____________________
(city) (Zip Code)

Owner / Management Company ____________________

Contact ____________________ Phone ( ) –

Inspector Name ____________________ Date ___/___/_____ Time ________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ____________________ Additional Notes ____________________

For Office Use Only

(Reviewed By)

(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO AND
WHEN RECORDED MAIL TO:

____

____

_______________________ ______

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
________________	________________	________________

This agreement is made by and between the City of San Diego, a municipal corporation [City] and __________________

____,

the owner or duly authorized representative of the owner [Property Owner] of property located at

9880 Campus Point Drive

(Property Address)

and more particularly described as: ____

____

(Legal Description of Property)

in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): ____________________.

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): ____________________.

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): ___________.

2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's SWQMP and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s) ____________.

3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibit(s): ______________________________

____
(Owner Signature)

____
(Print Name and Title)

____
(Company/Organization Name)

06/05/2017
(Date)

THE CITY OF SAN DIEGO

APPROVED:

____
(City Control Engineer Signature)

____
(Print Name)

____
(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDGMENTS PER CIVIL CODE SEC. 1180 ET.SEQ.

Reset Button Page 2

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

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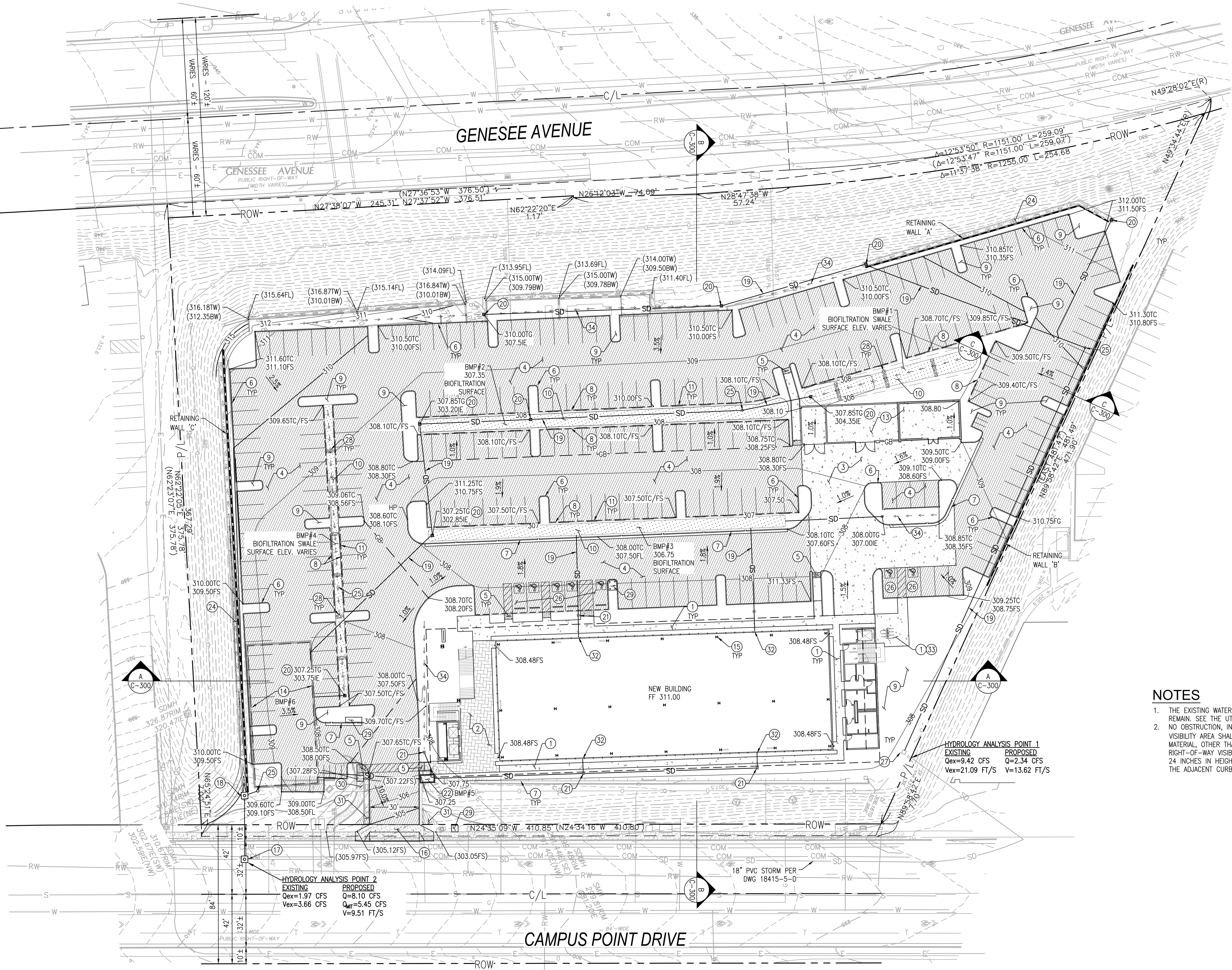
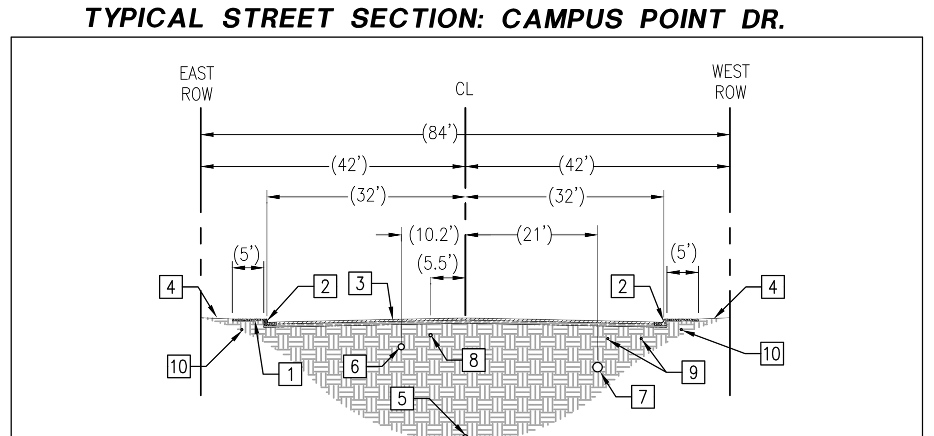


NOTES

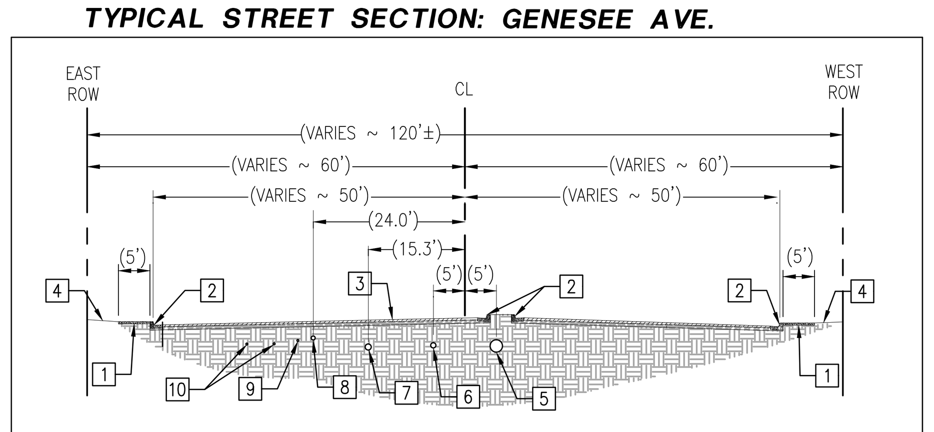
1. THE EXISTING WATER AND SEWER SERVICES WILL REMAIN. SEE THE UTILITY PLAN – SHEET C–200.
2. NO OBSTRUCTION, INCLUDING SOLID WALLS, IN THE VISIBILITY AREA SHALL EXCEED 3' IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, WITHIN THE PUBLIC RIGHT–OF–WAY VISIBILITY AREAS SHALL NOT EXCEED 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF THE ADJACENT CURB.

TYPICAL STREET SECTION: CAMPUS POINT DR.



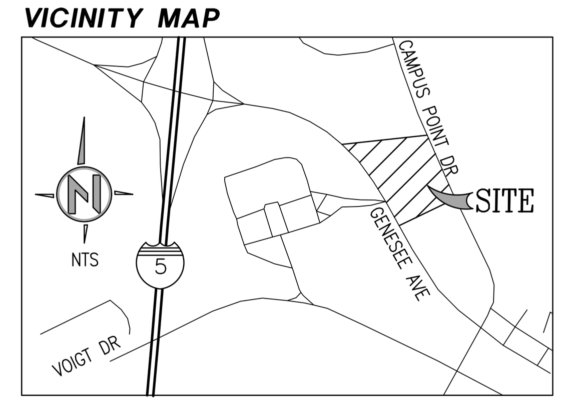
CAMPUS POINT DRIVE NOTES #	DEPTH (APPROX.):	REFERENCE DRAWINGS:
1 CONCRETE SIDEWALK		
2 6" CONCRETE CURB & GUTTER		
3 AC PAVEMENT		
4 LANDSCAPE AREA		
5 10" PVC SEWER	~18'	DWG 18415–5–D
6 12" ACP WATER	~3.5'	DWG 18415–5–D
7 18" PVC STORM	~8'	DWG 18415–5–D
8 6" PE GAS	~2.5'	SDG&E GAS ASSET MAP 15720–119370
9 COMMUNICATION LINES (SIZE UNKNOWN)	~3'	FIELD MARKOUT
10 ELECTRICAL LINES	~3.5'	WATER ATLAS MAP 120
11 8" PVC RECLAIMED WATER	~3.5'	DWG 27357–38–D
** ALL DIMENSIONS AND DEPTHS ARE APPROXIMATE. CONTRACTOR TO VERIFY IN FIELD**		

TYPICAL STREET SECTION: GENESEE AVE.



GENESEE AVENUE NOTES #	DEPTH (APPROX.):	REFERENCE DRAWINGS:
1 CONCRETE SIDEWALK		
2 6" CONCRETE CURB & GUTTER		
3 AC PAVEMENT		
4 LANDSCAPE AREA		
5 24" SCRW WATER	~4'	DWG 18416–16–D
6 10" ACP WATER	~3.5'	DWG 18416–16–D
7 24" CMLTC RECLAIMED WATER	~3.5'	DWG 27357–28–D
8 GAS LINE	~2.5'	SDG&E GAS ASSET MAP 15720–119370
9 COMMUNICATION LINES (SIZE UNKNOWN)	~3'	COX CABLE MAP
10 ELECTRICAL LINES	~3.5'	SDG&E GAS ASSET MAP 15720–119370
** ALL DIMENSIONS AND DEPTHS ARE APPROXIMATE. CONTRACTOR TO VERIFY IN FIELD**		

VICINITY MAP



LEGEND

- PROPERTY LINE/RIGHT–OF–WAY — P/L, ROW
- CENTER LINE — C/L
- AC PAVEMENT
- CONCRETE PAVEMENT
- CONC UNIT PAVERS
- TRUNCATED DOMES
- LANDSCAPE AREA
- BIORETENTION AREA
- CONC BROW DITCH
- NEW STORM LINE — SD
- NEW 6" CURB & GUTTER
- NEW 6" CURB
- NEW 0" CURB
- NEW RETAINING WALL
- NEW CATCH BASIN/INLET — OR
- FLOW DIRECTION — OR

CONSTRUCTION NOTES

1. NEW CONCRETE PAVEMENT
2. NEW CONCRETE UNIT PAVERS PER LANDSCAPE PLANS
3. NEW VEHICULAR CONCRETE PAVEMENT
4. NEW ASPHALT PAVEMENT
5. NEW TRUNCATED DOMES
6. NEW 6" CURB
7. NEW 6" CURB & GUTTER WITH CURB CUTS
8. NEW 0" CURB
9. NEW LANDSCAPED AREA
10. NEW BIOFILTRATION AREA PER DETAIL D/C–300
11. NEW WHEELSTOP PER LANDSCAPE PLANS
12. ROOF OVERHANG PER ARCH PLANS
13. NEW TRASH ENCLOSURE
14. NEW UNDERGROUND STORMWATER DETENTION SYSTEM WITH PARTIAL INFILTRATION PER DETAIL F/C–300
15. NEW COLUMN PER ARCH PLANS
16. NEW 30' WIDE DRIVEWAY PER SDG–163
17. TYPE 'A' STORM CLEANOUT PER D–09
18. TYPE 'F' STORM INLET PER SDD–119
19. NEW STORM PIPE
20. NEW PRECAST CATCH BASIN
21. 12" SQUARE ATRIUM DRAIN GRATE
22. MODULAR WETLAND STORMWATER TREATMENT SYSTEM PER DETAIL E/C–300
23. FLOW LINE
24. NEW CONCRETE BROW DITCH PER SDD–106, TYPE B
25. NEW STORM DRAIN CLEANOUT
26. NEW ADA PARKING
27. CONNECT NEW STORM PIPE TO EX CATCH BASIN
28. ROCK CHECK DAM
29. UTILITY PAD
30. PORTION OF EX. ADA RAMP TO REMAIN
31. VISIBILITY TRIANGLE. SEE NOTE 2
32. NEW ROOF DOWNSPOUT TO DISCHARGE TO ADJACENT LANDSCAPING
33. BICYCLE PARKING AREA PER ARCH PLANS
34. VEGETATED SWALE PER G/C–300

GRADING TABULATIONS

TOTAL LOT SIZE: 4.50 AC
TOTAL DISTURBANCE AREA: 4.43 AC
TOTAL CUT/MAX DEPTH OF CUT: 22,500 CY/17.5 FT
TOTAL FILL/MAX DEPTH OF FILL: 1,500 CY/3.2 FT
MAX HEIGHT OF FILL SLOPE/SLOPE RATIO: 2:1
MAX HEIGHT OF CUT SLOPE/SLOPE RATIO: 2:1
TOTAL EXPORT: 21,000 CY

NOTE:
1. GRADING QUANTITIES ARE ESTIMATED FOR DESIGN & PERMITTING PURPOSES ONLY AND SHALL BE INDEPENDENTLY VERIFIED BY THE GRADING CONTRACTOR PRIOR TO BIDDING. ACTUAL QUANTITIES MAY VARY DUE TO SHRINKAGE LOSSES, CLEARING OPERATIONS, COMPACTION, SETTLEMENT, ETC. CONTRACTOR TO NOTIFY THE ENGINEER OF RECORD OF ANY DISCREPANCIES PRIOR TO GRADING.
2. REMEDIAL GRADING IS NOT INCLUDED IN GRADING TABULATIONS, BUT MAY BE REQUIRED AS DIRECTED BY THE GEOTECHNICAL ENGINEER OF RECORD. REFER TO GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.

RETAINING WALLS

WALL	LENGTH	MAX HEIGHT
A	154'	6.0'
B	212'	2.5'
C	270'	3.0'

BENCHMARK

A BRASS PLUG ON TOP OF CURB INLET AT THE SOUTHEAST CURB RETURN OF GENESEE AVENUE AND LA JOLLA VILLAGE DRIVE, AS PUBLISHED IN THE CITY OF SAN DIEGO VERTICAL CONTROL BOOK.

ELEVATION = 364.177 (NGVD 29) M.S.L.

LEGAL DESCRIPTION

PARCELS 1 OF PARCEL MAP NO. 10410, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, SEPTEMBER 4, 1980.

SCALE IN FEET
15 0 30 60
1 inch = 30 ft.

ARCHITECT

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550 Ellis Street, Mountain View, CA 94043 650-943-1660
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STAMP

KEY PLAN

NO.	DESCRIPTION	DATE
	MIR SDP CITY SUBMITTAL	4.27.2017
	SDP CYCLE #1 REVIEW	6.15.2017
	SDP CYCLE #2 REVIEW	7.31.2017

CLIENT: **Alexandria Real Estate Equities**

PROJECT: **9880 Campus Pointe Drive**

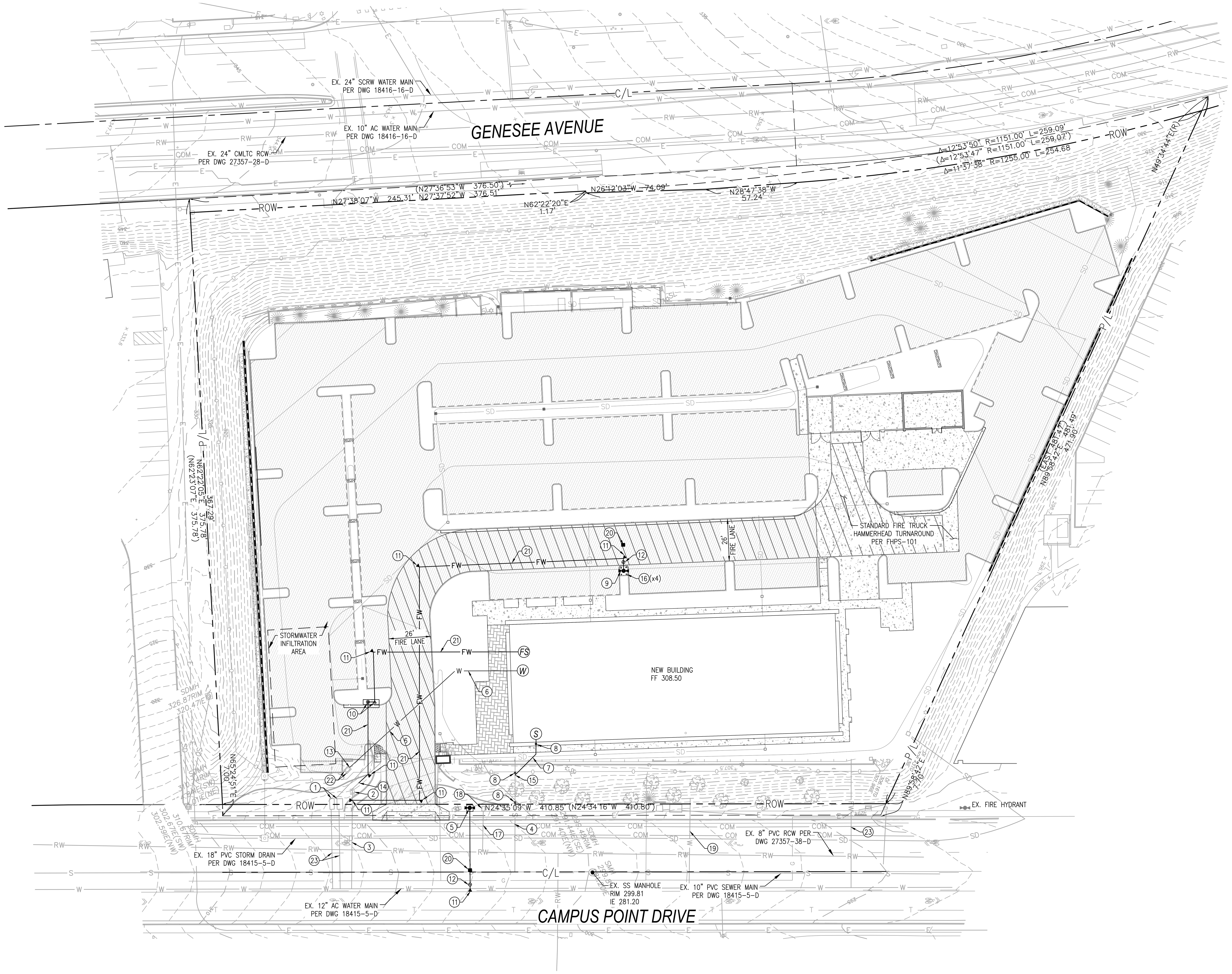
ADDRESS: 9880 Campus Pointe Drive

PROJECT NO. **17024**

SCALE: AS SHOWN

TITLE: PRELIMINARY GRADING & DRAINAGE

C–100



LEGEND

PROPERTY LINE/RIGHT-OF-WAY	ROW — — — P/L
CENTER LINE	C/L
FIRE ACCESS LANE (PER APPROVED SHEET A-004)	
NEW 6-INCH FIRE WATER LOOP	FW
NEW DOMESTIC WATER SERVICE	W
NEW PRIVATE SEWER LATERAL	S
NEW DOMESTIC WATER BUILDING POINT OF CONNECTION	(W)
NEW FIRE SERVICE BUILDING POINT OF CONNECTION	(FS)
NEW SEWER LATERAL BUILDING POINT OF CONNECTION	(S)
NEW FIRE HYDRANT	
NEW FDC & PIV	
NEW THRUST BLOCK	▲
NEW 6-INCH GATE VALVE	⊕
NEW 6-INCH DOUBLE CHECK DETECTOR ASSEMBLY (FIRE)	
NEW BLUE REFLECTOR FIRE HYDRANT MARKER	■

CONSTRUCTION NOTES

1. EX. DUAL 2" METERS FOR DOMESTIC WATER TO BE RETAINED & REUSED
2. EX. 6-INCH FIRE WATER BACKFLOW PREVENTER TO BE RETAINED & REUSED
3. EX. 6-INCH FIRE SERVICE TO BE RETAINED & REUSED
4. EX. 6-INCH SEWER LATERAL TO BE RETAINED & REUSED
5. NEW PUBLIC FIRE HYDRANT PER SDW-104
6. NEW PVT. DOMESTIC WATER SERVICE (SIZE PER PLUMBING)
7. NEW 6-INCH PVT. SEWER LATERAL
8. NEW 6-INCH PVT. SEWER CLEANOUT
9. NEW PVT. FIRE HYDRANT PER FS-0410
10. NEW PIV & FDC
11. NEW THRUST BLOCK PER NFPA STANDARDS (TYPICAL)
12. NEW 6-INCH GATE VALVE (TYPICAL)
13. CONNECT TO EX. DOMESTIC WATER SERVICE AFTER MANIFOLD
14. CONNECT TO EX. 6" FIRE SERVICE
15. CONNECT TO EX. 6" SEWER LATERAL
16. NEW PROTECTION POST PER WM-04
17. EX. 2" RECLAIMED WATER SERVICE TO BE RETAINED & REUSED FOR IRRIGATION
18. EX. 2" RECLAIMED IRRIGATION METER BOX (METER NOT INSTALLED)
19. EX. 2" IRRIGATION WATER SERVICE TO BE KILLED AT MAIN
20. NEW BLUE REFLECTOR FIRE HYDRANT MARKER PER SDW-104
21. NEW 6" FIRE WATER SERVICE
22. EX. DUAL 2" DOMESTIC WATER BACKFLOW PREVENTER DEVICES TO BE RETAINED & REUSED
23. EX. DUAL 2" DOMESTIC WATER SERVICES TO BE RETAINED & REUSED
24. EX. 6" FIRE WATER SERVICE TO BE KILLED AT MAIN

NOTES

1. THE EXISTING WATER AND SEWER SERVICES WILL BE RETAINED AND REUSED UNLESS OTHERWISE NOTED ON PLAN.

SCALE IN FEET 1 inch = 30 ft. (15 0 30 60)

ARCHITECT

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1720 8th Street, Sacramento, CA 95811 916-441-6800

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Traffic Engineeer
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STAMP

KEY PLAN

NO.	DESCRIPTION	DATE

CLIENT **Alexandria Real Estate Equities**

PROJECT **9880 Campus Pointe Drive**

ADDRESS 9880 Campus Pointe Drive

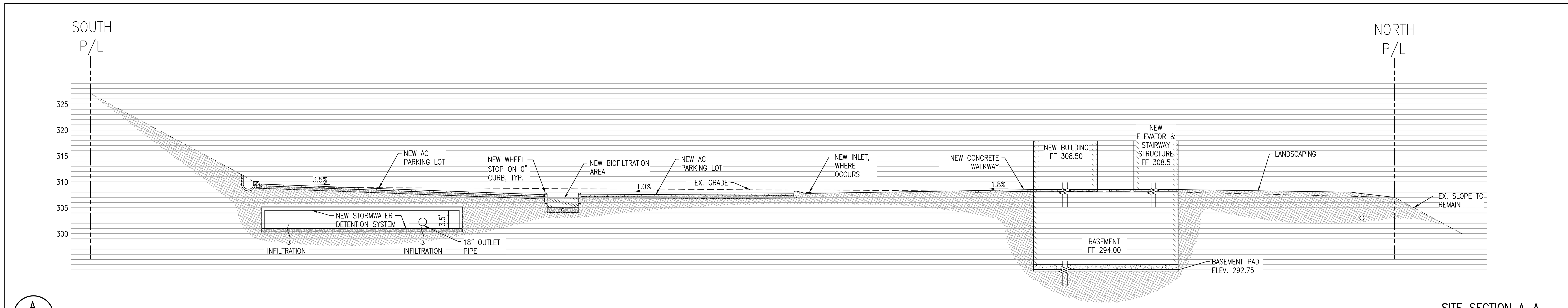
PROJECT NO. **17024**

SCALE AS SHOWN

TITLE

PRELIMINARY
WET UTILITY PLAN

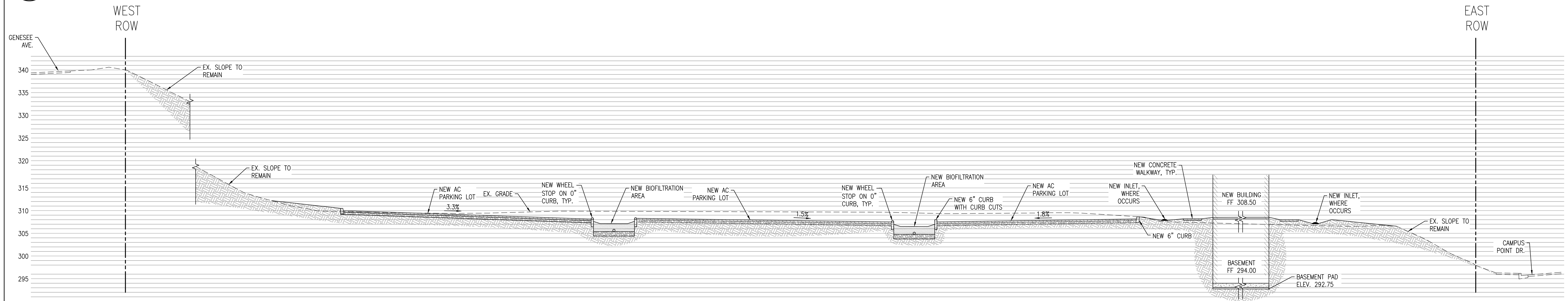
C-200



A
C-300

SITE SECTION A-A

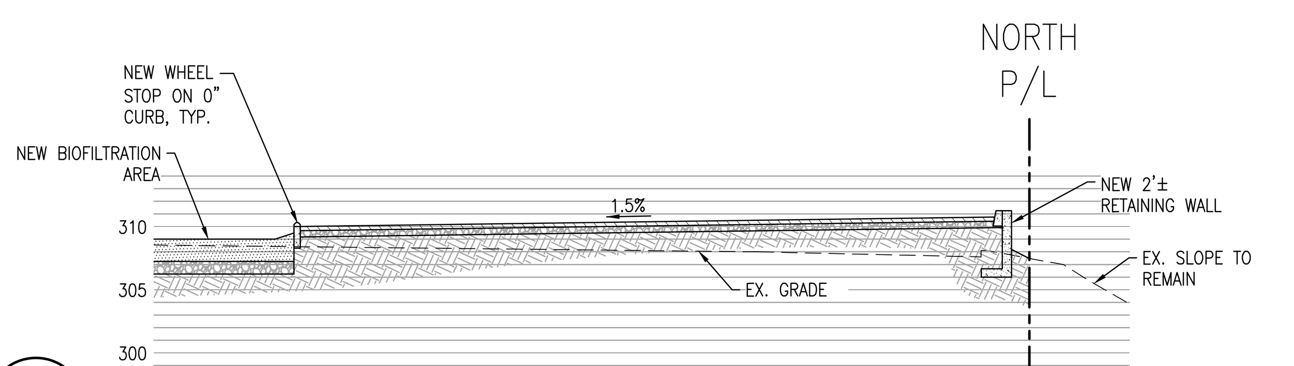
NO SCALE



B
C-300

SITE SECTION B-B

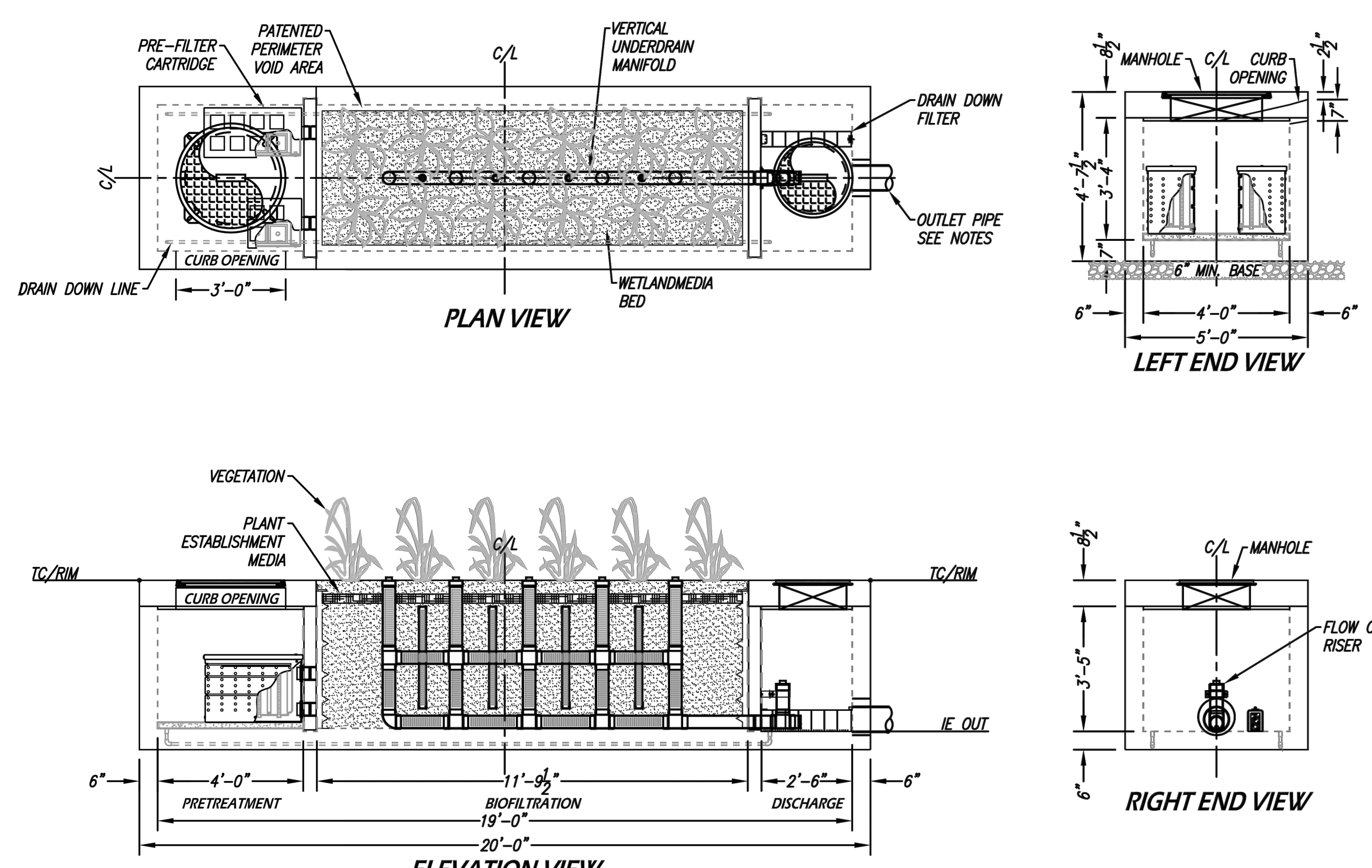
NO SCALE



C
C-300

SITE SECTION C-C

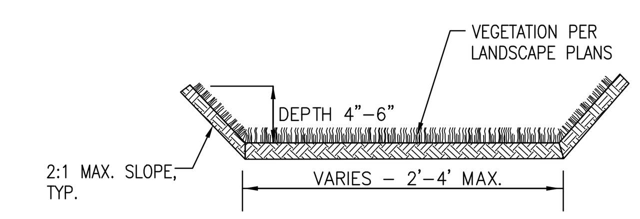
NO SCALE



E
C-300

MODULAR WETLAND STORMWATER TREATMENT SYSTEM

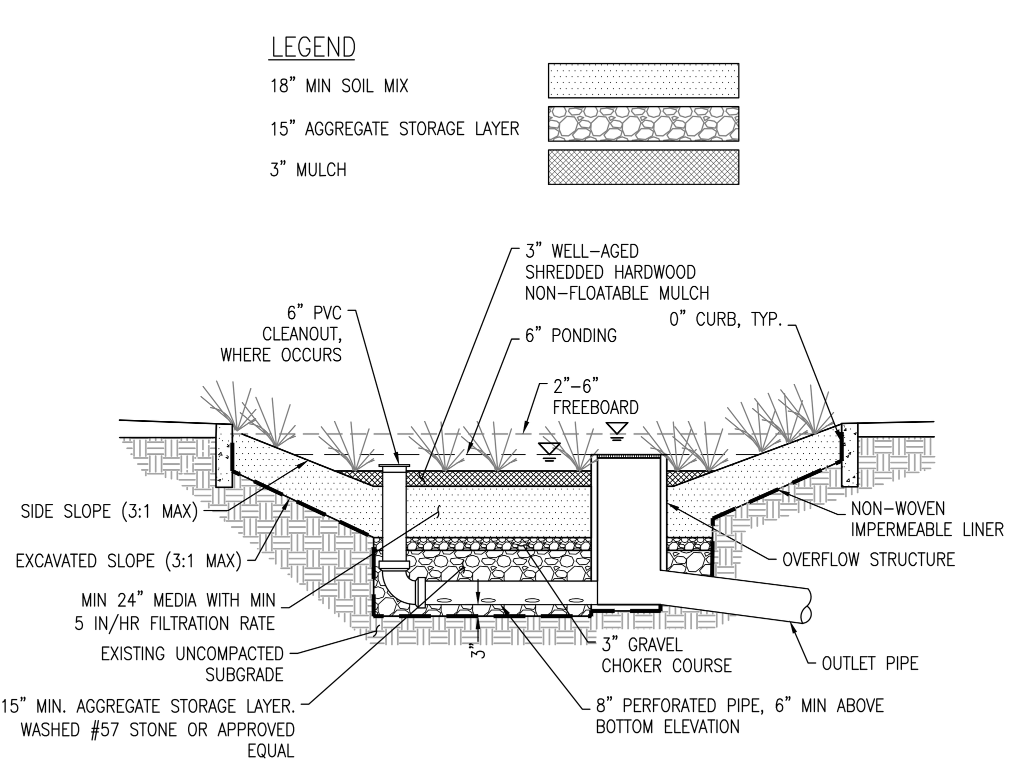
NO SCALE



G
C-300

VEGETATED SWALE

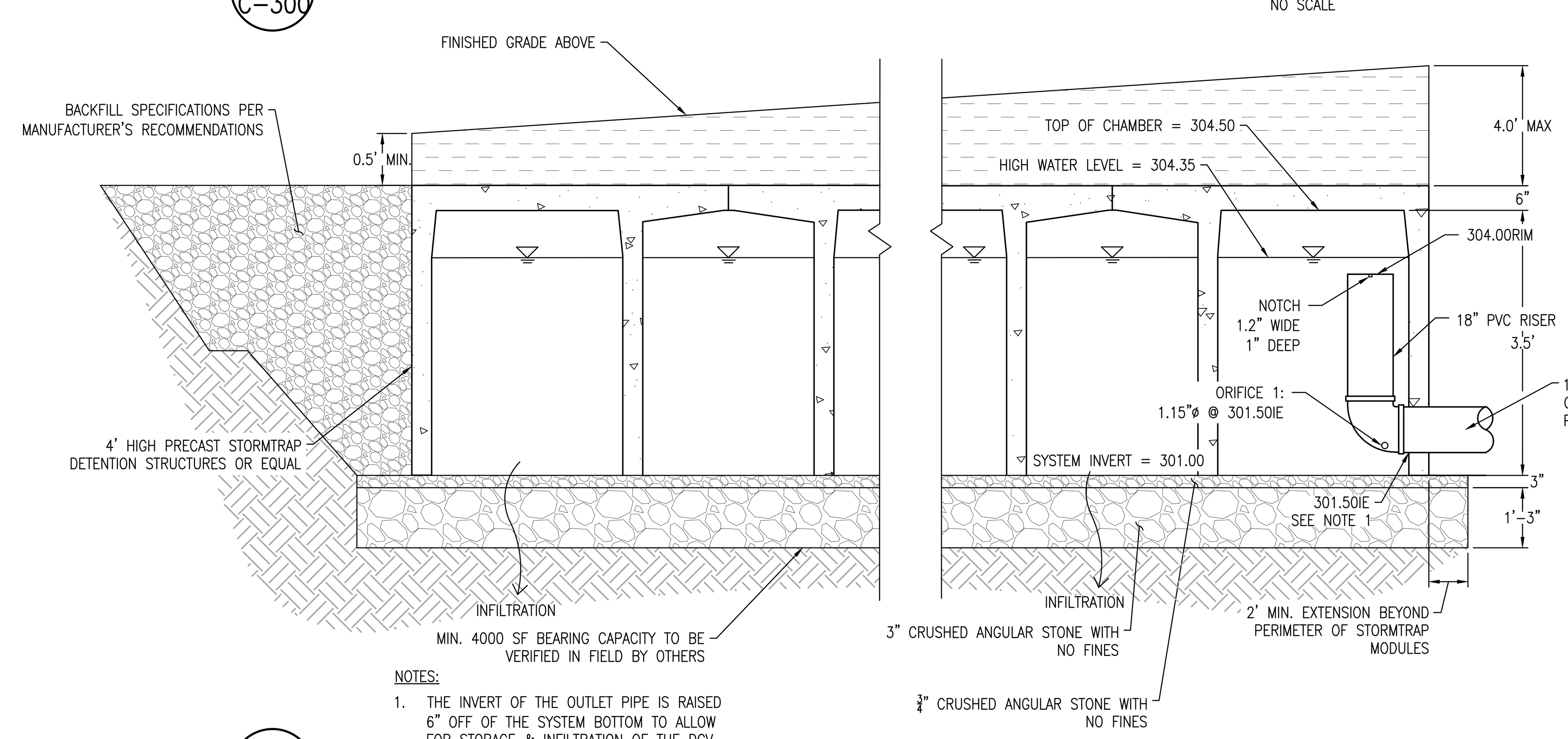
NO SCALE



D
C-300

TYPICAL BIOFILTRATION AREA

NO SCALE



NOTES:

1. THE INVERT OF THE OUTLET PIPE IS RAISED 6" OFF OF THE SYSTEM BOTTOM TO ALLOW FOR STORAGE & INFILTRATION OF THE DCV.

F
C-300

STORMWATER DETENTION STRUCTURE

NO SCALE

PLOT: M:\PROJECTS\12500\12836\1.00 9880 CAMPUS POINT DR\HYD\DWGS\SHEET_DWGS\12836 DETL SHT.DWG Brian Sellsmon 7/28/2017 7:24 PM

ARCHITECT

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STAMP

KEY PLAN

NO.	DESCRIPTION	DATE
	MIR SDP CITY SUBMITTAL	4.27.2017
	SDP CYCLE #1 REVIEW	6.15.2017
	SDP CYCLE #2 REVIEW	7.31.2017

CLIENT **Alexandria Real Estate Equities**

PROJECT **9880 Campus Pointe Drive**

ADDRESS 9880 Campus Pointe Drive

PROJECT NO. **17024**

SCALE AS SHOWN

TITLE

SECTIONS & DETAILS

C-300

Project Name: 9880 Campus Point Drive

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☒ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☒ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☒ Details and specifications for construction of structural BMP(s)
☐ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☐ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☐ All BMPs must be fully dimensioned on the plans
☒ When proprietery BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.

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ATTACHMENT 5
DRAINAGE REPORT

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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DRAINAGE STUDY
for

9880 Campus Point Drive
San Diego, CA 92121

Prepared By:

BWE
STRUCTURAL ENGINEERING • CIVIL ENGINEERING • SURVEYING • LAND PLANNING

9449 Balboa Avenue, Suite 270
San Diego, CA 92123
B&W Job #: 12836u

Date: June, 2017
Rev. Date: July, 2017

Table of Contents

Appendices

1. Purpose

The purpose of this drainage study is to analyze the existing and proposed drainage patterns, and peak flow rates for the 9880 Campus Point Drive site in the City of San Diego, California. This study also provides recommendations to mitigate stormwater runoff in the proposed condition in order for the project to match or decrease the pre-development peak flow rates.

To determine the impacts of the proposed development on the existing drainage patterns, the pre- and post- development peak flow rates are analyzed and compared for the 50-year storm event using the Rational Method. This report is prepared in accordance with the requirements of the City of San Diego Drainage Design Manual (1984). See Appendix E for excerpts from drainage design manual.

2. Background

This project is located in Region number 9, Penasquitos Hydrologic Unit, Miramar Reservoir Hydrologic Area/Subarea (HSA 906.1) as defined in the Regional Water Quality Control Board's Water Quality Control Plan. The site discharges ultimately into Los Penasquitos Lagoon and Pacific Ocean.

The Federal Emergency Management Agency (FEMA) categorizes the project site as Zone X, where Zone X is area determined to be outside 500-year floodplain (FIRM Panel 1338 of 2375). Appendix F illustrates the FEMA floodplain mapping within the vicinity of the project site.

The site does not consist of, nor will this project disturb any Waters of the United States. Therefore, the site is not subject to the Regional Water Quality Control Board requirements under the Federal Clean Water Act section 401 or 404.

3. Existing Condition

The 4.50 acre (approximately) site is located at 8890 Avenue in San Diego, California. The site is bounded by Campus Point Drive to the east, Genesee Avenue to the west, and existing office buildings to the north and south.

(See Appendix A for Vicinity Map)

The existing site contains a building and parking areas surrounded by vegetated slopes. The site generally drains to the north. The western half of the site flows to a ribbon-gutter, which flows north through the parking area before entering a storm drain. The southern portion of the site flows through the driveway to the east, along the Campus Point Dr. gutter, and into a storm drain. The northern and eastern portions of the site flow via gutters to the northeastern corner of the site, where they enter a storm drain system. The storm drain discharges to an unnamed canyon, and ultimately flows to the Pacific Ocean by way of Soledad Canyon, and Los Penasquitos Lagoon.

The site also receives run-on from slopes situated on the west and south sides of the existing parking lot. The runoff from the easterly slope drains directly to the curb & gutter along

Campus Point Drive. The runoff from the northerly slope drains to the neighboring property before being conveyed offsite to an existing curb inlet along Campus Point Drive. The runoff from the entire site confluences at this inlet via surface flow and the existing underground storm drain system.

The hydrology of the site area can be generally analyzed and compared at two discharge points as described below:

The site has two major drainage exit points in the existing condition. The runoff originating from the majority of the site area discharges offsite through discharge point 1, a drainage inlet situated at the northeastern corner of the site. The runoff concentrates at the inlet at this location prior to flowing offsite. Similarly, the runoff originating from the southerly portion of the site concentrates at Discharge Point 2 prior to discharging into Campus Point Dr. curb & gutter. Discharge Point 2 is situated at the eastern edge of the driveway on Campus Point Dr. The runoff from Discharge Point 2 confluences with the runoff originating from Discharge Point 1 at the curb inlet situated at the westerly side of the Campus Point Dr.

(See Appendix B for Existing Condition Hydrology Map & Runoff Discharge Points)

4. Proposed Improvements

The major development activities include, but are not limited to, clearing & grubbing, demolition, construction of a new office building, driveway, paved parking, and associated walkways, and landscaping. The demolition activities include the existing building, utility connections, the existing parking lot, and curbs, walkways etc.

The associated improvements will also include drainage improvements, and construction of Best Management Practices (BMPs). BMPs such as biofiltration, biofiltration with partial retention, and detention basin are proposed to control pollutants, as well as to maintain or reduce the existing condition peak flow rate. The detention basin is proposed because the site must comply with the requirements for hydromodification management as well as peak flow control requirements. Runoff from the site does not discharge to an exempt system.

A percolation test was also completed per the project geotech report, which determined that infiltration on-site is feasible to some extent. Therefore, the detention basin will include storage areas below the invert of the outlet pipe, to allow stormwater to infiltrate prior to entering the existing storm drain system. Infiltration will help meet the treatment requirements, as well as reduce the size of the required detention area for hydromodification control.

The on-site drainage pattern has changed to enhance the drainage condition. The majority of site runoff is directed to the new detention system situated at the southerly side of proposed building. This location is selected because the native infiltration rate at this location is better than the rest of the site area. Outflow from the detention is connected to the existing 18” storm drain system situated within the Campus Point Drive. The run-on pattern from the existing slopes (which will be replanted only), will bypass the onsite detention facility. Because the peak flow rate from the overall site is mitigated in the proposed condition, the redevelopment will not create drainage impacts to the existing receiving storm drain system.

As in the existing condition, the proposed site will have two drainage discharge points. The existing inlet at the northeastern corner of the site will remain, and will be maintained as Discharge Point 1. Runoff from the westerly slope area will bypass the proposed detention system and flow offsite through Discharge Point 1.

Discharge Point 2 in the proposed condition, will be located at a new storm cleanout to be installed along the ex. 18” line beneath Campus Point Dr. Essentially the discharge point will shift from above ground along the curb and gutter (existing condition), to below ground within the storm system. The confluence point for both discharge points will be maintained as the curb inlet situated at the westerly side of the Campus Point Dr.

The drainage impact due to the redevelopment is simply determined by comparing the cumulative peak flow rates from these two discharge points. Runoff from the slope area situated adjacent to Campus Point Drive will continue to surface flow to the street directly. A hydrologic analysis of the ex. 18” pipe within Campus Point Dr. is included in Appendix C to show that there is enough capacity for the increased flow.

(See Appendix C for Proposed Conditions Hydrology Map)

5. Soil Characteristics

Per the City of San Diego Drainage Design Manual page 82, “Type D” soil is to be used for all areas. Therefore, the hydrologic analysis is performed by utilizing soil type D.

6. Methodology

Rational Method: A rational method analysis was utilized to perform hydrologic calculations in this study. The Rational Method is a physically based numerical method where runoff is assumed to be directly proportional to rainfall and area, less losses for infiltration and depression storage

Rational Equation: $Q = C * I * A$

Where;
Q = Peak discharge, cfs
C = Rational method runoff coefficient
I = Rainfall intensity, inch/hour
A = Drainage area, acre

A computer model CivilD is used to automate the hydrology analysis process. This computer version of the rational method analysis allows user to develop a node-link model of the watershed. CivilD computer program has the capability of performing calculations utilizing mathematical functions. These functions are assigned code numbers, which appear in the printed results. The code numbers and their corresponding functions are described below;

Sub area Hydrologic Processes;

Code 1 - INITIAL subarea input, top of stream
Code 2 - STREET flow through subarea, includes subarea runoff
Code 3 - ADDITION of runoff from subarea to stream
Code 4 - STREET INLET + parallel street & pipe flow + area
Code 5 - PIPEFLOW travel time (program estimated pipe size)**
Code 6 - PIPEFLOW travel time (user specified pipe size)
Code 7 - IMPROVED channel travel time (open or box)**
Code 8 - IRREGULAR channel travel time**
Code 9 - USER specified entry of data at a point
Code 10 - CONFLUENCE at downstream point in current stream
Code 11 - CONFLUENCE of mainstreams
**NOTE: These options do not include subarea runoff
**NOTE: (#) - Required pipe size determined by the hydrology program

7. Calculations

a. Impervious and Pervious Areas

The impervious and pervious areas are calculated for both the existing and proposed site conditions. The site is designed to reduce the impervious area by 15,246 square feet (0.35 ac) as shown in Table 7-1.

Table 7-1 Summary of Areas

	Area (Acres)			Percent Impervious Area	Percent Pervious Area
	Total	**Impervious (Ai)**	**Pervious (Ap)**		
Existing Condition	4.49	3.10	1.39	69.0%	31.0%
Proposed Condition	4.49	2.75	1.74	61.2%	38.8%
Percentage Change		**-11.3%**	**25.2%**		

b. Runoff Coefficient

The proposed site is currently developed and comprised of a large office building, paved parking lot, and landscaping. The coefficients of runoff for the site are determined by utilizing Table 2 of the City of San Diego Drainage Design Manual by assuming commercial type development. Similar assumptions are made for both the existing and proposed conditions.

The “Revised C” values are calculated using the formula below:

$$= \frac{\text{(Actual Percentage of Impervious Area)}}{(80\%)} \times (0.85)$$

The impervious percentage in the existing condition is 69.0. As a result, the revised C value for the existing condition is determined to be 0.73. Similarly, the revised C value for the proposed condition is determined to be 0.65 based on the percent imperviousness of 61.25. These values are used in the hydrology analysis.

See Appendices B and C respectively for existing and proposed conditions runoff coefficient calculations.

c. Peak Flow Rates

The rational method is used to perform the hydrologic analysis. The software program CivilD, which utilizes the rational method of analysis, is used to determine peak flow rates from the site.

The peak flow rates for the 50 year design storm event are calculated for both existing and proposed condition and the results are summarized in Table 7-2. The detailed calculations/results for existing and proposed conditions analyses are located in Appendices B and C respectively.

Table 7-2 Existing and Proposed Conditions Peak Flow Rates Summary

	Drainage Area (acres)		50 Yr Flow (cfs)			% Change from Existing Condition
	Existing Condition	**Proposed Condition**	**Existing Condition**	**Proposed Condition**	**Mitigated Condition**	
Analysis/Exit Point 1	3.77	0.95	9.42	2.34	2.34	**-75.2**
Analysis/Exit Point 2	0.72	3.54	1.97	8.10	5.45	**176.6**
Total	**4.49**	**4.49**	**11.39**	**10.44**	**7.79**	**-31.6**

In the proposed condition, the unmitigated peak flow rate due to the 50 year storm event is anticipated to decrease by 0.95 cfs. The decrease in peak flow rate in the unmitigated condition is mainly due to the reduction in impervious area in the proposed condition.

d. Detention & Mitigated Flow Rates

The detention basin is also designed to control the hydromodification impact due to the redevelopment. A single detention basin with a gross volume equal to 11,160 cf is proposed for this purpose. This basin is located at the southeasterly side of the site, where the measured infiltration rate was determined to be the highest in the tested areas. The runoff from the biofiltraion basins is directed to the detention basin for additional quantity control, which cannot be achieved by the biofiltration basins only.

Peak flow rate mitigation is also achieved by routing the flow through the detention basin. The hydraflow/hydrograph extension for AutoCAD Civil 3D is utilized for this purpose. The total 50-yr peak flow rate from the site is attenuated from 11.39 to 7.79 cfs. Any detention storage within the biofiltration basins is assumed to be minimal and therefore, is not included in the analysis. See Appendix D for the results.

8. Downstream Drainage Impact Analysis

Although new drainage swales, and storm drains are proposed to capture and convey the runoff from the site, runoff will continue to discharge to the existing storm drain system and curb & gutter along Campus Point Drive.

The proposed condition peak flow rate from the site is reduced. Therefore, negative downstream drainage impacts are not anticipated from the redevelopment.

Furthermore, the preliminary analysis of the existing 18” pipe beneath Campus Point Dr. shows that it will have enough capacity for the increased flow.

9. Conclusion

Storm water runoff from the site is collected and conveyed by a system of roof downspouts, inlets, storm drain pipes, detention basin, and swales. The site is designed to mitigate the water quantity impacts due to the redevelopment. The new storm drain system is designed to convey the runoff due to 50-yr storm event and bypass the runoff due to 100-year storm event. The pipe sizing will be fine-tuned in the final engineering phase.

The offsite hydrology and hydraulic analysis of the existing receiving storm drain system is not performed. It is assumed that the existing storm drain system is adequately sized to convey the peak flow runoff originating from offsite as well as onsite tributary drainage areas.

The existing drainage patterns has been changed in order to accommodate the proposed redevelopment. The existing two drainage discharge points are maintained in the proposed condition. Runoff from the site continues to discharge from these discharge points.

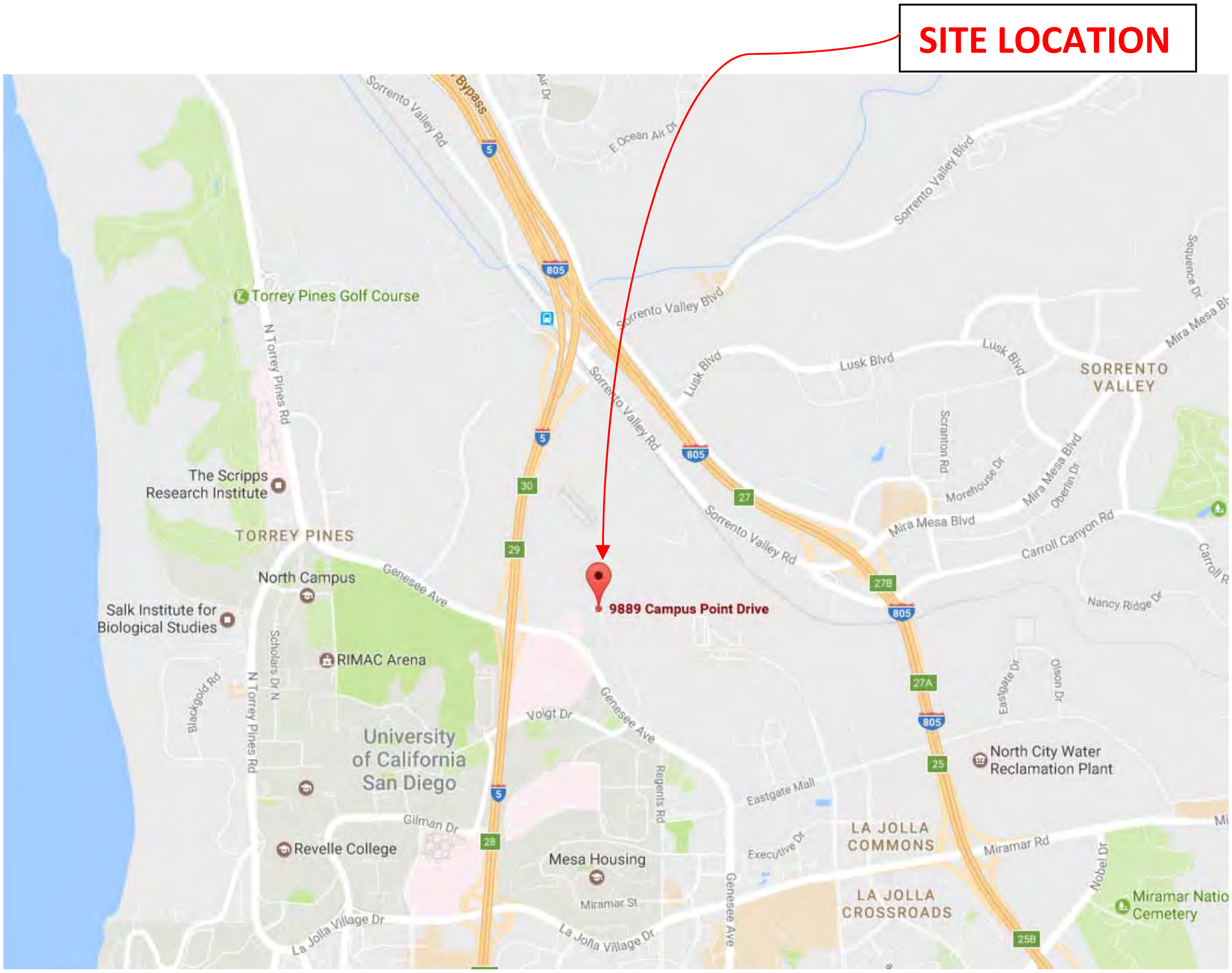
In the proposed condition, the site is designed to reduce the 50 year peak flow rate from 11.39 to 7.79 cfs (=3.6 cfs reduction). The capacity of the existing receiving storm drain system will not be impacted due to this redevelopment because the peak flow rate is reduced in the proposed condition.

10. References

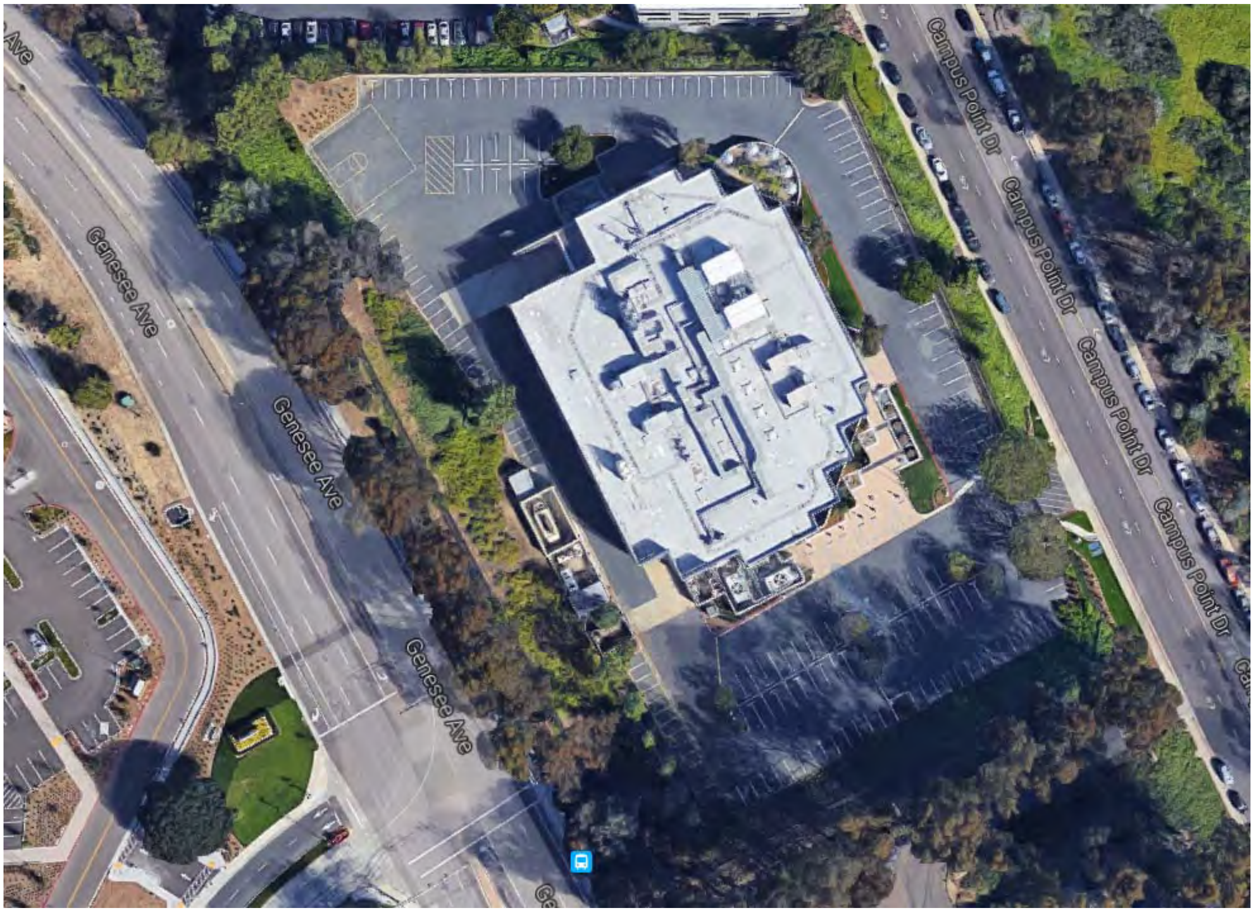
- Drainage design Manual
- County of San Diego Hydrology Manual, 2003
- Project’s Storm Water Quality Management Plan (SWQMP)

APPENDIX A:

Site Vicinity Map
Site Imagery Map



VICINITY MAP



Genesee Ave
Genesee Ave
Genesee Ave
Campus Point Dr
Campus Point Dr
Campus Point Dr
Campus Point Dr

IMAGERY MAP

APPENDIX B:

Existing Conditions Runoff Coefficient Calculations
Existing Condition Hydrology Calculations
Existing Conditions Hydrology Map

Runoff Coefficient Calculation (Existing Condition)

Project: 9880 Campus Point Drive

Similar to commercial development

C = 0.85 (Per Table 2, Soil Class D, Drainage Design Manual)

% imperviousness= 80% (Tabulated Imperviousness per Table 2)

Revised C= (Actual % Imp./Tabulated % Imp.)*0.85

Description	Area (Acres)		Actual % Imperviousness	Revised Runoff Coef. (C)	Used Runoff Coef. (C)
	Area (ac)	Imp. Area (Ai)			
Existing Condition	4.49	3.10	69.04%	0.73	0.73

```
                    San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
EXISTING CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 1


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =   65.000(Ft.)
Highest elevation =  345.000(Ft.)
Lowest elevation =  317.000(Ft.)
Elevation difference =   28.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.53 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*(  65.000^.5)/(  43.077^(1/3)]=   1.53
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.156(CFS)
Total initial stream area =        0.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.467(CFS)
Depth of flow =   0.218(Ft.), Average velocity =   4.922(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              1.00              0.00
        3              2.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.467(CFS)
  '     '        flow top width =      0.871(Ft.)
  '     '    velocity=    4.922(Ft/s)
  '     '        area =      0.095(Sq.Ft)
  '     '        Froude number =     2.628

Upstream point elevation =   316.500(Ft.)
Downstream point elevation =   309.800(Ft.)
Flow length =   162.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =    5.55 min.
Depth of flow =   0.218(Ft.)
Average velocity =   4.922(Ft/s)
Total irregular channel flow =     0.467(CFS)
Irregular channel normal depth above invert elev. =   0.218(Ft.)
Average velocity of channel(s) =   4.922(Ft/s)

Sub-Channel No. 1 Critical depth =      0.320(Ft.)
  '     '       '     Critical flow top width =      1.281(Ft.)
  '     '       '     Critical flow velocity=    2.276(Ft/s)
  '     '       '     Critical flow area =      0.205(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      4.073(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.595(CFS) for    0.200(Ac.)
Total runoff =      0.750(CFS)  Total area =       0.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     5.55 min.
Rainfall intensity =      4.073(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.684(CFS) for    0.230(Ac.)
Total runoff =      1.434(CFS)  Total area =       0.48(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.166(CFS)
Depth of flow =   0.423(Ft.), Average velocity =   2.419(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              2.50              0.00
        3              5.00              0.50
Manning's 'N' friction factor =   0.015
```

```
----------------------------------------------------------------
Sub-Channel flow  =      2.166(CFS)
  '     '        flow top width =      4.232(Ft.)
  '     '    velocity=    2.419(Ft/s)
  '     '        area =      0.896(Sq.Ft)
  '     '        Froude number =     0.927

Upstream point elevation =   309.800(Ft.)
Downstream point elevation =   309.300(Ft.)
Flow length =   103.000(Ft.)
Travel time  =    0.71 min.
Time of concentration =    6.26 min.
Depth of flow =   0.423(Ft.)
Average velocity =   2.419(Ft/s)
Total irregular channel flow =     2.166(CFS)
Irregular channel normal depth above invert elev. =   0.423(Ft.)
Average velocity of channel(s) =   2.419(Ft/s)

Sub-Channel No. 1 Critical depth =      0.410(Ft.)
  '     '       '     Critical flow top width =      4.102(Ft.)
  '     '       '     Critical flow velocity=    2.576(Ft/s)
  '     '       '     Critical flow area =      0.841(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.867(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.383(CFS) for    0.490(Ac.)
Total runoff =      2.818(CFS)  Total area =        0.97(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.718(CFS)
Depth of flow =   0.411(Ft.), Average velocity =   4.405(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00             0.50
        2             2.50             0.00
        3             5.00             0.50
Manning's 'N' friction factor =   0.015
----------------------------------------------------------------
Sub-Channel flow  =      3.718(CFS)
  '     '        flow top width =      4.109(Ft.)
  '     '    velocity=    4.405(Ft/s)
  '     '        area =      0.844(Sq.Ft)
  '     '        Froude number =     1.713

Upstream point elevation =   309.300(Ft.)
Downstream point elevation =   306.420(Ft.)
Flow length =   172.000(Ft.)
Travel time  =    0.65 min.
Time of concentration =    6.91 min.
Depth of flow =   0.411(Ft.)
Average velocity =   4.405(Ft/s)
Total irregular channel flow =     3.718(CFS)
Irregular channel normal depth above invert elev. =   0.411(Ft.)
Average velocity of channel(s) =   4.405(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.508(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    2.884(Ft/s)
  '     '       '     Critical flow area =      1.289(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.709(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.679(CFS) for    0.620(Ac.)
Total runoff =      4.496(CFS)  Total area =        1.59(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     6.91 min.
Rainfall intensity =      3.709(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.056(CFS) for    0.390(Ac.)
Total runoff =      5.552(CFS)  Total area =        1.98(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   304.870(Ft.)
Downstream point/station elevation =   301.330(Ft.)
Pipe length  =   184.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.552(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.552(CFS)
Normal flow depth in pipe =    8.54(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =   11.45(In.)
Pipe flow velocity =      7.69(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     7.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     7.31 min.
Rainfall intensity =      3.623(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.349(CFS) for    0.510(Ac.)
Total runoff =      6.901(CFS)  Total area =        2.49(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.490(Ac.)
Runoff from this stream =      6.901(CFS)
Time of concentration =    7.31 min.
```

```
Rainfall intensity =     3.623(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =  124.000(Ft.)
Highest elevation =  311.400(Ft.)
Lowest elevation =  309.500(Ft.)
Elevation difference =    1.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     6.43 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*( 124.000^.5)/( 1.532^(1/3)]=   6.43
Rainfall intensity (I) =      3.822(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.614(CFS)
Total initial stream area =        0.220(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.865(CFS)
Depth of flow =   0.290(Ft.), Average velocity =   3.432(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00               0.50
        2              1.50               0.00
        3              3.00               0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.865(CFS)
  '     '        flow top width =      1.739(Ft.)
  '     '    velocity=    3.432(Ft/s)
  '     '        area =      0.252(Sq.Ft)
  '     '        Froude number =     1.589

Upstream point elevation =   309.400(Ft.)
Downstream point elevation =   307.710(Ft.)
Flow length =   133.000(Ft.)
Travel time  =    0.65 min.
Time of concentration =    7.08 min.
Depth of flow =   0.290(Ft.)
Average velocity =   3.432(Ft/s)
Total irregular channel flow =     0.865(CFS)
Irregular channel normal depth above invert elev. =   0.290(Ft.)
Average velocity of channel(s) =   3.432(Ft/s)

Sub-Channel No. 1 Critical depth =      0.348(Ft.)
  '     '       '     Critical flow top width =      2.086(Ft.)
  '     '       '     Critical flow velocity=    2.386(Ft/s)
  '     '       '     Critical flow area =      0.363(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.672(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
```

```
Subarea runoff =      0.482(CFS) for    0.180(Ac.)
Total runoff =      1.096(CFS)  Total area =       0.40(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.302(CFS)
Depth of flow =   0.228(Ft.), Average velocity =   1.816(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              0.12              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =      2.302(CFS)
  '     '        flow top width =      9.935(Ft.)
  '     '    velocity=    1.816(Ft/s)
  '     '        area =      1.268(Sq.Ft)
  '     '        Froude number =     0.896

Upstream point elevation =   307.710(Ft.)
Downstream point elevation =   306.360(Ft.)
Flow length =   252.000(Ft.)
Travel time  =    2.31 min.
Time of concentration =    9.39 min.
Depth of flow =   0.228(Ft.)
Average velocity =   1.816(Ft/s)
Total irregular channel flow =     2.302(CFS)
Irregular channel normal depth above invert elev. =   0.228(Ft.)
Average velocity of channel(s) =   1.816(Ft/s)

Sub-Channel No. 1 Critical depth =      0.219(Ft.)
  '     '       '     Critical flow top width =      9.933(Ft.)
  '     '       '     Critical flow velocity=    1.953(Ft/s)
  '     '       '     Critical flow area =      1.179(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.272(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      2.102(CFS) for    0.880(Ac.)
Total runoff =      3.198(CFS)  Total area =       1.28(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.280(Ac.)
Runoff from this stream =      3.198(CFS)
Time of concentration =    9.39 min.
Rainfall intensity =     3.272(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```

```
1        6.901      7.31                 3.623
2        3.198      9.39                 3.272
Qmax(1) =
           1.000 *    1.000 *     6.901) +
           1.000 *    0.778 *     3.198) + =       9.390
Qmax(2) =
           0.903 *    1.000 *     6.901) +
           1.000 *    1.000 *     3.198) + =       9.429

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.901       3.198
Maximum flow rates at confluence using above data:
        9.390        9.429
Area of streams before confluence:
        2.490        1.280
Results of confluence:
Total flow rate =      9.429(CFS)
Time of concentration =     9.392 min.
Effective stream area after confluence =      3.770(Ac.)
End of computations, total study area =           3.770 (Ac.)
```

```
              San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
EXISTING CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 2


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =   39.000(Ft.)
Highest elevation =  326.000(Ft.)
Lowest elevation =  311.000(Ft.)
Elevation difference =   15.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.23 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*(  39.000^.5)/(  38.462^(1/3)]=   1.23
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.218(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.810(CFS)
Depth of flow =   0.131(Ft.), Average velocity =   1.889(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.20
        2              5.00              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.016
-----------------------------------------------------------------
Sub-Channel flow  =      0.810(CFS)
  '     '        flow top width =      6.546(Ft.)
  '     '    velocity=    1.889(Ft/s)
  '     '        area =      0.429(Sq.Ft)
  '     '        Froude number =     1.301

Upstream point elevation =   311.000(Ft.)
Downstream point elevation =   307.750(Ft.)
Flow length =   207.000(Ft.)
Travel time  =    1.83 min.
Time of concentration =    6.83 min.
Depth of flow =   0.131(Ft.)
Average velocity =   1.889(Ft/s)
Total irregular channel flow =     0.810(CFS)
Irregular channel normal depth above invert elev. =   0.131(Ft.)
Average velocity of channel(s) =   1.889(Ft/s)

Sub-Channel No. 1 Critical depth =      0.146(Ft.)
  '     '       '     Critical flow top width =      7.275(Ft.)
  '     '       '     Critical flow velocity=    1.529(Ft/s)
  '     '       '     Critical flow area =      0.529(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.728(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.034(CFS) for    0.380(Ac.)
Total runoff =      1.252(CFS)  Total area =        0.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.447(CFS)
Depth of flow =   0.126(Ft.), Average velocity =   3.661(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.20
        2              5.00              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.016
-----------------------------------------------------------------
Sub-Channel flow  =      1.447(CFS)
  '     '        flow top width =      6.286(Ft.)
  '     '    velocity=    3.661(Ft/s)
  '     '        area =      0.395(Sq.Ft)
  '     '        Froude number =     2.573

Upstream point elevation =   307.750(Ft.)
Downstream point elevation =   303.580(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.31 min.
Time of concentration =    7.13 min.
```

```
Depth of flow =   0.126(Ft.)
Average velocity =   3.661(Ft/s)
Total irregular channel flow =     1.447(CFS)
Irregular channel normal depth above invert elev. =   0.126(Ft.)
Average velocity of channel(s) =   3.661(Ft/s)

Sub-Channel No. 1 Critical depth =      0.184(Ft.)
  '     '       '     Critical flow top width =      9.180(Ft.)
  '     '       '     Critical flow velocity=    1.717(Ft/s)
  '     '       '     Critical flow area =      0.843(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.660(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.374(CFS) for    0.140(Ac.)
Total runoff =      1.626(CFS)  Total area =        0.59(Ac.)

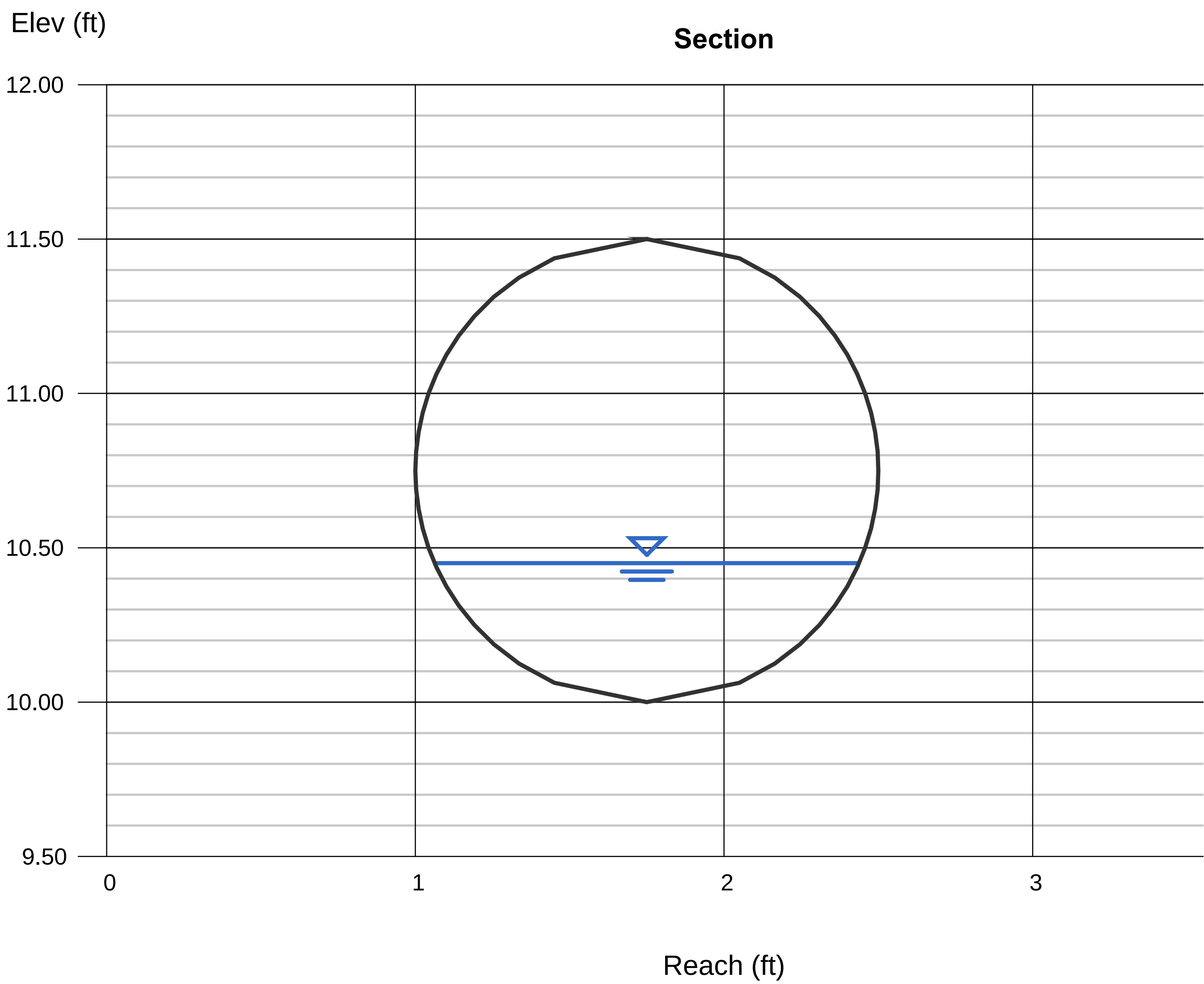

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     7.13 min.
Rainfall intensity =      3.660(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.347(CFS) for    0.130(Ac.)
Total runoff =      1.974(CFS)  Total area =        0.72(Ac.)
End of computations, total study area =          0.720 (Ac.)
```

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 28 2017

Exist 18 inch outlet_NE

Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 0.45
		Q (cfs)	= 9.420
		Area (sqft)	= 0.45
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 21.09
Slope (%)	= 21.00	Wetted Perim (ft)	= 1.74
N-Value	= 0.013	Crit Depth, Yc (ft)	= 1.19
		Top Width (ft)	= 1.38
Calculations		EGL (ft)	= 7.37
Compute by:	Known Q		
Known Q (cfs)	= 9.42		



LEGEND / SYMBOL

- OUTER BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- MINOR BASIN BOUNDARY
- EXISTING STORM DRAIN — SD —
- EXISTING CONTOUR — XXX —
- FLOW DIRECTION
- FLOW PATH
- FLOW LENGTH L=XXX.X'
- NODE/CONTOUR ELEVATION 306.43TG / 301.33IE
- HYDROLOGY NODE 200
- ANALYSIS/EXIT POINT 1
- DRAINAGE BASIN MARKER & AREA (AC) A-3 / X.XX

15 0 30 60

SCALE IN FEET
1 inch = 30 ft.

BWE
WWW.BWESD.COM
619.299.5550

SYM	DESCRIPTION	DATE	APPR

ISSUE DATE:
DRAWN BY:
CHECKED BY:
BWE JOB NUMBER:
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

SHEET TITLE

HYDROLOGY EXHIBIT EXISTING CONDITION

SHEET 1 OF 1

PROJECT

9880 CAMPUS POINT DRIVE

SITE ADDRESS
9880 CAMPUS POINT DRIVE
SAN DIEGO, CA 92093

APPENDIX C:

Proposed Conditions Runoff Coefficient Calculations
Proposed Condition Hydrology/Hydraulic Calculations
Proposed Conditions Hydrology Map

Runoff Coefficient Calculation for (Proposed Condition)

Project: 9880 Campus Point Drive

Similar to commercial development

C = 0.85 (Per Table 2, Soil Class D, Drainage Design Manual)

% imperviousness= 80% (Tabulated Imperviousness per Table 2)

Revised C= (Actual % Imp./Tabulated % Imp.)*0.85

Description	Area (Acres)		Actual % Imperviousness	Revised Runoff Coef. (C)	*Used Runoff Coef. (C)
	Total Area	Imp. Area (Ai)			
Proposed Condition	4.49	2.75	61.25%	0.65	0.65

*Revised C value is greater than limiting C for commercial development (= 0.5)

```
San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
PROPOSED CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 1


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   71.500(Ft.)
Highest elevation =  345.000(Ft.)
Lowest elevation =  315.000(Ft.)
Elevation difference =   30.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.97 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  71.500^.5)/(  41.958^(1/3)]=   1.97
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.166(CFS)
Total initial stream area =        0.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.624(CFS)
Depth of flow =   0.395(Ft.), Average velocity =   1.999(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.50
        2             1.00              0.00
        3             2.00              0.50
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.624(CFS)
  '     '        flow top width =      1.580(Ft.)
  '     '    velocity=    1.999(Ft/s)
  '     '        area =      0.312(Sq.Ft)
  '     '        Froude number =     0.792

Upstream point elevation =   314.000(Ft.)
Downstream point elevation =   313.000(Ft.)
Flow length =   137.000(Ft.)
Travel time  =    1.14 min.
Time of concentration =    6.14 min.
Depth of flow =   0.395(Ft.)
Average velocity =   1.999(Ft/s)
Total irregular channel flow =     0.624(CFS)
Irregular channel normal depth above invert elev. =   0.395(Ft.)
Average velocity of channel(s) =   1.999(Ft/s)

Sub-Channel No. 1 Critical depth =      0.359(Ft.)
  '     '       '     Critical flow top width =      1.438(Ft.)
  '     '       '     Critical flow velocity=    2.415(Ft/s)
  '     '       '     Critical flow area =      0.258(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.898(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.836(CFS) for    0.330(Ac.)
Total runoff =      1.003(CFS)  Total area =        0.39(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   310.000(Ft.)
Downstream point/station elevation =   308.500(Ft.)
Pipe length  =   142.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.003(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.003(CFS)
Normal flow depth in pipe =    4.97(In.)
Flow top width inside pipe =    8.95(In.)
Critical Depth =    5.51(In.)
Pipe flow velocity =      4.01(Ft/s)
Travel time through pipe =    0.59 min.
Time of concentration (TC) =     6.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     6.73 min.
Rainfall intensity =      3.749(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
```

```
Subarea runoff =      0.634(CFS) for    0.260(Ac.)
Total runoff =      1.636(CFS)  Total area =       0.65(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   306.500(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.636(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.636(CFS)
Normal flow depth in pipe =    5.32(In.)
Flow top width inside pipe =    8.85(In.)
Critical Depth =    7.05(In.)
Pipe flow velocity =      6.02(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     6.98 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     6.98 min.
Rainfall intensity =      3.694(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.336(CFS) for    0.140(Ac.)
Total runoff =      1.972(CFS)  Total area =       0.79(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   306.500(Ft.)
Downstream point/station elevation =   303.700(Ft.)
Pipe length  =   141.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.972(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.972(CFS)
Normal flow depth in pipe =    6.35(In.)
Flow top width inside pipe =    8.20(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =      5.92(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     7.37 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.37 min.
Rainfall intensity =      3.610(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.188(CFS) for    0.080(Ac.)
Total runoff =      2.160(CFS)  Total area =       0.87(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   303.700(Ft.)
Downstream point/station elevation =   301.330(Ft.)
Pipe length  =   265.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.160(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.160(CFS)
Normal flow depth in pipe =    6.98(In.)
Flow top width inside pipe =   11.84(In.)
Critical Depth =    7.54(In.)
Pipe flow velocity =      4.55(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =     8.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      306.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     8.34 min.
Rainfall intensity =      3.432(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.178(CFS) for    0.080(Ac.)
Total runoff =      2.338(CFS)  Total area =       0.95(Ac.)
End of computations, total study area =          0.950 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
PROPOSED CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 2


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   89.000(Ft.)
Highest elevation =  311.500(Ft.)
Lowest elevation =  309.000(Ft.)
Elevation difference =    2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.42 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  89.000^.5)/( 2.809^(1/3)]=   5.42
Rainfall intensity (I) =      4.117(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.187(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      101.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     5.42 min.
Rainfall intensity =      4.117(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.321(CFS) for    0.120(Ac.)
```

```
Total runoff =      0.508(CFS)  Total area =       0.19(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.870(CFS)
Depth of flow =   0.065(Ft.), Average velocity =   1.454(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.75
        2             2.00              0.00
        3            11.00              0.00
        4            13.00              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.870(CFS)
  '     '        flow top width =      9.348(Ft.)
  '     '    velocity=    1.454(Ft/s)
  '     '        area =      0.598(Sq.Ft)
  '     '        Froude number =     1.013

Upstream point elevation =   309.000(Ft.)
Downstream point elevation =   307.500(Ft.)
Flow length =   100.000(Ft.)
Travel time  =    1.15 min.
Time of concentration =    6.56 min.
Depth of flow =   0.065(Ft.)
Average velocity =   1.454(Ft/s)
Total irregular channel flow =     0.870(CFS)
Irregular channel normal depth above invert elev. =   0.065(Ft.)
Average velocity of channel(s) =   1.454(Ft/s)

Sub-Channel No. 1 Critical depth =      0.065(Ft.)
  '     '       '     Critical flow top width =      9.349(Ft.)
  '     '       '     Critical flow velocity=    1.449(Ft/s)
  '     '       '     Critical flow area =      0.600(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.790(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.665(CFS) for    0.270(Ac.)
Total runoff =      1.174(CFS)  Total area =       0.46(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   304.000(Ft.)
Downstream point/station elevation =   303.240(Ft.)
Pipe length  =   169.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.174(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.174(CFS)
Normal flow depth in pipe =    5.94(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    5.48(In.)
Pipe flow velocity =      3.03(Ft/s)
```

```
Travel time through pipe =    0.93 min.
Time of concentration (TC) =     7.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.49 min.
Rainfall intensity =      3.586(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.746(CFS) for    0.320(Ac.)
Total runoff =      1.920(CFS)  Total area =        0.78(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   303.240(Ft.)
Downstream point/station elevation =   302.900(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.920(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.920(CFS)
Normal flow depth in pipe =    7.72(In.)
Flow top width inside pipe =   11.49(In.)
Critical Depth =    7.09(In.)
Pipe flow velocity =      3.60(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     7.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.79 min.
Rainfall intensity =      3.529(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.321(CFS) for    0.140(Ac.)
Total runoff =      2.241(CFS)  Total area =        0.92(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   302.900(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    67.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.241(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.241(CFS)
Normal flow depth in pipe =    8.23(In.)
Flow top width inside pipe =   11.14(In.)
Critical Depth =    7.68(In.)
Pipe flow velocity =      3.91(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     8.08 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.920(Ac.)
Runoff from this stream =      2.241(CFS)
Time of concentration =    8.08 min.
Rainfall intensity =     3.477(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   51.500(Ft.)
Highest elevation =  309.500(Ft.)
Lowest elevation =  308.500(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.66 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  51.500^.5)/(   1.942^(1/3)]=   4.66
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.194(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.374(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   1.941(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              2.00              0.00
        3              4.00              0.50
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.374(CFS)
  '     '        flow top width =      1.757(Ft.)
  '     '    velocity=    1.941(Ft/s)
  '     '        area =      0.193(Sq.Ft)
  '     '        Froude number =     1.032

Upstream point elevation =   308.500(Ft.)
Downstream point elevation =   308.000(Ft.)
Flow length =    37.000(Ft.)
Travel time  =    0.32 min.
Time of concentration =    5.32 min.
Depth of flow =   0.220(Ft.)
Average velocity =   1.941(Ft/s)
Total irregular channel flow =     0.374(CFS)
Irregular channel normal depth above invert elev. =   0.220(Ft.)
Average velocity of channel(s) =   1.941(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.223(Ft.)
  '     '       '     Critical flow top width =      1.781(Ft.)
  '     '       '     Critical flow velocity=    1.887(Ft/s)
  '     '       '     Critical flow area =      0.198(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      4.150(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.351(CFS) for    0.130(Ac.)
Total runoff =      0.545(CFS)  Total area =        0.20(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   306.800(Ft.)
Downstream point/station elevation =   306.250(Ft.)
Pipe length  =    57.80(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.545(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.545(CFS)
Normal flow depth in pipe =    4.90(In.)
Flow top width inside pipe =    4.65(In.)
Critical Depth =    4.51(In.)
Pipe flow velocity =      3.18(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     5.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     5.62 min.
Rainfall intensity =      4.050(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.342(CFS) for    0.130(Ac.)
Total runoff =      0.887(CFS)  Total area =        0.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.129(CFS)
Depth of flow =   0.215(Ft.), Average velocity =   0.885(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00             0.75
        2             0.10             0.00
        3             6.00             0.00
        4             6.10             0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      1.129(CFS)
  '     '        flow top width =      5.957(Ft.)
  '     '    velocity=    0.885(Ft/s)
```

```
  '     '        area =      1.276(Sq.Ft)
  '     '        Froude number =     0.337

Upstream point elevation =   306.250(Ft.)
Downstream point elevation =   306.220(Ft.)
Flow length =    25.000(Ft.)
Travel time  =    0.47 min.
Time of concentration =    6.09 min.
Depth of flow =   0.215(Ft.)
Average velocity =   0.885(Ft/s)
Total irregular channel flow =     1.129(CFS)
Irregular channel normal depth above invert elev. =   0.215(Ft.)
Average velocity of channel(s) =   0.885(Ft/s)

Sub-Channel No. 1 Critical depth =      0.104(Ft.)
  '     '       '     Critical flow top width =      5.928(Ft.)
  '     '       '     Critical flow velocity=    1.827(Ft/s)
  '     '       '     Critical flow area =      0.618(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.912(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.458(CFS) for    0.180(Ac.)
Total runoff =      1.345(CFS)  Total area =        0.51(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.687(CFS)
Depth of flow =   0.287(Ft.), Average velocity =   0.991(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1            0.00              0.75
        2            0.10              0.00
        3            6.00              0.00
        4            6.10              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      1.687(CFS)
  '     '        flow top width =      5.976(Ft.)
  '     '    velocity=    0.991(Ft/s)
  '     '        area =      1.702(Sq.Ft)
  '     '        Froude number =     0.327

Upstream point elevation =   306.220(Ft.)
Downstream point elevation =   306.110(Ft.)
Flow length =   104.000(Ft.)
Travel time  =    1.75 min.
Time of concentration =    7.84 min.
Depth of flow =   0.287(Ft.)
Average velocity =   0.991(Ft/s)
Total irregular channel flow =     1.687(CFS)
Irregular channel normal depth above invert elev. =   0.287(Ft.)
Average velocity of channel(s) =   0.991(Ft/s)

Sub-Channel No. 1 Critical depth =      0.137(Ft.)
  '     '       '     Critical flow top width =      5.936(Ft.)
  '     '       '     Critical flow velocity=    2.086(Ft/s)
```

```
  '     '       '     Critical flow area =      0.809(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.520(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.595(CFS) for    0.260(Ac.)
Total runoff =      1.940(CFS)  Total area =        0.77(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.84 min.
Rainfall intensity =      3.520(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.252(CFS) for    0.110(Ac.)
Total runoff =      2.191(CFS)  Total area =        0.88(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.652(CFS)
Depth of flow =   0.354(Ft.), Average velocity =   1.258(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.75
        2              0.10              0.00
        3              6.00              0.00
        4              6.10              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      2.652(CFS)
  '     '        flow top width =      5.995(Ft.)
  '     '    velocity=    1.258(Ft/s)
  '     '        area =      2.108(Sq.Ft)
  '     '        Froude number =     0.374

Upstream point elevation =   306.110(Ft.)
Downstream point elevation =   306.000(Ft.)
Flow length =    83.500(Ft.)
Travel time  =    1.11 min.
Time of concentration =    8.95 min.
Depth of flow =   0.354(Ft.)
Average velocity =   1.258(Ft/s)
Total irregular channel flow =     2.652(CFS)
Irregular channel normal depth above invert elev. =   0.354(Ft.)
Average velocity of channel(s) =   1.258(Ft/s)

Sub-Channel No. 1 Critical depth =      0.184(Ft.)
  '     '       '     Critical flow top width =      5.949(Ft.)
  '     '       '     Critical flow velocity=    2.438(Ft/s)
  '     '       '     Critical flow area =      1.088(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.336(In/Hr) for a    50.0 year storm
```

```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.802(CFS) for    0.370(Ac.)
Total runoff =      2.994(CFS)  Total area =        1.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =      2.994(CFS)
Time of concentration =    8.95 min.
Rainfall intensity =     3.336(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.241      8.08                 3.477
2        2.994      8.95                 3.336
Qmax(1) =
           1.000 *    1.000 *     2.241) +
           1.000 *    0.903 *     2.994) + =       4.944
Qmax(2) =
           0.960 *    1.000 *     2.241) +
           1.000 *    1.000 *     2.994) + =       5.144

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.241       2.994
Maximum flow rates at confluence using above data:
        4.944        5.144
Area of streams before confluence:
        0.920        1.250
Results of confluence:
Total flow rate =      5.144(CFS)
Time of concentration =     8.947 min.
Effective stream area after confluence =      2.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.100(Ft.)
Pipe length  =    82.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.144(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.144(CFS)
Normal flow depth in pipe =   11.11(In.)
Flow top width inside pipe =   17.50(In.)
Critical Depth =   10.48(In.)
Pipe flow velocity =      4.49(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     9.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      112.000
**** SUBAREA FLOW ADDITION ****
```

```
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.25 min.
Rainfall intensity =      3.292(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.984(CFS) for    0.460(Ac.)
Total runoff =      6.128(CFS)  Total area =        2.63(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.25 min.
Rainfall intensity =      3.292(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.278(CFS) for    0.130(Ac.)
Total runoff =      6.406(CFS)  Total area =        2.76(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.25 min.
Rainfall intensity =      3.292(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.685(CFS) for    0.320(Ac.)
Total runoff =      7.091(CFS)  Total area =        3.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.080(Ac.)
Runoff from this stream =      7.091(CFS)
Time of concentration =    9.25 min.
Rainfall intensity =     3.292(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   35.000(Ft.)
Highest elevation =  326.000(Ft.)
Lowest elevation =  313.000(Ft.)
Elevation difference =   13.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.44 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  35.000^.5)/(  37.143^(1/3)]=   1.44
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.166(CFS)
Total initial stream area =        0.060(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.444(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   2.385(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              1.00              0.00
        3              2.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.444(CFS)
  '     '        flow top width =      1.220(Ft.)
  '     '    velocity=    2.385(Ft/s)
  '     '        area =      0.186(Sq.Ft)
  '     '        Froude number =     1.076

Upstream point elevation =   312.000(Ft.)
Downstream point elevation =   310.500(Ft.)
Flow length =   242.000(Ft.)
Travel time  =    1.69 min.
Time of concentration =    6.69 min.
Depth of flow =   0.305(Ft.)
Average velocity =   2.385(Ft/s)
Total irregular channel flow =     0.444(CFS)
Irregular channel normal depth above invert elev. =   0.305(Ft.)
Average velocity of channel(s) =   2.385(Ft/s)

Sub-Channel No. 1 Critical depth =      0.314(Ft.)
  '     '       '     Critical flow top width =      1.258(Ft.)
  '     '       '     Critical flow velocity=    2.243(Ft/s)
  '     '       '     Critical flow area =      0.198(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.759(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.489(CFS) for    0.200(Ac.)
Total runoff =      0.655(CFS)  Total area =       0.26(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.260(Ac.)
Runoff from this stream =      0.655(CFS)
Time of concentration =    6.69 min.
Rainfall intensity =     3.759(In/Hr)
Summary of stream data:

Stream   Flow rate      TC           Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        7.091      9.25                 3.292
2        0.655      6.69                 3.759
```

```
Qmax(1) =
           1.000 *    1.000 *     7.091) +
           0.876 *    1.000 *     0.655) + =       7.664
Qmax(2) =
           1.000 *    0.723 *     7.091) +
           1.000 *    1.000 *     0.655) + =       5.784

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.091       0.655
Maximum flow rates at confluence using above data:
        7.664        5.784
Area of streams before confluence:
        3.080        0.260
Results of confluence:
Total flow rate =      7.664(CFS)
Time of concentration =     9.251 min.
Effective stream area after confluence =      3.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   305.000(Ft.)
Downstream point/station elevation =   298.850(Ft.)
Pipe length  =    31.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.664(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.664(CFS)
Normal flow depth in pipe =    5.88(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.03(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     9.28 min.

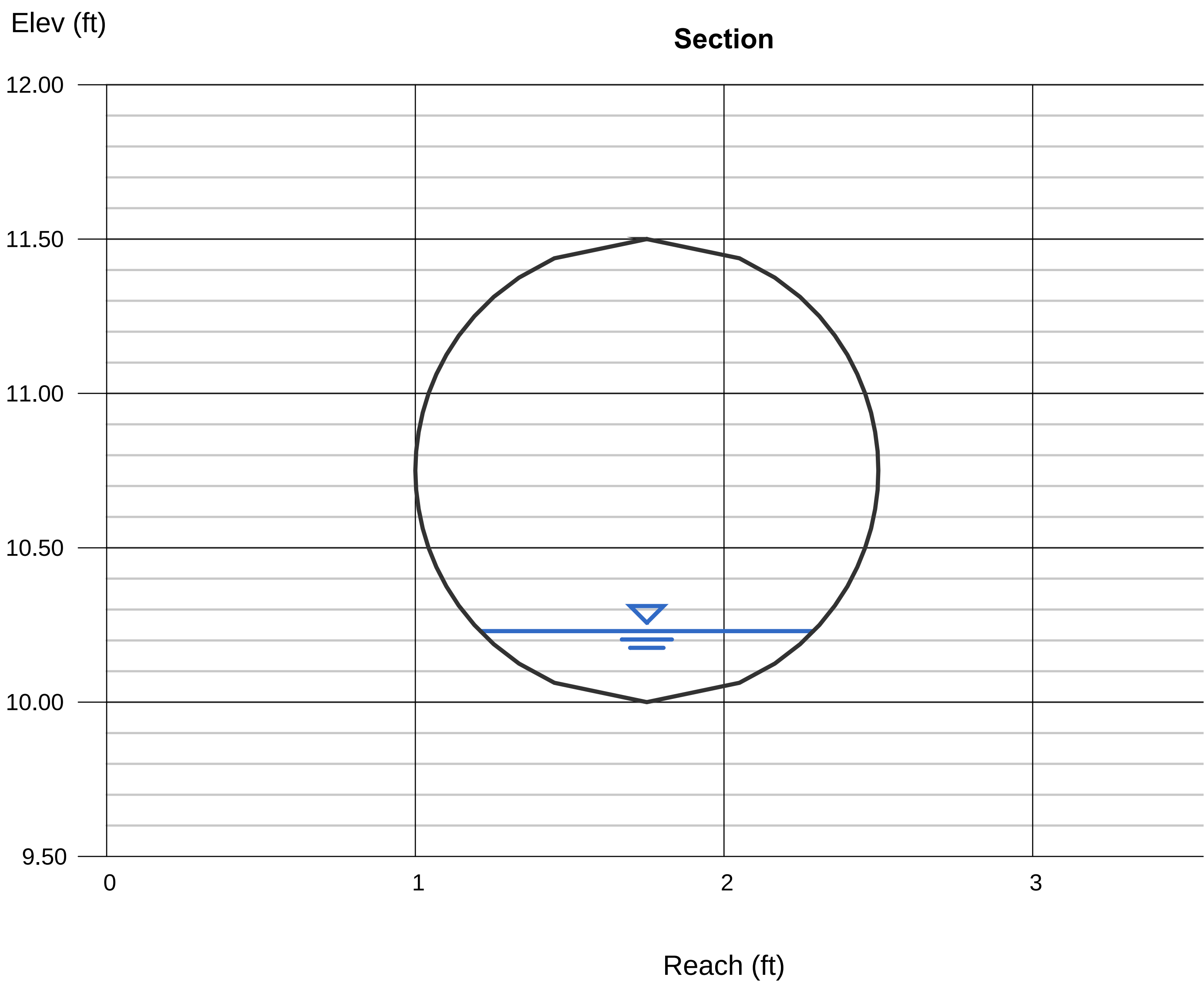

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.28 min.
Rainfall intensity =      3.288(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.128(CFS) for    0.060(Ac.)
Total runoff =      7.792(CFS)  Total area =       3.40(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.28 min.
Rainfall intensity =      3.288(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.299(CFS) for    0.140(Ac.)
Total runoff =      8.092(CFS)  Total area =       3.54(Ac.)
End of computations, total study area =          3.540 (Ac.)
```

Channel Report

18 inch outlet_NE-Prop

Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 0.23
		Q (cfs)	= 2.340
		Area (sqft)	= 0.17
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 13.62
Slope (%)	= 21.00	Wetted Perim (ft)	= 1.21
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.58
		Top Width (ft)	= 1.08
Calculations		EGL (ft)	= 3.12
Compute by:	Known Q		
Known Q (cfs)	= 2.34		



Channel Report

New 18 inch outlet_SE

Circular

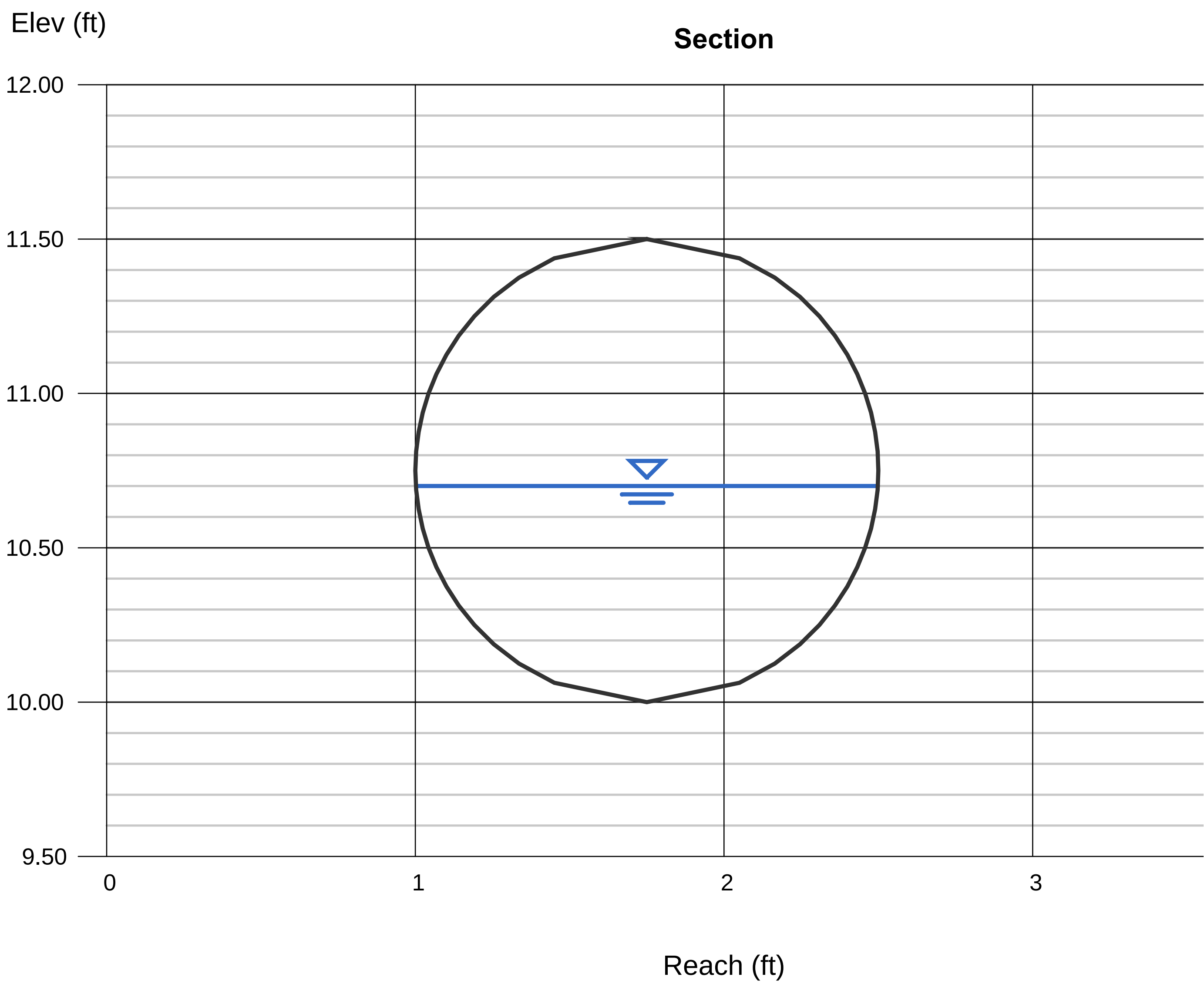
Diameter (ft)	= 1.50
Invert Elev (ft)	= 10.00
Slope (%)	= 2.75
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.70

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 7.700
Area (sqft)	= 0.81
Velocity (ft/s)	= 9.51
Wetted Perim (ft)	= 2.26
Crit Depth, Yc (ft)	= 1.08
Top Width (ft)	= 1.50
EGL (ft)	= 2.11



Ex. 18" Pipe Analysis - Campus Point Dr.


```
                 San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
Offsite Hydrology Analysis





------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =  100.000(Ft.)
Lowest elevation =   98.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.57 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 100.000^.5)/(   2.000^(1/3)]=   3.57
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.725(CFS)
Total initial stream area =        0.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    95.000(Ft.)
Downstream point/station elevation =    88.000(Ft.)
```

```
Pipe length  =   300.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.725(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.725(CFS)
Normal flow depth in pipe =    4.23(In.)
Flow top width inside pipe =    5.47(In.)
Critical Depth =    5.13(In.)
Pipe flow velocity =      4.90(Ft/s)
Travel time through pipe =    1.02 min.
Time of concentration (TC) =     6.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration =     6.02 min.
Rainfall intensity =      3.932(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      7.185(CFS) for    2.150(Ac.)
Total runoff =      7.910(CFS)  Total area =        2.35(Ac.)
End of computations, total study area =          2.350 (Ac.)
```

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 31 2017

Ex. 18 in. Pipe - Campus Point Dr.

MAX Q OF 18" PIPE @ 3.12%

Circular
Diameter (ft) = 1.50

Invert Elev (ft) = 1.00
Slope (%) = 3.12
N-Value = 0.013

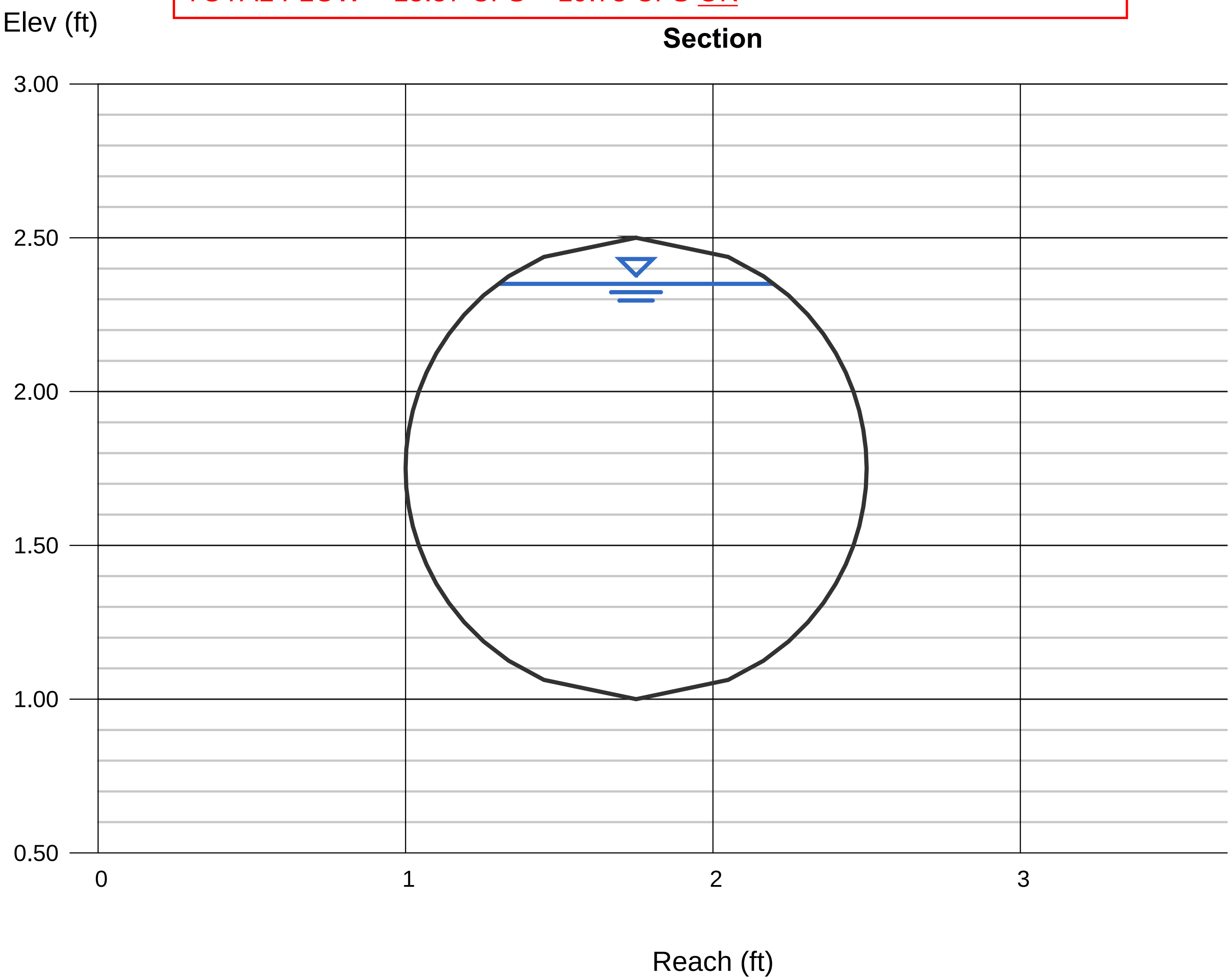
Calculations
Compute by: Q vs Depth
No. Increments = 10

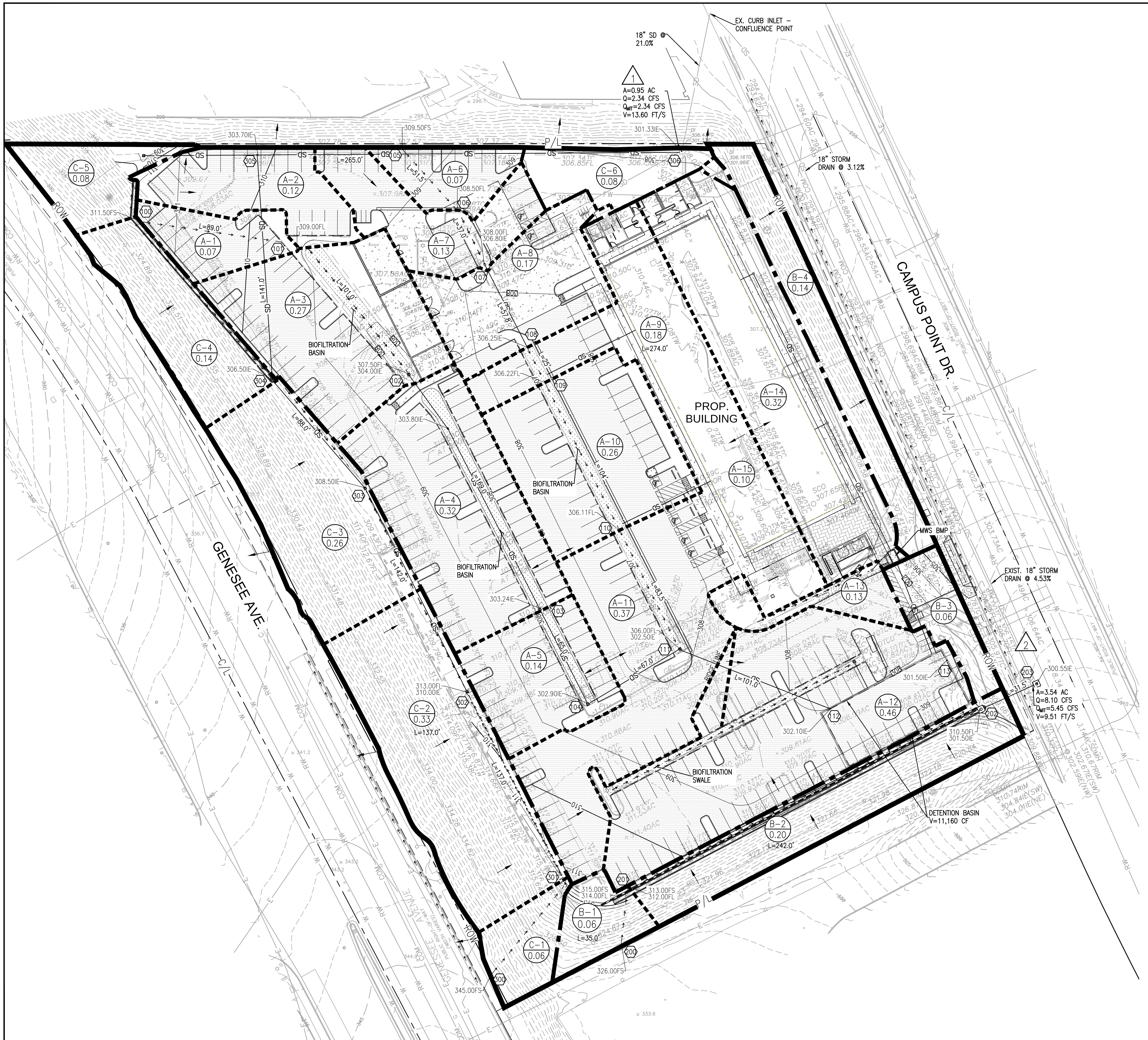
Highlighted
Depth (ft) = 1.35
Q (cfs) = 19.78
Area (sqft) = 1.68
Velocity (ft/s) = 11.80
Wetted Perim (ft) = 3.75
Crit Depth, Yc (ft) = 1.47
Top Width (ft) = 0.90
EGL (ft) = 3.51

SLOPE OF LIMITING SEGMENT PER 18216-3-D

EX. Q THROUGH EX. 18" PIPE = 7.91 CFS (PRELIMINARY)
ADDITIONAL Q THROUGH EX. 18" PIPE = 7.66 CFS

TOTAL FLOW = 15.57 CFS < 19.78 CFS OK





LEGEND / SYMBOL

- OUTER BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- MINOR BASIN BOUNDARY
- EXISTING STORM DRAIN
- NEW STORM DRAIN
- EXISTING CONTOUR
- NEW CONTOUR
- FLOW DIRECTION
- FLOW PATH
- FLOW LENGTH — L=XXX.X'
- NODE/CONTOUR ELEVATION — 306.43TG / 301.33IE
- HYDROLOGY NODE — 200
- ANALYSIS/EXIT POINT — 1
- DRAINAGE BASIN MARKER & AREA (AC) — B-X / X.XX

PEAK FLOW RATE SUMMARY

	Drainage Area (acres)		50 Yr Flow (cfs)			% Change from Existing Condition
	Existing Condition	Proposed Condition	Existing Condition	Proposed Condition	Mitigated Condition	
Analysis/Exit Point 1	3.77	0.95	9.42	2.34	2.34	-75.2
Analysis/Exit Point 2	0.72	3.54	1.97	8.10	5.45	176.6
Total	4.49	4.49	11.39	10.44	7.79	-31.6

15 0 30 60
SCALE IN FEET
1 inch = 30 ft.

BWE
WWW.BWESD.COM
619.299.5550

APPR | DATE | DESCRIPTION | SYM

ISSUE DATE:
DRAWN BY:
CHECKED BY:
BWE JOB NUMBER:
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

SHEET TITLE: HYDROLOGY EXHIBIT PROPOSED CONDITION

SHEET 1 OF 1

PROJECT: 9880 CAMPUS POINT DRIVE

SITE ADDRESS: 9880 CAMPUS POINT DRIVE, SAN DIEGO, CA 92093

PLOT: M:\PROJECTS\12500\12836\1.00 9880 CAMPUS POINT DRIVE\DWGS\EXHIBITS\DRAINAGE\2017-07-REVISION\12836\1 HYDRO-PROP.DWG Malcolm D. Smith 8/11/2017 3:49 PM

APPENDIX D

Detention Analysis

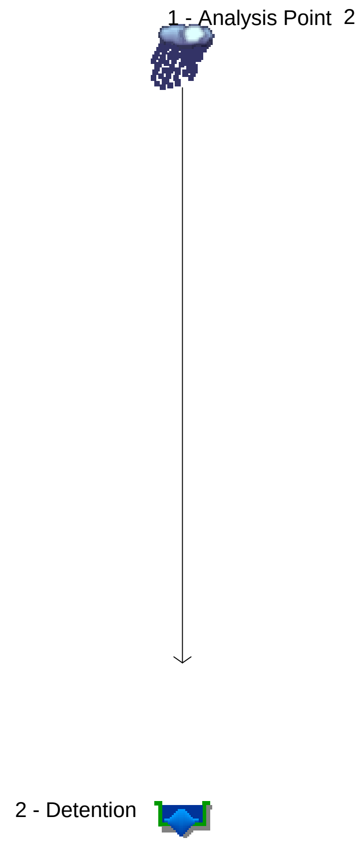
RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 7/28/2017
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 3.08 ACRES
RUNOFF COEFFICIENT 0.65
PEAK DISCHARGE 7.1 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 0.3
TIME (MIN) = 27	DISCHARGE (CFS) = 0.3
TIME (MIN) = 36	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 54	DISCHARGE (CFS) = 0.3
TIME (MIN) = 63	DISCHARGE (CFS) = 0.3
TIME (MIN) = 72	DISCHARGE (CFS) = 0.3
TIME (MIN) = 81	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.3
TIME (MIN) = 99	DISCHARGE (CFS) = 0.3
TIME (MIN) = 108	DISCHARGE (CFS) = 0.4
TIME (MIN) = 117	DISCHARGE (CFS) = 0.4
TIME (MIN) = 126	DISCHARGE (CFS) = 0.4
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 144	DISCHARGE (CFS) = 0.4
TIME (MIN) = 153	DISCHARGE (CFS) = 0.4
TIME (MIN) = 162	DISCHARGE (CFS) = 0.5
TIME (MIN) = 171	DISCHARGE (CFS) = 0.5
TIME (MIN) = 180	DISCHARGE (CFS) = 0.6
TIME (MIN) = 189	DISCHARGE (CFS) = 0.6
TIME (MIN) = 198	DISCHARGE (CFS) = 0.7
TIME (MIN) = 207	DISCHARGE (CFS) = 0.7
TIME (MIN) = 216	DISCHARGE (CFS) = 0.9
TIME (MIN) = 225	DISCHARGE (CFS) = 1
TIME (MIN) = 234	DISCHARGE (CFS) = 1.5
TIME (MIN) = 243	DISCHARGE (CFS) = 2.6
TIME (MIN) = 252	DISCHARGE (CFS) = 7.1
TIME (MIN) = 261	DISCHARGE (CFS) = 1.2
TIME (MIN) = 270	DISCHARGE (CFS) = 0.8
TIME (MIN) = 279	DISCHARGE (CFS) = 0.6
TIME (MIN) = 288	DISCHARGE (CFS) = 0.5
TIME (MIN) = 297	DISCHARGE (CFS) = 0.5
TIME (MIN) = 306	DISCHARGE (CFS) = 0.4
TIME (MIN) = 315	DISCHARGE (CFS) = 0.4
TIME (MIN) = 324	DISCHARGE (CFS) = 0.3
TIME (MIN) = 333	DISCHARGE (CFS) = 0.3
TIME (MIN) = 342	DISCHARGE (CFS) = 0.3
TIME (MIN) = 351	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 369	DISCHARGE (CFS) = 0

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Project: Det-1 YR 50.gpw	Friday, 07 / 28 / 2017

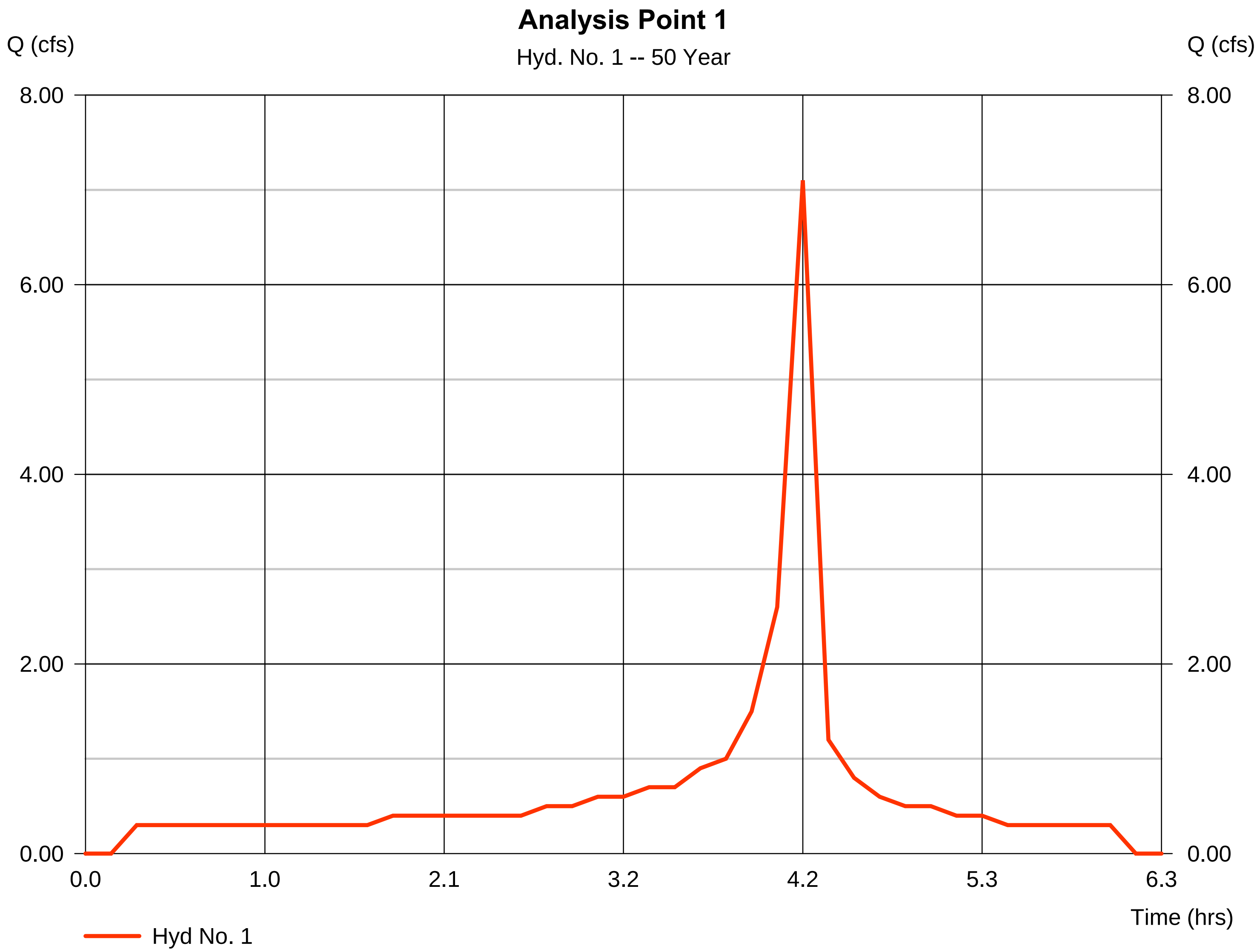
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Friday, 07 / 28 / 2017

Hyd. No. 1

Analysis Point 1

Hydrograph type	= Manual	Peak discharge	= 7.100 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.20 hrs
Time interval	= 9 min	Hyd. volume	= 15,120 cuft



Hydrograph Report

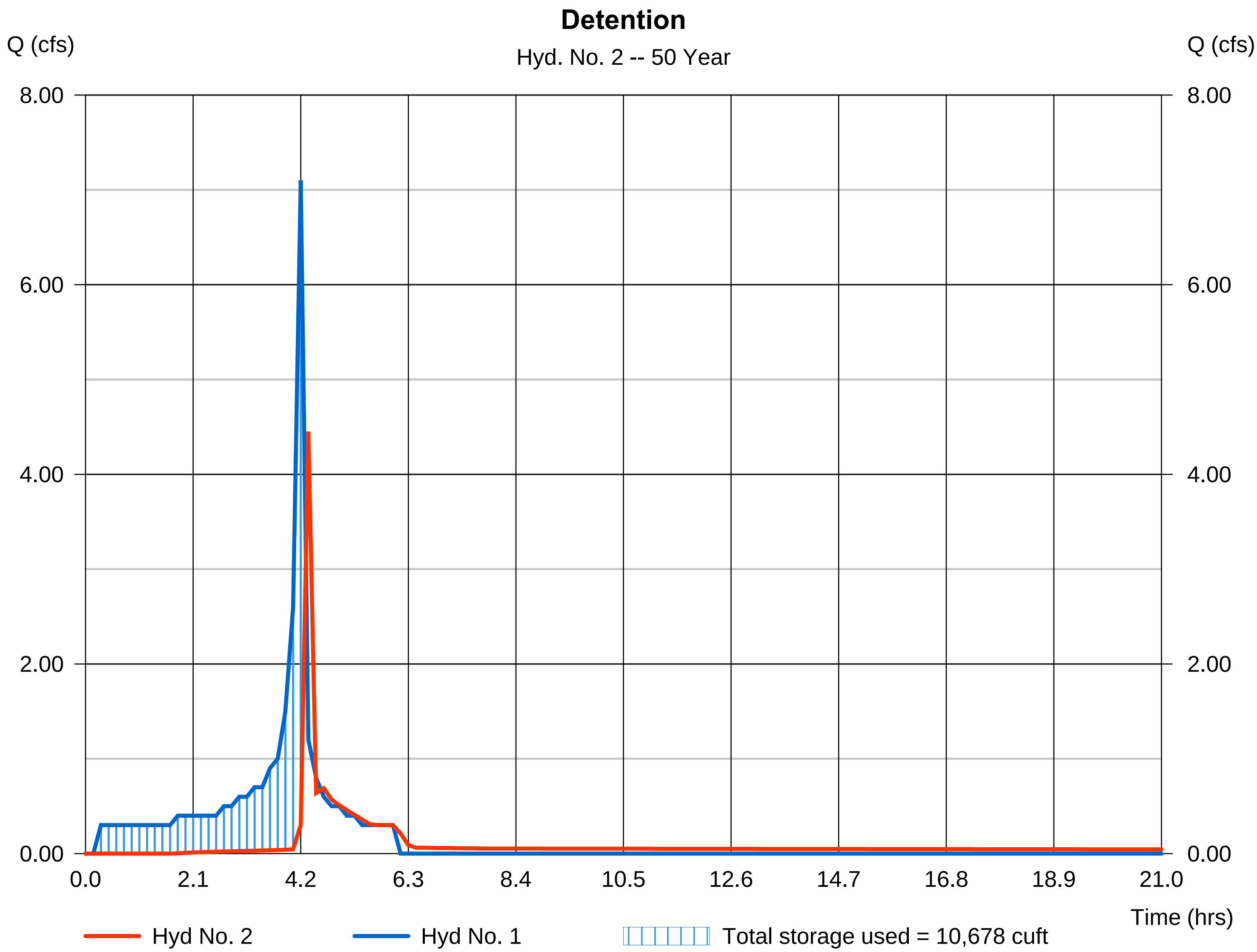
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 07 / 28 / 2017

Hyd. No. 2

Detention

Hydrograph type	= Reservoir	Peak discharge	= 4.451 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.35 hrs
Time interval	= 9 min	Hyd. volume	= 13,486 cuft
Inflow hyd. No.	= 1 - Analysis Point 1	Max. Elevation	= 305.50 ft
Reservoir name	= Detention 1	Max. Storage	= 10,678 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Pond No. 1 - Detention 1

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	302.00	n/a	0	0
1.00	303.00	n/a	3,188	3,188
2.00	304.00	n/a	3,188	6,375
3.00	305.00	n/a	3,188	9,563
3.50	305.50	n/a	1,598	11,160

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	1.15	Inactive	Inactive
Span (in)	= 18.00	1.15	5.80	24.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 302.00	302.50	305.45	48.25
Length (ft)	= 273.00	0.00	0.00	2.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	0.08	Inactive	Inactive
Crest El. (ft)	= 305.00	304.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.470 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	302.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	0.000	---	0.000
1.00	3,188	303.00	0.02 ic	0.02 ic	0.00	0.00	0.00	0.00	---	---	0.000	---	0.023
2.00	6,375	304.00	0.05 ic	0.04 ic	0.00	0.00	0.00	0.00	---	---	0.000	---	0.042
3.00	9,563	305.00	0.06 ic	0.05 ic	0.00	0.00	0.00	0.01	---	---	0.000	---	0.063
3.50	11,160	305.50	7.57 ic	0.05 ic	0.00	0.00	7.39	0.13	---	---	0.000	---	7.571

APPENDIX E:

Hydrologic Information/
Excerpts from Hydrology Manual

TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Type (1)
Residential:	D
Single Family	.55
Multi-Units	.70
Mobile Homes	.65
Rural (lots greater than 1/2 acre)	.45
Commercial (2) 80% Impervious	.85
Industrial (2) 90% Impervious	.95

NOTES:

(1) Type D soil to be used for all areas.

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%

Tabulated imperviousness = 80%

$$\text{Revised C} = \frac{50}{80} \times 0.85 = 0.53$$

APPENDIX I

RATIONAL METHOD

Watersheds Less than 0.5 Square Mile

Method of Computing Runoff

Use the Rational Formula Q = CIA where:

Q is the peak rate of flow in cubic feet per second.

C is a runoff coefficient expressed as that percentage of rainfall which becomes surface runoff.

I is the average rainfall intensity in inches per hour for a storm duration equal to the time of concentration (T_c) of the contributing drainage area.

A is the drainage area in acres tributary to design point.

(1) Runoff Coefficient, C

Appendix I-A lists the estimated coefficients for urban areas.

For urban areas select an appropriate coefficient for each type of land use from Table, 2, Appendix I-A. Multiply this coefficient by the percentage of the total area included in that class. The sum of the products for all land uses in San Diego County is the weighted runoff coefficient.

(2) Rainfall Intensity, I

Intensity - duration - frequency curves applicable to all areas within San Diego County are given in Appendix I-B.

(3) Time of Concentration, Tc

The time of concentration is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration.

Methods of calculation differ for natural watersheds (non-urbanized) and for urban drainage systems. Also, when designing storm drain systems, the designer must consider the possibility that an existing natural watershed may become urbanized during the useful life of the storm drain system.

(a) Natural watersheds: Obtain T_c from Appendices I-C and I-D.

(b) Urban drainage systems: In the case of urban drainage systems, the time of concentration at any point within the drainage area is given by:

$$T_c = T_i + T_f \text{ where}$$

$\underline{T_i}$ is the inlet time or the time required for the storm water to flow to the first inlet in thesystem. It is the sum of time in overland flow across lots and in the street gutter.

$\underline{T_f}$ is the travel time or the time required for the storm water to flow in the storm drain from the most upstream inlet to the point in question.

Travel Time, T_f, is computed by dividing the length of storm drain by the computed flow velocity. Since the velocity normally changes at each inlet because of changes in flow rate or slope, total travel time must be computed as the sum of the travel times for each section of the storm drain.

The overland flow component of inlet time, T_i, may be estimated by the use of the chart shown in Appendix I-E. Use Appendix I-F to estimate time of travel for street gutter flow.

APPENDIX F:

FEMA Flood Plain Map

JOINS PANEL 1339

ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1338G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1338 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1338	G

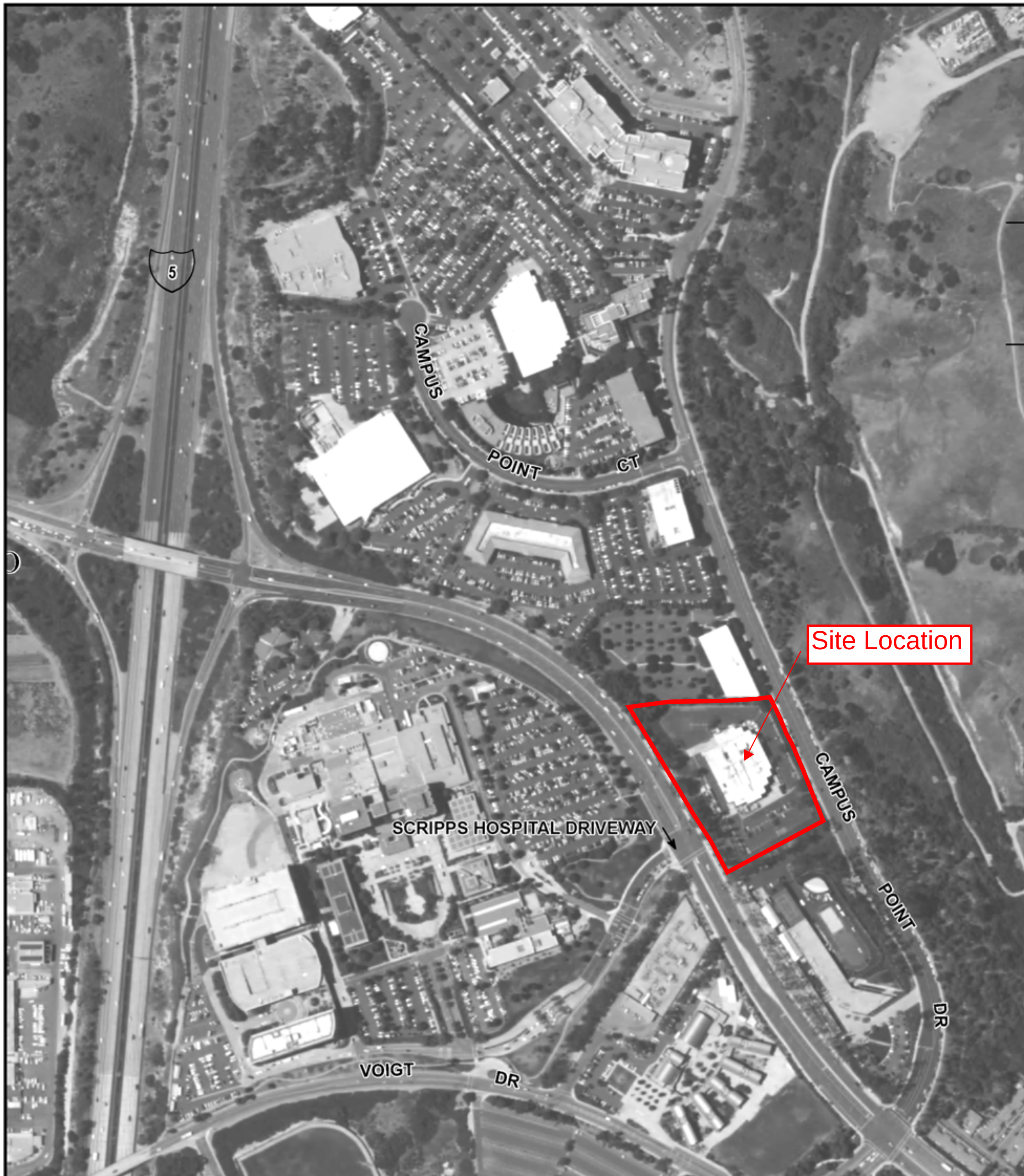
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1338G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



ance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1338G

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1338 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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ATTACHMENT 6
GEOTECHNICAL AND GROUNDWATER INVESTIGATION REPORT

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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RESPONSE TO REVIEW COMMENTS

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ALEXANDRIA REAL ESTATE EQUITIES
SAN DIEGO, CALIFORNIA

JUNE 2, 2017
PROJECT NO. G2099-52-01

Project No. G2099-52-01
June 2, 2017

Alexandria Real Estate Equities
10996 Torreyana Road, Suite 250
San Diego, California 92121

Attention: Mr. Mike Barbera

Subject: RESPONSE TO REVIEW COMMENTS
9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Investigation, 9880 Campus Point Drive, San Diego, California*, prepared by Geocon Incorporated, dated April 18, 2017 (Project No. G2099-52-01).
2. *Preliminary Grading & Drainage Plan, 9880 Campus Point Drive, San Diego, California*, prepared by BWE, undated (Project No. 17024).
3. *LDR – Geology, Cycle Type: 3 Preliminary Review, Review Comments for 9880 Campus Point – SDP*, prepared by City of San Diego, dated May 24, 2017 (Project No. 549731).

Dear Mr. Barbera:

In accordance with the request of Mr. Jon Ohlson with DGA, we prepared this letter to address review comments provided by the City of San Diego LDR-Geology dated May 24, 2017, regarding development of the subject site. The city's comments are listed herein with the Geocon response immediately following.

Comment 3: *The project's geotechnical should delineate on the geologic map (Figure No. 2) the area(s) where partial infiltration is feasible and where storm water infiltration is considered non-feasible based on their site-specific investigation.*

Response: We updated the Geologic Map, Figure 1, that depicts the area where partial infiltration is feasible based on our findings presented in the referenced geotechnical investigation report. The areas outside this delineated area is considered an area where infiltration is non-feasible.

Comment 15: *Storm Water Requirements for the proposed conceptual development will be evaluated by LDR-Engineering review. Priority Development Projects (PDPs) may require investigation of storm water infiltration feasibility in accordance with the Storm Water Standards (including Appendix C and D). Check with your LDR-*

Engineering reviewer on requirements. LDR-Engineer may determine that LDR-Geology review of a storm water infiltration evaluation is required.

Response: Acknowledged. We performed a storm water investigation for the subject project and the results of the investigation are presented in Appendix C of the referenced geotechnical investigation report.

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

Very truly yours,

GEOCON INCORPORATED

Lilian E. Rodriguez
RCE 83227

REGISTERED PROFESSIONAL ENGINEER LILIAN E. RODRIGUEZ No.83227 CIVIL STATE OF CALIFORNIA

Shawn Foy Weedon
GE 2714

REGISTERED PROFESSIONAL ENGINEER SHAWN WEEDON No. 2714 GEOTECHNICAL STATE OF CALIFORNIA

LER:SFW:dmc

(e-mail) Addressee
(e-mail) BWE
Attention: Mr. Brian Saltzman

GEOCON LEGEND

- Qpf ....PREVIOUSLY PLACED FILL
- Tsc ....SCRIPP FORMATION (Dotted Where Buried)
- ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- B-9 ....APPROX. LOCATION OF BORING
- P-4 ....APPROX. LOCATION OF PERMEAMETER TEST
- (45') ....APPROX. DEPTH TO SCRIPPS FORMATION (In Feet)
- B B' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION
- ....APPROX. ALLOWABLE AREA FOR PARTIAL INFILTRATION

GEOLOGIC MAP

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

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

SCALE 1" = 30'	DATE 06 - 02 - 2017	
PROJECT NO. G2099 - 52 - 01		FIGURE 1
SHEET 1 OF 1		

Plotted:06/02/2017 2:01PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\SHEETS\G2099-52-01 Updated Geo Map.dwg

GEOCON INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

PREPARED FOR

ALEXANDRIA REAL ESTATE EQUITIES INCORPORATED
SAN DIEGO, CALIFORNIA

APRIL 18, 2017
PROJECT NO. G2099-52-01

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2099-52-01
April 18, 2017

Alexandria Real Estate Equities
10996 Torreyana Road, Suite 250
San Diego, California 92121

Attention: Mr. Mike Barbera

Subject: GEOTECHNICAL INVESTIGATION
9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

Dear Mr. Barbera:

In accordance with your authorization of our Proposal No. LG-17062, we herein submit the results of our geotechnical investigation for the subject site. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed science building project. The site is considered suitable for development provided the recommendations of this report are followed.

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

Very truly yours,

GEOCON INCORPORATED

Lilian E. Rodriguez
RCE 83227

Shawn Foy Weedon
GE 2714

John Hoobs
CEG 1524

REGISTERED PROFESSIONAL ENGINEER · LILIAN E. RODRIGUEZ · No.83227 · CIVIL · STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER · SHAWN WEEDON · No. 2714 · GEOTECHNICAL · STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST · JOHN HOOBS · No. 1524 · CERTIFIED ENGINEERING GEOLOGIST · STATE OF CALIFORNIA

LER:SFW:JH:ejc

(e-mail) Addressee

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the planned science building project located at 9880 Campus Point Drive in the City of San Diego, California (see Vicinity Map, Figure 1). The purpose of the geotechnical investigation is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may impact development of the property including faulting, liquefaction and seismic shaking based on the 2016 CBC seismic design criteria. In addition, we provided recommendations for remedial grading, shallow foundations, concrete slab-on-grade, concrete flatwork, preliminary pavement, and retaining walls. The scope of this investigation also included a review of readily available published and unpublished geologic literature (see *List of References*).

The scope of this investigation included performing a site reconnaissance, field exploration, engineering analyses and the preparing this report. We performed our field investigation on March 20 and 21, 2017 by advancing 13 small-diameter borings to a maximum depth of approximately 45½ feet below the existing ground surface. The Geologic Map, Figure 2, presents the approximate locations of the borings. Appendix A provides a detailed discussion of the field investigation including logs of the borings. Details of the laboratory tests and a summary of the test results are presented on the boring logs in Appendix A and in Appendix B. Appendix C present the results of the storm water investigation to help evaluate proposed storm water management devices.

Recommendations presented herein are based on analyses of data obtained from our site investigation and our understanding of proposed site development. References reviewed to prepare this report are provided in the List of References. If project details vary significantly from those described herein, Geocon should be contacted to evaluate the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located to the east of Genesee Avenue, west of Campus Point Drive and about 800 feet south of Campus Point Court in the City of San Diego, California. Commercial buildings exist to the north and south of the subject site. A 2-story building is located in the center of the property surrounded by surface, asphalt concrete parking areas and landscaping. Access to the property is on the southwest corner. Slopes on the south and west ascend to a neighboring property and Genesee Avenue, respectively, with heights ranging from about 15 to 35 feet. Slopes on the north and east descend to the neighboring property and Campus Pointe Drive, respectively, with heights of 5 to 15 feet. In addition, an existing nature canyon slope with heights up to approximately 150 feet existing directly east of the adjacent Campus Point Drive. The existing grades adjacent to the existing building ranges from approximate elevation 308 to 312 feet above Mean Sea Level (MSL).

We understand the proposed project consists of demolishing the existing office building and constructing a new 5-story science building with a subterranean level. The new building will possess laboratory stations, building amenities and utility areas. The proposed finished floor elevation of the science building at-grade and at the subterranean level will be 311.35 and 296.85 feet MSL, respectively. Maximum cuts and fills are expected to be less than 15 feet to achieve proposed finished grades. Retaining walls are proposed along the north, northwest and northeast perimeters of the site to accommodate for the proposed grading. We understand surface drainage will be directed to a storm water biofiltration within the southeast corner of the site. In addition, improvements consisting of accommodating landscaping, utilities, surface parking and driveways are proposed.

The site descriptions and proposed development are based on a site reconnaissance, review of published geologic literature, our field investigation, a review of preliminary architectural and grading plans, and discussions with you. If development plans differ from those described herein, Geocon should be contacted for review of the plans and possible revisions to this report.

3. GEOLOGIC SETTING

The site is located in a coastal plain environment within the southern portion of the Peninsular Ranges Geomorphic Province of southern California. The Peninsular Ranges is a geologic and geomorphic province that extends from the Imperial Valley to the Pacific Ocean and from the Transverse Ranges to the north and into Baja California to the south. The coastal plain of San Diego County is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary rocks that thicken to the west and range in age from Upper Cretaceous through the Pleistocene with intermittent deposition. The sedimentary units are deposited on bedrock, Cretaceous to Jurassic age igneous and metavolcanic rocks. Geomorphically, the coastal plain is characterized by a series of 21 stair-stepped, marine terraces which are younger to the west and have been dissected by west flowing rivers that drain the Peninsular Ranges to the east. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault Zone and the active Rose Canyon Fault Zone. The Peninsular Ranges Province is also dissected by the Elsinore Fault Zone that is associated with and sub-parallel to the San Andreas Fault Zone, which is the plate boundary between the Pacific and North American Plates.

The site is located within the western portion of the coastal plain geologic province on a ridge that has been dissected by drainages that are located to the east along Interstate 805 and to the west along Interstate 5. The drainages flow to the north within Carroll Canyon drainage channel and enters the Pacific Ocean at Los Penasquitos Lagoon west of State Route 56. Shallow to deep fill soils are present across the site underlain by Eocene-age Scripps Formation. The geologic maps have that area mapped as undifferentiated Scripps Formation and Ardath Shale. However, based on our boring information the material is more typical of the Scripps Formation These materials were deposited in a marine environment where sandstones and siltstones where formed. Pleistocene-age Very Old Paralic

Deposits were deposited in the area but have either been removed by erosion or by former grading activities. The Scripps Formation is typically overconsolidated and can be very dense and slightly to moderately cemented.

4. SOIL AND GEOLOGIC CONDITIONS

We encountered one surficial soil (consisting of previously placed fill) and one geologic unit (consisting of Scripps Formation) during our field investigation. The occurrence, distribution and description of each unit encountered are shown on the Geologic Map, Figure 2 and the boring logs in Appendix A. Figure 3 presents Geologic Cross-Sections showing the approximate underlying geologic conditions. We prepared the geologic cross-sections using interpolation between exploratory trenches and previous observations; therefore, actual geotechnical conditions may vary from those illustrated and should be considered approximate. The surficial soils and geologic units are described herein in order of increasing age.

4.1 Previously Placed Fill (Qpf)

We encountered previously placed fill to depths ranging from about 1½ to 45 feet from existing grade in the exploratory borings. The fill is generally less than 5 feet in depth within the southern and eastern portions of the site, and deepens within the northwest portion of the site. The fill is likely associated with the previous grading operations performed during the original development of the property. We expect a canyon fill exists within the northwest portion of the site. The fill is generally composed of medium dense to dense, silty sand and sandy silt. Based on the laboratory test results, the fill material at the location tested possesses a “medium” expansion potential (expansion index of 51 to 90). The upper portion of the previously placed fill is considered unsuitable for additional fill or structural loads. Remedial grading of the upper portion of the previously placed fill will be required as discussed herein.

4.2 Scripps Formation (Tsc)

We encountered Eocene-age Scripps Formation underlying the previously placed fill. The Scripps Formation generally consists of dense to very dense, silty sandstone and hard, sandy siltstone. Scripps Formation also typically contains localized areas of highly cemented concretionary beds. Previous experience indicates that such concretionary beds can be difficult to excavate and may result in the production of oversize materials that will likely require export. The Scripps Formation materials possess a “very low” to “high” expansion potential (Expansion Index of 130 or less). Gypsum crystals are commonly the formational materials that cause the soil to possess elevated water-soluble sulfate contents. The Scripps Formation is considered suitable to support additional loads from fill and the planned development.

5. GROUNDWATER

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades. However, it is not uncommon for seepage conditions to develop where none previously existed. Groundwater and seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Faulting

The *City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Sheet 34* defines the site with a geologic hazard Category 25: *Slide-Prone Formations, Ardath: neutral or favorable geologic structure*, a geologic hazard Category 51: *Other Terrain: Level mesas – underlain by terrace deposits and bedrock, nominal risk*, and a geologic hazard Category 53: *Other Terrain: Other level areas, gently sloping to steep terrain, favorable geologic structure, low risk.* Based on a review of geologic literature and our experience with the soil and geologic conditions in the general area, it is our opinion that known active, potentially active, or inactive faults are not located at the site. The site is not located within the Downtown Special Studies Fault Zone or State of California (Alquist-Priolo) Earthquake Fault Zone. The Salk Fault and an unnamed fault, both east-west trending and defined as *Potentially Active, Inactive, Presumed Inactive, or Activity Unknown*, are located approximately 2,000 and 1,000 feet north, respectively. The unnamed fault bends to the southeast, and the site is located approximately 1,200 feet from the southeast trending section of the fault.

6.2 Seismicity

According to the computer program *EZ-FRISK* (Version 7.65), 6 known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the nearest known active faults are the Newport-Inglewood/Rose Canyon Fault system, located approximately 3 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on this fault system or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.48g, respectively. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Rose Canyon Fault are 6.9 and 0.42g, respectively. Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for these and other faults in relationship to the site location. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-

Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS2008 acceleration-attenuation relationships in our analysis.

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Approximate Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood	3	7.5	0.38	0.39	0.48
Rose Canyon	3	6.9	0.34	0.38	0.42
Coronado Bank	17	7.4	0.18	0.14	0.16
Palos Verdes Connected	17	7.7	0.20	0.15	0.19
Elsinore	34	7.9	0.13	0.09	0.11
Earthquake Valley	42	6.8	0.06	0.05	0.04

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in our analysis in the analysis. Table 6.2.2 presents the probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
2% in a 50 Year Period	0.47	0.50	0.56
5% in a 50 Year Period	0.31	0.32	0.35
10% in a 50 Year Period	0.22	0.22	0.23

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the 2016 California Building Code (CBC) or other applicable guidelines.

It is our opinion the site could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed on Table 6.2.1 or other faults in the southern California/ northern Baja California region. We do not consider the site to possess a greater risk than that of the surrounding developments.

6.3 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects that earth surface. The potential for ground rupture is considered to be very low due to the absence of active or potentially active faults at the subject site.

6.4 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. Due to the lack of a permanent, near-surface groundwater table and the very dense nature of the underlying fill and formational materials, liquefaction potential for the site is considered very low.

6.5 Seiches and Tsunamis

Seiches are caused by the movement of an inland body of water due to the movement from seismic forces. The site is not located near an inland body of water. Therefore, the risk of a seiche from flooding within the river valley is considered low.

A tsunami is a series of long-period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The site is located approximately 1¾ miles from the Pacific Ocean at an elevation of at least approximately 295 feet above Mean Sea Level. Therefore, the risk of tsunamis affecting the site is negligible.

6.6 Landslides

According to the *City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Sheet 34*, the site is located approximately 330 feet east of a landslide defined as *Confirmed, known, or highly suspected*. The site is also approximately a horizontal distance of 150 feet east of the top of the natural landslide slope. In addition, the same landslide is mapped on the USGS *Geologic Map of the San Diego 30'x60' Quadrangle* by Kennedy, M. P., and S. S. Tan, 2008. Due to the relatively large distance to the top of the natural landslide slope, and the relatively level topography at the site, it is our opinion landslides are not present at the property or at a location that could impact the subject site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for construction of the proposed new science building project provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 The site is located approximately 3 miles from the nearest active fault. Based on our background research, it is our opinion active, potentially active, or inactive faults do not extend across the site. Risks associated with seismic activity consist of the potential for moderate to strong seismic shaking.

7.1.3 Our field investigation indicates the site is underlain by previously placed fill overlying the Scripps Formation. The thickness of the previously placed fill encountered at the site during the investigation ranges from approximately 1½ to 45 feet. The fill is generally less than 5 feet within the southern and eastern portions of the site and deepens within the northwest portion of the site where a canyon was previously filled in. The upper portion of the previously placed fill is considered unsuitable for the support of additional fill and/or settlement-sensitive building structures in its current state and will require remedial grading if encountered at the base of the removal for the planned subterranean level. The Scripps Formation is considered suitable for the support of compacted fill and settlement-sensitive structures.

7.1.4 We expect grading for the basement levels of the structure will require cuts ranging from approximately 10 to 15 feet to achieve planned finish grades exposing the Scripps Formation. Therefore, the planned structure can be supported on a shallow foundation system. If fill materials exist below the planned structure, the foundation should be extended into the formational materials or drilled piers should be installed.

7.1.5 We did not encounter groundwater during our investigation and do not expect groundwater would impact site improvements. However, wet conditions and seepage could affect proposed construction if grading and improvement operations occur during or shortly after a rain event.

7.1.6 Based on our review of the project plans, we opine the planned development can be constructed in accordance with our recommendations provided herein. We do not expect the planned development will destabilize or result in settlement of adjacent properties or impact public right-a-ways.

7.1.7 Proper drainage should be maintained in order to preserve the engineering properties of the fill in the sheet-graded pad and slope areas.

7.1.8 Surface settlement monuments and canyon subdrains will not be required prior to or during site grading or improvements. However, monitoring of the temporary shoring may be required by the project shoring engineer.

7.1.9 Final grading or foundation plans have not been provided for our review. Geocon Incorporated should review the plans prior to the submittal to regulatory agencies for approval. Additional analyses may be required once the plans have been provided.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. We expect that some cemented zones within the existing materials may be encountered during grading and trenching operations requiring very heavy effort. In addition, raveling and sidewall instability may occur within the on-site soil due to the existence of cohesionless sand encountered during the drilling operations. Also, we encountered refusal in Borings B-1 and B-3 during the drilling operations within the Scripps Formation at depths of about 10½ and 13½ feet, respectively, in possible concretions.

7.2.2 The soil encountered in the field investigation is considered to be "expansive" (expansion index [EI] of greater than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 7.2.1 presents soil classifications based on the expansion index. We expect a majority of the soil encountered possess a "very low" to "high" expansion potential (EI of 130 or less).

TABLE 7.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the locations tested possess "S0" to "S2" sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. Table 7.2.2 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 7.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0	SO_4<0.10	No Type Restriction	n/a	2,500
S1	0.10≤SO_4<0.20	II	0.50	4,000
S2	0.20≤SO_4≤2.00	V	0.45	4,500
S3	SO_4>2.00	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements susceptible to corrosion are planned.

7.3 Slope Stability

7.3.1 We performed slope stability analyses utilizing average drained direct shear strength parameters obtained from our laboratory testing and our experience with similar soil conditions. These analyses indicate the existing approximately 2:1 (horizontal to vertical) ascending slope located along the west perimeter of the site possess calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions as required by current City of San Diego guidelines. If the slopes are not properly maintained, localized sloughing may occur due to heavy rain fall, over-irrigation and allowing water flowing from the top of the slope. These surficial instabilities, if they occur, should be immediately repaired and fixed to reduce the potential for progressive failure. In addition, these slopes should not have an adverse effect on the performance of the building pads or existing improvements. Figure 4 presents the slope stability calculations for deep-seated and surficial fill slope stability.

7.4 Seismic Design Criteria

7.4.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS to evaluate the seismic design criteria. Table 7.4.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements as currently proposed should be designed using a Site Class C in accordance with ASCE 7-10 Section 20.3.1. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10 using blow count data presented on the boring logs in Appendix A and the unconfined compressive strength results of the samples collected during the investigation presented in Appendix B. The values presented in Table 7.4.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.4.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	C	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.139g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.440g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.000	Table 1613.3.3(1)
Site Coefficient, F_V	1.360	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.139g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.598g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.759g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.399g	Section 1613.3.4 (Eqn 16-40)

7.4.2 Table 7.4.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.4.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Site Class	C	Section 1613.3.2
Mapped MCE_G Peak Ground Acceleration, PGA	0.487g	Figure 22-7
Site Coefficient, F_{PGA}	1.000	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.487g	Section 11.8.3 (Eqn 11.8-1)

7.4.3 Conformance to the criteria in Tables 7.4.1 and 7.4.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.5 Excavation Slopes

7.5.1 The recommendations included herein are provided for stable temporary excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

7.5.2 Temporary excavations should be made in conformance with OSHA requirements. The previously placed fill should be considered a Type C soil, properly compacted fill can be considered a Type B soil (Type C soil if seepage or groundwater is encountered), and the Very Old Paralic Deposits and San Diego Formation can be considered a Type A soil (Type B soil if seepage or groundwater is encountered) in accordance with OSHA requirements. In general, special shoring requirements will not be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be sloped back at an appropriate inclination. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.6 Grading

7.6.1 Grading should be performed in accordance with the recommendations provided in this report, the *Recommended Grading Specifications* contained in Appendix D and the City of San Diego Grading Ordinance.

7.6.2 Prior to commencing grading, a pre-construction conference should be held at the site with the owner/developer, city inspector, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling requirements can be discussed at that time.

7.6.3 Grading of the site should commence with the demolition of existing structures, improvements, vegetation, and deleterious debris from the area to be graded. Deleterious debris should be exported from the site and should not be mixed with the fill. Existing underground improvements within the proposed development area should be removed and the resulting depressions properly backfilled in accordance with the procedures described herein.

7.6.4 We expect the base of the removal for the planned structure will expose the Scripps Formation. If fill materials are exposed at the base of the removal for the subterranean level, the upper 2 feet of the fill should be removed and replaced with properly compacted fill. The removals can be limited to expose the top of the Scripps Formation. Remedial grading will not be required where the formational materials are exposed at planned grade unless disturbed during basement level excavations.

7.6.5 The upper 1 to 2 feet of fill materials in areas outside of the planned structure and within the planned improvements should be removed and replaced with properly compacted fill prior to the placement of flatwork and pavement. The removals can be limited to the formational materials.

7.6.6 Some areas of overly wet and saturated soil should be expected due to the existing pavement and landscape areas. The saturated soil would require additional effort prior to placement of compacted fill or additional improvements. Stabilization of the soil would include scarifying and air-drying, removing and replacement with drier soil, use of stabilization fabric (e.g. Tensar TX7 or other approved fabric), or chemical treating (i.e. cement or lime treatment) may be required within proposed new pavement areas.

7.6.7 The site should then be brought to final subgrade elevations with fill compacted in layers, where necessary. In general, soil native to the site is suitable for use as fill if relatively free from vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content, as determined in accordance with ASTM Test Procedure D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations.

7.6.8 Import fill soil (if necessary) should consist of granular materials with a “very low” to “medium” expansion potential (EI of 90 or less) free of deleterious material and stones larger than 3 inches and should be compacted as recommended herein. Geocon

Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

7.7 Shallow Foundations

7.7.1 The proposed structures can be supported on a shallow foundation system bearing in the formational materials. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 12 inches wide and extend at least 24 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 2 feet and should also extend at least 24 inches below lowest adjacent pad grade. Figure 5 presents a wall/column footing dimension detail.

7.7.2 Steel reinforcement for continuous footings should consist of at least four No. 5 steel reinforcing bars placed horizontally in the footings, two near the top and two near the bottom. Steel reinforcement for the spread footings should be designed by the project structural engineer.

7.7.3 The recommendations presented herein are based on soil characteristics only (EI of 130 or less) and are not intended to replace steel reinforcement required for structural considerations.

7.7.4 We expect foundations will be founded in the underlying formational materials. Foundations may be designed for an allowable soil bearing pressure of 6,000 pounds per square foot (psf) (dead plus live load) for footings founded in Scripps Formation. This soil bearing pressure may be increased by 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil pressure of 10,000 psf in formational materials. The values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

7.7.5 Overexcavation of the footings and replacement with slurry can be performed in areas where the formational materials are not encountered at the bottom of the footing excavations. Minimum two-sack slurry can be placed in the excavations for the conventional foundations to the bottom of proposed footing elevation.

7.7.6 We estimate the total and differential settlements under the imposed allowable loads to be about ½ inch based on a 6-foot square footing. The total and differential settlement for a 12-foot square footing is 1 inch and ½ inch in 40 feet, respectively.

7.7.7 We should observe the foundation excavations prior to the placement of reinforcing steel and concrete to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

7.7.8 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

7.7.9 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.8 Concrete Slabs-On-Grade

7.8.1 Concrete floor slabs should possess a thickness of at least 5 inches and reinforced with a minimum of No. 4 steel reinforcing bars at 18 inches on center in both horizontal directions. The structural engineer should design the steel required for the planned loading conditions.

7.8.2 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.8.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common to have 3 to 4 inches of sand in the southern California region. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.8.4 Concrete slabs should be provided with adequate construction joints and/or expansion joints to control unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed concrete finished floors are planned.

7.8.5 Consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

7.8.6 The foundation and concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting expected loads.

7.8.7 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.9 Concrete Flatwork

7.9.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with 4 x 4 – W4.0/W4.0 (4 x 4 – 4/4) welded wire mesh or No. 4 reinforcing bars spaced 18 inches on center in each direction to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete.

7.9.2 Even with the incorporation of the recommendations within this report, the exterior concrete flatwork has a likelihood of experiencing some movement due to swelling or settlement; therefore, the steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork. It is generally not economical to mitigate liquefaction for flatwork. Therefore, some repairs to flatwork will likely be required following a liquefaction event.

7.9.3 Where exterior flatwork abuts structures at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.9.4 The recommendations presented herein are intended to reduce the potential for cracking as a result of differential movement. However, even with the incorporation of the recommendations presented herein, concrete will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.10 Retaining Walls

7.10.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 40 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal to vertical), we recommend an active soil pressure of 55 pcf. Soil with an expansion index (EI) of greater than 90 should not be used as backfill material behind retaining walls.

7.10.2 Retaining walls shall be designed to ensure stability against overturning sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

7.10.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure of 7H psf should be added to the active soil pressure for walls 8 feet or less. For walls greater than 8 feet tall, an additional uniform pressure of 13H psf should be applied to the wall starting at 8 feet from the base of the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

7.10.4 The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. Figure 6 presents a typical retaining wall drain detail. If conditions different than those described are expected or walls are planned that will extend below the water elevation, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.10.5 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2016 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 16H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.487g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.3.

7.10.6 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

7.10.7 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.11 Lateral Loading

7.11.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid density of 350 pounds per cubic foot (pcf) should be used for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

7.11.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design. The friction coefficient may be reduced depending on the vapor barrier or waterproofing material used for construction in accordance with the manufacturer’s recommendations.

7.11.3 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

7.12 Preliminary Pavement Recommendations

7.12.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck and fire truck traffic areas, respectively. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections for the pavement should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have assumed an R-Value of 8 and 78 for the subgrade soil and base materials, respectively, for the purposes of this preliminary analysis. Table 7.12.1 presents the preliminary flexible pavement sections.

TABLE 7.12.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Parking stalls for automobiles and light-duty vehicles	5.0	8	3	10
Driveways for automobiles and light-duty vehicles	5.5	8	3	11
Medium truck traffic areas	6.0	8	3.5	12
Driveways for heavy truck and fire truck traffic	7.0	8	4	15

7.12.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

7.12.3 Base materials should conform to Section 26-1.028 of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a ¾-inch maximum size aggregate. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook).*

7.12.4 The base thickness can be reduced if a reinforcement geogrid is used during the installation of the pavement. Geocon should be contact for additional recommendations, if required.

7.12.5 A rigid Portland cement concrete (PCC) pavement section should be placed in driveway entrance aprons and trash bin loading/storage areas. The concrete pad for trash truck areas should be large enough such that the truck wheels will be positioned on the concrete during loading. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 *Guide for Design and Construction of Concrete Parking Lots* using the parameters presented in Table 7.12.2.

TABLE 7.12.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	50 pci
Modulus of rupture for concrete, M_R	500 psi
Traffic Category, TC	A and C
Average daily truck traffic, ADTT	10 and 100

7.12.6 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 7.12.3.

TABLE 7.12.3
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Automobile Parking Stalls (TC=A)	6.0
Heavy Truck and Fire Lane Areas (TC=C)	7.5

7.12.7 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch).

7.12.8 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., 6-inch and 7.5-inch-thick slabs would have an 8- and 9.5-inch-thick edge, respectively). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

7.12.9 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 15 feet for the 6.0-inch and thicker slabs and should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report. The depth of the crack-control joints should be at least ¼ of the slab thickness when using a conventional saw, or at least 1 inch when using early-entry saws on slabs 9 inches or less in thickness, as determined by the referenced ACI report discussed in the pavement section herein. Cuts at least ¼ inch wide are required for sealed joints, and a ⅜ inch wide cut is commonly recommended. A narrow joint width of 1/10- to 1/8-inch wide is common for unsealed joints.

7.12.10 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed at the as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

7.12.11 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, cross-gutters, or sidewalk so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

7.13 Site Drainage and Moisture Protection

7.13.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.13.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.13.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.13.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

7.14 Grading and Foundation Plan Review

7.14.1 Geocon Incorporated should review the project grading and foundation plans prior to final design submittal to check if additional analyses and/or recommendations are required.

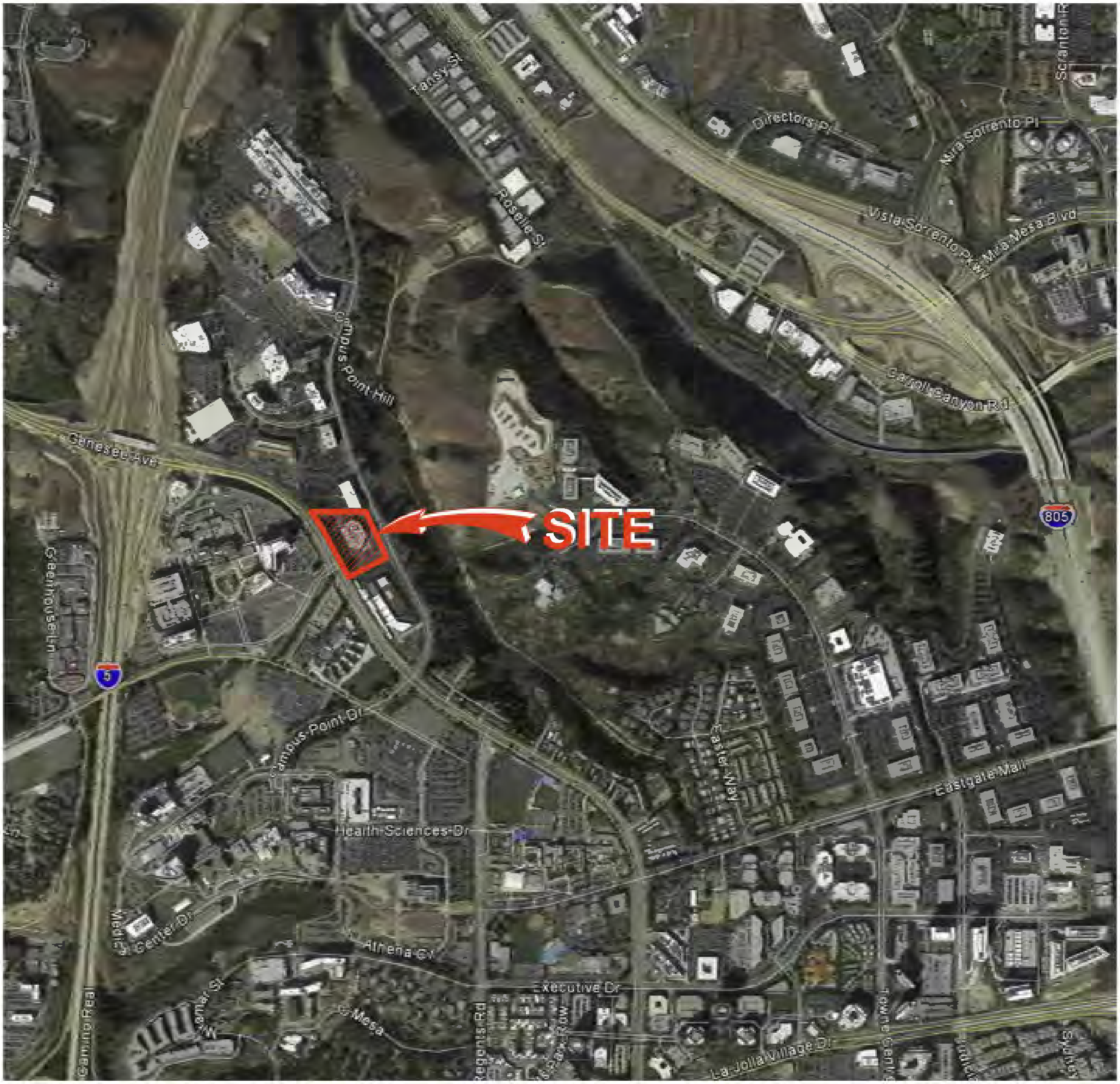
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

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

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



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NO SCALE

VICINITY MAP

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9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

LR / CW		DSK/GTYPD	DATE 04 - 18 - 2017	PROJECT NO. G2099 - 52 - 01	FIG. 1

Plotted:04/18/2017 10:06AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\DETAILS\G2099-52-01_Vicinity Map.dwg

GEOLOGIC MAP

9880 CAMPUS POINT DRIVE
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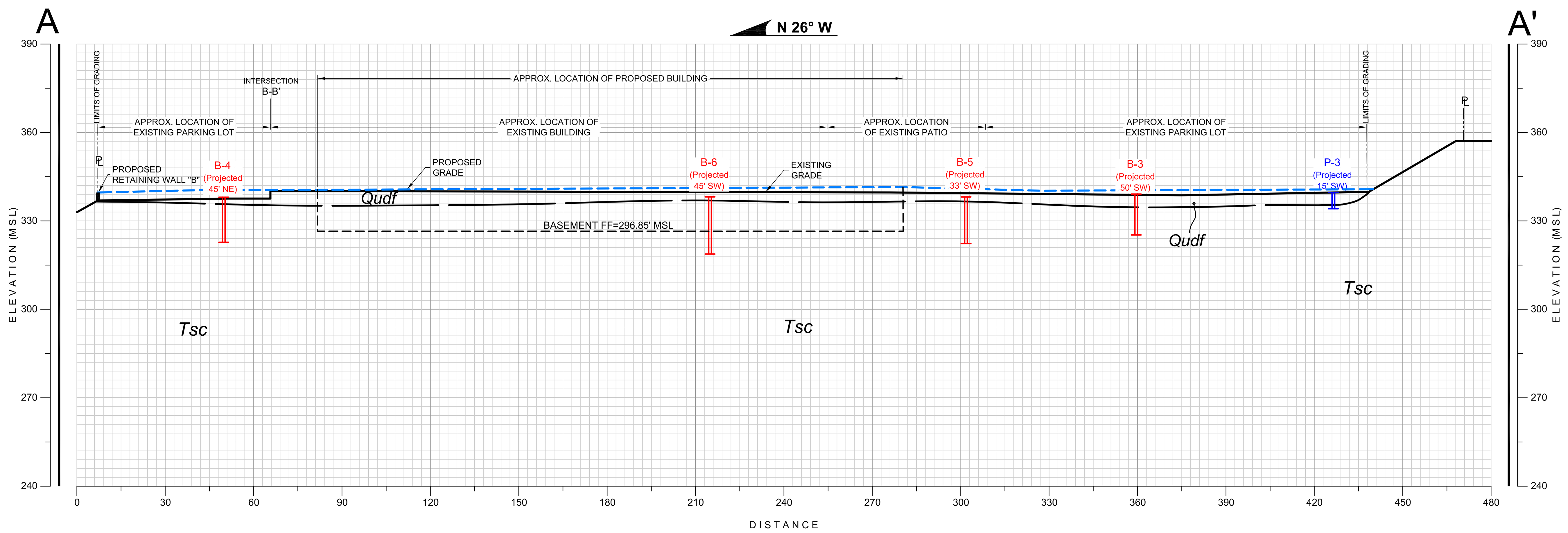
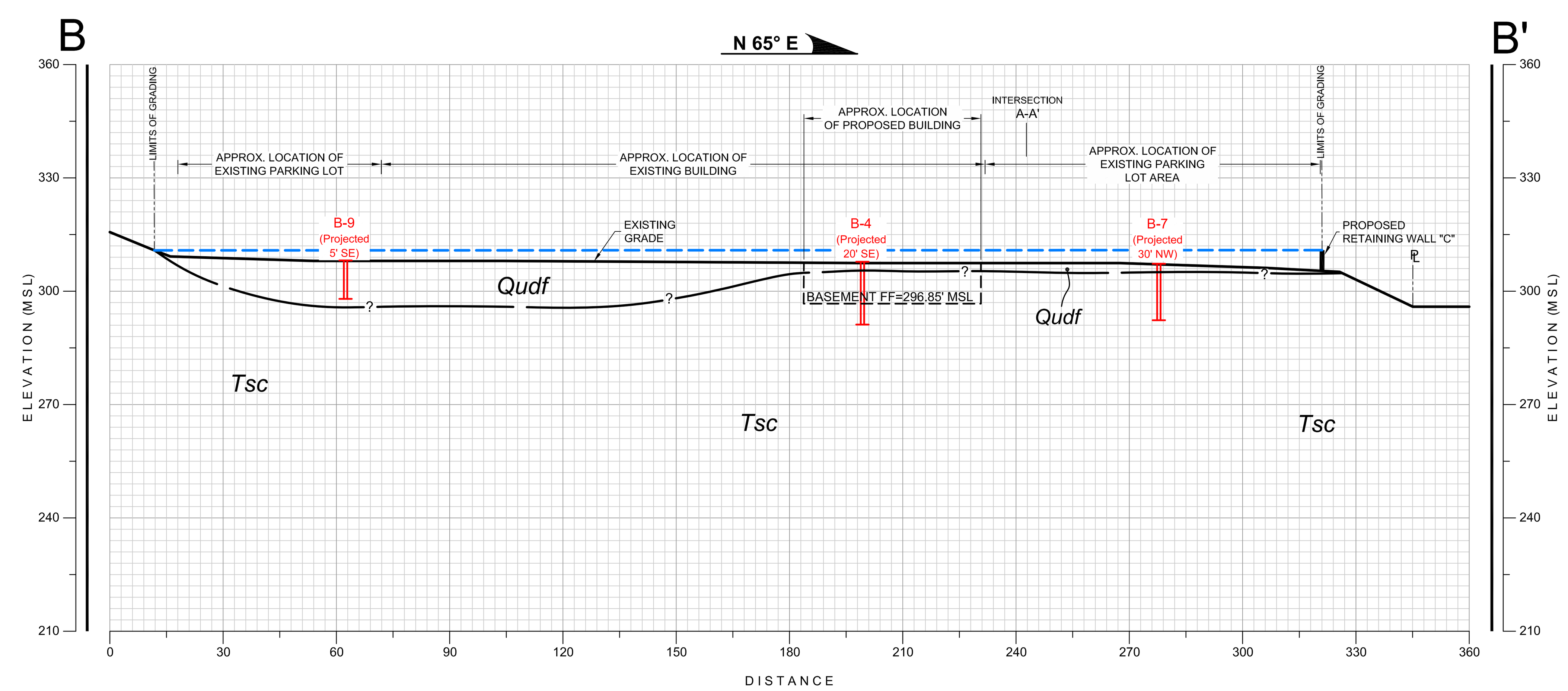
SCALE 1" = 30'
DATE 04 - 18 - 2017
PROJECT NO. G2099 - 52 - 01
FIGURE 2
SHEET 1 OF 1

Plotted:04/24/2017 3:49PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\SHEETS\G2099-52-01 Geo Map.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 30' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 30' (Vert. = Horiz.)

GEOCON LEGEND

Qudf ........UNDOCUMENTED FILL

Tsc ....SCRIPP FORMATION

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

B-9 ....APPROX. LOCATION OF BORING

P-3 ....APPROX. LOCATION OF BORING (Infiltration Test)

GEOLOGIC CROSS SECTION

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SCALE 1" = 30'	DATE 04 - 18 - 2017
PROJECT NO. G2099 - 52 - 01	FIGURE 3
SHEET 1 OF 1	

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Surficial Slope Stability Evaluation

Slope Height, H (feet)	∞	
Vertical Depth of Stauration, Z (feet)	3	
Slope Inclination	2.00	:1
Slope Inclination, I (degrees)	26.6	
Unit Weight of Water, γW (pcf)	62.4	
Total Unit Weight of Soil, γ_T (pcf)	125	
Friction Angle, ϕ (degrees)	30	
Cohesion, C (psf)	300	
Factor of Safety = $(C+(\gamma_T-\gamma_W)Z \cos^2 i \tan\phi)/(\gamma_T Z \sin i \cos i)$	2.58	

References: (1) Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage* , Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62.

(2) Skempton, A. W., and F. A. Delory, *Stability of Natural Slopes in London Clay* , Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81.

Slope Stability Evaluation

Slope Height, H (feet)	35	
Slope Inclination	2.0	:1
Total Unit Weight of Soil, γ_T (pcf)	125	
Friction Angle, ϕ (degrees)	30	
Cohesion, C (psf)	300	
$\gamma_{C\phi} = (\gamma H \tan\phi)/C$	8.4	
N_{Cf} (from Chart)	28	
Factor of Safety = $(N_{Cf}C)/(\gamma H)$	1.92	

References: (1) Janbu, N. *Stability Analysis of Slopes with Dimensionless Parameters,* Harvard Soil Mechanics, Series No. 46, 1954.

(2) Janbu, N. *Discussion of J.M. Bell, DimensionlessParameters for Homogeneous Earth Slopes,* Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

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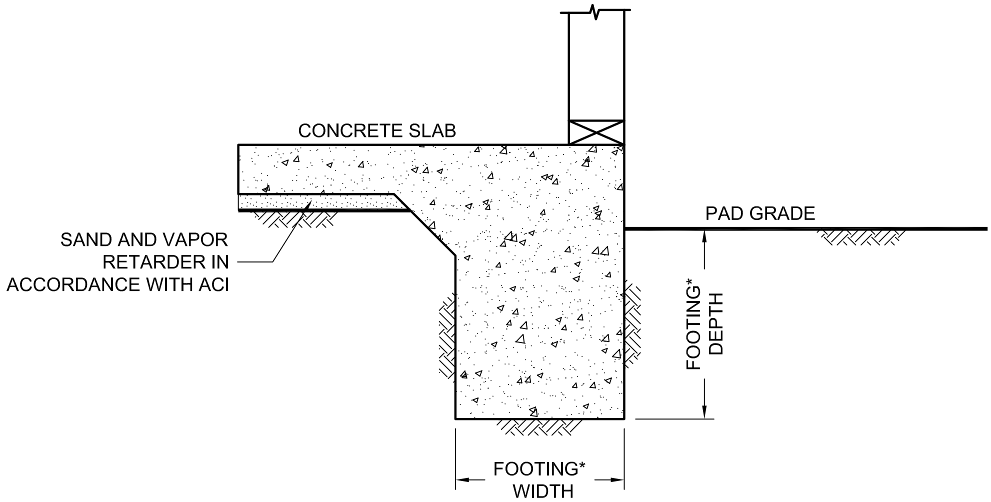
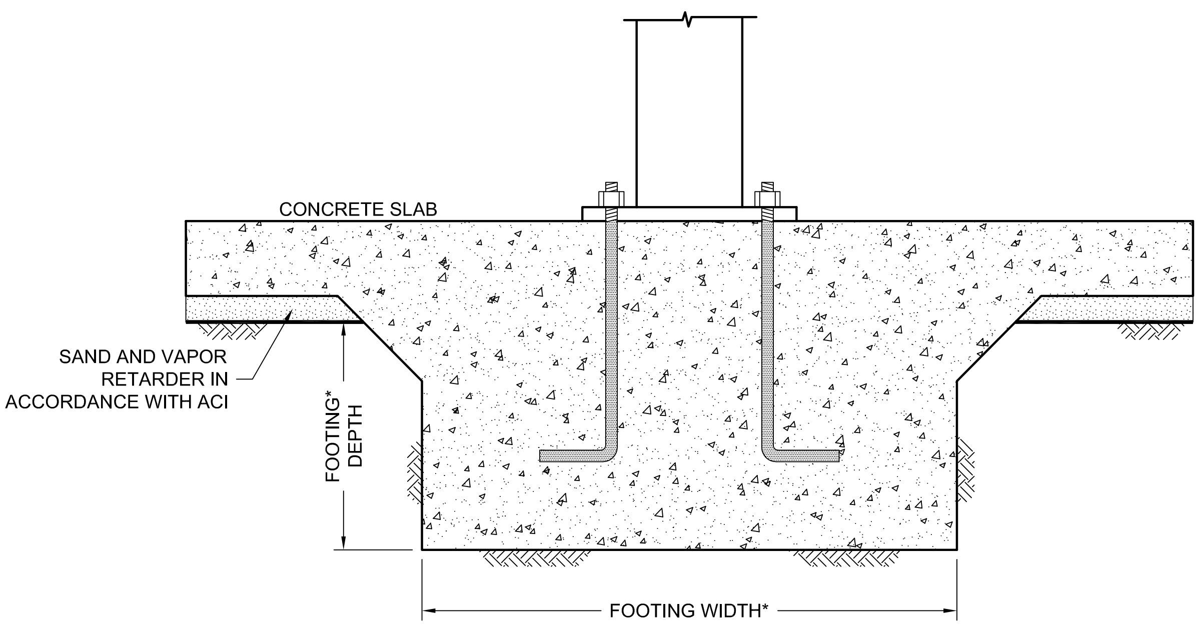
SW / SW

SLOPE STABILITY ANALYSIS

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

DATE 04-18-2017 | PROJECT NO. G2099-52-01 | FIG. 4





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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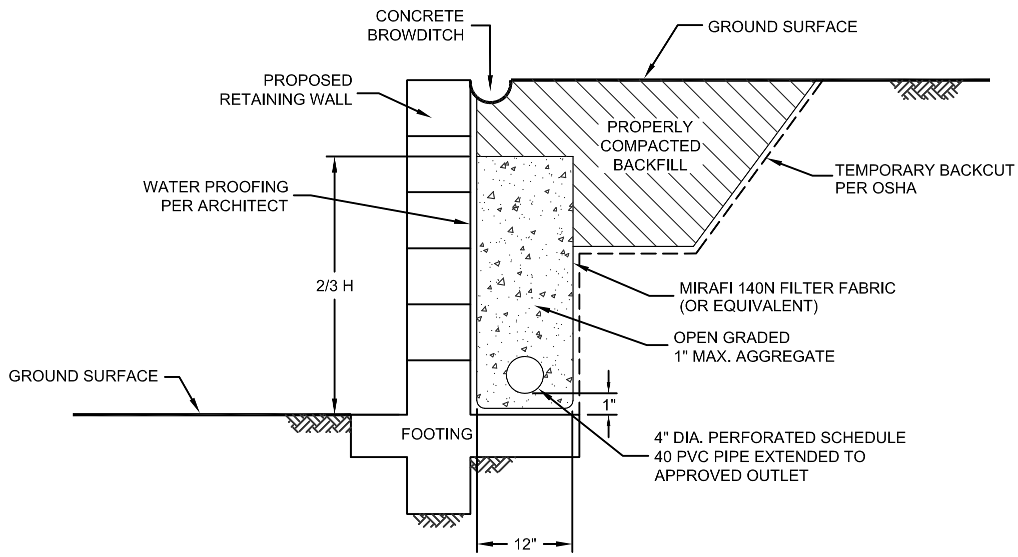
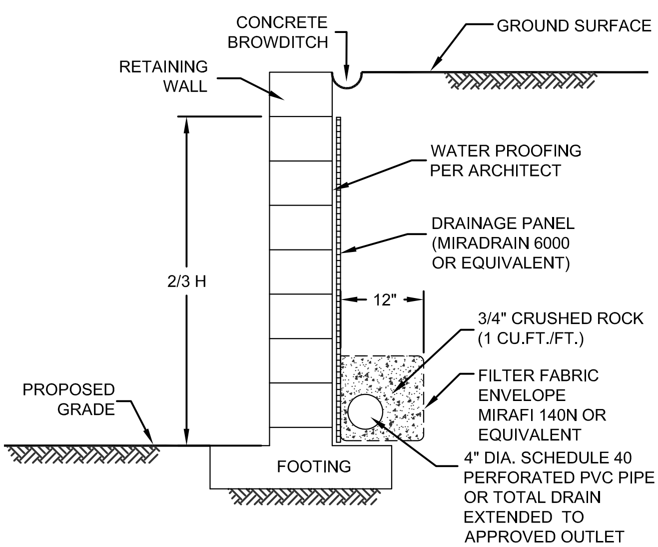
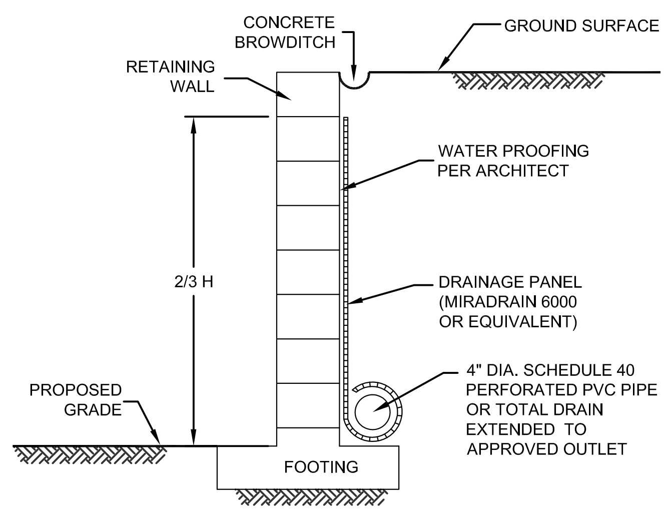
LR / CW		DSK/GTYPD	DATE 04 - 18 - 2017	PROJECT NO. G2099 - 52 - 01	FIG. 5







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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Plotted:04/18/2017 10:08AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2099-52-01 9880 Campus Point Drive\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

Fieldwork for our investigation included a subsurface exploration and soil sampling. The Geologic Map, Figure 2 presents the locations of the exploratory borings. Boring logs and an explanation of the geologic units encountered are presented in figures following the text in this appendix. We located the borings in the field using a measuring tape and existing reference points. Therefore, actual boring locations may deviate slightly. We performed a field investigation on March 20 and 21, 2017 which consisted of drilling 13 exploratory borings to a maximum depth of approximately 45½ feet below existing grade with an Ingersoll Rand A-300 drill rig equipped with 8-inch-diameter hollow-stem auger with Scott's Drilling Company. We obtained bulk and ring samples from the exploratory borings for laboratory testing.

We obtained samples during our boring excavations using a California split-spoon sampler. The sampler is composed of steel and is driven to obtain the soil samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 2.875 inches. Up to 18 rings are placed inside the sampler that is 2.4 inches in diameter and 1 inch in height. Ring samples at appropriate intervals were retained in moisture-tight containers and transported to the laboratory for testing. We also retained bulk samples from the borings for laboratory testing. The type of sample is noted on the exploratory boring logs.

The samplers were driven 12 using the California into the bottom of the excavations with the use of a Cathead hammer and the use of A rods. The sampler is connected to the A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler if driven 18 inches. If the sampler was not driven for 18 inches, an approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values, adjustments have not been applied. We estimated elevations shown on the boring logs from a topographic map.

We visually examined the soil conditions encountered within the borings, classified, and logged in general accordance with the Unified Soil Classification System (USCS). Logs of the borings are presented on Figures A-1 through A-13. The logs depict the general soil and geologic conditions encountered and the depth at which we obtained the samples. A copy of the County of San Diego Department of Environmental Health Geotechnical Boring Construction Permit has been included.

BORING B 1

ELEV. (MSL.) **309'** DATE COMPLETED **03-21-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 6-INCH BASE**			
	B1-1			SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish brown, Silty, fine to coarse SAND			
2								
4								
	B1-2							
6				SM/ML	**SCRIPPS FORMATION (**SCRIPPS FORMATION (Tsc)**)** Very dense/hard, yellowish brown to gray, Silty, fine-grained SANDSTONE, to Sandy SILTSTONE; moderately cemented	76/11.5	112.9	16.5
8								
10					-Grinding on possible concretion	50/3"		

REFUSAL AT 10.25 FEET
No groundwater encountered

Figure A-1,
Log of Boring B 1, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING B 2

ELEV. (MSL.) 308.5' DATE COMPLETED 03-21-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 6-INCH BASE**			
	B2-1			SM/ML	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense/very stiff, moist, yellowish to grayish brown, Silty, fine to coarse SAND to Sandy SILT			
2								
4								
	B2-2				-Becomes dense/hard	55	106.0	19.5
6								
8								
10	B2-3					59	111.2	14.0
12								
14								
	B2-4					65	110.0	19.4
16								
18								
20	B2-5					71	107.4	20.7
22								
24								
	B2-6					59	108.4	20.6
26								
28								

Figure A-2,
Log of Boring B 2, Page 1 of 2

G2099-52-01.GPJ

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

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

GEOCON

BORING B 2

ELEV. (MSL.) **308.5'** DATE COMPLETED **03-21-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-7			SM/ML		49	107.1	19.6
32								
34								
	B2-8				-Becomes medium dense/very stiff	45	102.2	22.1
36								
38								
40								
42								
44								
	B2-9			SM/ML	**SCRIPPS FORMATION (Tsc)** Very dense/hard, damp, yellowish brown to gray, Silty, fine grained SANDSTONE to Sandy SILTSTONE	50/5"		

BORING TERMINATED AT 45.5 FEET
No groundwater encountered
Backfilled with 15.9 cu.ft. bentonite grout slurry.

Figure A-2,
Log of Boring B 2, Page 2 of 2

G2099-52-01.GPJ

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

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

GEOCON

BORING B 3

ELEV. (MSL.) **309.5'** DATE COMPLETED **03-21-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**4-INCH ASPHALT OVER 5-INCH BASE**			
	B3-1			SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish brown, Silty, fine to medium SAND; trace cobble/gravel			
2								
4								
	B3-2			SW/SM	**SCRIPPS FORMATION (Tsc)** Very dense, damp, light yellowish to grayish brown, well-graded, fine to medium grained SANDSTONE to Silty, fine to medium grained SANDSTONE	50/5.5"	99.0	8.0
6								
8								
10	B3-3					50/5.5"	97.3	8.5
12					-Possible concretion, very difficult drilling			
						50/1"		
					REFUSAL AT 13.5 FEET No groundwater encountered			

Figure A-3,
Log of Boring B 3, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

PROJECT NO. G2099-52-01

BORING B 4

ELEV. (MSL.) **308.5'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3.5-INCH ASPHALT OVER 5.5-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, damp, brown, Silty, fine to coarse SAND; trace gravel			
2				ML/SM	**SCRIPPS FORMATION (Tsc)** Very dense/hard, damp, yellowish brown to gray, Sandy SILTSTONE to Silty, fine-grained SANDSTONE; weakly to medium cemented			
	B4-1					50/6"	105.2	20.0
4								
	B4-2					50/5.5"	100.6	18.2
6								
8								
10	B4-3					50/4"	103.1	20.2
12								
14								
	B4-4					50/5.5"	99.7	15.3
					BORING TERMINATED AT 15.5 FEET No groundwater encountered			

Figure A-4,
Log of Boring B 4, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

PROJECT NO. G2099-52-01

BORING B 5

ELEV. (MSL.) **308'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**5-INCH ASPHALT OVER 7-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, light yellowish brown, Silty, fine to medium SAND			
2				SM/SW	**SCRIPPS FORMATION (Tsc)** Very dense, damp, light yellowish to grayish brown, Silty, fine- to medium-grained, SANDSTONE to well graded, fine- to medium-grained SANDSTONE; weakly cemented			
	B5-1					76/11"	101.3	7.2
4								
	B5-2					50/5.5	98.0	8.0
6								
8								
10								
	B5-3					50/6"	99.3	9.6
	B5-4							
12								
14								
	B5-5					50/5.5"	99.1	10.5
					BORING TERMINATED AT 15.5 FEET No groundwater encountered			

Figure A-5,
Log of Boring B 5, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

PROJECT NO. G2099-52-01

BORING B 6

ELEV. (MSL.) **308'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 6-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)**			
2				ML	Medium dense, moist, yellowish brown, Silty, fine to medium SAND; trace gravel			
	B6-1				**SCRIPPS FORMATION (Tsc)** Hard, damp, gray, Sandy SILTSTONE; moderately cemented	85/9"	98.8	17.8
4								
	B6-2					50/5"	105.4	16.6
6					-Drilling becomes difficult from 6-6.5 feet; possible concretion			
8								
10	B6-3 B6-4				-Becomes yellowish brown	50/4.5"	104.4	20.7
12								
14								
	B6-5				-Becomes gray	79/8"	107.5	19.4
16								
18								
	B6-6					50/4.5"		

BORING TERMINATED AT 19.5 FEET
No groundwater encountered

Figure A-6,
Log of Boring B 6, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING B 7

ELEV. (MSL.) **307.5'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B7-1				**4-INCH ASPHALT OVER 6-INCH BASE**			
				ML	**PREVIOUSLY PLACED FILL (Qpf)** Stiff, damp, light yellowish to grayish brown, Sandy SILT			
2				ML	**SCRIPPS FORMATION (Tsc)** Hard, damp, yellowish brown, Sandy SILTSTONE			
	B7-2					90/9.5"	102.8	22.0
4								
	B7-3					50/6"	103.7	21.0
6								
8								
10	B7-4					50/5.5"		
12					-Very difficult drilling (possible concretion)			
14								
					-No recovery	50/1"		
					BORING TERMINATED AT 15 FEET No groundwater encountered			

Figure A-7,
Log of Boring B 7, Page 1 of 1

G2099-52-01.GPJ

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

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

PROJECT NO. G2099-52-01

BORING B 8

ELEV. (MSL.) **308'** DATE COMPLETED **03-21-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**5-INCH ASPHALT OVER 7-INCH BASE**			
2				SM/ML	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense/very stiff, moist, yellowish to grayish brown, Silty, fine SAND to Sandy SILT			
4	B8-1					31	103.4	20.8
6								
8	B8-2				-Becomes dense/hard	70	109.5	16.7
10	B8-3				-Becomes very dense/hard	85	109.0	14.0
12								
14								
16	B8-4				-Becomes medium dense/very stiff	47	108.8	19.3
18								
20	B8-5					40	105.7	19.2
22								
24								
26	B8-6			SM/ML	**SCRIPPS FORMATION (Tsc)** Very dense/hard, damp, yellowish brown to gray, Silty, fine-grained SANDSTONE to Sandy SILTSTONE; moderately cemented	50/6"		
28	B8-7					50/5"		

BORING TERMINATED AT 28 FEET
No groundwater encountered
Backfilled with 9.8 cu.ft. bentonite grout slurry

Figure A-8,
Log of Boring B 8, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

PROJECT NO. G2099-52-01

BORING B 9

ELEV. (MSL.) 308' DATE COMPLETED 03-21-2017

EQUIPMENT IR A-300 BY: L. RODRIGUEZ

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3.5-INCH ASPHALT OVER 3.5-INCH BASE**			
2				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish brown, Silty, fine to coarse SAND; trace gravel			
4	B9-1			SM/ML	Medium dense/very stiff, yellowish to grayish brown, Silty, fine SAND to Sandy SILT	46	106.8	19.7
6	B9-2				-Trace gravel	75/8.5"	96.5	11.1
8								
10	B9-3				-Becomes very dense/hard	77	109.0	16.8
					BORING TERMINATED AT 10 FEET No groundwater encountered			

Figure A-9,
Log of Boring B 9, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING P 1

ELEV. (MSL.) **312'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 5-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, olive brown, Silty, fine to medium SAND			
2				SM	**SCRIPPS FORMATION (Tsc)** Very dense, damp, yellowish to grayish brown, Silty, fine to medium grained SANDSTONE; weakly cemented			
4	P1-1					50/5"	96.1	8.9

BORING TERMINATED AT 4.5 FEET
No groundwater encountered

Figure A-10,
Log of Boring P 1, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING P 2

ELEV. (MSL.) **311'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 5-INCH BASE**			
				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, yellowish to grayish brown, Silty, fine to medium SAND			
2								
4	P2-1			SM/SW	**SCRIPPS FORMATION (Tsc)** Medium dense, damp, yellowish to grayish brown, Silty, fine- to medium-grained SANDSTONE to well-graded, fine- to medium-grained SANDSTONE; weakly cemented	28		
6								
8	P2-2				-Becomes very dense	50/5"	96.3	8.7

BORING TERMINATED AT 8.5 FEET
No groundwater encountered

Figure A-11,
Log of Boring P 2, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING P 3

ELEV. (MSL.) **309'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3-INCH ASPHALT OVER 5-INCH BASE**			
2				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, olive brown, Silty, fine to medium SAND			
4	P3-1			SM	**SCRIPPS FORMATION (Tsc)** Very dense, damp, gray, Silty, fine- to medium-grained SANDSTONE; weakly cemented	78	103.7	9.6

BORING TERMINATED AT 5.5 FEET
No groundwater encountered

Figure A-12,
Log of Boring P 3, Page 1 of 1

G2099-52-01.GPJ

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

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

GEOCON

BORING P 4

ELEV. (MSL.) **308'** DATE COMPLETED **03-20-2017**

EQUIPMENT **IR A-300** BY: **L. RODRIGUEZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3.5-INCH ASPHALT OVER 5-INCH BASE**			
2				SM	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, moist, olive brown, Silty, fine to medium SAND; trace concrete debris			
4	P4-1			SM	**SCRIPPS FORMATION (Tsc)** Medium dense, damp, grayish brown, Silty, fine- to medium-grained SANDSTONE to well-graded, fine- to medium-grained SANDSTONE; weakly cemented	41	103.9	8.1
6								

BORING TERMINATED AT 6 FEET
No groundwater encountered

Figure A-13,
Log of Boring P 4, Page 1 of 1

G2099-52-01.GPJ

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

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PERMIT #: LMWP-002777
A.P.N.: 343-230-44
EST #: None

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION
MONITORING WELL PROGRAM

GEOTECHNICAL BORING CONSTRUCTION PERMIT

SITE NAME: 9880 CAMPUS POINT LLC

SITE ADDRESS: 9880 CAMPUS POINT DRIVE, SAN DIEGO 92121

PERMIT FOR: **GEOTECHNICAL BORINGS (4)**

PERMIT APPROVAL DATE: 3/13/2017

PERMIT EXPIRES ON: 7/13/2017

RESPONSIBLE PARTY: ALEXANDRIA REAL ESTATE EQUITIES (Michael Barbera)

PERMIT CONDITIONS:

1. All borings must be sealed from the bottom of the boring to the ground surface with an approved sealing material as specified in California Well Standards Bulletin 74-90, Part III, Section 19.D. **Drill cuttings are not an acceptable fill material.**

2. All borings must be properly destroyed within 24 hours of drilling.

3. Placement of any sealing material at a depth greater than 30 feet must be done using the tremie method.

4. This work is not connected to any known unauthorized release of hazardous substances. Any contamination found in the course of drilling and sampling must be reported to DEH. All water and soil resulting from the activities covered by this permit must be managed, stored and disposed of as specified in the SAM Manual in Section 5, II, D-4. (http://www.sdcounty.ca.gov/deh/lwq/sam/manual_guidelines.html) In addition, drill cuttings must be properly handled and disposed in compliance with the Stormwater Best Management Practices of the local jurisdiction.

5. Within 60 days of completing work, submit a well/boring construction report, including all well and/or boring logs and laboratory data to the Well Permit Desk. This report must include all items required by the SAM Manual, Section 5, Pages 6 & 7.

6. **This office must be given 24-hour notice of any drilling activity on this site and advanced notification of drilling cancellation. Please contact the Well Permit Desk at (858) 505-6688.**

Jon Senaha — Digitally signed by Senaha, Jon Date: 2017.03.13 09:40:38 -07'00'

APPROVED BY: ______________________ DATE: 3/13/2017

Jon Senaha

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with generally currently accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for in-place density and moisture content, maximum dry density and optimum moisture content, direct shear strength, expansion index, water-soluble sulfate content, resistance value (R-Value), unconfined compressive strength, gradation and consolidation. Tables B-I through B-VI and Figures B-1 through B-3 present the results of our laboratory tests. In addition, the in-place dry density and moisture content test results are presented on the boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B2-1	Yellowish to grayish brown, Sandy SILT to Silty, fine to coarse SAND (Qudf)	122.1	12.7

TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Depth (feet)	Geologic Unit	Dry Density (pcf)	Moisture Content (%)		Peak [Ultimate[1]] Cohesion (psf)	Peak [Ultimate[1]] Angle of Shear Resistance (degrees)
				Initial	Final		
B5-5	15	Tsc	99.1	10.5	21.8	275 [275]	34 [30]
B6-5	15	Tsc	107.5	19.4	24.2	320 [270]	36 [31]

[1] Ultimate measured at 0.2-inch deflection.

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Depth (feet)	Geologic Unit	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification	2016 CBC Expansion Classification
			Before Test	After Test				
B2-1	¾-5	Qudf	11.1	21.5	106.1	51	Medium	Expansive
B6-4	10-15	Tsc	12.2	31.0	100.3	113	High	Expansive

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	Sulfate Exposure Class
B2-1	1-5	Qudf	0.004	S0
B6-4	10-15	Tsc	0.235	S2

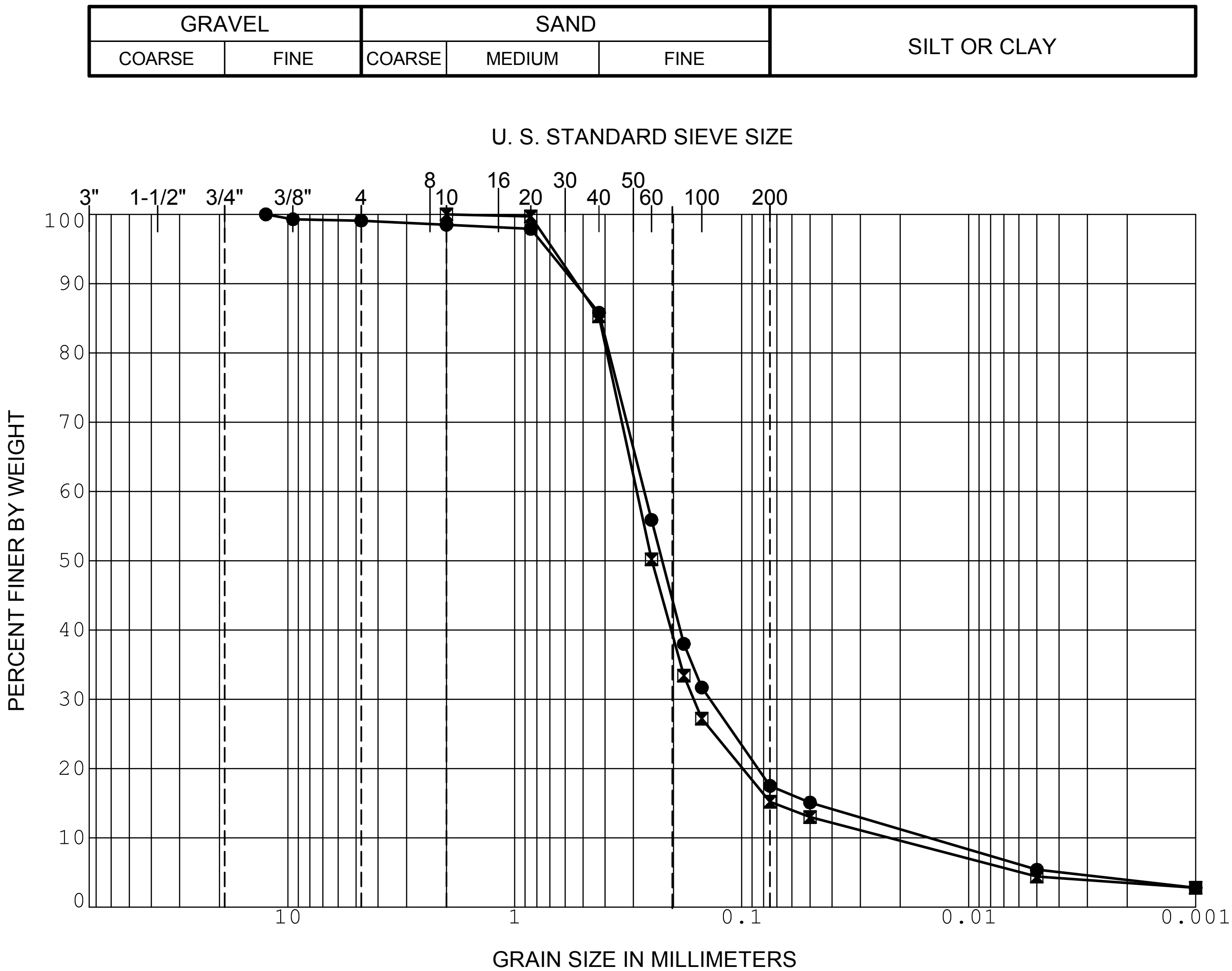
TABLE B-V
SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844

Sample No.	Depth (feet)	Description (Geologic Unit)	R-Value
B2-1	0-5	Yellowish to grayish brown, Silty, fine to coarse SAND to Sandy SILT	8

TABLE B-VI
SUMMARY OF LABORATORY UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS
ASTM D 1558

Sample No.	Depth (feet)	Geologic Unit	Hand Penetrometer Reading, Unconfined Compression Strength (tsf)	Undrained Shear Strength (ksf)
B1-2	5	Tsc	4.5+	4.5+
B2-2	5	Qudf	4.5+	4.5+
B2-3	10	Qudf	4.5+	4.5+
B2-4	15	Qudf	4.5+	4.5+
B2-5	20	Qudf	4.5+	4.5+
B2-6	25	Qudf	4.5+	4.5+
B2-7	30	Qudf	4.5+	4.5+
B2-8	35	Qudf	4.5+	4.5+
B2-9	45	Tsc	4.5+	4.5+
B4-1	2.5	Tsc	4.5+	4.5+
B4-2	5	Tsc	4.5+	4.5+
B4-3	10	Tsc	4.5+	4.5+
B4-4	15	Tsc	4.5+	4.5+
B6-1	2.5	Tsc	4.5+	4.5+
B6-2	5	Tsc	4.5+	4.5+
B6-3	10	Tsc	4.5+	4.5+
B6-5	15	Tsc	4.5+	4.5+
B6-6	19.5	Tsc	4.5+	4.5+
B7-2	2.5	Tsc	4.5+	4.5+
B7-3	5	Tsc	4.5+	4.5+
B7-4	10	Tsc	4.5+	4.5+
B8-1	4	Qudf	4.5+	4.5+
B8-2	7.5	Qudf	4.5+	4.5+
B8-3	10	Qudf	4.5+	4.5+
B8-4	15	Qudf	4.5+	4.5+
B8-5	20	Qudf	4.5+	4.5+
B8-6	25	Tsc	4.5+	4.5+
B8-7	27.5	Tsc	4.5+	4.5+
B9-1	4	Qudf	4.5+	4.5+
B9-2	6	Qudf	4.5+	4.5+
B9-3	9	Qudf	4.5+	4.5+

PROJECT NO. G2099-52-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	P1-1	4.0	SM - Silty SAND				
⊠	P3-1	4.0	SM - Silty SAND				
▲							

GRADATION CURVE

9880 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

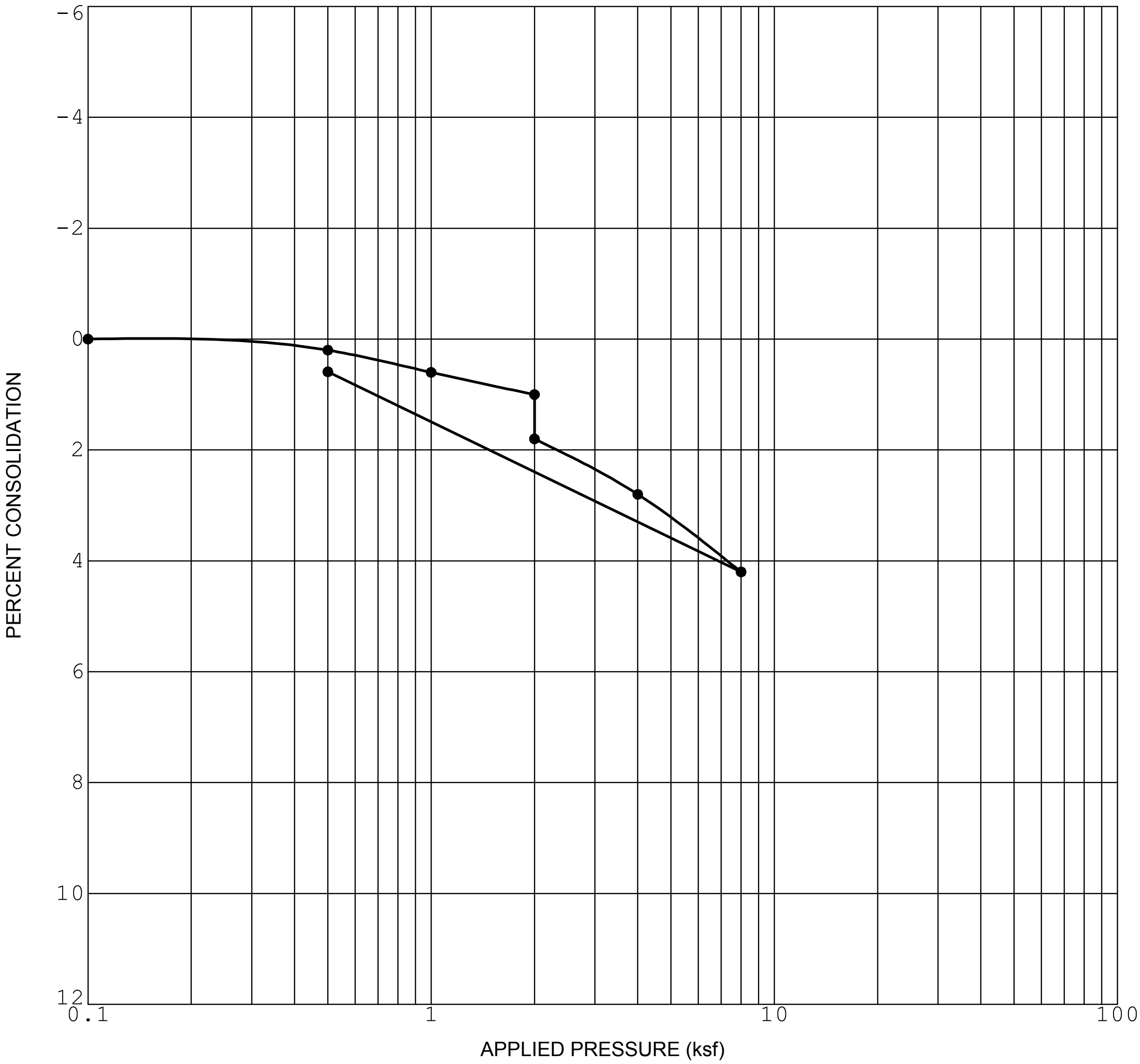
G2099-52-01.GPJ

Figure B-1

GEOCON

PROJECT NO. G2099-52-01

SAMPLE NO. P1-1



Initial Dry Density (pcf)	96.1		**Initial Saturation (%)**	35.6
Initial Water Content (%)	8.9		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

9880 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

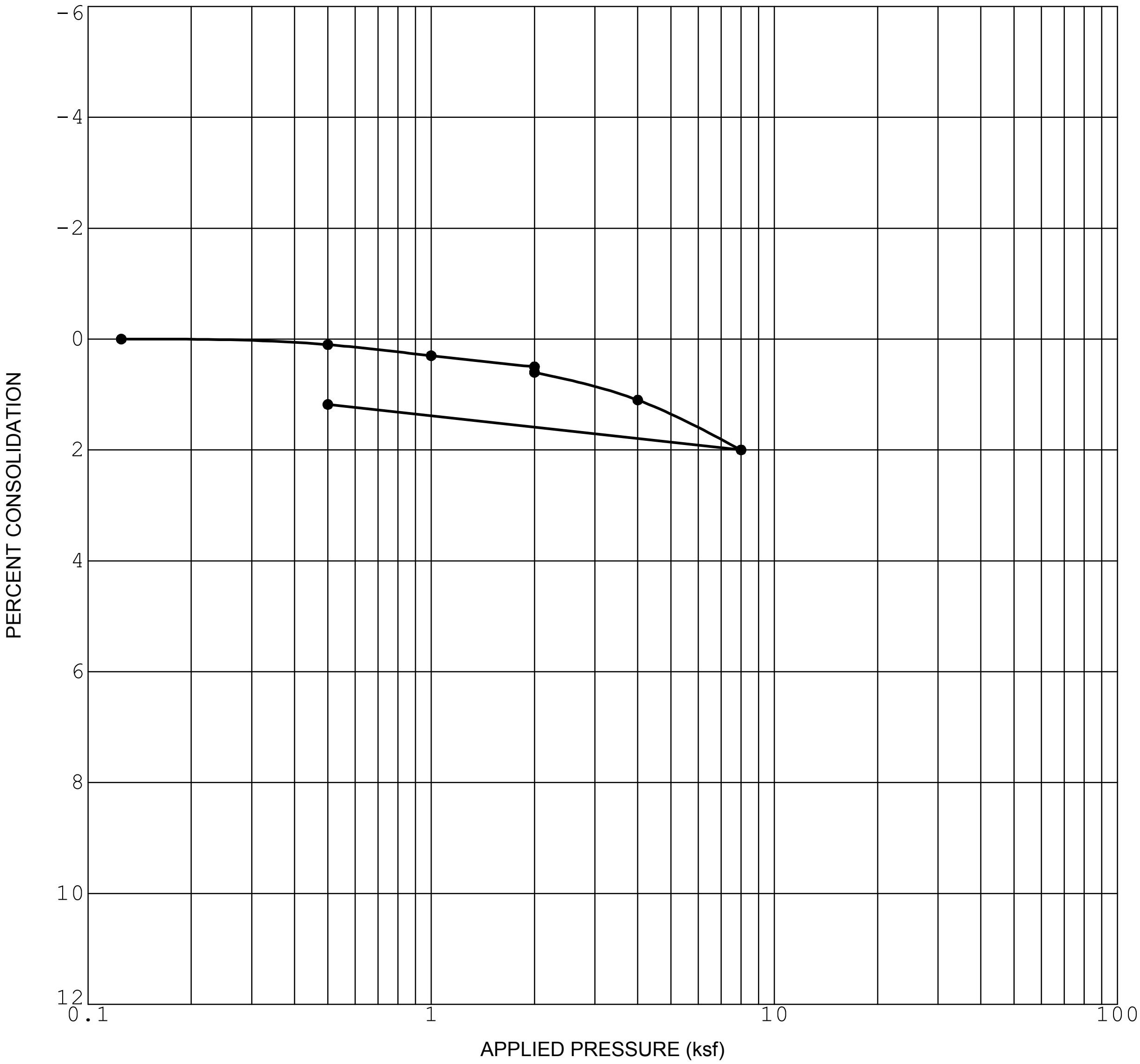
G2099-52-01.GPJ

Figure B-2

GEOCON

PROJECT NO. G2099-52-01

SAMPLE NO. P3-1



Initial Dry Density (pcf)	103.7
Initial Water Content (%)	9.6

Initial Saturation (%)	42.3
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

9880 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

G2099-52-01.GPJ

Figure B-3

GEOCON

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices will be used in accordance with the *2016 City of San Diego BMP Design Manual*. If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

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

TABLE C-I
HYDROLOGIC SOIL GROUP DEFINITIONS

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

The property is underlain by man-made previously placed fill and should be classified as Soil Group D. Table C-II presents the information from the USDA website for the subject property. The Hydrologic Soil Group Map, provided at the end of this appendix, presents output from the USDA website showing the limits of the soil units.

TABLE C-II
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Altamont clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	AtF	17	C	0.06 – 0.20
Chesterton fine sandy loam, 2 to 5 percent slopes	CfB	72	D	0.00 – 0.06
Terrace escarpments	TeF	11	NA	NA

In-Situ Testing

The infiltration rate, percolation rates and saturated hydraulic conductivity are different and have different meanings. Percolation rates tend to overestimate infiltration rates and saturated hydraulic conductivities by a factor of 10 or more. Table C-III describes the differences in the definitions.

TABLE C-III
SOIL PERMEABILITY DEFINITIONS

Term	Definition
Infiltration Rate	The observation of the flow of water through a material into the ground downward into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Percolation Rate	The observation of the flow of water through a material into the ground downward and laterally into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Saturated Hydraulic Conductivity (k_{SAT}, Permeability)	The volume of water that will move in a porous medium under a hydraulic gradient through a unit area. This is a function of density, structure, stratification, fines content and discontinuities. It is also a function of the properties of the liquid as well as of the porous medium.

The degree of soil compaction or in-situ density has a significant impact on soil permeability and infiltration. Based on our experience and other studies we performed, an increase in compaction results in a decrease in soil permeability.

We performed 4 Aardvark Permeameter tests at locations shown on the attached Geologic Map, Figure 2. The test borings were 8 inches in diameter. The results of the tests provide parameters regarding the saturated hydraulic conductivity and infiltration characteristics of on-site soil and geologic units. Table C-IV presents the results of the estimated field saturated hydraulic conductivity and estimated infiltration rates obtained from the Aardvark Permeameter tests. The field sheets are also attached herein. We used a factor of safety applied to the test results on the worksheet values. The designer of storm water devices should apply an appropriate factor of safety. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil. Based on a discussion in the County of Riverside *Design Handbook for Low Impact Development Best Management Practices*, the infiltration rate should be considered equal to the saturated hydraulic conductivity rate.

TABLE C-IV
FIELD PERMEAMETER INFILTRATION TEST RESULTS

Test Location	Test Depth (feet, below grade)	Geologic Unit	Field-Saturated Infiltration Rate, k_{sat} (inch/hour)	C.4-1 Worksheet Infiltration Rate[1], k_{sat} (inch/hour)
P-1	5.1	Tsc	0.249	0.125
P-2	6.8	Tsc	0.527	0.264
P-3	5.1	Tsc	0.712	0.356
P-4	5.7	Tsc	1.161	0.581
		Average:	0.662	0.332

[1] Using a factor of safety of 2.

STORM WATER MANAGEMENT CONCLUSIONS

The Geologic Map, Figure 2, depicts the existing property and the locations of the field excavations and the in-situ infiltration test locations.

Soil Types

Previously Placed Fill – We encountered previously placed fill to depths ranging from about 1½ to 45 feet from existing grade in the exploratory borings. The fill is generally less than 5 feet in depth within the southern and eastern portions of the site, and deepens within the northwest portion of the site. The fill is associated with the previous grading operations performed for the site. We expect a canyon fill exists within the northwest portion of the site. The fill is generally composed of medium dense to dense, silty sand and sandy silt. Based on the laboratory test results, the fill material at the location tested possesses a "low" to "medium" expansion potential (expansion index of 21 to 90). The previously placed fill should be considered to be highly variable on the property and within adjacent properties and right-of-ways. Previously placed fill should also be considered to possess relatively high hydroconsolidation characteristics. Water that is allowed to migrate within the previously placed fill soil cannot be controlled, would destabilize support for the existing improvements, and would shrink and swell. Therefore, full and partial infiltration should not be allowed within the previously placed fill.

Scripps Formation – We encountered Eocene-age Friars Formation underlying the previously placed fill. The Scripps Formation generally consists of dense to very dense, silty sandstone within the southern portion of the site and hard, sandy siltstone within the northern portion of the site. Scripps Formation also typically contains localized areas of highly cemented concretionary beds. The Scripps Formation materials possess a "very low" to "high" expansion potential (Expansion Index of 130 or less). The siltstone portion of the Scripps Formation is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the silty and cemented nature of the material. Therefore, full and partial infiltration should be considered infeasible within the siltstone portion of the Scripps Formation. However, partial infiltration into the sandy portions of the Scripps Formation within the southern portion of the site can be considered feasible.

Proposed Compacted Fill – Some compacted fills will be placed on the property during site improvements. The compacted fill will be comprised of on-site materials that are considered fine-grained soil. In addition, the fill will be compacted to a dry density of at least 90 percent of the laboratory maximum dry density and used to support the planned improvements. In our experience, compacted fill does not possess infiltration rates appropriate with infiltration. Compacted fill will possess swelling (expansion) potential and will support planned improvements. Therefore, full and partial infiltration should be considered infeasible.

Infiltration Rates

We performed 4 Aardvark Permeameter tests at depths ranging from approximately 5.1 to 6.8 feet within the sandy layer of the Scripps Formation within the southern portion of the site. The test results indicate the approximate infiltration rates range from approximately 0.249 to 1.161 inches per hour (0.125 to 0.581 inches per hour with an applied factor of safety of 2). The average infiltration rate with an applied factor of safety of 2 is 0.332 inches per hour. Full infiltration should be considered infeasible at the site because the average infiltration rate is less than 0.50 inches per hour. Partial infiltration is considered feasible within the southern portion of the site where sandy layers of the Scripps Formation exist near existing elevations.

Groundwater Elevations

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

New or Existing Utilities

Utilities are present on the existing property boundaries and within the existing Campus Point Drive. Full or partial infiltration should not be allowed in the areas of the utilities to help prevent potential damage/distress to improvements. Mitigation measures to prevent water from infiltrating the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners.

Existing and Planned Structures

Existing structures exist to the north and south of the site. Water should not be allowed to infiltrate in areas where it could affect the existing and neighboring properties and existing and adjacent structures, improvements and roadways. Mitigation for existing structures consists of not allowing water infiltration within a 1:1 plane from existing foundations and extending the infiltration areas at least 10 feet below the existing foundations and into formational materials.

Slopes and Other Geologic Hazards

Slopes on the north and east descend to the neighboring property and Campus Pointe Drive, respectively, with heights of 5 to 15 feet. In addition, an existing nature canyon slope with heights up to approximately 150 feet exists directly east of the adjacent Campus Point Drive. The State of California Department of Conservation Landslide Inventory (Beta) shows a single feature landslide exists approximately 300 feet of the site near the tow of the canyon slope to the east of Campus Point Drive. Table C.5-1 pf the 2016 Storm Water Standards (SWS) states *BMPs (particularly infiltration BMPs) must not be sited in areas with high potential for liquefaction or landslides to minimize earthquake/landslide risks*.

Storm Water Management Devices

Liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

Liners should be installed on the side walls of the proposed basins located at the south side of the property where geologic hazards do not exist. Liners should be installed on the sides and the bottoms of the planned storm water devices on the remaining portion of the property due to the existence of the fill materials and the dense siltstone and sloping conditions. We understand the storm water for the property will be directed to the southern basins to allow partial infiltration.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-V describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-V
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., Infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Based on our geotechnical investigation and the previous table, Table C-VI presents the estimated factor values for the evaluation of the factor of safety. This table only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

TABLE C-VI
FACTOR OF SAFETY WORKSHEET DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	2	0.50
Predominant Soil Texture	0.25	2	0.50
Site Soil Variability	0.25	3	0.75
Depth to Groundwater/ Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.00

[1] The project civil engineer should complete Worksheet D.5-1 or Form I-9 using the data on this table. Additional information is required to evaluate the design factor of safety.

Categorization of Infiltration Feasibility Condition			Worksheet C.4-1
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: We performed 4 Aardvark Permeameter tests at the site within the sandy portion of the Scripps Formation within the southern end of the site. The following presents the results of our field infiltration tests: P-1 at 5.1 feet: 0.249 inches/hour (0.125 inches/hour with FOS=2) P-2 at 6.8 feet: 0.527 inches/hour (0.264 inches/hour with FOS=2) P-3 at 5.1 feet: 0.712 inches/hour (0.356 inches/hour with FOS=2) P-4 at 5.7 feet: 1.161 inches/hour (0.581 inches/hour with FOS=2) These tests result in an average of 0.774 inches/hour (0.385 inches/hour with an applied factor of safety of 2). Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The average infiltration rate within the sandy portion of the Scripps Formation in the southern portion of the site is less than 0.5 inches/hour (with an applied factor of safety of 2), therefore, full infiltration is considered infeasible. The northwest portion of the site is underlain by greater than 5 feet of fill; therefore, full infiltration should be considered infeasible. The northern portion of the site is underlain by a cemented siltstone portion of the Scripps Formation. Cemented siltstone is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the high fine content and cemented nature of the material, therefore, full infiltration should be considered infeasible. Therefore, full infiltration should be considered infeasible at the site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We do not expect infiltration will cause water balance issues such as seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td>No Full Infiltration</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis:

We performed 4 Aardvark Permeameter tests at the site within the sandy portion of the Scripps Formation within the southern end of the site. The following presents the results of our field infiltration tests:

P-1 at 5.1 feet: 0.249 inches/hour (0.125 inches/hour with FOS=2)
P-2 at 6.8 feet: 0.527 inches/hour (0.264 inches/hour with FOS=2)
P-3 at 5.1 feet: 0.712 inches/hour (0.356 inches/hour with FOS=2)
P-4 at 5.7 feet: 1.161 inches/hour (0.581 inches/hour with FOS=2)

These tests result in an average of 0.774 inches/hour (0.385 inches/hour with an applied factor of safety of 2).

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

The average infiltration rate within the sandy portion of the Scripps Formation in the southern portion of the site is greater than 0.05 inches/hour (with an applied factor of safety of 2), therefore, partial infiltration is considered feasible.

The northwest portion of the site is underlain by greater than 5 feet of fill, therefore, partial infiltration should be considered infeasible. The northern portion of the site is underlain by a cemented siltstone portion of the Scripps Formation. Cemented siltstone is not conducive to infiltration and has a greater propensity for lateral water migration over vertical water migration due to the high fine content and cemented nature of the material, therefore, full and partial infiltration should be considered infeasible.

Therefore, partial infiltration should be considered feasible only within the southern end of the site underlain by the sandy portion of the Scripps Formation.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not encounter groundwater or seepage during the site investigation. We expect groundwater exists at depths greater than 100 feet below existing grades.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

We did not provide a study regarding water rights. However, these rights are not typical in the San Diego County area.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.

If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td>Partial Infiltration</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

GEOCON

Aardvark Permeameter Data Analysis

Project Name: 9880 Campus Point Dr.
Project Number: G2099-52-01
Test Number: P-1

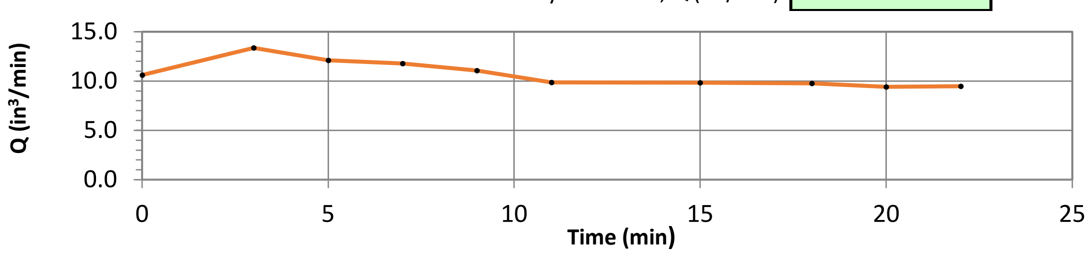
Date: 3/20/2017
By: JML

Borehole Diameter, d (in.): 8.00
Borehole Depth, **H** (in): 61.00
Distance Between Reservoir & Top of Borehole (in.): 31.00
Estimated Depth to Water Table, **S** (feet): 100.00
Height APM Raised from Bottom (in.): 1.00
Pressure Reducer Used: No

Ref. EL (feet, MSL): 312.0
Bottom EL (feet, MSL): 306.9

Distance Between Resevoir and APM Float, **D** (in.): 83.75
Head Height Calculated, **h** (in.): 4.78
Head Height Measured, **h** (in.): 4.00
Distance Between Constant Head and Water Table, **L** (in.): 1143.00

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.000	0.00
2	3.00	1.150	31.846	10.615
3	2.00	0.965	26.723	13.362
4	2.00	0.875	24.231	12.115
5	2.00	0.850	23.538	11.769
6	2.00	0.800	22.154	11.077
7	4.00	1.425	39.462	9.865
8	3.00	1.065	29.492	9.831
9	2.00	0.705	19.523	9.762
10	2.00	0.680	18.831	9.415
11	3.00	1.025	28.385	9.462
12	2.00	0.675	18.692	9.346
13	2.00	0.660	18.277	9.138
14	2.00	0.000	0.000	0.000
15	2.00	0.645	17.862	8.931
16	2.00	0.645	17.862	8.931
17	2.00	0.635	17.585	8.792
18	2.00	0.675	18.692	9.346
19	3.00	0.965	26.723	8.908
20	2.00	0.635	17.585	8.792
21	2.00	0.645	17.862	8.931
22	2.00	0.630	17.446	8.723
23	2.00	0.630	17.446	8.723
24	2.00	0.625	17.308	8.654
25	2.00	0.635	17.585	8.792
26	2.00	0.620	17.169	8.585
27	2.00	0.620	17.169	8.585
28	2.00	0.235	6.508	3.254
			Steady Flow Rate, Q (in^3/min):	7.902



Soil Matric Flux Potential, Φ_m

Φ_m = 0.163 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 4.15E-03 in/min | 0.249 in/hr

GEOCON

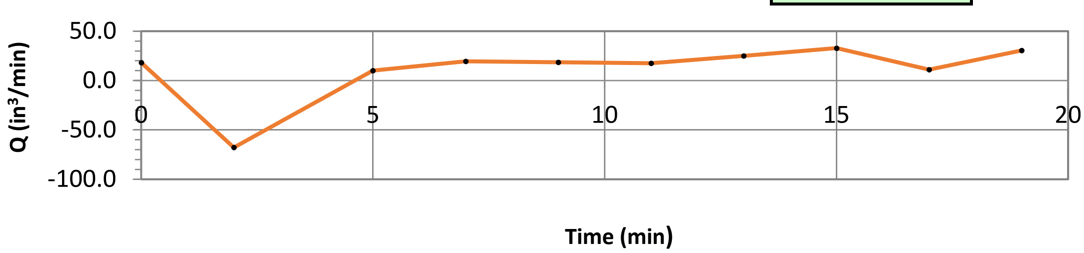
Aardvark Permeameter Data Analysis

Project Name:	9880 Campus Point Dr.	Date:	3/20/2017
Project Number:	G2099-52-01	By:	JML
Test Number:	P-2	Ref. EL (feet, MSL):	311.0
		Bottom EL (feet, MSL):	304.2

Borehole Diameter, d (in.):	8.00
Borehole Depth, **H** (in):	82.00
Distance Between Reservoir & Top of Borehole (in.):	31.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	1.00
Pressure Reducer Used:	No

Distance Between Resevoir and APM Float, **D** (in.):	104.75
Head Height Calculated, **h** (in.):	4.85
Head Height Measured, **h** (in.):	4.75
Distance Between Constant Head and Water Table, **L** (in.):	1122.75

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	2.00	2.410	66.74	33.369
3	3.00	3.365	93.18	31.062
4	2.00	2.080	57.60	28.800
5	2.00	0.000	0.00	0.000
6	2.00	1.845	51.09	25.546
7	2.00	1.930	53.45	26.723
8	2.00	1.835	50.82	25.408
9	2.00	1.510	41.82	20.908
10	2.00	1.490	41.26	20.631
11	3.00	-16.535	-457.89	-152.631
12	2.00	1.780	49.29	24.646
13	2.00	1.845	51.09	25.546
14	2.00	1.895	52.48	26.238
15	2.00	1.890	52.34	26.169
16	2.00	-8.000	-221.54	-110.769
17	2.00	0.970	26.86	13.431
18	2.00	1.420	39.32	19.662
19	1.00	1.355	37.52	37.523
20	3.00	1.270	35.17	11.723
21	2.00	1.315	36.42	18.208
22	3.00	-7.350	-203.54	-67.846
23	1.00	0.360	9.97	9.969
24	2.00	1.400	38.77	19.385
25	2.00	1.335	36.97	18.485
26	2.00	1.275	35.31	17.654
27	2.00	1.805	49.98	24.992
28	2.00	2.375	65.77	32.885
29	2.00	0.795	22.02	11.008
30	2.00	2.210	61.20	30.600
			Steady Flow Rate, Q (in^3/min):	18.069



Soil Matric Flux Potential, Φ_m

Φ_m= 0.346 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 8.78E-03 in/min 0.527 in/hr

GEOCON

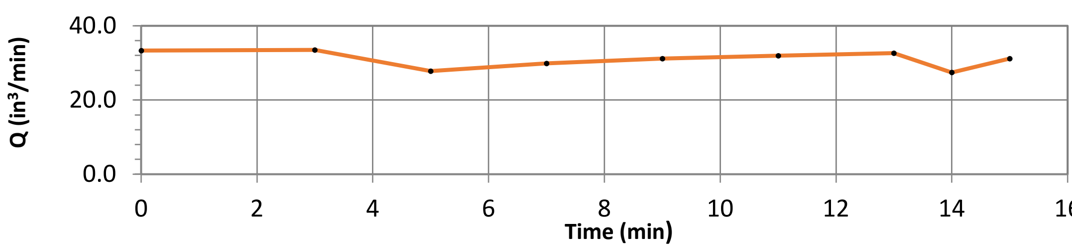
Aardvark Permeameter Data Analysis

Project Name:	9880 Campus Point Dr.	Date:	3/20/2017
Project Number:	G2099-52-01	By:	JML
Test Number:	P-3	Ref. EL (feet, MSL):	309.0
		Bottom EL (feet, MSL):	303.9

Borehole Diameter, d (in.):	8.00
Borehole Depth, **H** (in):	61.00
Distance Between Reservoir & Top of Borehole (in.):	31.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	3.00
Pressure Reducer Used:	No

Distance Between Resevoir and APM Float, **D** (in.):	81.75
Head Height Calculated, **h** (in.):	6.77
Head Height Measured, **h** (in.):	7.00
Distance Between Constant Head and Water Table, **L** (in.):	1146.00

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	3.00	6.475	179.31	59.769
3	2.00	-7.670	-212.40	-106.200
4	2.00	2.290	63.42	31.708
5	2.00	3.365	93.18	46.592
6	2.00	3.355	92.91	46.454
7	2.00	-10.240	-283.57	-141.785
8	1.00	0.985	27.28	27.277
9	1.00	0.830	22.98	22.985
10	3.00	3.690	102.18	34.062
11	2.00	2.580	71.45	35.723
12	2.00	2.750	76.15	38.077
13	2.00	-6.430	-178.06	-89.031
14	2.00	2.395	66.32	33.162
15	2.00	2.555	70.75	35.377
16	1.00	1.245	34.48	34.477
17	1.00	-7.810	-216.28	-216.277
18	2.00	1.690	46.80	23.400
19	2.00	2.300	63.69	31.846
20	2.00	2.410	66.74	33.369
21	1.00	1.210	33.51	33.508
23	2.00	2.005	55.52	27.762
24	2.00	2.160	59.82	29.908
25	1.00	1.125	31.15	31.154
26	1.00	1.155	31.98	31.985
27	1.00	1.180	32.68	32.677
29	2.00	1.980	54.83	27.415
30	3.00	3.375	93.46	31.154
			Steady Flow Rate, Q (in^3/min):	29.608



Soil Matric Flux Potential, Φ_m

Φ_m= 0.467 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 1.19E-02 in/min | 0.712 in/hr

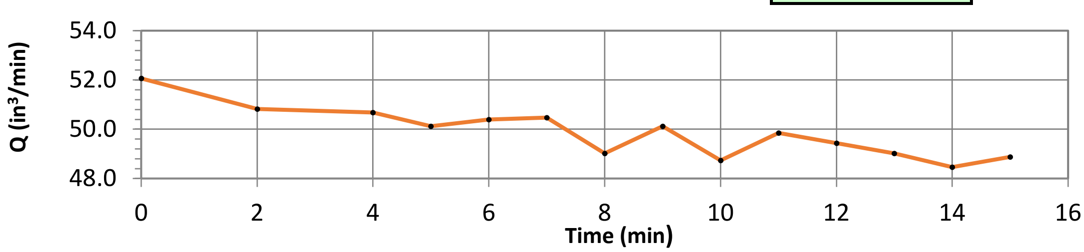
Aardvark Permeameter Data Analysis

Project Name:	9880 Campus Point Dr.	Date:	3/20/2017
Project Number:	G2099-52-01	By:	JML
Test Number:	P-4	Ref. EL (feet, MSL):	308.0
		Bottom EL (feet, MSL):	302.3

Borehole Diameter, d (in.):	8.00
Borehole Depth, **H** (in):	68.00
Distance Between Reservoir & Top of Borehole (in.):	30.50
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	3.00
Pressure Reducer Used:	No

Distance Between Resevoir and APM Float, **D** (in.):	88.25
Head Height Calculated, **h** (in.):	6.79
Head Height Measured, **h** (in.):	7.25
Distance Between Constant Head and Water Table, **L** (in.):	1139.25

Reading	Time Elapsed (min)	Water Weight Consummed (lbs)	Water Volume Consummed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	2.00	4.755	131.68	65.838
3	2.00	3.930	108.83	54.415
4	1.00	1.955	54.14	54.138
5	1.00	1.985	54.97	54.969
6	1.00	2.025	56.08	56.077
7	1.00	-8.840	-244.80	-244.800
8	1.00	1.935	53.58	53.585
9	1.00	1.900	52.62	52.615
10	1.00	1.905	52.75	52.754
11	1.00	1.870	51.78	51.785
12	1.00	-8.780	-243.14	-243.138
13	1.00	1.880	52.06	52.062
14	1.00	1.835	50.82	50.815
15	1.00	1.830	50.68	50.677
16	1.00	1.810	50.12	50.123
17	1.00	1.820	50.40	50.400
19	2.00	3.645	100.94	50.469
20	1.00	1.770	49.02	49.015
21	1.00	1.810	50.12	50.123
22	1.00	1.760	48.74	48.738
24	1.00	1.800	49.85	49.846
25	1.00	1.785	49.43	49.431
26	2.00	3.540	98.03	49.015
27	1.00	1.750	48.46	48.462
29	1.00	1.765	48.88	48.877
30	1.00	1.700	47.08	47.077
			Steady Flow Rate, Q (in^3/min):	49.188



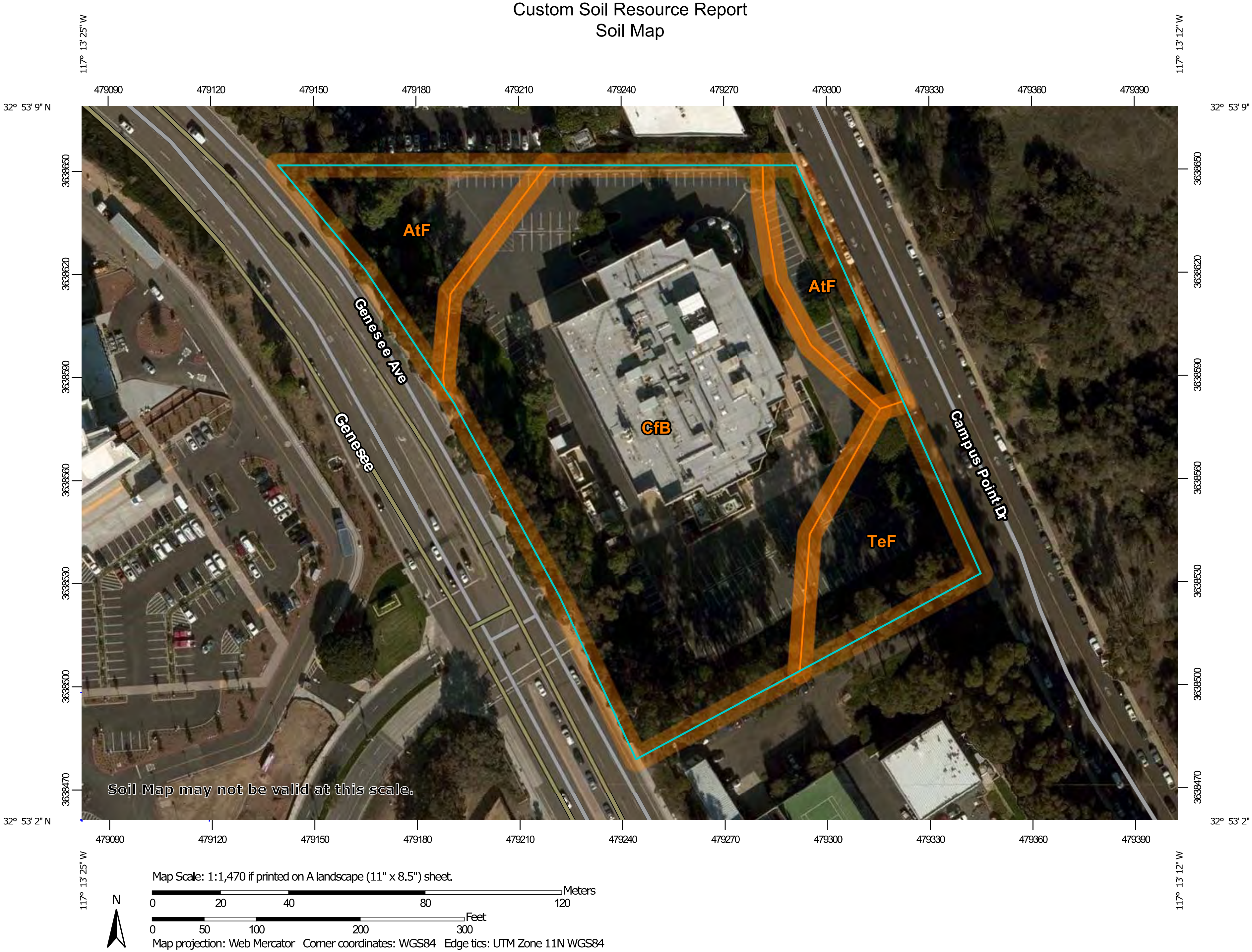
Soil Matric Flux Potential, Φ_m

Φ_m= 0.762 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 1.93E-02 in/min 1.161 in/hr

Soil Map


117° 13' 25" W
117° 13' 12" W
32° 53' 9" N
32° 53' 2" N
479090
479120
479150
479180
479210
479240
479270
479300
479330
479360
479390
3638650
3638620
3638590
3638560
3638530
3638500
3638470
AtF
AtF
CfB
TeF
Genesee Ave
Genesee
Campus Point Dr
Soil Map may not be valid at this scale.
Map Scale: 1:1,470 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

9880 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2099-52-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

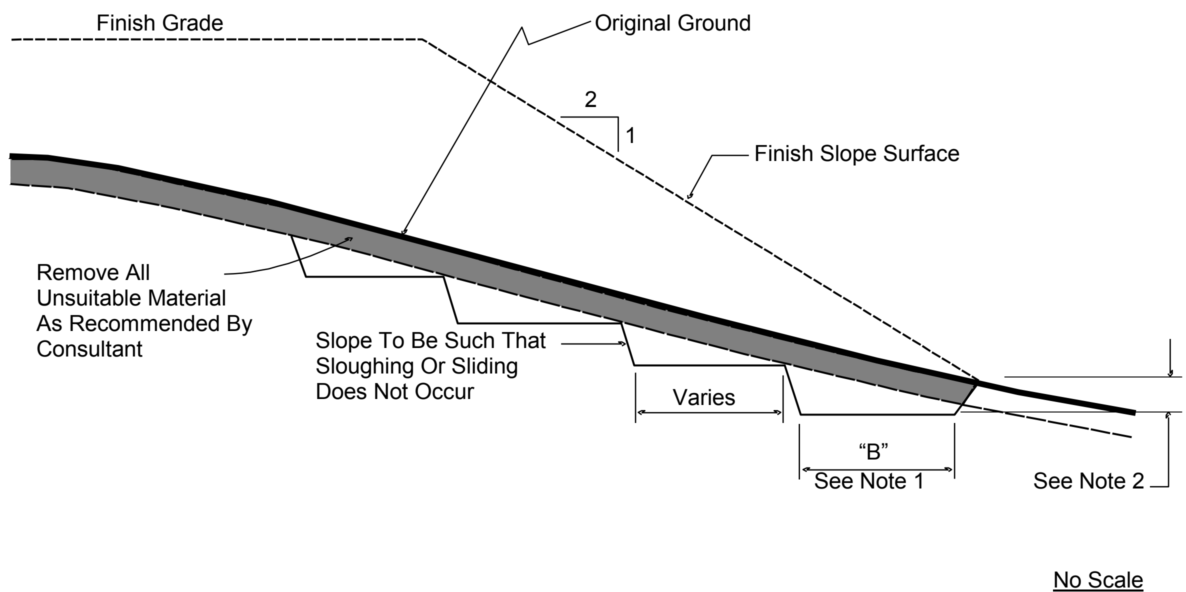
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

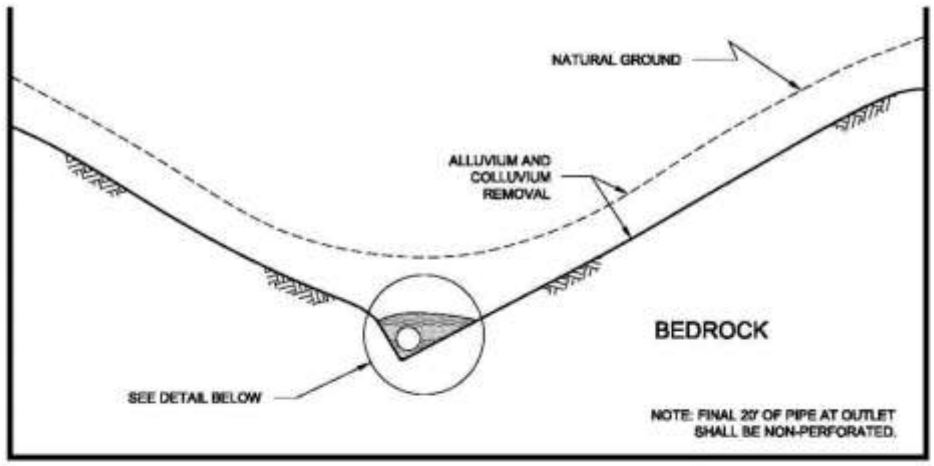
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

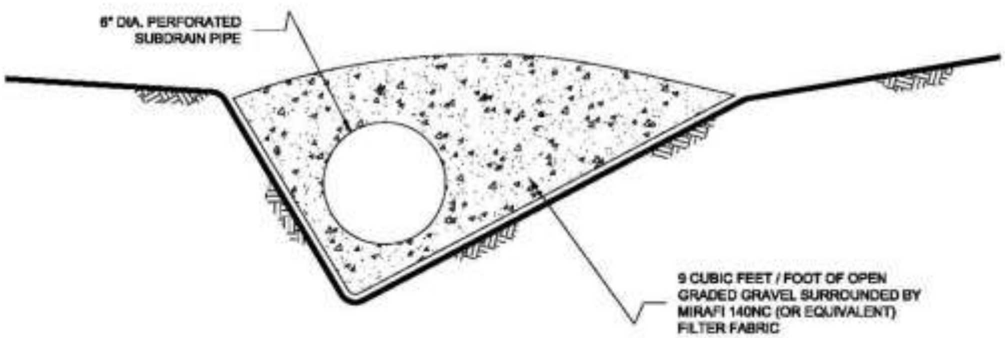
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

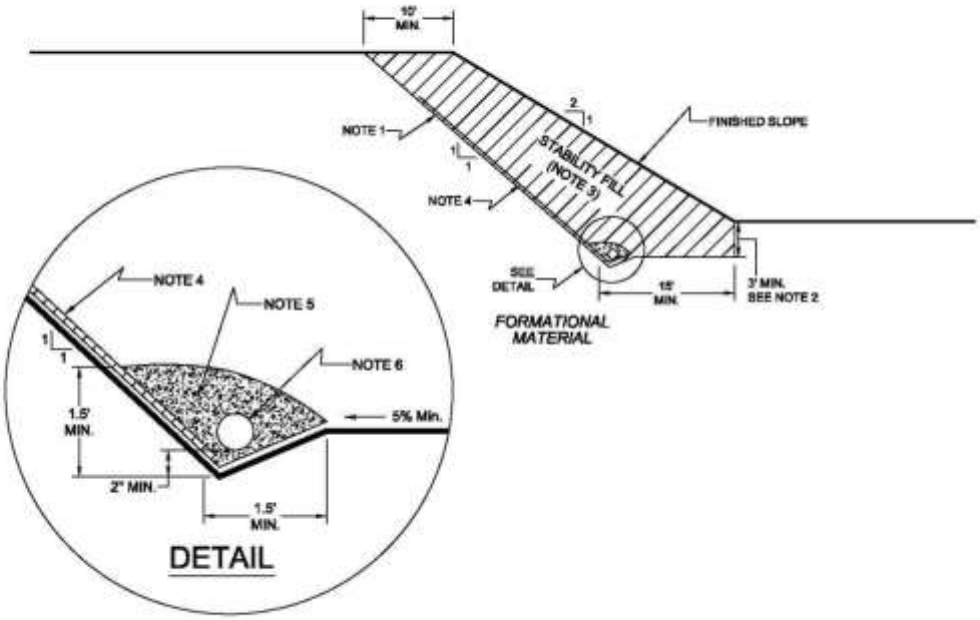
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

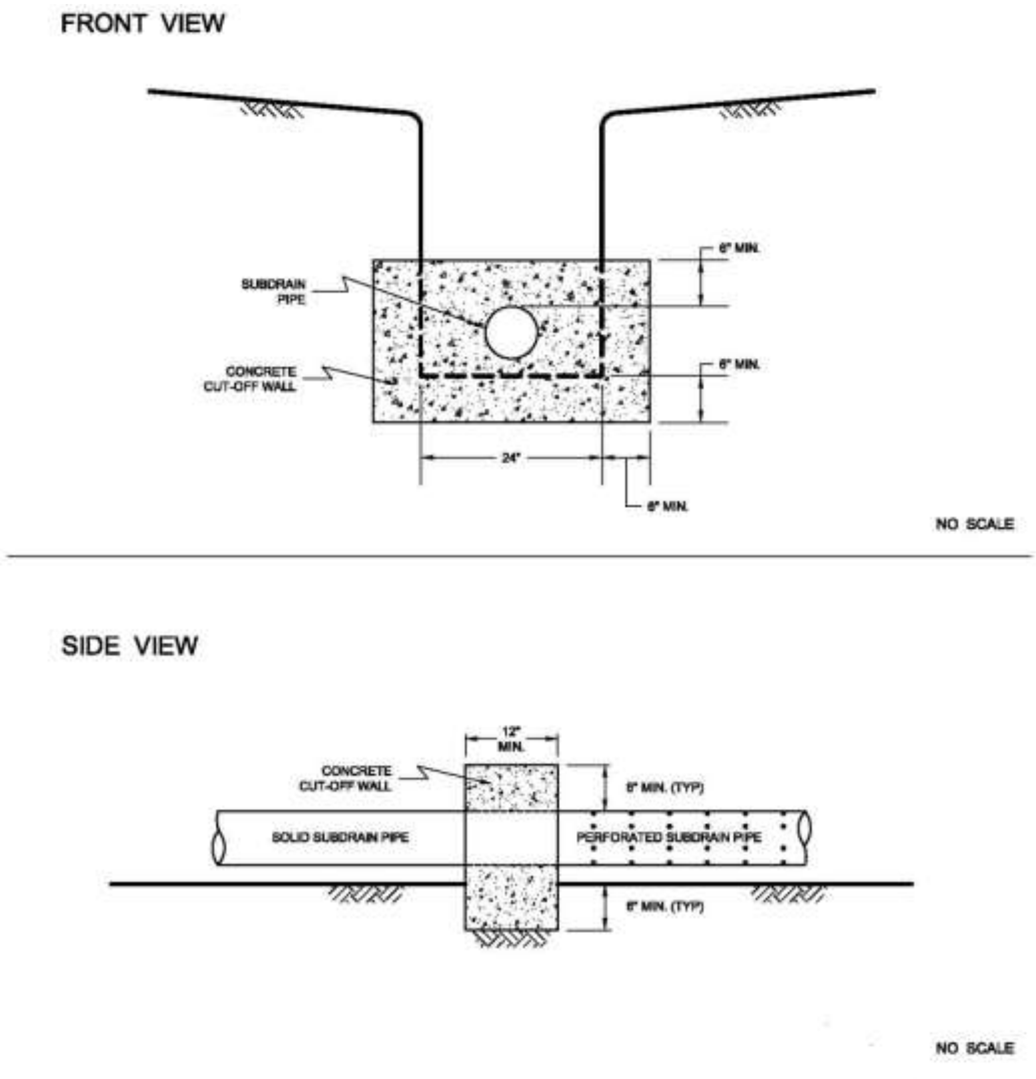
NO SCALE

7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

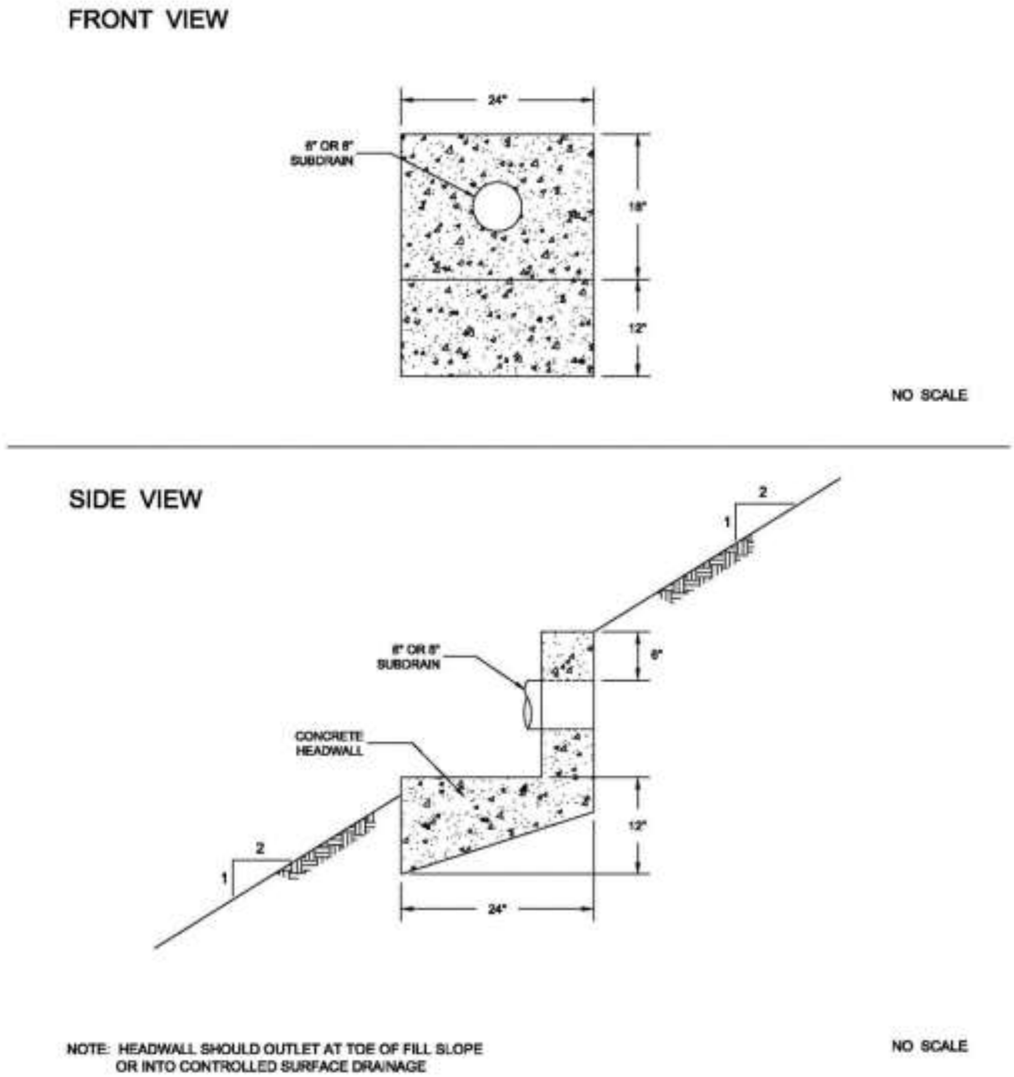
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL



7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL



7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. *2016 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2015 International Building Code,* prepared by California Building Standards Commission, dated July, 2016.

2. *ACI 318-14, Building Code Requirements for Structural Concrete* and *Commentary on Building Code Requirements for Structural Concrete,* prepared by the American Concrete Institute, dated September, 2014.

3. *ACI 330-08, Guide for the Design and Construction of Concrete Parking Lots,* American Concrete Institute, June 2008.

4. Anderson, J. G., T. K. Rockwell, and D. C. Agnew, *Past and Possible Future Earthquakes of Significance to the San Diego Region*: Earthquake Spectra, v.5, no. 2, p.299-333, 1989.

5. ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures,* Second Printing, April 6, 2011.

6. Boore, D. M., and G. M Atkinson (2008), *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 S,* Earthquake Spectra, Volume 24, Issue 1, pp. 99-138, February 2008.

7. BWE, *Preliminary Grading and Drainage Plan, 9880 Campus Point Drive, San Diego, Californi*a, Project No. 17024, undated.

8. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

9. California Emergency Management Agency, California Geological Survey, University of Southern California (2009). *Tsunami Inundation Map for Emergency Planning, State of California, County of San Diego, Point Loma Triangle, Scale 1:24,000,* dated June 1.

10. California Geological Survey, *Seismic Shaking Hazards in California*, Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years. http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

11. California Geologic Survey, State of California Earthquake Fault Zones, Point Loma Quadrangle, May 1, 2003.

12. California Geologic Survey (2008), Special Publication 117, *Guidelines For Evaluating and Mitigating Seismic Hazards in California*, Revised and Re-adopted September 11.

13. Campbell, K. W., and Y. Bozorgnia, *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s,* Preprint of version submitted for publication

in the NGA Special Volume of Earthquake Spectra, Volume 24, Issue 1, pages 139-171, February 2008.

14. Chiou, Brian S. J., and Robert R. Youngs, *A NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra*, preprint for article to be published in NGA Special Edition for Earthquake Spectra, Spring 2008.

15. *City of San Diego Seismic Safety Study, Geologic Hazards and Faults*, 2008 edition, Tile Map Sheet 34.

16. County of San Diego, *San Diego County Multi-Jurisdictional Hazard Mitigation Plan, San Diego, California – Final Draft*, July 2010.

17. Jennings, C. W., 1994, California Division of Mines and Geology, *Fault Activity Map of California and Adjacent Areas*, California Geologic Data Map Series Map No. 6.

18. Kennedy, M. P., and S. S. Tan, 2008, *Geologic Map of the San Diego 30'x60' Quadrangle, California*, USGS Regional Map Series Map No. 3, Scale 1:100,000.

19. Risk Engineering, *EZFRISK*, 2015.

20. United States Geological Survey, *2008 Interactive Deaggregations*, http://geohazards.usgs.gov/deaggint/2008/.

21. Unpublished Geotechnical Reports and Information, Geocon Incorporated.

City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM **DS-560**

OCTOBER 2016

Project Address: 9880 Campus Point Dr., San Diego, CA 92121	Project Number *(for City Use Only)*:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runoff?

☐ Yes; WPCP required, skip 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

☐ Yes; WPCP required, skip 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?

- Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
- Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
- Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☒ If you checked "Yes" for question 1, **a SWPPP is REQUIRED. Continue to PART B**

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3, **a WPCP is REQUIRED.** If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all questions 1-3, and checked "Yes" for question 4 PART B **does not apply and no document is required. Continue to Section 2.**

1. More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**

a. Projects located in the ASBS watershed.

2. ☒ **High Priority**

a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.

b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ **Medium Priority**

a. Projects 1 acre or more but not subject to an ASBS or high priority designation.

b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**

a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.
Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes ☒ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes ☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes ☒ No

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:

- **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
- **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
- **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

☐ Yes; PDP exempt requirements apply ☒ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1.	**New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☐ Yes ☒ No
2.	**Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☒ Yes ☐ No
3.	**New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface.	☐ Yes ☒ No
4.	**New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater.	☒ Yes ☐ No
5.	**New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	☒ Yes ☐ No
6.	**New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☐ Yes ☒ No

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☒ Yes ☐ No

8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ☐ Yes ☒ No

9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**. ☐
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☒

Name of Owner or Agent *(Please Print)*	Title
Signature	Date

DRAINAGE STUDY
for

9880 Campus Point Drive
San Diego, CA 92121

Prepared By:

STRUCTURAL ENGINEERING • CIVIL ENGINEERING • SURVEYING • LAND PLANNING

9449 Balboa Avenue, Suite 270
San Diego, CA 92123
B&W Job #: 12836u

Date: June, 2017
Rev. Date: July, 2017
Rev. Date: September, 2017

Table of Contents

Appendices

1. Purpose

The purpose of this drainage study is to analyze the existing and proposed drainage patterns, and peak flow rates for the 9880 Campus Point Drive site in the City of San Diego, California. This study also provides recommendations to mitigate stormwater runoff in the proposed condition in order for the project to match or decrease the pre-development peak flow rates.

To determine the impacts of the proposed development on the existing drainage patterns, the pre- and post- development peak flow rates are analyzed and compared for the 50 & 100-year storm events using the Rational Method. This report is prepared in accordance with the requirements of the City of San Diego Drainage Design Manual (2017). See Appendix E for excerpts from drainage design manual.

2. Background

This project is located in Region number 9, Penasquitos Hydrologic Unit, Miramar Reservoir Hydrologic Area/Subarea (HSA 906.1) as defined in the Regional Water Quality Control Board's Water Quality Control Plan. The site discharges ultimately into Los Penasquitos Lagoon and Pacific Ocean.

The Federal Emergency Management Agency (FEMA) categorizes the project site as Zone X, where Zone X is area determined to be outside 500-year floodplain (FIRM Panel 1338 of 2375). Appendix F illustrates the FEMA floodplain mapping within the vicinity of the project site.

The site does not consist of, nor will this project disturb any Waters of the United States. Therefore, the site is not subject to the Regional Water Quality Control Board requirements under the Federal Clean Water Act section 401 or 404.

3. Existing Condition

The 4.50 acre (approximately) site is located at 8890 Avenue in San Diego, California. The site is bounded by Campus Point Drive to the east, Genesee Avenue to the west, and existing office buildings to the north and south.

(See Appendix A for Vicinity Map)

The existing site contains a building and parking areas surrounded by vegetated slopes. The site generally drains to the north. The western half of the site flows to a ribbon-gutter, which flows north through the parking area before entering a storm drain. The southern portion of the site flows through the driveway to the east, along the Campus Point Dr. gutter, and into a storm drain. The northern and eastern portions of the site flow via gutters to the northeastern corner of the site, where they enter a storm drain system. The storm drain discharges to an unnamed canyon, and ultimately flows to the Pacific Ocean by way of Soledad Canyon, and Los Penasquitos Lagoon.

The site also receives run-on from slopes situated on the west and south sides of the existing parking lot. The runoff from the easterly slope drains directly to the curb & gutter along

Campus Point Drive. The runoff from the northerly slope drains to the neighboring property before being conveyed offsite to an existing curb inlet along Campus Point Drive. The runoff from the entire site confluences at this inlet via surface flow and the existing underground storm drain system.

The hydrology of the site area can be generally analyzed and compared at two discharge points as described below:

The site has two major drainage exit points in the existing condition. The runoff originating from the majority of the site area discharges offsite through discharge point 1, a drainage inlet situated at the northeastern corner of the site. The runoff concentrates at the inlet at this location prior to flowing offsite. Similarly, the runoff originating from the southerly portion of the site concentrates at Discharge Point 2 prior to discharging into Campus Point Dr. curb & gutter. Discharge Point 2 is situated at the eastern edge of the driveway on Campus Point Dr. The runoff from Discharge Point 2 confluences with the runoff originating from Discharge Point 1 at the curb inlet situated at the westerly side of the Campus Point Dr.

(See Appendix B for Existing Condition Hydrology Map & Runoff Discharge Points)

4. Proposed Improvements

The major development activities include, but are not limited to, clearing & grubbing, demolition, construction of a new office building, driveway, paved parking, and associated walkways, and landscaping. The demolition activities include the existing building, utility connections, the existing parking lot, and curbs, walkways etc.

The associated improvements will also include drainage improvements, and construction of Best Management Practices (BMPs). BMPs such as biofiltration, biofiltration with partial retention, and detention basin are proposed to control pollutants, as well as to maintain or reduce the existing condition peak flow rate. The detention basin is proposed because the site must comply with the requirements for hydromodification management as well as peak flow control requirements. Runoff from the site does not discharge to an exempt system.

A percolation test was also completed per the project geotech report, which determined that infiltration on-site is feasible to some extent. Therefore, the detention basin will include storage areas below the invert of the outlet pipe, to allow stormwater to infiltrate prior to entering the existing storm drain system. Infiltration will help meet the treatment requirements, as well as reduce the size of the required detention area for hydromodification control.

The on-site drainage pattern has changed to enhance the drainage condition. The majority of site runoff is directed to the new detention system situated at the southerly side of proposed building. This location is selected because the native infiltration rate at this location is better than the rest of the site area. Outflow from the detention is connected to the existing 18” storm drain system situated within the Campus Point Drive. The run-on pattern from the existing slopes (which will be replanted only), will bypass the onsite detention facility. Because the peak flow rate from the overall site is mitigated in the proposed condition, the redevelopment will not create drainage impacts to the existing receiving storm drain system.

As in the existing condition, the proposed site will have two drainage discharge points. The existing inlet at the northeastern corner of the site will remain, and will be maintained as Discharge Point 1. Runoff from the westerly slope area will bypass the proposed detention system and flow offsite through Discharge Point 1.

Discharge Point 2 in the proposed condition, will be located at a new storm cleanout to be installed along the ex. 18” line beneath Campus Point Dr. Essentially the discharge point will shift from above ground along the curb and gutter (existing condition), to below ground within the storm system. The confluence point for both discharge points will be maintained as the curb inlet situated at the westerly side of the Campus Point Dr.

The drainage impact due to the redevelopment is simply determined by comparing the cumulative peak flow rates from these two discharge points. Runoff from the slope area situated adjacent to Campus Point Drive will continue to surface flow to the street directly. A hydrologic analysis of the ex. 18” pipe within Campus Point Dr. is included in Appendix C to show that there is enough capacity for the increased flow.

(See Appendix C for Proposed Conditions Hydrology Map)

5. Soil Characteristics

Per the City of San Diego Drainage Design Manual page 82, “Type D” soil is to be used for all areas. Therefore, the hydrologic analysis is performed by utilizing soil type D.

6. Methodology

Rational Method: A rational method analysis was utilized to perform hydrologic calculations in this study. The Rational Method is a physically based numerical method where runoff is assumed to be directly proportional to rainfall and area, less losses for infiltration and depression storage

Rational Equation: $Q = C * I * A$

Where;
Q = Peak discharge, cfs
C = Rational method runoff coefficient
I = Rainfall intensity, inch/hour
A = Drainage area, acre

A computer model CivilD is used to automate the hydrology analysis process. This computer version of the rational method analysis allows user to develop a node-link model of the watershed. CivilD computer program has the capability of performing calculations utilizing mathematical functions. These functions are assigned code numbers, which appear in the printed results. The code numbers and their corresponding functions are described below;

Sub area Hydrologic Processes;

Code 1 - INITIAL subarea input, top of stream
Code 2 - STREET flow through subarea, includes subarea runoff
Code 3 - ADDITION of runoff from subarea to stream
Code 4 - STREET INLET + parallel street & pipe flow + area
Code 5 - PIPEFLOW travel time (program estimated pipe size)**
Code 6 - PIPEFLOW travel time (user specified pipe size)
Code 7 - IMPROVED channel travel time (open or box)**
Code 8 - IRREGULAR channel travel time**
Code 9 - USER specified entry of data at a point
Code 10 - CONFLUENCE at downstream point in current stream
Code 11 - CONFLUENCE of mainstreams
**NOTE: These options do not include subarea runoff
**NOTE: (#) - Required pipe size determined by the hydrology program

7. Calculations

a. Impervious and Pervious Areas

The impervious and pervious areas are calculated for both the existing and proposed site conditions. The site is designed to reduce the impervious area by 15,246 square feet (0.35 ac) as shown in Table 7-1.

Table 7-1 Summary of Areas

	Area (Acres)			Percent Impervious Area	Percent Pervious Area
	Total	**Impervious (Ai)**	**Pervious (Ap)**		
Existing Condition	4.49	3.10	1.39	69.0%	31.0%
Proposed Condition	4.49	2.75	1.74	61.2%	38.8%
Percentage Change		**-11.3%**	**25.2%**		

b. Runoff Coefficient

The proposed site is currently developed and comprised of a large office building, paved parking lot, and landscaping. The coefficients of runoff for the site are determined by utilizing Table 2 of the City of San Diego Drainage Design Manual by assuming commercial type development. Similar assumptions are made for both the existing and proposed conditions.

The "Revised C" values are calculated using the formula below:

$$= \frac{\text{(Actual Percentage of Impervious Area)}}{(80\%)} \times (0.85)$$

The impervious percentage in the existing condition is 69.0. As a result, the revised C value for the existing condition is determined to be 0.73. Similarly, the revised C value for the proposed condition is determined to be 0.65 based on the percent imperviousness of 61.25. These values are used in the hydrology analysis.

See Appendices B and C respectively for existing and proposed conditions runoff coefficient calculations.

c. Peak Flow Rates

The rational method is used to perform the hydrologic analysis. The software program CivilD, which utilizes the rational method of analysis, is used to determine peak flow rates from the site.

The peak flow rates for the 50 & 100 year design storm events are calculated for both existing and proposed condition and the results are summarized in Table 7-2. The detailed calculations/results for existing and proposed conditions analyses are located in Appendices B and C respectively.

Table 7-2 Existing and Proposed Conditions Peak Flow Rates Summary

	Drainage Area (acres)		50 Yr Flow (cfs)			% Change from Existing Condition	100 Yr Flow (cfs)	
	Existing Condition	Proposed Condition	Existing Condition	Proposed Condition	Mitigated Condition		Existing Condition	Proposed Condition
Analysis/Exit Point 1	3.77	0.95	9.42	2.34	2.34	**-75.2**	9.92	2.44
Analysis/Exit Point 2	0.72	3.54	1.97	8.10	5.45	**176.6**	2.06	8.49
Total	**4.49**	**4.49**	**11.39**	**10.44**	**7.79**	**-31.6**	**11.98**	**10.93**

In the proposed condition, the unmitigated peak flow rate due to the 50 year storm event is anticipated to decrease by 0.95 cfs. Similarly, the peak flow rate due to 100 year storm event is anticipated to decrease by 1.05 cfs. The decrease in peak flow rate in the unmitigated condition is mainly due to the reduction in impervious area in the proposed condition.

d. Detention & Mitigated Flow Rates

The detention basin is also designed to control the hydromodification impact due to the redevelopment. A single detention basin with a gross volume equal to 11,160 cf is proposed for this purpose. This basin is located at the southeasterly side of the site, where the measured infiltration rate was determined to be the highest in the tested areas. The runoff from the biofiltraion basins is directed to the detention basin for additional quantity control, which cannot be achieved by the biofiltration basins only.

Peak flow rate mitigation is also achieved by routing the flow through the detention basin. The hydraflow/hydrograph extension for AutoCAD Civil 3D is utilized for this purpose. The total 50-yr peak flow rate from the site is attenuated from 11.39 to 7.79 cfs. Detention basin is also analyzed to determine the adequacy of the basin to bypass the peak flow rate due to 100 year storm event. Any detention storage within the biofiltration basins is assumed to be minimal and therefore, is not included in the analysis. See Appendix D for the results.

8. Downstream Drainage Impact Analysis

Although new drainage swales, and storm drains are proposed to capture and convey the runoff from the site, runoff will continue to discharge to the existing storm drain system and curb & gutter along Campus Point Drive.

The proposed condition peak flow rate from the site is reduced. Therefore, negative downstream drainage impacts are not anticipated from the redevelopment.

Furthermore, the preliminary analysis of the existing 18" pipe beneath Campus Point Dr. shows that it will have enough capacity for the increased flow.

9. Conclusion

Storm water runoff from the site is collected and conveyed by a system of roof downspouts, inlets, storm drain pipes, detention basin, and swales. The site is designed to mitigate the water quantity impacts due to the redevelopment. The new storm drain system is designed to convey the runoff due to 50-yr storm event and bypass the runoff due to 100-year storm event. The pipe sizing will be fine-tuned in the final engineering phase.

The offsite hydrology and hydraulic analysis of the existing receiving storm drain system is not performed. However, the confluence of the site discharge points has been analyzed under the 100-year peak flow conditions and is demonstrated to be reduced from 11.98 cfs to 10.93 cfs under proposed conditions and therefore does not adversely impact the existing MS4 infrastructure. It is assumed that the existing storm drain system is adequately sized to convey the peak flow runoff originating from offsite as well as onsite tributary drainage areas.

The existing drainage patterns has been changed in order to accommodate the proposed redevelopment. The existing two drainage discharge points are maintained in the proposed condition. Runoff from the site continues to discharge from these discharge points.

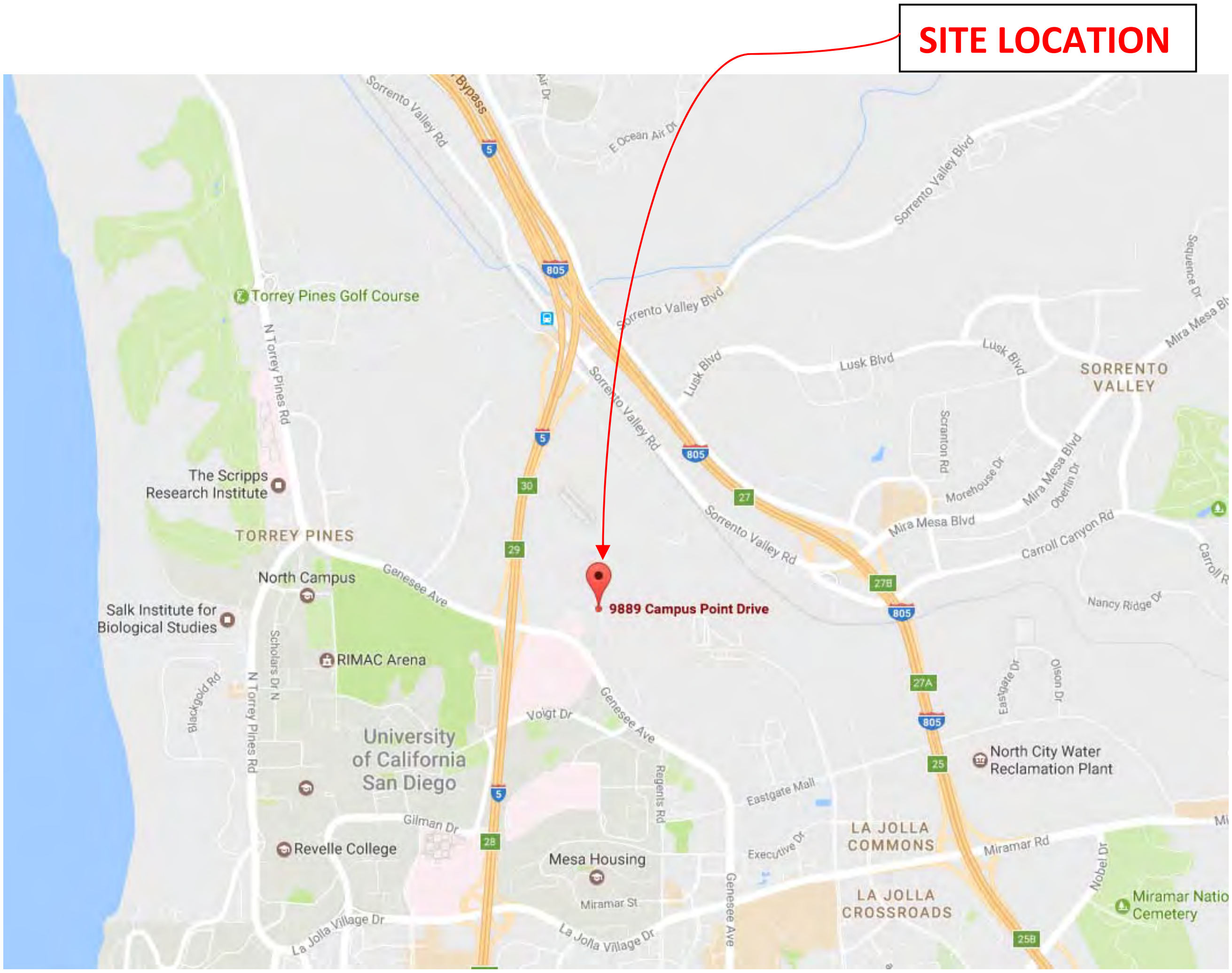
In the proposed condition, the site is designed to reduce the 50 year peak flow rate from 11.39 to 7.79 cfs (=3.6 cfs reduction). The capacity of the existing receiving storm drain system will not be impacted due to this redevelopment because the peak flow rates for both the 50-year and 100-year storm events are reduced in the proposed condition.

10. References

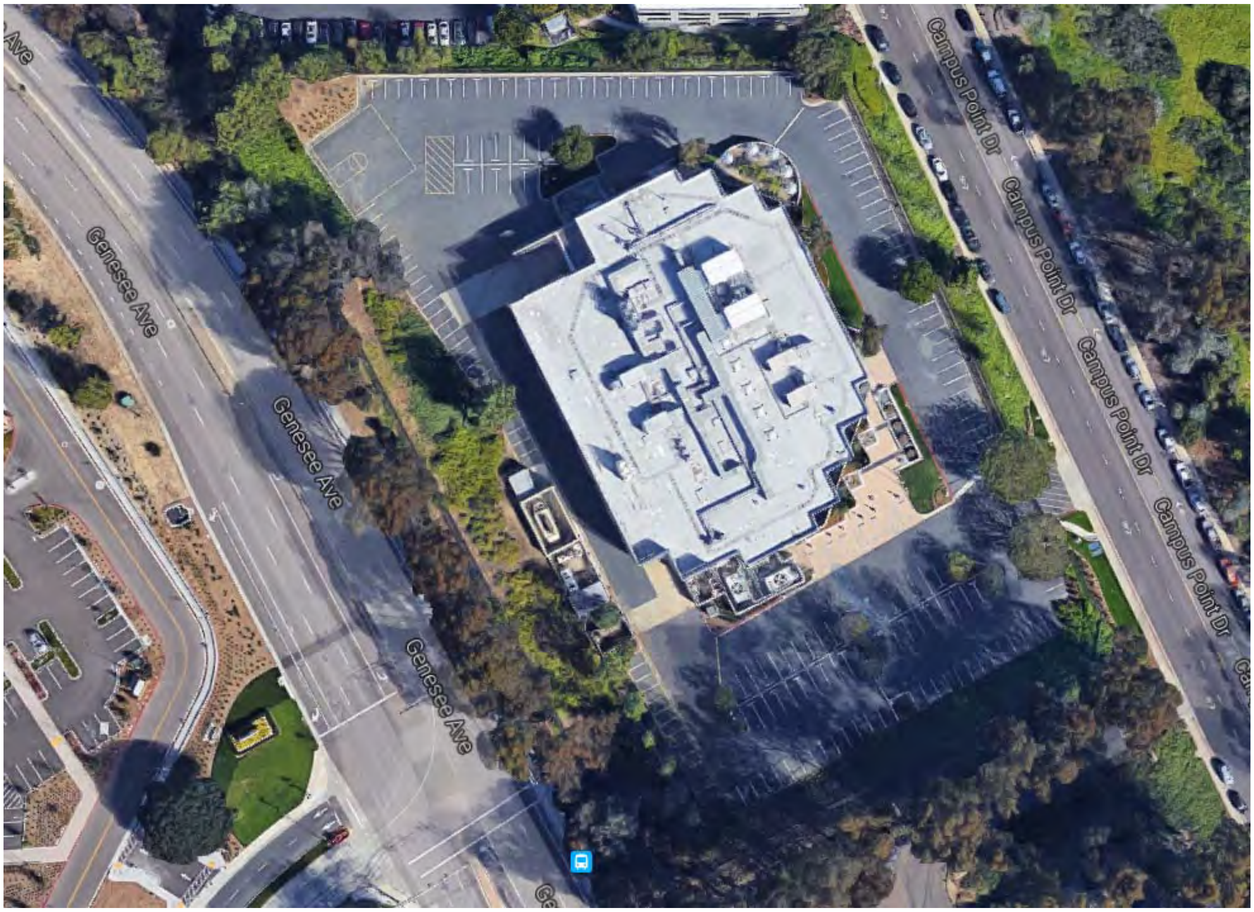
- City of San Diego Drainage design Manual, 2017
- County of San Diego Hydrology Manual, 2003
- Project's Storm Water Quality Management Plan (SWQMP)

APPENDIX A:

Site Vicinity Map
Site Imagery Map



VICINITY MAP



Genesee Ave
Genesee Ave
Genesee Ave
Campus Point Dr
Campus Point Dr
Campus Point Dr
Campus Point Dr

IMAGERY MAP

APPENDIX B:

Existing Conditions Runoff Coefficient Calculations
Existing Condition Hydrology Calculations
Existing Conditions Hydrology Map

Runoff Coefficient Calculation (Existing Condition)

Project: 9880 Campus Point Drive

Similar to commercial development

C = 0.85 (Per Table 2, Soil Class D, Drainage Design Manual)

% imperviousness= 80% (Tabulated Imperviousness per Table 2)

Revised C= (Actual % Imp./Tabulated % Imp.)*0.85

Description	Area (Acres)		Actual % Imperviousness	Revised Runoff Coef. (C)	Used Runoff Coef. (C)
	Area (ac)	Imp. Area (Ai)			
Existing Condition	4.49	3.10	69.04%	0.73	0.73

50 YEAR STORM ANALYSIS

```
              San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
EXISTING CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 1


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =   65.000(Ft.)
Highest elevation =  345.000(Ft.)
Lowest elevation =  317.000(Ft.)
Elevation difference =   28.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.53 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*(  65.000^.5)/(  43.077^(1/3)]=   1.53
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.156(CFS)
Total initial stream area =        0.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.467(CFS)
Depth of flow =   0.218(Ft.), Average velocity =   4.922(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00               0.50
        2              1.00               0.00
        3              2.00               0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.467(CFS)
  '     '        flow top width =      0.871(Ft.)
  '     '    velocity=    4.922(Ft/s)
  '     '        area =      0.095(Sq.Ft)
  '     '        Froude number =     2.628

Upstream point elevation =   316.500(Ft.)
Downstream point elevation =   309.800(Ft.)
Flow length =   162.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =    5.55 min.
Depth of flow =   0.218(Ft.)
Average velocity =   4.922(Ft/s)
Total irregular channel flow =     0.467(CFS)
Irregular channel normal depth above invert elev. =   0.218(Ft.)
Average velocity of channel(s) =   4.922(Ft/s)

Sub-Channel No. 1 Critical depth =      0.320(Ft.)
  '     '       '     Critical flow top width =      1.281(Ft.)
  '     '       '     Critical flow velocity=    2.276(Ft/s)
  '     '       '     Critical flow area =      0.205(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      4.073(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.595(CFS) for    0.200(Ac.)
Total runoff =      0.750(CFS)  Total area =        0.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     5.55 min.
Rainfall intensity =      4.073(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.684(CFS) for    0.230(Ac.)
Total runoff =      1.434(CFS)  Total area =        0.48(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.166(CFS)
Depth of flow =   0.423(Ft.), Average velocity =   2.419(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00               0.50
        2              2.50               0.00
        3              5.00               0.50
Manning's 'N' friction factor =   0.015
```

```
--------------------------------------------------------------
Sub-Channel flow  =      2.166(CFS)
  '     '         flow top width =      4.232(Ft.)
  '     '     velocity=    2.419(Ft/s)
  '     '         area =      0.896(Sq.Ft)
  '     '         Froude number =     0.927

Upstream point elevation =   309.800(Ft.)
Downstream point elevation =   309.300(Ft.)
Flow length =   103.000(Ft.)
Travel time  =    0.71 min.
Time of concentration =    6.26 min.
Depth of flow =   0.423(Ft.)
Average velocity =   2.419(Ft/s)
Total irregular channel flow =     2.166(CFS)
Irregular channel normal depth above invert elev. =   0.423(Ft.)
Average velocity of channel(s) =   2.419(Ft/s)

Sub-Channel No. 1 Critical depth =      0.410(Ft.)
  '     '       '     Critical flow top width =      4.102(Ft.)
  '     '       '     Critical flow velocity=    2.576(Ft/s)
  '     '       '     Critical flow area =      0.841(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.867(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.383(CFS) for    0.490(Ac.)
Total runoff =      2.818(CFS)  Total area =        0.97(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.718(CFS)
Depth of flow =   0.411(Ft.), Average velocity =   4.405(Ft/s)
        ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              2.50              0.00
        3              5.00              0.50
Manning's 'N' friction factor =   0.015
--------------------------------------------------------------
Sub-Channel flow  =      3.718(CFS)
  '     '         flow top width =      4.109(Ft.)
  '     '     velocity=    4.405(Ft/s)
  '     '         area =      0.844(Sq.Ft)
  '     '         Froude number =     1.713

Upstream point elevation =   309.300(Ft.)
Downstream point elevation =   306.420(Ft.)
Flow length =   172.000(Ft.)
Travel time  =    0.65 min.
Time of concentration =    6.91 min.
Depth of flow =   0.411(Ft.)
Average velocity =   4.405(Ft/s)
Total irregular channel flow =     3.718(CFS)
Irregular channel normal depth above invert elev. =   0.411(Ft.)
Average velocity of channel(s) =   4.405(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.508(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    2.884(Ft/s)
  '     '       '     Critical flow area =      1.289(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.709(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.679(CFS) for    0.620(Ac.)
Total runoff =      4.496(CFS)  Total area =        1.59(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     6.91 min.
Rainfall intensity =      3.709(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.056(CFS) for    0.390(Ac.)
Total runoff =      5.552(CFS)  Total area =        1.98(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   304.870(Ft.)
Downstream point/station elevation =   301.330(Ft.)
Pipe length  =   184.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.552(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.552(CFS)
Normal flow depth in pipe =    8.54(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =   11.45(In.)
Pipe flow velocity =      7.69(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     7.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     7.31 min.
Rainfall intensity =      3.623(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.349(CFS) for    0.510(Ac.)
Total runoff =      6.901(CFS)  Total area =        2.49(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.490(Ac.)
Runoff from this stream =      6.901(CFS)
Time of concentration =    7.31 min.
```

```
Rainfall intensity =     3.623(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =  124.000(Ft.)
Highest elevation =  311.400(Ft.)
Lowest elevation =  309.500(Ft.)
Elevation difference =    1.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     6.43 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*( 124.000^.5)/( 1.532^(1/3)]=   6.43
Rainfall intensity (I) =      3.822(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.614(CFS)
Total initial stream area =        0.220(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.865(CFS)
Depth of flow =   0.290(Ft.), Average velocity =   3.432(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              1.50              0.00
        3              3.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.865(CFS)
  '     '        flow top width =      1.739(Ft.)
  '     '    velocity=    3.432(Ft/s)
  '     '        area =      0.252(Sq.Ft)
  '     '        Froude number =     1.589

Upstream point elevation =   309.400(Ft.)
Downstream point elevation =   307.710(Ft.)
Flow length =   133.000(Ft.)
Travel time  =    0.65 min.
Time of concentration =    7.08 min.
Depth of flow =   0.290(Ft.)
Average velocity =   3.432(Ft/s)
Total irregular channel flow =     0.865(CFS)
Irregular channel normal depth above invert elev. =   0.290(Ft.)
Average velocity of channel(s) =   3.432(Ft/s)

Sub-Channel No. 1 Critical depth =      0.348(Ft.)
  '     '      '     Critical flow top width =      2.086(Ft.)
  '     '      '     Critical flow velocity=    2.386(Ft/s)
  '     '      '     Critical flow area =      0.363(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.672(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
```

```
Subarea runoff =      0.482(CFS) for    0.180(Ac.)
Total runoff =      1.096(CFS)  Total area =       0.40(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.302(CFS)
Depth of flow =   0.228(Ft.), Average velocity =   1.816(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              0.12              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =      2.302(CFS)
  '     '        flow top width =      9.935(Ft.)
  '     '    velocity=    1.816(Ft/s)
  '     '        area =      1.268(Sq.Ft)
  '     '        Froude number =     0.896

Upstream point elevation =   307.710(Ft.)
Downstream point elevation =   306.360(Ft.)
Flow length =   252.000(Ft.)
Travel time  =    2.31 min.
Time of concentration =    9.39 min.
Depth of flow =   0.228(Ft.)
Average velocity =   1.816(Ft/s)
Total irregular channel flow =     2.302(CFS)
Irregular channel normal depth above invert elev. =   0.228(Ft.)
Average velocity of channel(s) =   1.816(Ft/s)

Sub-Channel No. 1 Critical depth =      0.219(Ft.)
  '     '      '     Critical flow top width =      9.933(Ft.)
  '     '      '     Critical flow velocity=    1.953(Ft/s)
  '     '      '     Critical flow area =      1.179(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.272(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      2.102(CFS) for    0.880(Ac.)
Total runoff =      3.198(CFS)  Total area =       1.28(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.280(Ac.)
Runoff from this stream =      3.198(CFS)
Time of concentration =    9.39 min.
Rainfall intensity =     3.272(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```

```
1        6.901      7.31                 3.623
2        3.198      9.39                 3.272
Qmax(1) =
           1.000 *    1.000 *     6.901) +
           1.000 *    0.778 *     3.198) + =       9.390
Qmax(2) =
           0.903 *    1.000 *     6.901) +
           1.000 *    1.000 *     3.198) + =       9.429

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.901       3.198
Maximum flow rates at confluence using above data:
        9.390        9.429
Area of streams before confluence:
        2.490        1.280
Results of confluence:
Total flow rate =      9.429(CFS)
Time of concentration =     9.392 min.
Effective stream area after confluence =      3.770(Ac.)
End of computations, total study area =           3.770 (Ac.)
```

```
               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
EXISTING CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 2


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =   39.000(Ft.)
Highest elevation =  326.000(Ft.)
Lowest elevation =  311.000(Ft.)
Elevation difference =   15.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.23 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*(  39.000^.5)/(  38.462^(1/3)]=   1.23
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.218(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.810(CFS)
Depth of flow =   0.131(Ft.), Average velocity =   1.889(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.20
        2              5.00              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.016
-----------------------------------------------------------------
Sub-Channel flow  =      0.810(CFS)
  '     '        flow top width =      6.546(Ft.)
  '     '    velocity=    1.889(Ft/s)
  '     '        area =      0.429(Sq.Ft)
  '     '        Froude number =     1.301

Upstream point elevation =   311.000(Ft.)
Downstream point elevation =   307.750(Ft.)
Flow length =   207.000(Ft.)
Travel time  =    1.83 min.
Time of concentration =    6.83 min.
Depth of flow =   0.131(Ft.)
Average velocity =   1.889(Ft/s)
Total irregular channel flow =     0.810(CFS)
Irregular channel normal depth above invert elev. =   0.131(Ft.)
Average velocity of channel(s) =   1.889(Ft/s)

Sub-Channel No. 1 Critical depth =      0.146(Ft.)
  '     '       '     Critical flow top width =      7.275(Ft.)
  '     '       '     Critical flow velocity=    1.529(Ft/s)
  '     '       '     Critical flow area =      0.529(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.728(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.034(CFS) for    0.380(Ac.)
Total runoff =      1.252(CFS)  Total area =        0.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.447(CFS)
Depth of flow =   0.126(Ft.), Average velocity =   3.661(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.20
        2              5.00              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.016
-----------------------------------------------------------------
Sub-Channel flow  =      1.447(CFS)
  '     '        flow top width =      6.286(Ft.)
  '     '    velocity=    3.661(Ft/s)
  '     '        area =      0.395(Sq.Ft)
  '     '        Froude number =     2.573

Upstream point elevation =   307.750(Ft.)
Downstream point elevation =   303.580(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.31 min.
Time of concentration =    7.13 min.
```

```
Depth of flow =   0.126(Ft.)
Average velocity =   3.661(Ft/s)
Total irregular channel flow =     1.447(CFS)
Irregular channel normal depth above invert elev. =   0.126(Ft.)
Average velocity of channel(s) =   3.661(Ft/s)

Sub-Channel No. 1 Critical depth =      0.184(Ft.)
  '     '       '     Critical flow top width =      9.180(Ft.)
  '     '       '     Critical flow velocity=    1.717(Ft/s)
  '     '       '     Critical flow area =      0.843(Sq.Ft)

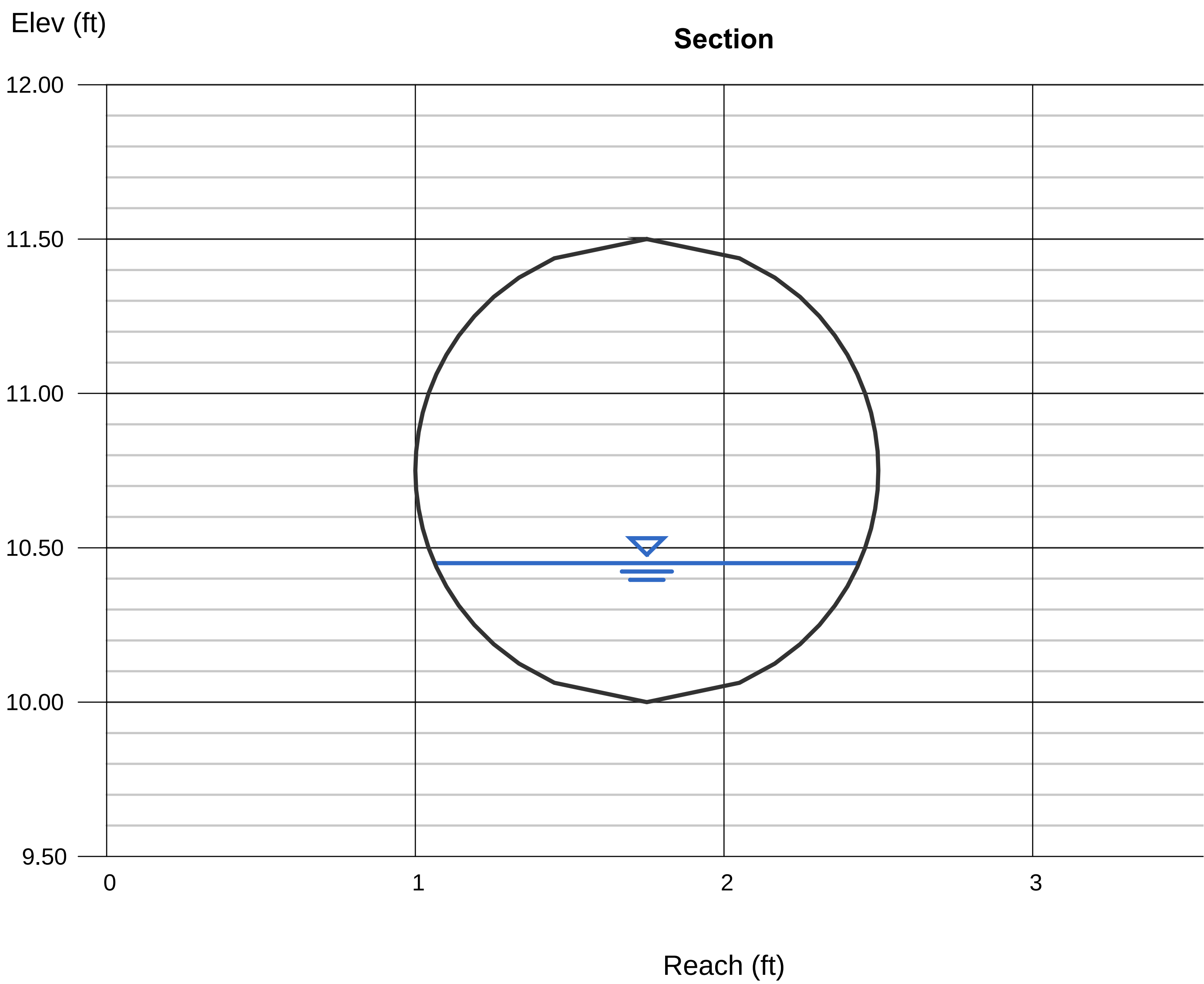
 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.660(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.374(CFS) for    0.140(Ac.)
Total runoff =      1.626(CFS)  Total area =       0.59(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     7.13 min.
Rainfall intensity =      3.660(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.347(CFS) for    0.130(Ac.)
Total runoff =      1.974(CFS)  Total area =       0.72(Ac.)
End of computations, total study area =          0.720 (Ac.)
```

Channel Report

Exist 18 inch outlet_NE

Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 0.45
		Q (cfs)	= 9.420
		Area (sqft)	= 0.45
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 21.09
Slope (%)	= 21.00	Wetted Perim (ft)	= 1.74
N-Value	= 0.013	Crit Depth, Yc (ft)	= 1.19
		Top Width (ft)	= 1.38
Calculations		EGL (ft)	= 7.37
Compute by:	Known Q		
Known Q (cfs)	= 9.42		



100 YEAR STORM ANALYSIS

```
San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 09/20/17
------------------------------------------------------------------------
EXISTING CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 1


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =   65.000(Ft.)
Highest elevation =  345.000(Ft.)
Lowest elevation =  317.000(Ft.)
Elevation difference =   28.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.53 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*(  65.000^.5)/(  43.077^(1/3)]=   1.53
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.160(CFS)
Total initial stream area =        0.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.481(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   4.957(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              1.00              0.00
        3              2.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.481(CFS)
  '     '        flow top width =      0.881(Ft.)
  '     '    velocity=    4.957(Ft/s)
  '     '        area =      0.097(Sq.Ft)
  '     '        Froude number =     2.633

Upstream point elevation =   316.500(Ft.)
Downstream point elevation =   309.800(Ft.)
Flow length =   162.000(Ft.)
Travel time  =    0.54 min.
Time of concentration =    5.54 min.
Depth of flow =   0.220(Ft.)
Average velocity =   4.957(Ft/s)
Total irregular channel flow =     0.481(CFS)
Irregular channel normal depth above invert elev. =   0.220(Ft.)
Average velocity of channel(s) =   4.957(Ft/s)

Sub-Channel No. 1 Critical depth =      0.324(Ft.)
  '     '       '     Critical flow top width =      1.297(Ft.)
  '     '       '     Critical flow velocity=    2.286(Ft/s)
  '     '       '     Critical flow area =      0.210(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      4.210(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.615(CFS) for    0.200(Ac.)
Total runoff =      0.775(CFS)  Total area =       0.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     5.54 min.
Rainfall intensity =      4.210(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.707(CFS) for    0.230(Ac.)
Total runoff =      1.482(CFS)  Total area =       0.48(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.238(CFS)
Depth of flow =   0.428(Ft.), Average velocity =   2.439(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              2.50              0.00
        3              5.00              0.50
Manning's 'N' friction factor =   0.015
```

```
----------------------------------------------------------------
Sub-Channel flow  =      2.238(CFS)
  '     '         flow top width =      4.284(Ft.)
  '     '     velocity=    2.439(Ft/s)
  '     '         area =      0.918(Sq.Ft)
  '     '         Froude number =     0.929

Upstream point elevation =   309.800(Ft.)
Downstream point elevation =   309.300(Ft.)
Flow length =   103.000(Ft.)
Travel time  =    0.70 min.
Time of concentration =    6.25 min.
Depth of flow =   0.428(Ft.)
Average velocity =   2.439(Ft/s)
Total irregular channel flow =     2.238(CFS)
Irregular channel normal depth above invert elev. =   0.428(Ft.)
Average velocity of channel(s) =   2.439(Ft/s)

Sub-Channel No. 1 Critical depth =      0.416(Ft.)
  '     '       '     Critical flow top width =      4.160(Ft.)
  '     '       '     Critical flow velocity=    2.586(Ft/s)
  '     '       '     Critical flow area =      0.865(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      4.017(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.437(CFS) for    0.490(Ac.)
Total runoff =      2.918(CFS)  Total area =        0.97(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.851(CFS)
Depth of flow =   0.416(Ft.), Average velocity =   4.444(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.50
        2             2.50              0.00
        3             5.00              0.50
Manning's 'N' friction factor =   0.015
----------------------------------------------------------------
Sub-Channel flow  =      3.851(CFS)
  '     '         flow top width =      4.163(Ft.)
  '     '     velocity=    4.444(Ft/s)
  '     '         area =      0.867(Sq.Ft)
  '     '         Froude number =     1.717

Upstream point elevation =   309.300(Ft.)
Downstream point elevation =   306.420(Ft.)
Flow length =   172.000(Ft.)
Travel time  =    0.65 min.
Time of concentration =    6.89 min.
Depth of flow =   0.416(Ft.)
Average velocity =   4.444(Ft/s)
Total irregular channel flow =     3.851(CFS)
Irregular channel normal depth above invert elev. =   0.416(Ft.)
Average velocity of channel(s) =   4.444(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.516(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    2.900(Ft/s)
  '     '       '     Critical flow area =      1.328(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.869(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.751(CFS) for    0.620(Ac.)
Total runoff =      4.669(CFS)  Total area =        1.59(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     6.89 min.
Rainfall intensity =      3.869(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.101(CFS) for    0.390(Ac.)
Total runoff =      5.771(CFS)  Total area =        1.98(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   304.870(Ft.)
Downstream point/station elevation =   301.330(Ft.)
Pipe length  =   184.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.771(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.771(CFS)
Normal flow depth in pipe =    8.75(In.)
Flow top width inside pipe =   14.79(In.)
Critical Depth =   11.66(In.)
Pipe flow velocity =      7.76(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     7.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     7.29 min.
Rainfall intensity =      3.788(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.410(CFS) for    0.510(Ac.)
Total runoff =      7.181(CFS)  Total area =        2.49(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.490(Ac.)
Runoff from this stream =      7.181(CFS)
Time of concentration =    7.29 min.
```

```
Rainfall intensity =     3.788(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =  124.000(Ft.)
Highest elevation =  311.400(Ft.)
Lowest elevation =  309.500(Ft.)
Elevation difference =    1.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     6.43 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*( 124.000^.5)/( 1.532^(1/3)]=   6.43
Rainfall intensity (I) =      3.972(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.638(CFS)
Total initial stream area =        0.220(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.899(CFS)
Depth of flow =   0.294(Ft.), Average velocity =   3.465(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00               0.50
        2             1.50               0.00
        3             3.00               0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.899(CFS)
  '     '        flow top width =      1.764(Ft.)
  '     '    velocity=    3.465(Ft/s)
  '     '        area =      0.259(Sq.Ft)
  '     '        Froude number =     1.593

Upstream point elevation =   309.400(Ft.)
Downstream point elevation =   307.710(Ft.)
Flow length =   133.000(Ft.)
Travel time  =    0.64 min.
Time of concentration =    7.07 min.
Depth of flow =   0.294(Ft.)
Average velocity =   3.465(Ft/s)
Total irregular channel flow =     0.899(CFS)
Irregular channel normal depth above invert elev. =   0.294(Ft.)
Average velocity of channel(s) =   3.465(Ft/s)

Sub-Channel No. 1 Critical depth =      0.355(Ft.)
  '     '       '     Critical flow top width =      2.133(Ft.)
  '     '       '     Critical flow velocity=    2.371(Ft/s)
  '     '       '     Critical flow area =      0.379(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.831(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
```

```
Subarea runoff =      0.503(CFS) for    0.180(Ac.)
Total runoff =      1.141(CFS)  Total area =       0.40(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.397(CFS)
Depth of flow =   0.231(Ft.), Average velocity =   1.845(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.50
        2             0.12              0.00
        3            10.00              0.20
Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
Sub-Channel flow  =      2.397(CFS)
  '     '        flow top width =      9.935(Ft.)
  '     '    velocity=    1.845(Ft/s)
  '     '        area =      1.299(Sq.Ft)
  '     '        Froude number =     0.899

Upstream point elevation =   307.710(Ft.)
Downstream point elevation =   306.360(Ft.)
Flow length =   252.000(Ft.)
Travel time  =    2.28 min.
Time of concentration =    9.35 min.
Depth of flow =   0.231(Ft.)
Average velocity =   1.845(Ft/s)
Total irregular channel flow =     2.397(CFS)
Irregular channel normal depth above invert elev. =   0.231(Ft.)
Average velocity of channel(s) =   1.845(Ft/s)

Sub-Channel No. 1 Critical depth =      0.223(Ft.)
  '     '      '     Critical flow top width =      9.933(Ft.)
  '     '      '     Critical flow velocity=    1.968(Ft/s)
  '     '      '     Critical flow area =      1.218(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.457(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      2.221(CFS) for    0.880(Ac.)
Total runoff =      3.362(CFS)  Total area =       1.28(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.280(Ac.)
Runoff from this stream =      3.362(CFS)
Time of concentration =    9.35 min.
Rainfall intensity =     3.457(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```

```
1        7.181      7.29                 3.788
2        3.362      9.35                 3.457
Qmax(1) =
           1.000 *    1.000 *     7.181) +
           1.000 *    0.780 *     3.362) + =       9.803
Qmax(2) =
           0.913 *    1.000 *     7.181) +
           1.000 *    1.000 *     3.362) + =       9.916

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.181       3.362
Maximum flow rates at confluence using above data:
        9.803        9.916
Area of streams before confluence:
        2.490        1.280
Results of confluence:
Total flow rate =      9.916(CFS)
Time of concentration =     9.349 min.
Effective stream area after confluence =      3.770(Ac.)
End of computations, total study area =           3.770 (Ac.)
```

```
                 San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 09/20/17
------------------------------------------------------------------------
EXISTING CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 2


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =   39.000(Ft.)
Highest elevation =  326.000(Ft.)
Lowest elevation =  311.000(Ft.)
Elevation difference =   15.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.23 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*(  39.000^.5)/(  38.462^(1/3)]=   1.23
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      0.224(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.833(CFS)
Depth of flow =   0.132(Ft.), Average velocity =   1.903(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.20
        2              5.00              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.016
-----------------------------------------------------------------
Sub-Channel flow  =      0.833(CFS)
  '     '        flow top width =      6.617(Ft.)
  '     '    velocity=    1.903(Ft/s)
  '     '        area =      0.438(Sq.Ft)
  '     '        Froude number =     1.304

Upstream point elevation =   311.000(Ft.)
Downstream point elevation =   307.750(Ft.)
Flow length =   207.000(Ft.)
Travel time  =    1.81 min.
Time of concentration =    6.81 min.
Depth of flow =   0.132(Ft.)
Average velocity =   1.903(Ft/s)
Total irregular channel flow =     0.833(CFS)
Irregular channel normal depth above invert elev. =   0.132(Ft.)
Average velocity of channel(s) =   1.903(Ft/s)

Sub-Channel No. 1 Critical depth =      0.147(Ft.)
  '     '       '     Critical flow top width =      7.373(Ft.)
  '     '       '     Critical flow velocity=    1.532(Ft/s)
  '     '       '     Critical flow area =      0.544(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.886(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      1.078(CFS) for    0.380(Ac.)
Total runoff =      1.302(CFS)  Total area =        0.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.505(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.697(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.20
        2              5.00              0.00
        3             10.00              0.20
Manning's 'N' friction factor =   0.016
-----------------------------------------------------------------
Sub-Channel flow  =      1.505(CFS)
  '     '        flow top width =      6.380(Ft.)
  '     '    velocity=    3.697(Ft/s)
  '     '        area =      0.407(Sq.Ft)
  '     '        Froude number =     2.580

Upstream point elevation =   307.750(Ft.)
Downstream point elevation =   303.580(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.30 min.
Time of concentration =    7.12 min.
```

```
Depth of flow =   0.128(Ft.)
Average velocity =   3.697(Ft/s)
Total irregular channel flow =     1.505(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.697(Ft/s)

Sub-Channel No. 1 Critical depth =      0.187(Ft.)
  '     '       '     Critical flow top width =      9.326(Ft.)
  '     '       '     Critical flow velocity=    1.730(Ft/s)
  '     '       '     Critical flow area =      0.870(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.730 given for subarea
Rainfall intensity =      3.823(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.391(CFS) for    0.140(Ac.)
Total runoff =      1.693(CFS)  Total area =        0.59(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.730 given for subarea
Time of concentration =     7.12 min.
Rainfall intensity =      3.823(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      0.363(CFS) for    0.130(Ac.)
Total runoff =      2.056(CFS)  Total area =        0.72(Ac.)
End of computations, total study area =           0.720 (Ac.)
```

LEGEND

LEGEND	SYMBOL
OUTER BASIN BOUNDARY	
MAJOR BASIN BOUNDARY	
MINOR BASIN BOUNDARY	
EXISTING STORM DRAIN	SD
EXISTING CONTOUR	XXX
FLOW DIRECTION	
FLOW PATH	
FLOW LENGTH	L=XXX.X'
NODE/CONTOUR ELEVATION	306.43TG / 301.33IE
HYDROLOGY NODE	200
ANALYSIS/EXIT POINT	1
DRAINAGE BASIN MARKER & AREA (AC)	A-3 / X.XX

SCALE IN FEET
15 0 30 60
1 inch = 30 ft.

BWE
WWW.BWESD.COM
619.299.5550

SYM	DESCRIPTION	DATE	APPR

ISSUE DATE:
DRAWN BY:
CHECKED BY:
BWE JOB NUMBER:
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

SHEET TITLE
HYDROLOGY EXHIBIT EXISTING CONDITION

SHEET 1 OF 1

PROJECT
9880 CAMPUS POINT DRIVE

SITE ADDRESS
9880 CAMPUS POINT DRIVE
SAN DIEGO, CA 92093

PLOT: M:\PROJECTS\12500\12836U.1.00 9880 CAMPUS POINT DRIVE\DWGS\EXHIBITS\DRAINAGE\2017-07-REVISION\12836U.1 HYDRO-EXIST REV.DWG Min GC 9/21/2017 11:34 AM

APPENDIX C:

Proposed Conditions Runoff Coefficient Calculations
Proposed Condition Hydrology/Hydraulic Calculations
Proposed Conditions Hydrology Map

Runoff Coefficient Calculation for (Proposed Condition)

Project: 9880 Campus Point Drive

Similar to commercial development

C = 0.85 (Per Table 2, Soil Class D, Drainage Design Manual)

% imperviousness= 80% (Tabulated Imperviousness per Table 2)

Revised C= (Actual % Imp./Tabulated % Imp.)*0.85

Description	Area (Acres)		Actual % Imperviousness	Revised Runoff Coef. (C)	*Used Runoff Coef. (C)
	Total Area	Imp. Area (Ai)			
Proposed Condition	4.49	2.75	61.25%	0.65	0.65

*Revised C value is greater than limiting C for commercial development (= 0.5)

50 YEAR STORM ANALYSIS

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
PROPOSED CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 1


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   71.500(Ft.)
Highest elevation =  345.000(Ft.)
Lowest elevation =  315.000(Ft.)
Elevation difference =   30.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.97 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  71.500^.5)/(  41.958^(1/3)]=   1.97
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.166(CFS)
Total initial stream area =        0.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.624(CFS)
Depth of flow =   0.395(Ft.), Average velocity =   1.999(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.50
        2             1.00              0.00
        3             2.00              0.50
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.624(CFS)
  '     '        flow top width =      1.580(Ft.)
  '     '    velocity=    1.999(Ft/s)
  '     '        area =      0.312(Sq.Ft)
  '     '        Froude number =     0.792

Upstream point elevation =   314.000(Ft.)
Downstream point elevation =   313.000(Ft.)
Flow length =   137.000(Ft.)
Travel time  =    1.14 min.
Time of concentration =    6.14 min.
Depth of flow =   0.395(Ft.)
Average velocity =   1.999(Ft/s)
Total irregular channel flow =     0.624(CFS)
Irregular channel normal depth above invert elev. =   0.395(Ft.)
Average velocity of channel(s) =   1.999(Ft/s)

Sub-Channel No. 1 Critical depth =      0.359(Ft.)
  '     '       '     Critical flow top width =      1.438(Ft.)
  '     '       '     Critical flow velocity=    2.415(Ft/s)
  '     '       '     Critical flow area =      0.258(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.898(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.836(CFS) for    0.330(Ac.)
Total runoff =      1.003(CFS)  Total area =        0.39(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   310.000(Ft.)
Downstream point/station elevation =   308.500(Ft.)
Pipe length  =   142.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.003(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.003(CFS)
Normal flow depth in pipe =    4.97(In.)
Flow top width inside pipe =    8.95(In.)
Critical Depth =    5.51(In.)
Pipe flow velocity =      4.01(Ft/s)
Travel time through pipe =    0.59 min.
Time of concentration (TC) =     6.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     6.73 min.
Rainfall intensity =      3.749(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
```

```
Subarea runoff =      0.634(CFS) for    0.260(Ac.)
Total runoff =      1.636(CFS)  Total area =        0.65(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   306.500(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.636(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.636(CFS)
Normal flow depth in pipe =    5.32(In.)
Flow top width inside pipe =    8.85(In.)
Critical Depth =    7.05(In.)
Pipe flow velocity =      6.02(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     6.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     6.98 min.
Rainfall intensity =      3.694(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.336(CFS) for    0.140(Ac.)
Total runoff =      1.972(CFS)  Total area =        0.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   306.500(Ft.)
Downstream point/station elevation =   303.700(Ft.)
Pipe length  =   141.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.972(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.972(CFS)
Normal flow depth in pipe =    6.35(In.)
Flow top width inside pipe =    8.20(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =      5.92(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     7.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.37 min.
Rainfall intensity =      3.610(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.188(CFS) for    0.080(Ac.)
Total runoff =      2.160(CFS)  Total area =        0.87(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   303.700(Ft.)
Downstream point/station elevation =   301.330(Ft.)
Pipe length  =   265.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.160(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.160(CFS)
Normal flow depth in pipe =    6.98(In.)
Flow top width inside pipe =   11.84(In.)
Critical Depth =    7.54(In.)
Pipe flow velocity =      4.55(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =     8.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      306.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     8.34 min.
Rainfall intensity =      3.432(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.178(CFS) for    0.080(Ac.)
Total runoff =      2.338(CFS)  Total area =       0.95(Ac.)
End of computations, total study area =          0.950 (Ac.)
```

```
               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
PROPOSED CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 2


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   89.000(Ft.)
Highest elevation =  311.500(Ft.)
Lowest elevation =  309.000(Ft.)
Elevation difference =    2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.42 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  89.000^.5)/( 2.809^(1/3)]=   5.42
Rainfall intensity (I) =      4.117(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.187(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      101.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     5.42 min.
Rainfall intensity =      4.117(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.321(CFS) for    0.120(Ac.)
```

```
Total runoff =      0.508(CFS)  Total area =       0.19(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.870(CFS)
Depth of flow =   0.065(Ft.), Average velocity =   1.454(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.75
        2             2.00              0.00
        3            11.00              0.00
        4            13.00              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.870(CFS)
  '     '        flow top width =      9.348(Ft.)
  '     '    velocity=    1.454(Ft/s)
  '     '        area =      0.598(Sq.Ft)
  '     '        Froude number =     1.013

Upstream point elevation =   309.000(Ft.)
Downstream point elevation =   307.500(Ft.)
Flow length =   100.000(Ft.)
Travel time  =    1.15 min.
Time of concentration =    6.56 min.
Depth of flow =   0.065(Ft.)
Average velocity =   1.454(Ft/s)
Total irregular channel flow =     0.870(CFS)
Irregular channel normal depth above invert elev. =   0.065(Ft.)
Average velocity of channel(s) =   1.454(Ft/s)

Sub-Channel No. 1 Critical depth =      0.065(Ft.)
  '     '       '     Critical flow top width =      9.349(Ft.)
  '     '       '     Critical flow velocity=    1.449(Ft/s)
  '     '       '     Critical flow area =      0.600(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.790(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.665(CFS) for    0.270(Ac.)
Total runoff =      1.174(CFS)  Total area =       0.46(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   304.000(Ft.)
Downstream point/station elevation =   303.240(Ft.)
Pipe length  =   169.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.174(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.174(CFS)
Normal flow depth in pipe =    5.94(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    5.48(In.)
Pipe flow velocity =      3.03(Ft/s)
```

```
Travel time through pipe =    0.93 min.
Time of concentration (TC) =     7.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.49 min.
Rainfall intensity =      3.586(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.746(CFS) for    0.320(Ac.)
Total runoff =      1.920(CFS)  Total area =        0.78(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   303.240(Ft.)
Downstream point/station elevation =   302.900(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.920(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.920(CFS)
Normal flow depth in pipe =    7.72(In.)
Flow top width inside pipe =   11.49(In.)
Critical Depth =    7.09(In.)
Pipe flow velocity =      3.60(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     7.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.79 min.
Rainfall intensity =      3.529(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.321(CFS) for    0.140(Ac.)
Total runoff =      2.241(CFS)  Total area =        0.92(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   302.900(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    67.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.241(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.241(CFS)
Normal flow depth in pipe =    8.23(In.)
Flow top width inside pipe =   11.14(In.)
Critical Depth =    7.68(In.)
Pipe flow velocity =      3.91(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     8.08 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.920(Ac.)
Runoff from this stream =      2.241(CFS)
Time of concentration =    8.08 min.
Rainfall intensity =     3.477(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   51.500(Ft.)
Highest elevation =  309.500(Ft.)
Lowest elevation =  308.500(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.66 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  51.500^.5)/(   1.942^(1/3)]=   4.66
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.194(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.374(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   1.941(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              2.00              0.00
        3              4.00              0.50
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.374(CFS)
  '     '        flow top width =      1.757(Ft.)
  '     '    velocity=    1.941(Ft/s)
  '     '        area =      0.193(Sq.Ft)
  '     '        Froude number =     1.032

Upstream point elevation =   308.500(Ft.)
Downstream point elevation =   308.000(Ft.)
Flow length =    37.000(Ft.)
Travel time  =    0.32 min.
Time of concentration =    5.32 min.
Depth of flow =   0.220(Ft.)
Average velocity =   1.941(Ft/s)
Total irregular channel flow =     0.374(CFS)
Irregular channel normal depth above invert elev. =   0.220(Ft.)
Average velocity of channel(s) =   1.941(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.223(Ft.)
  '     '      '     Critical flow top width =      1.781(Ft.)
  '     '      '     Critical flow velocity=    1.887(Ft/s)
  '     '      '     Critical flow area =      0.198(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      4.150(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.351(CFS) for    0.130(Ac.)
Total runoff =      0.545(CFS)  Total area =       0.20(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   306.800(Ft.)
Downstream point/station elevation =   306.250(Ft.)
Pipe length  =    57.80(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.545(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.545(CFS)
Normal flow depth in pipe =    4.90(In.)
Flow top width inside pipe =    4.65(In.)
Critical Depth =    4.51(In.)
Pipe flow velocity =      3.18(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     5.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     5.62 min.
Rainfall intensity =      4.050(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.342(CFS) for    0.130(Ac.)
Total runoff =      0.887(CFS)  Total area =       0.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.129(CFS)
Depth of flow =   0.215(Ft.), Average velocity =   0.885(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1            0.00             0.75
        2            0.10             0.00
        3            6.00             0.00
        4            6.10             0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      1.129(CFS)
  '     '        flow top width =      5.957(Ft.)
  '     '    velocity=    0.885(Ft/s)
```

```
  '     '        area =      1.276(Sq.Ft)
  '     '        Froude number =     0.337

Upstream point elevation =   306.250(Ft.)
Downstream point elevation =   306.220(Ft.)
Flow length =    25.000(Ft.)
Travel time  =    0.47 min.
Time of concentration =    6.09 min.
Depth of flow =   0.215(Ft.)
Average velocity =   0.885(Ft/s)
Total irregular channel flow =     1.129(CFS)
Irregular channel normal depth above invert elev. =   0.215(Ft.)
Average velocity of channel(s) =   0.885(Ft/s)

Sub-Channel No. 1 Critical depth =      0.104(Ft.)
  '     '       '     Critical flow top width =      5.928(Ft.)
  '     '       '     Critical flow velocity=    1.827(Ft/s)
  '     '       '     Critical flow area =      0.618(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.912(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.458(CFS) for    0.180(Ac.)
Total runoff =      1.345(CFS)  Total area =        0.51(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.687(CFS)
Depth of flow =   0.287(Ft.), Average velocity =   0.991(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.75
        2             0.10              0.00
        3             6.00              0.00
        4             6.10              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      1.687(CFS)
  '     '        flow top width =      5.976(Ft.)
  '     '    velocity=    0.991(Ft/s)
  '     '        area =      1.702(Sq.Ft)
  '     '        Froude number =     0.327

Upstream point elevation =   306.220(Ft.)
Downstream point elevation =   306.110(Ft.)
Flow length =   104.000(Ft.)
Travel time  =    1.75 min.
Time of concentration =    7.84 min.
Depth of flow =   0.287(Ft.)
Average velocity =   0.991(Ft/s)
Total irregular channel flow =     1.687(CFS)
Irregular channel normal depth above invert elev. =   0.287(Ft.)
Average velocity of channel(s) =   0.991(Ft/s)

Sub-Channel No. 1 Critical depth =      0.137(Ft.)
  '     '       '     Critical flow top width =      5.936(Ft.)
  '     '       '     Critical flow velocity=    2.086(Ft/s)
```

```
  '     '       '     Critical flow area =      0.809(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.520(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.595(CFS) for    0.260(Ac.)
Total runoff =      1.940(CFS)  Total area =        0.77(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.84 min.
Rainfall intensity =      3.520(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.252(CFS) for    0.110(Ac.)
Total runoff =      2.191(CFS)  Total area =        0.88(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.652(CFS)
Depth of flow =   0.354(Ft.), Average velocity =   1.258(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.75
        2              0.10              0.00
        3              6.00              0.00
        4              6.10              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      2.652(CFS)
  '     '        flow top width =      5.995(Ft.)
  '     '    velocity=    1.258(Ft/s)
  '     '        area =      2.108(Sq.Ft)
  '     '        Froude number =     0.374

Upstream point elevation =   306.110(Ft.)
Downstream point elevation =   306.000(Ft.)
Flow length =    83.500(Ft.)
Travel time  =    1.11 min.
Time of concentration =    8.95 min.
Depth of flow =   0.354(Ft.)
Average velocity =   1.258(Ft/s)
Total irregular channel flow =     2.652(CFS)
Irregular channel normal depth above invert elev. =   0.354(Ft.)
Average velocity of channel(s) =   1.258(Ft/s)

Sub-Channel No. 1 Critical depth =      0.184(Ft.)
  '     '       '     Critical flow top width =      5.949(Ft.)
  '     '       '     Critical flow velocity=    2.438(Ft/s)
  '     '       '     Critical flow area =      1.088(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.336(In/Hr) for a    50.0 year storm
```

```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.802(CFS) for    0.370(Ac.)
Total runoff =      2.994(CFS)  Total area =        1.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =      2.994(CFS)
Time of concentration =    8.95 min.
Rainfall intensity =     3.336(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.241      8.08                 3.477
2        2.994      8.95                 3.336
Qmax(1) =
           1.000 *    1.000 *     2.241) +
           1.000 *    0.903 *     2.994) + =       4.944
Qmax(2) =
           0.960 *    1.000 *     2.241) +
           1.000 *    1.000 *     2.994) + =       5.144

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.241       2.994
Maximum flow rates at confluence using above data:
        4.944       5.144
Area of streams before confluence:
        0.920       1.250
Results of confluence:
Total flow rate =      5.144(CFS)
Time of concentration =     8.947 min.
Effective stream area after confluence =      2.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.100(Ft.)
Pipe length  =    82.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.144(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.144(CFS)
Normal flow depth in pipe =   11.11(In.)
Flow top width inside pipe =   17.50(In.)
Critical Depth =   10.48(In.)
Pipe flow velocity =      4.49(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     9.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      112.000
**** SUBAREA FLOW ADDITION ****
```

```
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.25 min.
Rainfall intensity =      3.292(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.984(CFS) for    0.460(Ac.)
Total runoff =      6.128(CFS)  Total area =        2.63(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.25 min.
Rainfall intensity =      3.292(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.278(CFS) for    0.130(Ac.)
Total runoff =      6.406(CFS)  Total area =        2.76(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.25 min.
Rainfall intensity =      3.292(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.685(CFS) for    0.320(Ac.)
Total runoff =      7.091(CFS)  Total area =        3.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.080(Ac.)
Runoff from this stream =      7.091(CFS)
Time of concentration =    9.25 min.
Rainfall intensity =     3.292(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   35.000(Ft.)
Highest elevation =  326.000(Ft.)
Lowest elevation =  313.000(Ft.)
Elevation difference =   13.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.44 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  35.000^.5)/(  37.143^(1/3)]=   1.44
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.166(CFS)
Total initial stream area =        0.060(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.444(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   2.385(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00               0.50
        2              1.00               0.00
        3              2.00               0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.444(CFS)
  '     '        flow top width =      1.220(Ft.)
  '     '    velocity=    2.385(Ft/s)
  '     '        area =      0.186(Sq.Ft)
  '     '        Froude number =     1.076

Upstream point elevation =   312.000(Ft.)
Downstream point elevation =   310.500(Ft.)
Flow length =   242.000(Ft.)
Travel time  =    1.69 min.
Time of concentration =    6.69 min.
Depth of flow =   0.305(Ft.)
Average velocity =   2.385(Ft/s)
Total irregular channel flow =     0.444(CFS)
Irregular channel normal depth above invert elev. =   0.305(Ft.)
Average velocity of channel(s) =   2.385(Ft/s)

Sub-Channel No. 1 Critical depth =      0.314(Ft.)
  '     '       '     Critical flow top width =      1.258(Ft.)
  '     '       '     Critical flow velocity=    2.243(Ft/s)
  '     '       '     Critical flow area =      0.198(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.759(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.489(CFS) for    0.200(Ac.)
Total runoff =      0.655(CFS)  Total area =       0.26(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.260(Ac.)
Runoff from this stream =      0.655(CFS)
Time of concentration =    6.69 min.
Rainfall intensity =     3.759(In/Hr)
Summary of stream data:

Stream   Flow rate      TC           Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        7.091      9.25                 3.292
2        0.655      6.69                 3.759
```

```
Qmax(1) =
           1.000 *    1.000 *     7.091) +
           0.876 *    1.000 *     0.655) + =       7.664
Qmax(2) =
           1.000 *    0.723 *     7.091) +
           1.000 *    1.000 *     0.655) + =       5.784

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.091       0.655
Maximum flow rates at confluence using above data:
        7.664        5.784
Area of streams before confluence:
        3.080        0.260
Results of confluence:
Total flow rate =      7.664(CFS)
Time of concentration =     9.251 min.
Effective stream area after confluence =      3.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   305.000(Ft.)
Downstream point/station elevation =   298.850(Ft.)
Pipe length  =    31.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.664(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.664(CFS)
Normal flow depth in pipe =    5.88(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.03(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     9.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.28 min.
Rainfall intensity =      3.288(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.128(CFS) for    0.060(Ac.)
Total runoff =      7.792(CFS)  Total area =        3.40(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.28 min.
Rainfall intensity =      3.288(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.299(CFS) for    0.140(Ac.)
Total runoff =      8.092(CFS)  Total area =        3.54(Ac.)
End of computations, total study area =          3.540 (Ac.)
```

100 YEAR STORM ANALYSIS

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 09/20/17
------------------------------------------------------------------------
PROPOSED CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 1


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   71.500(Ft.)
Highest elevation =  345.000(Ft.)
Lowest elevation =  315.000(Ft.)
Elevation difference =   30.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.97 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  71.500^.5)/(  41.958^(1/3)]=   1.97
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.171(CFS)
Total initial stream area =        0.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.642(CFS)
Depth of flow =   0.399(Ft.), Average velocity =   2.013(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00               0.50
        2              1.00               0.00
        3              2.00               0.50
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.642(CFS)
  '     '        flow top width =      1.597(Ft.)
  '     '    velocity=    2.013(Ft/s)
  '     '        area =      0.319(Sq.Ft)
  '     '        Froude number =     0.794

Upstream point elevation =   314.000(Ft.)
Downstream point elevation =   313.000(Ft.)
Flow length =   137.000(Ft.)
Travel time  =    1.13 min.
Time of concentration =    6.13 min.
Depth of flow =   0.399(Ft.)
Average velocity =   2.013(Ft/s)
Total irregular channel flow =     0.642(CFS)
Irregular channel normal depth above invert elev. =   0.399(Ft.)
Average velocity of channel(s) =   2.013(Ft/s)

Sub-Channel No. 1 Critical depth =      0.363(Ft.)
  '     '       '     Critical flow top width =      1.453(Ft.)
  '     '       '     Critical flow velocity=    2.432(Ft/s)
  '     '       '     Critical flow area =      0.264(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      4.046(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.868(CFS) for    0.330(Ac.)
Total runoff =      1.039(CFS)  Total area =       0.39(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   310.000(Ft.)
Downstream point/station elevation =   308.500(Ft.)
Pipe length  =   142.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.039(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.039(CFS)
Normal flow depth in pipe =    5.08(In.)
Flow top width inside pipe =    8.92(In.)
Critical Depth =    5.62(In.)
Pipe flow velocity =      4.04(Ft/s)
Travel time through pipe =    0.59 min.
Time of concentration (TC) =     6.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     6.72 min.
Rainfall intensity =      3.906(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
```

```
Subarea runoff =      0.660(CFS) for    0.260(Ac.)
Total runoff =      1.699(CFS)  Total area =        0.65(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   306.500(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.699(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.699(CFS)
Normal flow depth in pipe =    5.45(In.)
Flow top width inside pipe =    8.80(In.)
Critical Depth =    7.18(In.)
Pipe flow velocity =      6.07(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     6.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     6.96 min.
Rainfall intensity =      3.854(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.351(CFS) for    0.140(Ac.)
Total runoff =      2.050(CFS)  Total area =        0.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   306.500(Ft.)
Downstream point/station elevation =   303.700(Ft.)
Pipe length  =   141.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.050(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.050(CFS)
Normal flow depth in pipe =    6.55(In.)
Flow top width inside pipe =    8.01(In.)
Critical Depth =    7.78(In.)
Pipe flow velocity =      5.95(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =     7.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.36 min.
Rainfall intensity =      3.775(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.196(CFS) for    0.080(Ac.)
Total runoff =      2.246(CFS)  Total area =        0.87(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   303.700(Ft.)
Downstream point/station elevation =   301.330(Ft.)
Pipe length  =   265.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.246(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.246(CFS)
Normal flow depth in pipe =    7.16(In.)
Flow top width inside pipe =   11.77(In.)
Critical Depth =    7.70(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    0.96 min.
Time of concentration (TC) =     8.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      306.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     8.32 min.
Rainfall intensity =      3.608(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.188(CFS) for    0.080(Ac.)
Total runoff =      2.434(CFS)  Total area =       0.95(Ac.)
End of computations, total study area =          0.950 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 09/20/17
------------------------------------------------------------------------
PROPOSED CONDITION HYDROLOGY ANALYSIS
9880 CAMPUS POINT DRIVE
ANALYSIS POINT 2


------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   89.000(Ft.)
Highest elevation =  311.500(Ft.)
Lowest elevation =  309.000(Ft.)
Elevation difference =    2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.42 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  89.000^.5)/( 2.809^(1/3)]=   5.42
Rainfall intensity (I) =      4.249(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.193(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      101.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     5.42 min.
Rainfall intensity =      4.249(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.331(CFS) for    0.120(Ac.)
```

```
Total runoff =      0.525(CFS)  Total area =        0.19(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.898(CFS)
Depth of flow =   0.066(Ft.), Average velocity =   1.472(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.75
        2             2.00              0.00
        3            11.00              0.00
        4            13.00              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.898(CFS)
  '     '        flow top width =      9.354(Ft.)
  '     '    velocity=    1.472(Ft/s)
  '     '        area =      0.610(Sq.Ft)
  '     '        Froude number =     1.016

Upstream point elevation =   309.000(Ft.)
Downstream point elevation =   307.500(Ft.)
Flow length =   100.000(Ft.)
Travel time  =    1.13 min.
Time of concentration =    6.55 min.
Depth of flow =   0.066(Ft.)
Average velocity =   1.472(Ft/s)
Total irregular channel flow =     0.898(CFS)
Irregular channel normal depth above invert elev. =   0.066(Ft.)
Average velocity of channel(s) =   1.472(Ft/s)

Sub-Channel No. 1 Critical depth =      0.067(Ft.)
  '     '       '     Critical flow top width =      9.359(Ft.)
  '     '       '     Critical flow velocity=    1.451(Ft/s)
  '     '       '     Critical flow area =      0.619(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.945(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.692(CFS) for    0.270(Ac.)
Total runoff =      1.217(CFS)  Total area =        0.46(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   304.000(Ft.)
Downstream point/station elevation =   303.240(Ft.)
Pipe length  =   169.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.217(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.217(CFS)
Normal flow depth in pipe =    6.06(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    5.58(In.)
Pipe flow velocity =      3.06(Ft/s)
```

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Travel time through pipe =    0.92 min.
Time of concentration (TC) =     7.47 min.


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Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.47 min.
Rainfall intensity =      3.754(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.781(CFS) for    0.320(Ac.)
Total runoff =      1.998(CFS)  Total area =        0.78(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   303.240(Ft.)
Downstream point/station elevation =   302.900(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.998(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.998(CFS)
Normal flow depth in pipe =    7.93(In.)
Flow top width inside pipe =   11.36(In.)
Critical Depth =    7.24(In.)
Pipe flow velocity =      3.62(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     7.77 min.


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Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.77 min.
Rainfall intensity =      3.699(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.337(CFS) for    0.140(Ac.)
Total runoff =      2.335(CFS)  Total area =        0.92(Ac.)


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Process from Point/Station      104.000 to Point/Station      111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   302.900(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    67.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.335(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.335(CFS)
Normal flow depth in pipe =    8.48(In.)
Flow top width inside pipe =   10.92(In.)
Critical Depth =    7.85(In.)
Pipe flow velocity =      3.93(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.05 min.
```

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Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.920(Ac.)
Runoff from this stream =      2.335(CFS)
Time of concentration =    8.05 min.
Rainfall intensity =     3.651(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   51.500(Ft.)
Highest elevation =  309.500(Ft.)
Lowest elevation =  308.500(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.66 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  51.500^.5)/(   1.942^(1/3)]=   4.66
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.200(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.385(CFS)
Depth of flow =   0.222(Ft.), Average velocity =   1.955(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              2.00              0.00
        3              4.00              0.50
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      0.385(CFS)
  '     '        flow top width =      1.776(Ft.)
  '     '    velocity=    1.955(Ft/s)
  '     '        area =      0.197(Sq.Ft)
  '     '        Froude number =     1.034

Upstream point elevation =   308.500(Ft.)
Downstream point elevation =   308.000(Ft.)
Flow length =    37.000(Ft.)
Travel time  =    0.32 min.
Time of concentration =    5.32 min.
Depth of flow =   0.222(Ft.)
Average velocity =   1.955(Ft/s)
Total irregular channel flow =     0.385(CFS)
Irregular channel normal depth above invert elev. =   0.222(Ft.)
Average velocity of channel(s) =   1.955(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.225(Ft.)
  '     '       '     Critical flow top width =      1.797(Ft.)
  '     '       '     Critical flow velocity=    1.909(Ft/s)
  '     '       '     Critical flow area =      0.202(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      4.281(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.362(CFS) for    0.130(Ac.)
Total runoff =      0.561(CFS)  Total area =       0.20(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   306.800(Ft.)
Downstream point/station elevation =   306.250(Ft.)
Pipe length  =    57.80(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.561(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.561(CFS)
Normal flow depth in pipe =    3.66(In.)
Flow top width inside pipe =    8.84(In.)
Critical Depth =    4.07(In.)
Pipe flow velocity =      3.32(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     5.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     5.61 min.
Rainfall intensity =      4.191(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.354(CFS) for    0.130(Ac.)
Total runoff =      0.916(CFS)  Total area =       0.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.165(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   0.895(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00             0.75
        2             0.10             0.00
        3             6.00             0.00
        4             6.10             0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      1.165(CFS)
  '     '        flow top width =      5.959(Ft.)
  '     '    velocity=    0.895(Ft/s)
```

```
  '     '        area =      1.302(Sq.Ft)
  '     '        Froude number =     0.338

Upstream point elevation =   306.250(Ft.)
Downstream point elevation =   306.220(Ft.)
Flow length =    25.000(Ft.)
Travel time  =    0.47 min.
Time of concentration =    6.07 min.
Depth of flow =   0.220(Ft.)
Average velocity =   0.895(Ft/s)
Total irregular channel flow =     1.165(CFS)
Irregular channel normal depth above invert elev. =   0.220(Ft.)
Average velocity of channel(s) =   0.895(Ft/s)

Sub-Channel No. 1 Critical depth =      0.106(Ft.)
  '     '       '     Critical flow top width =      5.928(Ft.)
  '     '       '     Critical flow velocity=    1.851(Ft/s)
  '     '       '     Critical flow area =      0.630(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      4.062(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.475(CFS) for    0.180(Ac.)
Total runoff =      1.391(CFS)  Total area =        0.51(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.745(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   1.004(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1             0.00              0.75
        2             0.10              0.00
        3             6.00              0.00
        4             6.10              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      1.745(CFS)
  '     '        flow top width =      5.978(Ft.)
  '     '    velocity=    1.004(Ft/s)
  '     '        area =      1.738(Sq.Ft)
  '     '        Froude number =     0.328

Upstream point elevation =   306.220(Ft.)
Downstream point elevation =   306.110(Ft.)
Flow length =   104.000(Ft.)
Travel time  =    1.73 min.
Time of concentration =    7.80 min.
Depth of flow =   0.293(Ft.)
Average velocity =   1.004(Ft/s)
Total irregular channel flow =     1.745(CFS)
Irregular channel normal depth above invert elev. =   0.293(Ft.)
Average velocity of channel(s) =   1.004(Ft/s)

Sub-Channel No. 1 Critical depth =      0.139(Ft.)
  '     '       '     Critical flow top width =      5.937(Ft.)
  '     '       '     Critical flow velocity=    2.127(Ft/s)
```

```
  '     '       '     Critical flow area =      0.821(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.695(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.624(CFS) for    0.260(Ac.)
Total runoff =      2.015(CFS)  Total area =        0.77(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      110.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     7.80 min.
Rainfall intensity =      3.695(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.264(CFS) for    0.110(Ac.)
Total runoff =      2.279(CFS)  Total area =        0.88(Ac.)


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Process from Point/Station      110.000 to Point/Station      111.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.759(CFS)
Depth of flow =   0.363(Ft.), Average velocity =   1.277(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.75
        2              0.10              0.00
        3              6.00              0.00
        4              6.10              0.75
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =      2.759(CFS)
  '     '        flow top width =      5.997(Ft.)
  '     '    velocity=    1.277(Ft/s)
  '     '        area =      2.161(Sq.Ft)
  '     '        Froude number =     0.375

Upstream point elevation =   306.110(Ft.)
Downstream point elevation =   306.000(Ft.)
Flow length =    83.500(Ft.)
Travel time  =    1.09 min.
Time of concentration =    8.89 min.
Depth of flow =   0.363(Ft.)
Average velocity =   1.277(Ft/s)
Total irregular channel flow =     2.759(CFS)
Irregular channel normal depth above invert elev. =   0.363(Ft.)
Average velocity of channel(s) =   1.277(Ft/s)

Sub-Channel No. 1 Critical depth =      0.189(Ft.)
  '     '       '     Critical flow top width =      5.951(Ft.)
  '     '       '     Critical flow velocity=    2.457(Ft/s)
  '     '       '     Critical flow area =      1.123(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.522(In/Hr) for a   100.0 year storm
```

Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff = 0.847(CFS) for 0.370(Ac.)
Total runoff = 3.126(CFS) Total area = 1.25(Ac.)

++
Process from Point/Station 111.000 to Point/Station 111.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 1.250(Ac.)
Runoff from this stream = 3.126(CFS)
Time of concentration = 8.89 min.
Rainfall intensity = 3.522(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.335	8.05	3.651
2	3.126	8.89	3.522

Qmax(1) =
1.000 * 1.000 * 2.335) +
1.000 * 0.906 * 3.126) + = 5.168
Qmax(2) =
0.965 * 1.000 * 2.335) +
1.000 * 1.000 * 3.126) + = 5.378

Total of 2 streams to confluence:
Flow rates before confluence point:
2.335 3.126
Maximum flow rates at confluence using above data:
5.168 5.378
Area of streams before confluence:
0.920 1.250
Results of confluence:
Total flow rate = 5.378(CFS)
Time of concentration = 8.887 min.
Effective stream area after confluence = 2.170(Ac.)

++
Process from Point/Station 111.000 to Point/Station 112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 302.500(Ft.)
Downstream point/station elevation = 302.100(Ft.)
Pipe length = 82.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.378(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 5.378(CFS)
Normal flow depth in pipe = 11.45(In.)
Flow top width inside pipe = 17.32(In.)
Critical Depth = 10.73(In.)
Pipe flow velocity = 4.54(Ft/s)
Travel time through pipe = 0.30 min.
Time of concentration (TC) = 9.19 min.

++
Process from Point/Station 112.000 to Point/Station 112.000
**** SUBAREA FLOW ADDITION ****

```
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.19 min.
Rainfall intensity =      3.479(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      1.040(CFS) for    0.460(Ac.)
Total runoff =      6.419(CFS)  Total area =        2.63(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.19 min.
Rainfall intensity =      3.479(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.294(CFS) for    0.130(Ac.)
Total runoff =      6.713(CFS)  Total area =        2.76(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.19 min.
Rainfall intensity =      3.479(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.724(CFS) for    0.320(Ac.)
Total runoff =      7.436(CFS)  Total area =        3.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.080(Ac.)
Runoff from this stream =      7.436(CFS)
Time of concentration =    9.19 min.
Rainfall intensity =     3.479(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Initial subarea flow distance  =   35.000(Ft.)
Highest elevation =  326.000(Ft.)
Lowest elevation =  313.000(Ft.)
Elevation difference =   13.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.44 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6500)*(  35.000^.5)/(  37.143^(1/3)]=   1.44
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.650
Subarea runoff =      0.171(CFS)
Total initial stream area =        0.060(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.456(CFS)
Depth of flow =   0.308(Ft.), Average velocity =   2.402(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2              1.00              0.00
        3              2.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.456(CFS)
  '     '        flow top width =      1.233(Ft.)
  '     '    velocity=    2.402(Ft/s)
  '     '        area =      0.190(Sq.Ft)
  '     '        Froude number =     1.078

Upstream point elevation =   312.000(Ft.)
Downstream point elevation =   310.500(Ft.)
Flow length =   242.000(Ft.)
Travel time  =    1.68 min.
Time of concentration =    6.68 min.
Depth of flow =   0.308(Ft.)
Average velocity =   2.402(Ft/s)
Total irregular channel flow =     0.456(CFS)
Irregular channel normal depth above invert elev. =   0.308(Ft.)
Average velocity of channel(s) =   2.402(Ft/s)

Sub-Channel No. 1 Critical depth =      0.318(Ft.)
  '     '       '     Critical flow top width =      1.273(Ft.)
  '     '       '     Critical flow velocity=    2.252(Ft/s)
  '     '       '     Critical flow area =      0.203(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.650 given for subarea
Rainfall intensity =      3.915(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.509(CFS) for    0.200(Ac.)
Total runoff =      0.680(CFS)  Total area =        0.26(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.260(Ac.)
Runoff from this stream =      0.680(CFS)
Time of concentration =    6.68 min.
Rainfall intensity =     3.915(In/Hr)
Summary of stream data:

Stream   Flow rate      TC           Rainfall Intensity
 No.       (CFS)      (min)                 (In/Hr)


1        7.436      9.19                 3.479
2        0.680      6.68                 3.915
```

```
Qmax(1) =
           1.000 *    1.000 *     7.436) +
           0.889 *    1.000 *     0.680) + =       8.041
Qmax(2) =
           1.000 *    0.727 *     7.436) +
           1.000 *    1.000 *     0.680) + =       6.086

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.436       0.680
Maximum flow rates at confluence using above data:
        8.041        6.086
Area of streams before confluence:
        3.080        0.260
Results of confluence:
Total flow rate =      8.041(CFS)
Time of concentration =     9.188 min.
Effective stream area after confluence =      3.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   305.000(Ft.)
Downstream point/station elevation =   298.850(Ft.)
Pipe length  =    31.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.041(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.041(CFS)
Normal flow depth in pipe =    6.05(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.27(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     9.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.21 min.
Rainfall intensity =      3.476(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.136(CFS) for    0.060(Ac.)
Total runoff =      8.176(CFS)  Total area =       3.40(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.650 given for subarea
Time of concentration =     9.21 min.
Rainfall intensity =      3.476(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.650
Subarea runoff =      0.316(CFS) for    0.140(Ac.)
Total runoff =      8.492(CFS)  Total area =       3.54(Ac.)
End of computations, total study area =          3.540 (Ac.)
```

Channel Report

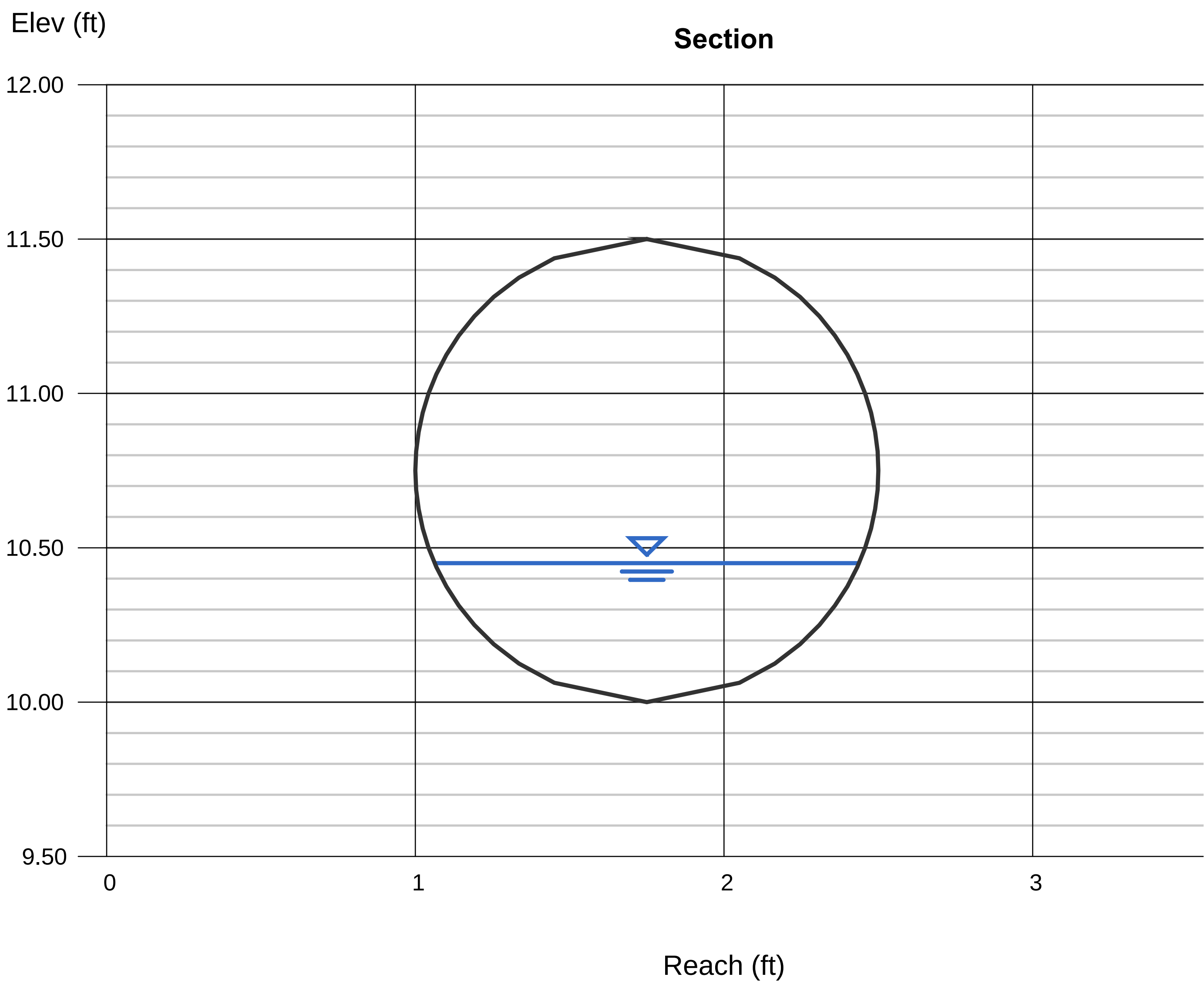
Exist 18 inch outlet_NE 50 yr

Circular
Diameter (ft) = 1.50

Invert Elev (ft) = 10.00
Slope (%) = 21.00
N-Value = 0.013

Calculations
Compute by: Known Q
Known Q (cfs) = 9.42

Highlighted
Depth (ft) = 0.45
Q (cfs) = 9.420
Area (sqft) = 0.45
Velocity (ft/s) = 21.09
Wetted Perim (ft) = 1.74
Crit Depth, Yc (ft) = 1.19
Top Width (ft) = 1.38
EGL (ft) = 7.37

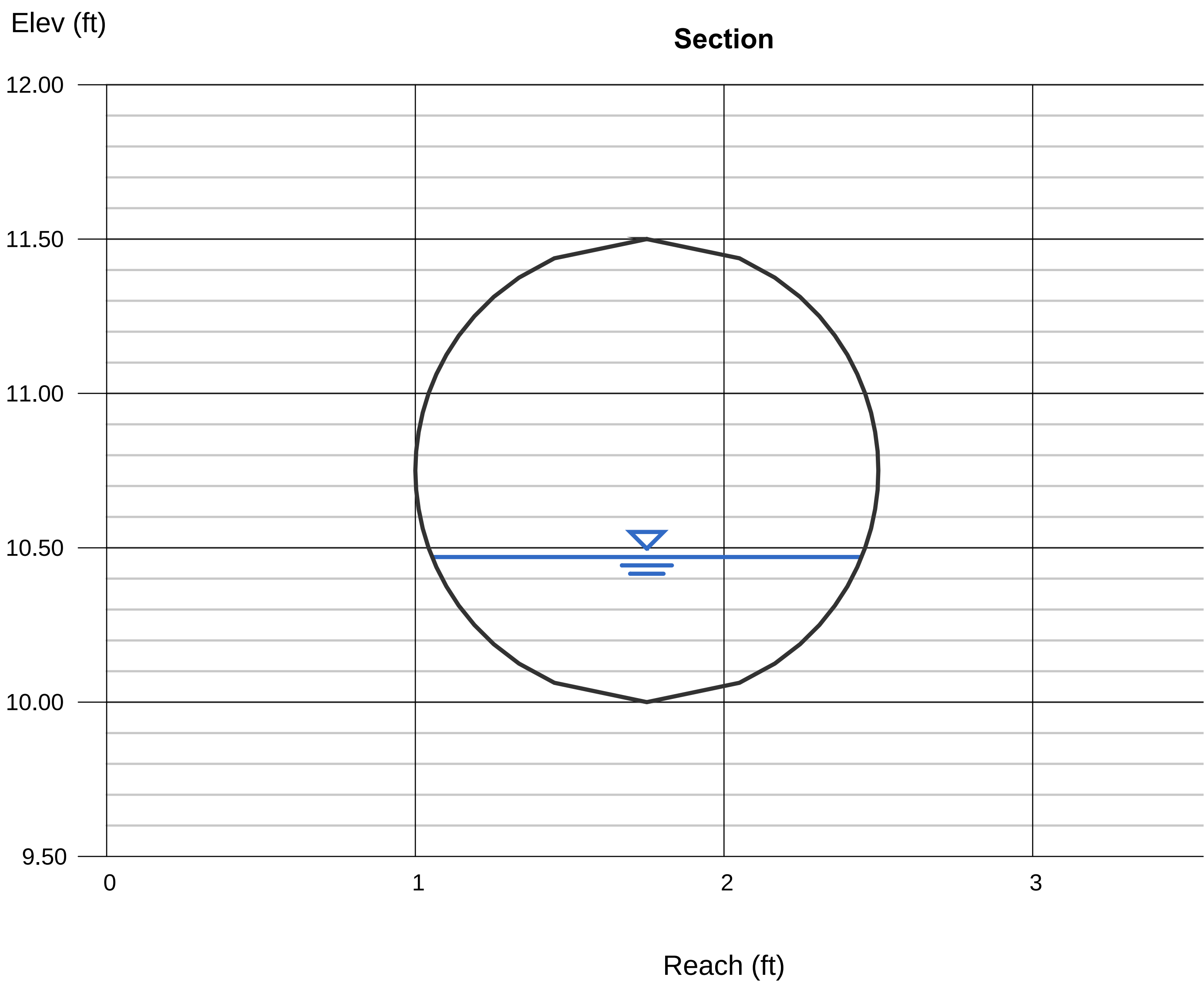


Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Sep 20 2017

Exist 18 inch outlet_NE **100 yr**

Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 0.47
		Q (cfs)	= 9.920
		Area (sqft)	= 0.48
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 20.87
Slope (%)	= 21.00	Wetted Perim (ft)	= 1.78
N-Value	= 0.013	Crit Depth, Yc (ft)	= 1.22
		Top Width (ft)	= 1.39
Calculations		EGL (ft)	= 7.24
Compute by:	Known Q		
Known Q (cfs)	= 9.92		



Channel Report

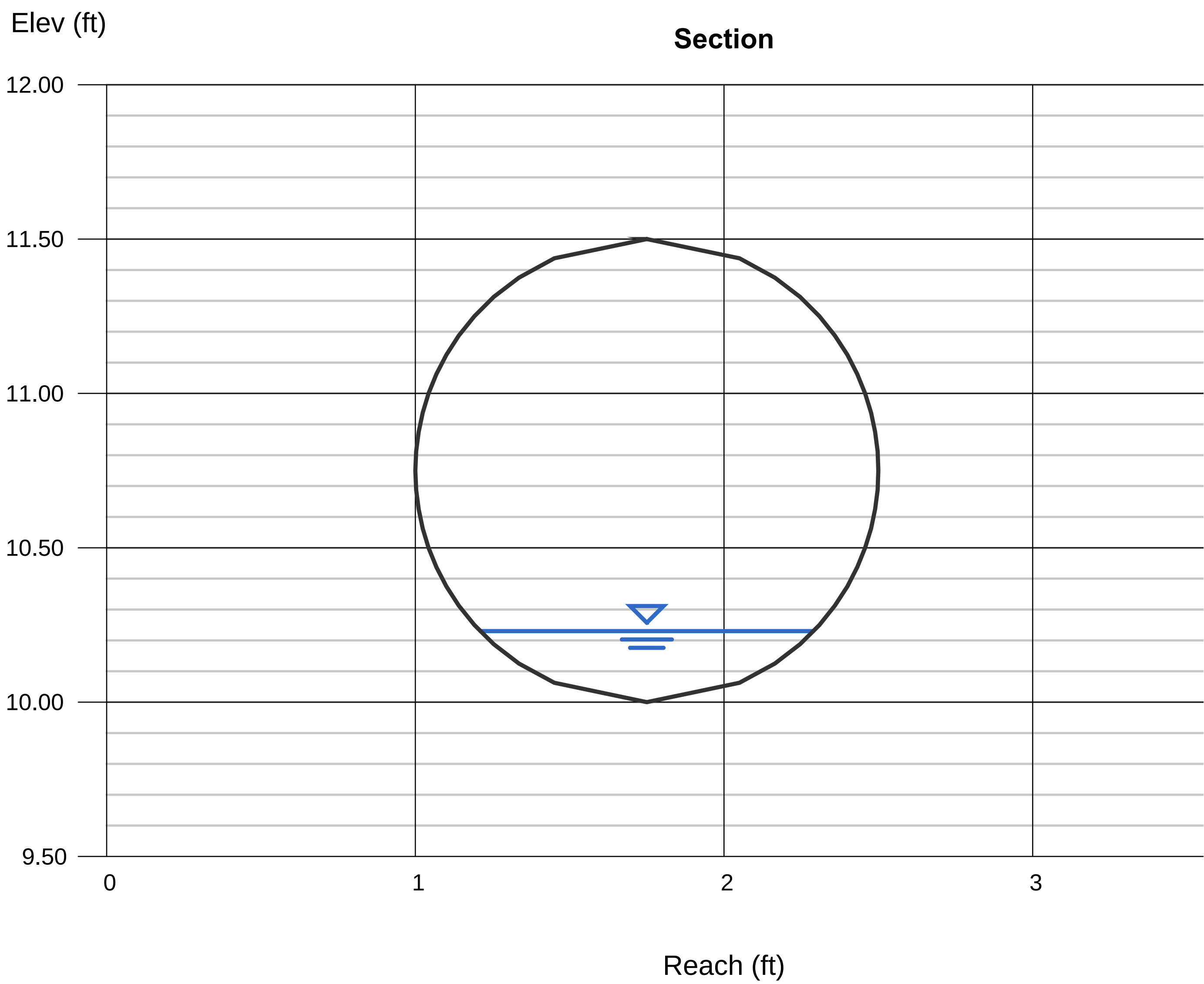
18 inch outlet_NE-Prop 50 YR

Circular
Diameter (ft) = 1.50

Invert Elev (ft) = 10.00
Slope (%) = 21.00
N-Value = 0.013

Calculations
Compute by: Known Q
Known Q (cfs) = 2.34

Highlighted
Depth (ft) = 0.23
Q (cfs) = 2.340
Area (sqft) = 0.17
Velocity (ft/s) = 13.62
Wetted Perim (ft) = 1.21
Crit Depth, Yc (ft) = 0.58
Top Width (ft) = 1.08
EGL (ft) = 3.12

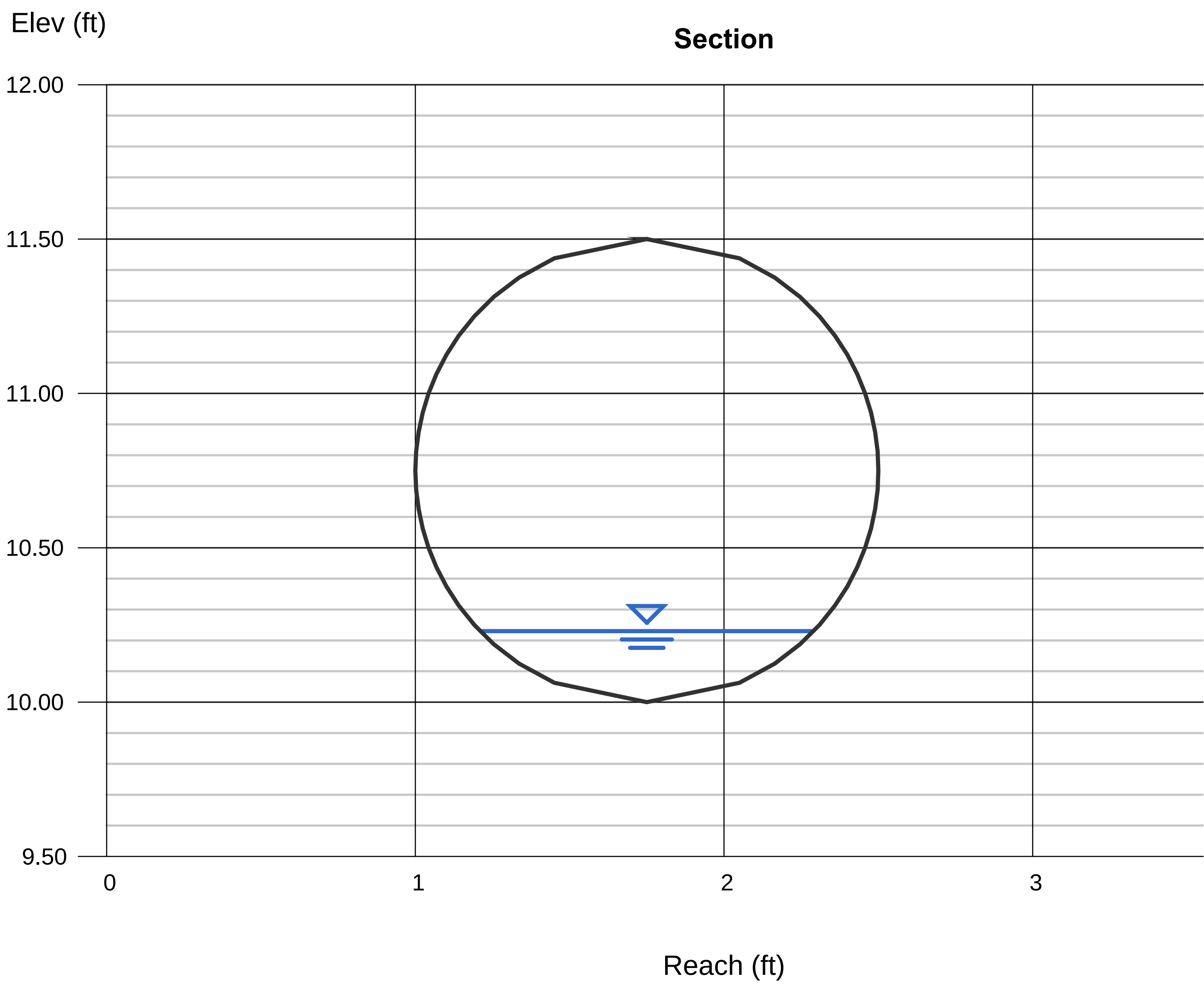


Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Sep 21 2017

18 inch outlet_NE-Prop 100 yr

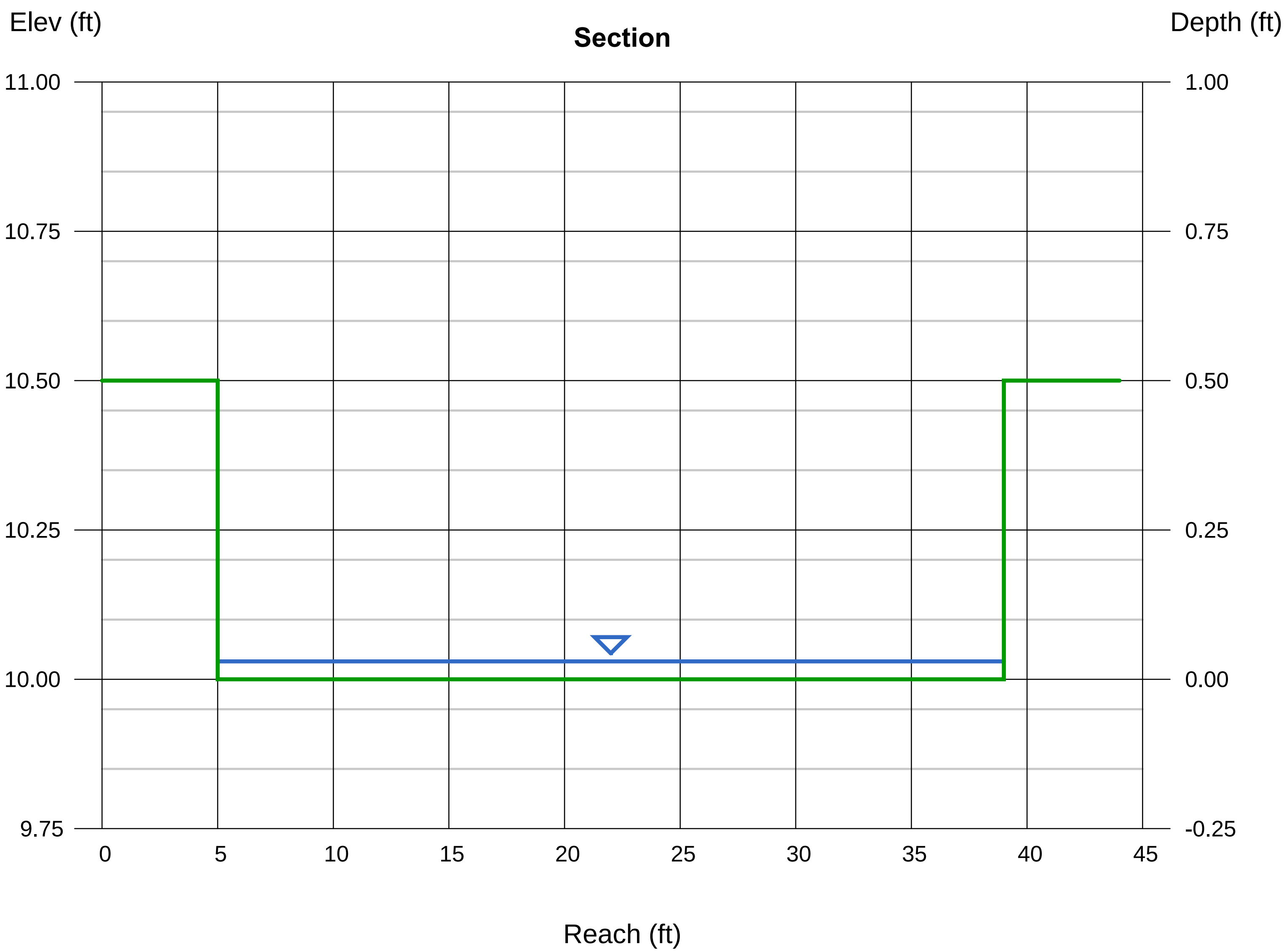
Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 0.23
		Q (cfs)	= 2.440
		Area (sqft)	= 0.17
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 14.20
Slope (%)	= 21.00	Wetted Perim (ft)	= 1.21
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.59
		Top Width (ft)	= 1.08
Calculations		EGL (ft)	= 3.37
Compute by:	Known Q		
Known Q (cfs)	= 2.44		



Channel Report

Driveway - 50 yr

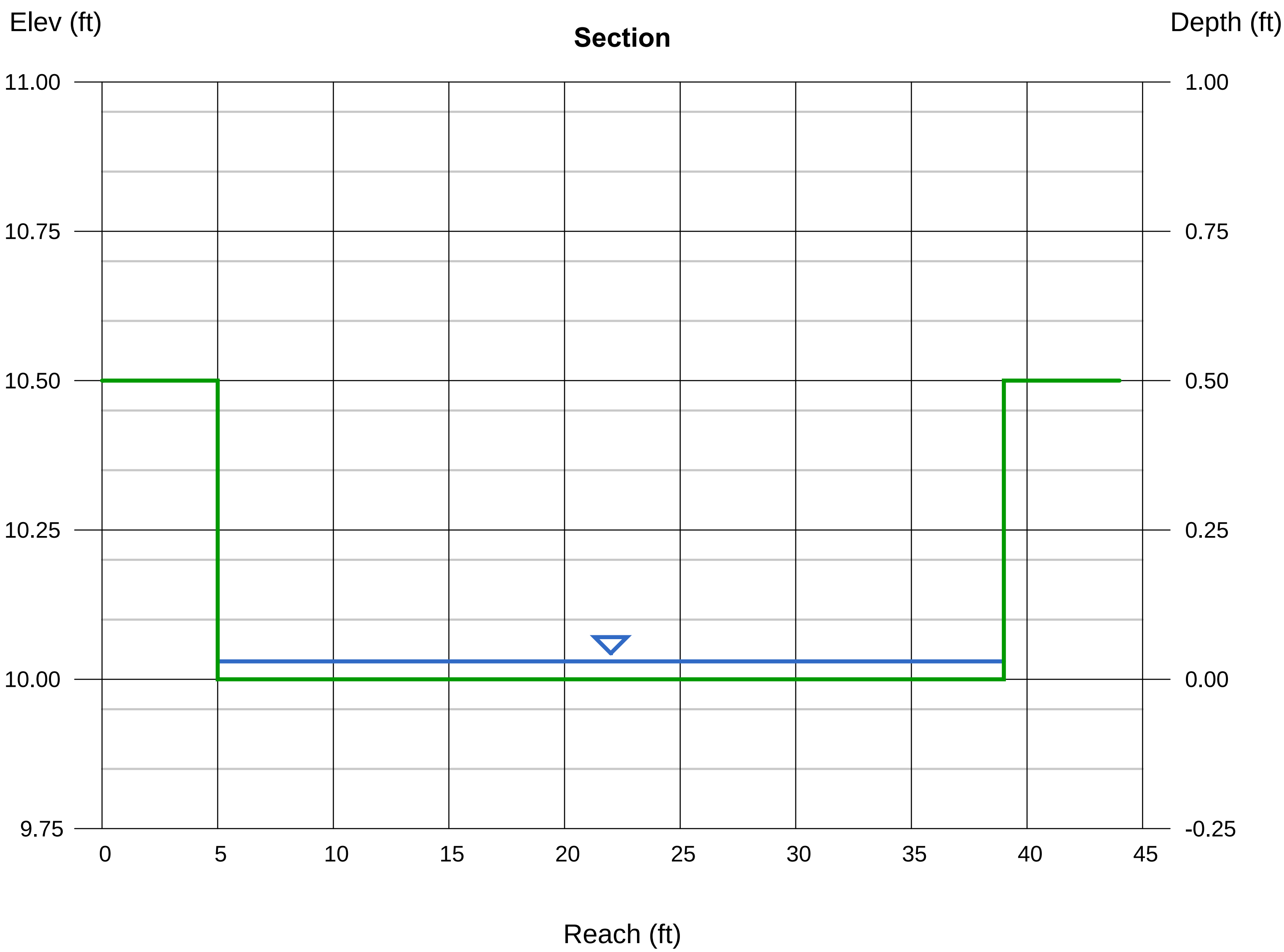
Rectangular		**Highlighted**	
Bottom Width (ft)	= 34.00	Depth (ft)	= 0.03
Total Depth (ft)	= 0.50	Q (cfs)	= 1.970
		Area (sqft)	= 1.02
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 1.93
Slope (%)	= 8.90	Wetted Perim (ft)	= 34.06
N-Value	= 0.016	Crit Depth, Yc (ft)	= 0.05
		Top Width (ft)	= 34.00
Calculations		EGL (ft)	= 0.09
Compute by:	Known Q		
Known Q (cfs)	= 1.97		



Channel Report

Driveway - 100 yr

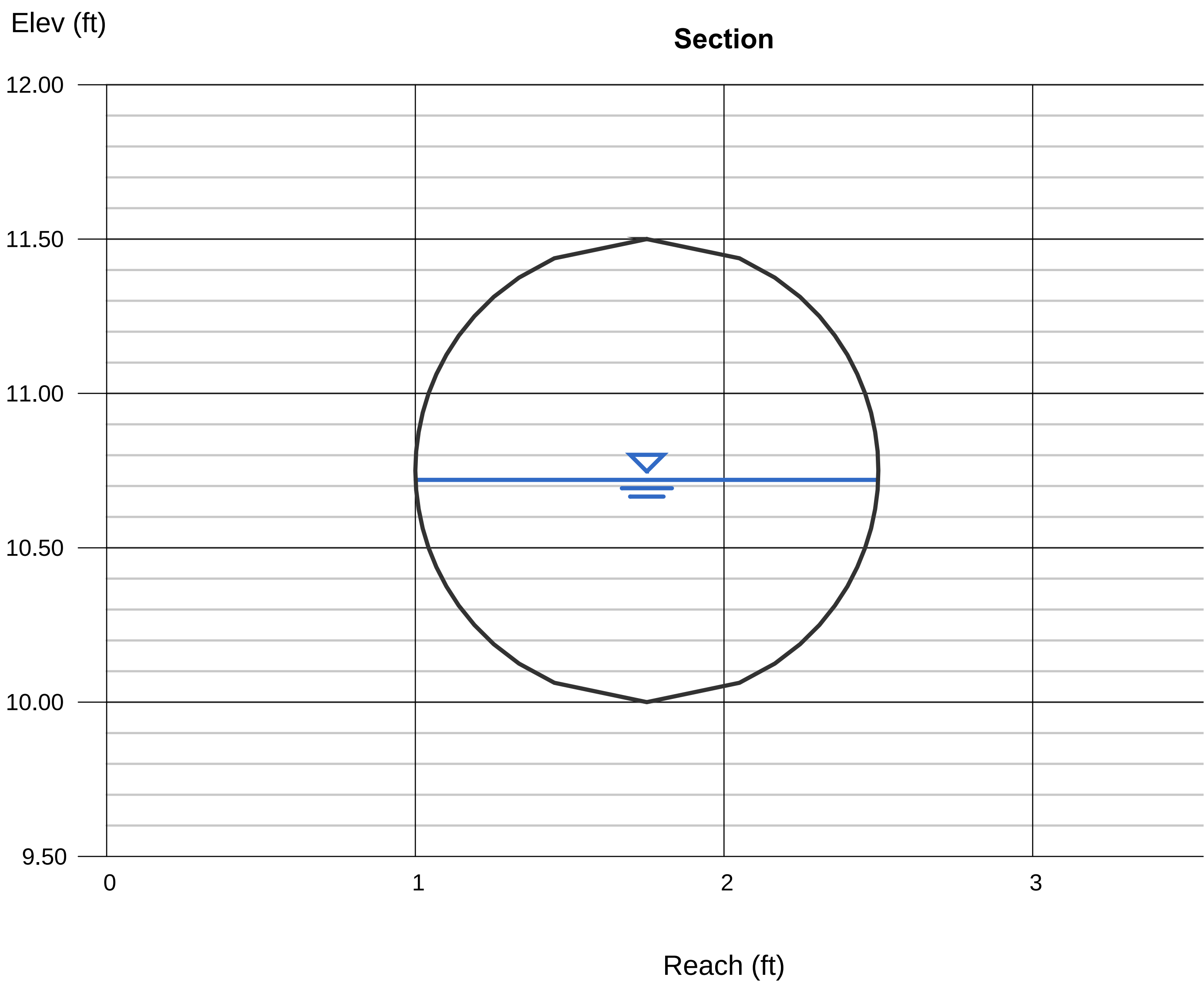
Rectangular		**Highlighted**	
Bottom Width (ft)	= 34.00	Depth (ft)	= 0.03
Total Depth (ft)	= 0.50	Q (cfs)	= 2.060
		Area (sqft)	= 1.02
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 2.02
Slope (%)	= 8.90	Wetted Perim (ft)	= 34.06
N-Value	= 0.016	Crit Depth, Yc (ft)	= 0.05
		Top Width (ft)	= 34.00
Calculations		EGL (ft)	= 0.09
Compute by:	Known Q		
Known Q (cfs)	= 2.06		



Channel Report

New 18 inch outlet_SE **50 yr**

Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 0.72
		Q (cfs)	= 8.100
		Area (sqft)	= 0.84
Invert Elev (ft)	= 10.00	Velocity (ft/s)	= 9.60
Slope (%)	= 2.75	Wetted Perim (ft)	= 2.30
N-Value	= 0.013	Crit Depth, Yc (ft)	= 1.11
		Top Width (ft)	= 1.50
Calculations		EGL (ft)	= 2.15
Compute by:	Known Q		
Known Q (cfs)	= 8.10		



Channel Report

New 18 inch outlet_SE **100 yr**

Circular

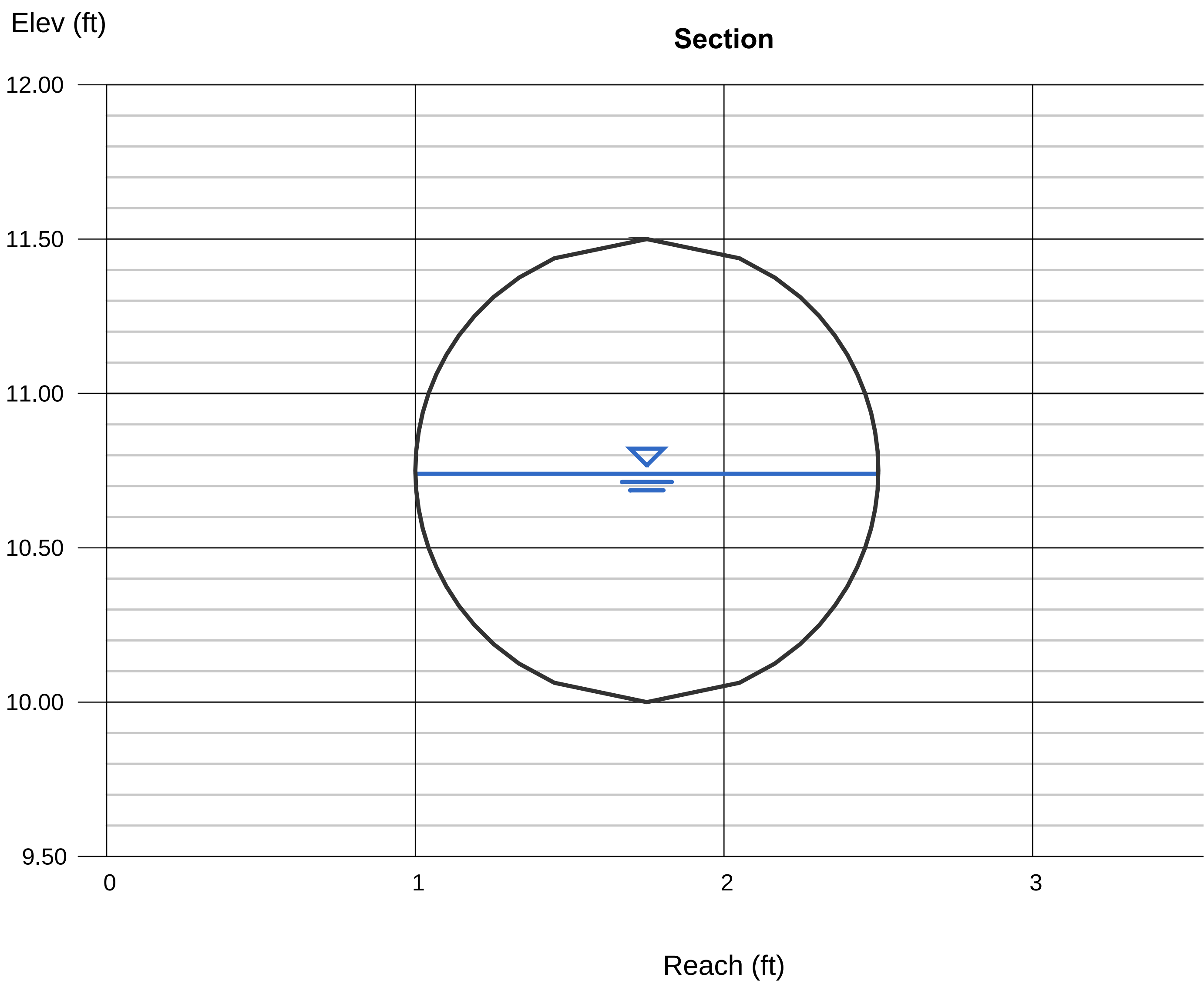
Diameter (ft)	= 1.50
Invert Elev (ft)	= 10.00
Slope (%)	= 2.75
N-Value	= 0.013

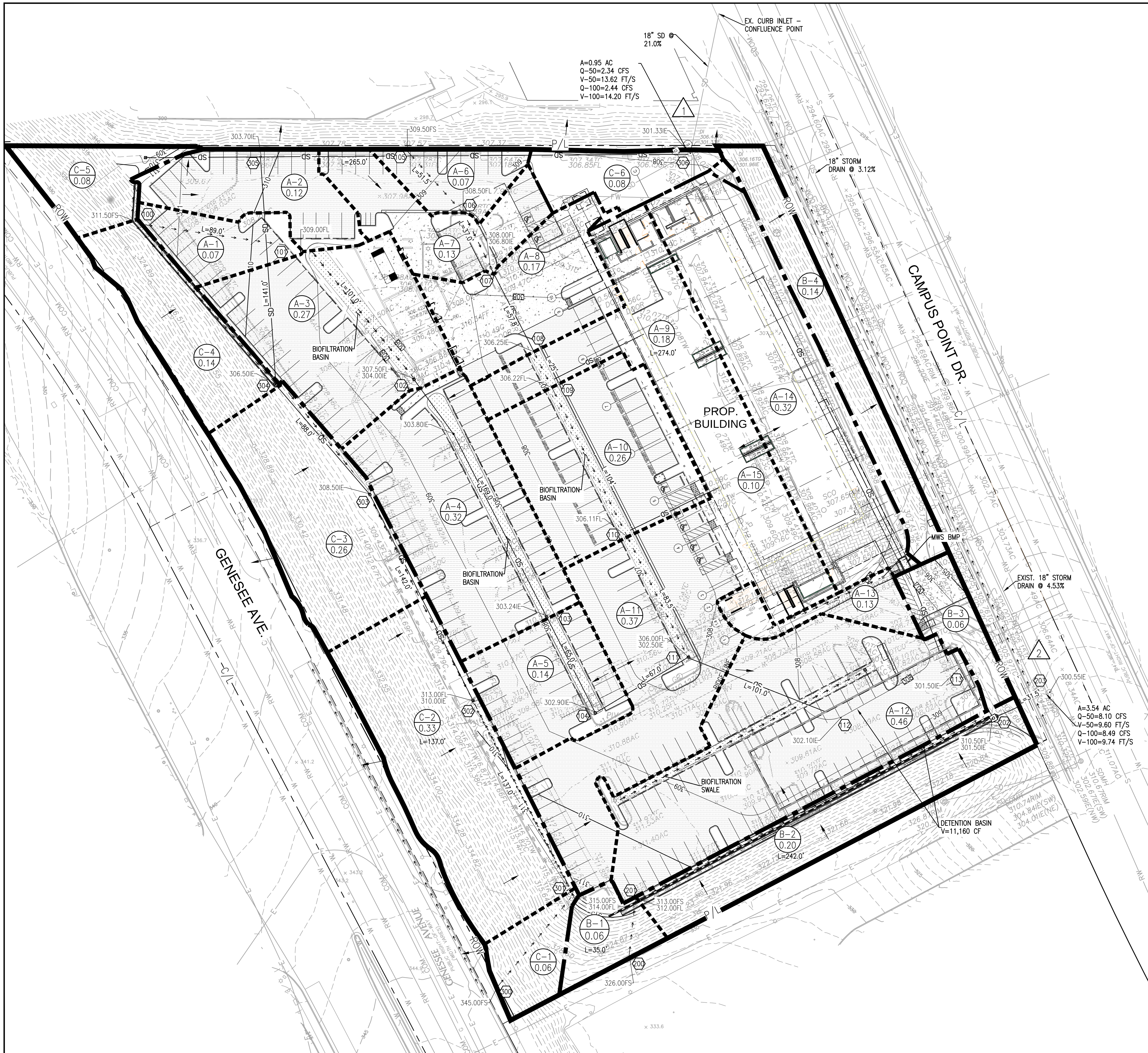
Calculations

Compute by:	Known Q
Known Q (cfs)	= 8.49

Highlighted

Depth (ft)	= 0.74
Q (cfs)	= 8.490
Area (sqft)	= 0.87
Velocity (ft/s)	= 9.74
Wetted Perim (ft)	= 2.34
Crit Depth, Yc (ft)	= 1.13
Top Width (ft)	= 1.50
EGL (ft)	= 2.22





LEGEND

LEGEND	SYMBOL
OUTER BASIN BOUNDARY	
MAJOR BASIN BOUNDARY	
MINOR BASIN BOUNDARY	
EXISTING STORM DRAIN	SD
NEW STORM DRAIN	SD
EXISTING CONTOUR	XXX
NEW CONTOUR	XXX
FLOW DIRECTION	
FLOW PATH	
FLOW LENGTH	L=XXX.X'
NODE/CONTOUR ELEVATION	306.43TG / 301.33IE
HYDROLOGY NODE	200
ANALYSIS/EXIT POINT	1
DRAINAGE BASIN MARKER & AREA (AC)	B–X / X.XX

PEAK FLOW RATE SUMMARY

	Drainage Area (acres)		50 Yr Flow (cfs)			% Change from Existing Condition	100 Yr Flow (cfs)	
	Existing Condition	Proposed Condition	Existing Condition	Proposed Condition	Mitigated Condition		Existing Condition	Proposed Condition
Analysis/Exit Point 1	3.77	0.95	9.42	2.34	2.34	-75.2	9.92	2.44
Analysis/Exit Point 2	0.72	3.54	1.97	8.10	5.45	176.6	2.06	8.49
Total	4.49	4.49	11.39	10.44	7.79	-31.6	11.98	10.93

15 0 30 60
SCALE IN FEET
1 inch = 30 ft.

BWE
WWW.BWESD.COM
619.299.5550

SYM	DESCRIPTION	DATE	APPR

ISSUE DATE:
DRAWN BY:
CHECKED BY:
BWE JOB NUMBER:
CLIENT JOB NUMBER:
MUNICIPALITY PROJECT NUMBER:

SHEET TITLE
HYDROLOGY EXHIBIT PROPOSED CONDITION

SHEET 1 OF 1

PROJECT
9880 CAMPUS POINT DRIVE

SITE ADDRESS
9880 CAMPUS POINT DRIVE
SAN DIEGO, CA 92093

OFFSITE HYDROLOGY ANALYSIS

Ex. 18" Pipe Analysis - Campus Point Dr.


```
                    San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 07/28/17
------------------------------------------------------------------------
Offsite Hydrology Analysis




------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6116

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =  100.000(Ft.)
Lowest elevation =   98.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.57 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 100.000^.5)/(   2.000^(1/3)]=   3.57
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.725(CFS)
Total initial stream area =        0.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    95.000(Ft.)
Downstream point/station elevation =    88.000(Ft.)
```

```
Pipe length  =   300.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.725(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.725(CFS)
Normal flow depth in pipe =    4.23(In.)
Flow top width inside pipe =    5.47(In.)
Critical Depth =    5.13(In.)
Pipe flow velocity =      4.90(Ft/s)
Travel time through pipe =    1.02 min.
Time of concentration (TC) =     6.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration =     6.02 min.
Rainfall intensity =      3.932(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      7.185(CFS) for    2.150(Ac.)
Total runoff =      7.910(CFS)  Total area =        2.35(Ac.)
End of computations, total study area =           2.350 (Ac.)
```

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 31 2017

MAX Q OF 18" PIPE @ 3.12%

Ex. 18 in. Pipe - Campus Point Dr.

Circular
Diameter (ft) = 1.50

Invert Elev (ft) = 1.00
Slope (%) = 3.12
N-Value = 0.013

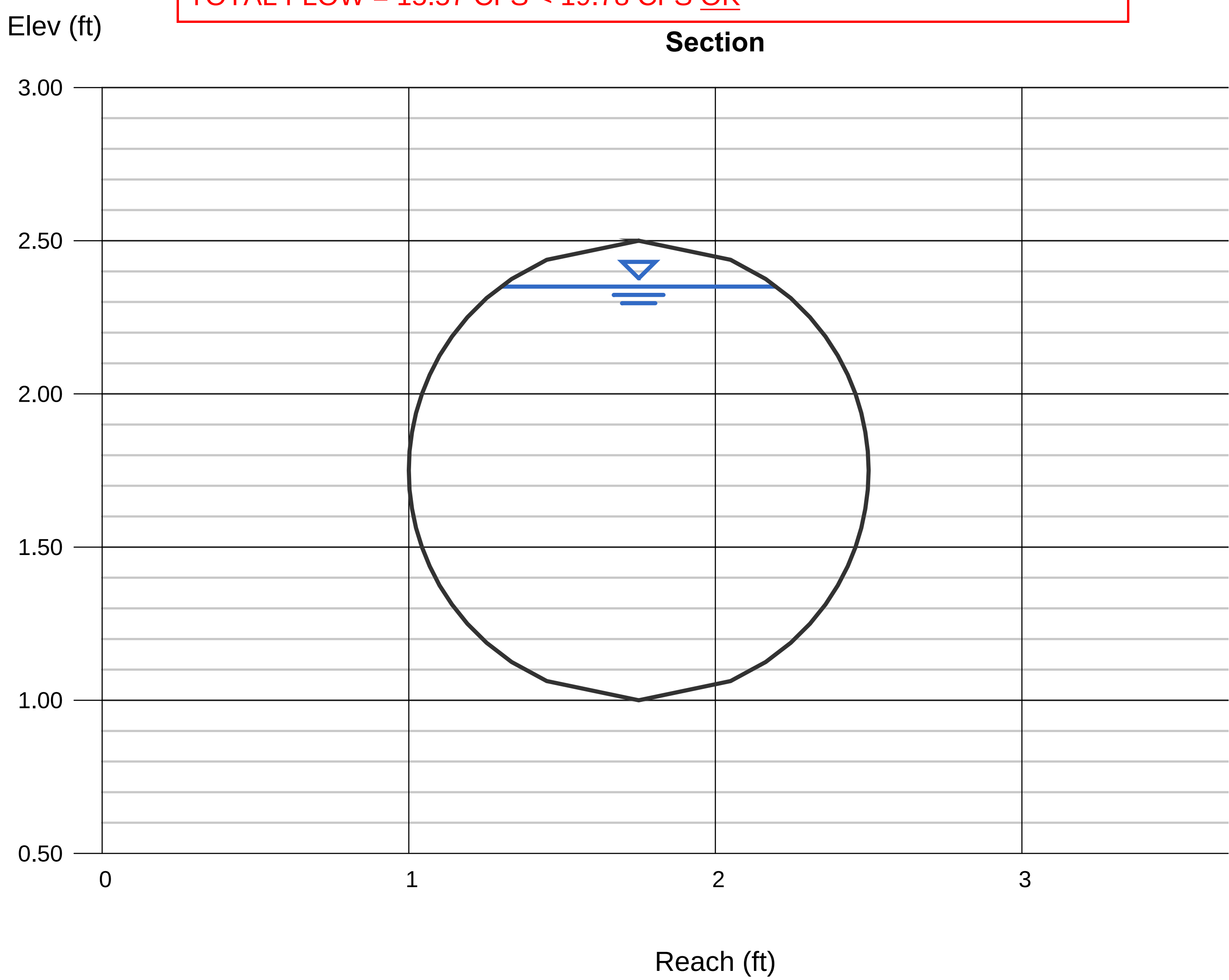
Calculations
Compute by: Q vs Depth
No. Increments = 10

Highlighted
Depth (ft) = 1.35
Q (cfs) = 19.78
Area (sqft) = 1.68
Velocity (ft/s) = 11.80
Wetted Perim (ft) = 3.75
Crit Depth, Yc (ft) = 1.47
Top Width (ft) = 0.90
EGL (ft) = 3.51

SLOPE OF LIMITING SEGMENT PER 18216-3-D

EX. Q THROUGH EX. 18" PIPE = 7.91 CFS (PRELIMINARY)
ADDITIONAL Q THROUGH EX. 18" PIPE = 7.66 CFS

TOTAL FLOW = 15.57 CFS < 19.78 CFS OK



APPENDIX D

Detention Analysis

RATIONAL METHOD HYDROGRAPH PROGRAM

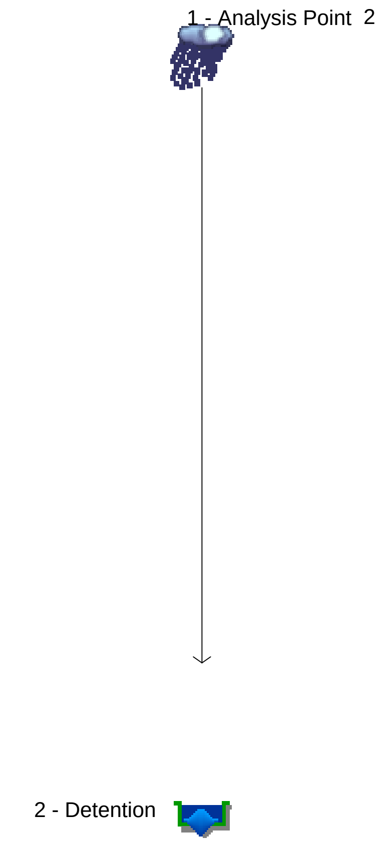
50 yr Detention Analysis

RUN DATE 7/28/2017
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 3.08 ACRES
RUNOFF COEFFICIENT 0.65
PEAK DISCHARGE 7.1 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 0.3
TIME (MIN) = 27	DISCHARGE (CFS) = 0.3
TIME (MIN) = 36	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 54	DISCHARGE (CFS) = 0.3
TIME (MIN) = 63	DISCHARGE (CFS) = 0.3
TIME (MIN) = 72	DISCHARGE (CFS) = 0.3
TIME (MIN) = 81	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.3
TIME (MIN) = 99	DISCHARGE (CFS) = 0.3
TIME (MIN) = 108	DISCHARGE (CFS) = 0.4
TIME (MIN) = 117	DISCHARGE (CFS) = 0.4
TIME (MIN) = 126	DISCHARGE (CFS) = 0.4
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 144	DISCHARGE (CFS) = 0.4
TIME (MIN) = 153	DISCHARGE (CFS) = 0.4
TIME (MIN) = 162	DISCHARGE (CFS) = 0.5
TIME (MIN) = 171	DISCHARGE (CFS) = 0.5
TIME (MIN) = 180	DISCHARGE (CFS) = 0.6
TIME (MIN) = 189	DISCHARGE (CFS) = 0.6
TIME (MIN) = 198	DISCHARGE (CFS) = 0.7
TIME (MIN) = 207	DISCHARGE (CFS) = 0.7
TIME (MIN) = 216	DISCHARGE (CFS) = 0.9
TIME (MIN) = 225	DISCHARGE (CFS) = 1
TIME (MIN) = 234	DISCHARGE (CFS) = 1.5
TIME (MIN) = 243	DISCHARGE (CFS) = 2.6
TIME (MIN) = 252	DISCHARGE (CFS) = 7.1
TIME (MIN) = 261	DISCHARGE (CFS) = 1.2
TIME (MIN) = 270	DISCHARGE (CFS) = 0.8
TIME (MIN) = 279	DISCHARGE (CFS) = 0.6
TIME (MIN) = 288	DISCHARGE (CFS) = 0.5
TIME (MIN) = 297	DISCHARGE (CFS) = 0.5
TIME (MIN) = 306	DISCHARGE (CFS) = 0.4
TIME (MIN) = 315	DISCHARGE (CFS) = 0.4
TIME (MIN) = 324	DISCHARGE (CFS) = 0.3
TIME (MIN) = 333	DISCHARGE (CFS) = 0.3
TIME (MIN) = 342	DISCHARGE (CFS) = 0.3
TIME (MIN) = 351	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 369	DISCHARGE (CFS) = 0

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Project: Det-1 YR 50.gpw	Friday, 07 / 28 / 2017

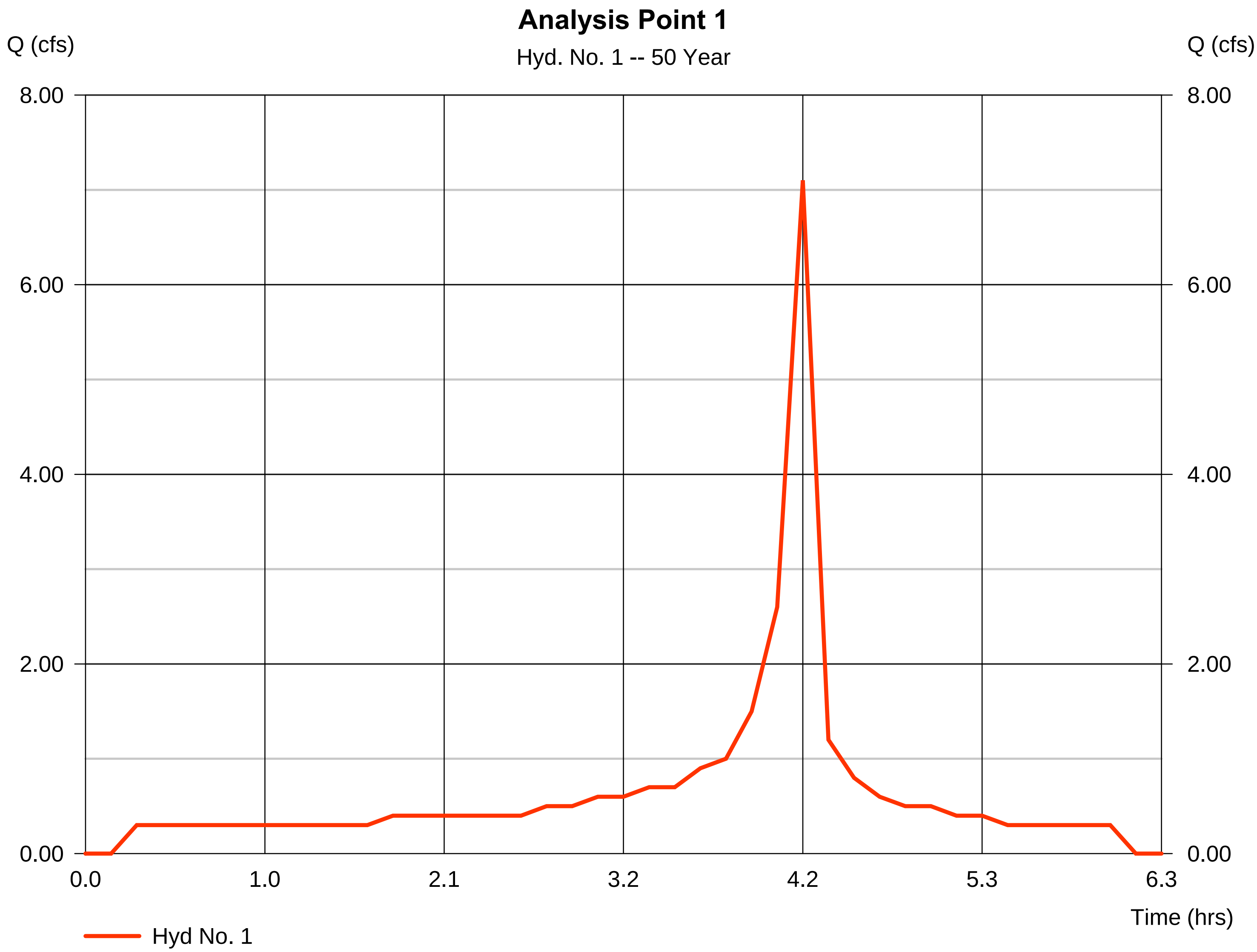
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 07 / 28 / 2017

Hyd. No. 1

Analysis Point 1

Hydrograph type	= Manual	Peak discharge	= 7.100 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.20 hrs
Time interval	= 9 min	Hyd. volume	= 15,120 cuft



Hydrograph Report

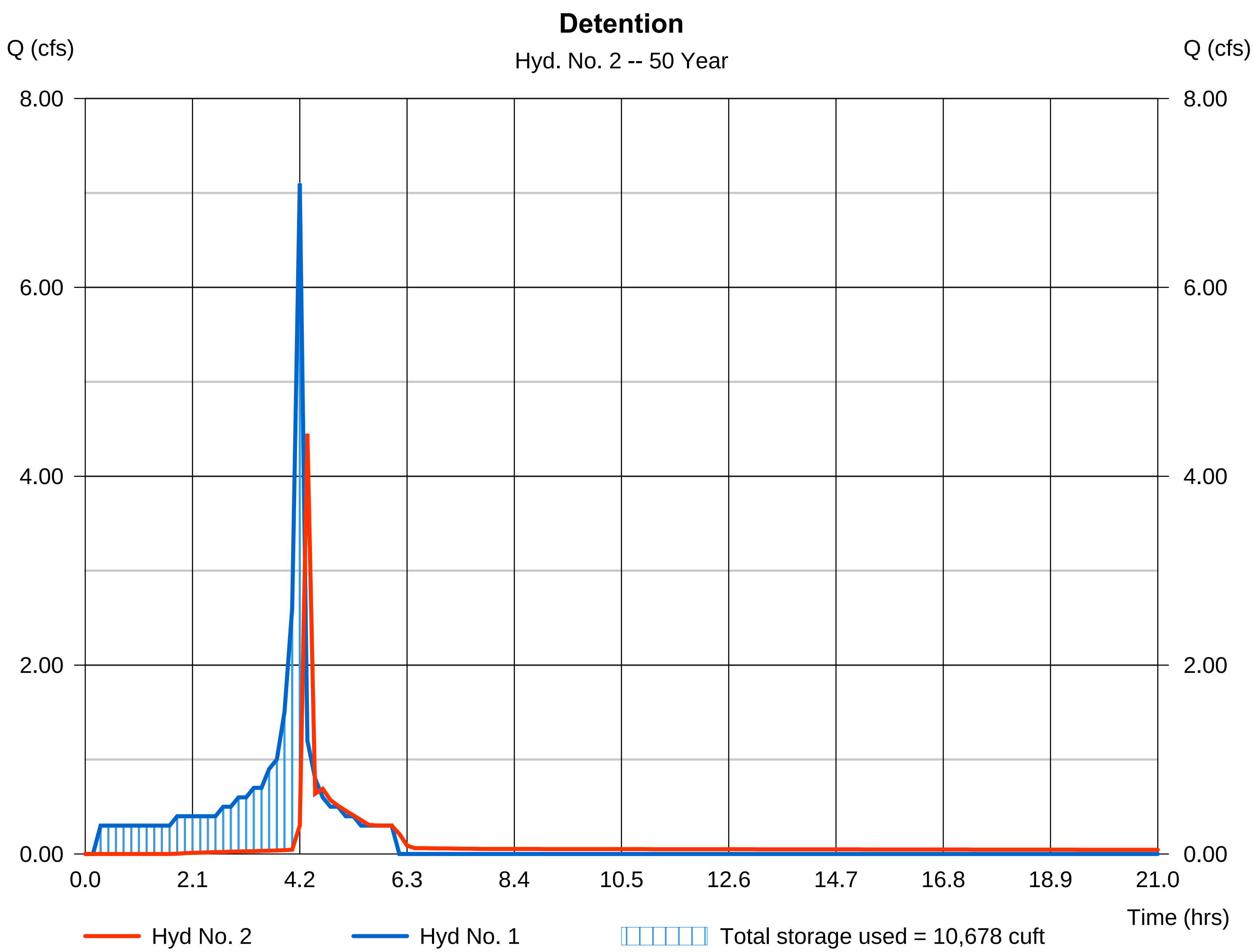
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Friday, 07 / 28 / 2017

Hyd. No. 2

Detention

Hydrograph type	= Reservoir	Peak discharge	= 4.451 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.35 hrs
Time interval	= 9 min	Hyd. volume	= 13,486 cuft
Inflow hyd. No.	= 1 - Analysis Point 1	Max. Elevation	= 305.50 ft
Reservoir name	= Detention 1	Max. Storage	= 10,678 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond No. 1 - Detention 1

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	302.00	n/a	0	0
1.00	303.00	n/a	3,188	3,188
2.00	304.00	n/a	3,188	6,375
3.00	305.00	n/a	3,188	9,563
3.50	305.50	n/a	1,598	11,160

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	1.15	Inactive	Inactive
Span (in)	= 18.00	1.15	5.80	24.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 302.00	302.50	305.45	48.25
Length (ft)	= 273.00	0.00	0.00	2.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	0.08	Inactive	Inactive
Crest El. (ft)	= 305.00	304.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.470 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	302.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	0.000	---	0.000
1.00	3,188	303.00	0.02 ic	0.02 ic	0.00	0.00	0.00	0.00	---	---	0.000	---	0.023
2.00	6,375	304.00	0.05 ic	0.04 ic	0.00	0.00	0.00	0.00	---	---	0.000	---	0.042
3.00	9,563	305.00	0.06 ic	0.05 ic	0.00	0.00	0.00	0.01	---	---	0.000	---	0.063
3.50	11,160	305.50	7.57 ic	0.05 ic	0.00	0.00	7.39	0.13	---	---	0.000	---	7.571

RATIONAL METHOD HYDROGRAPH PROGRAM

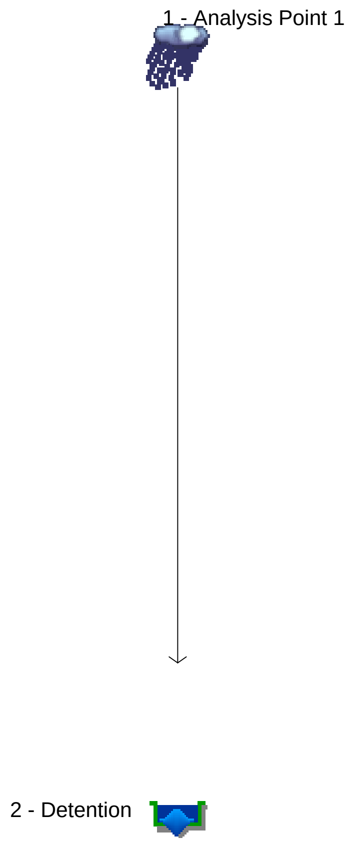
100 yr Detention Analysis

RUN DATE 9/21/2017
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 2.3 INCHES
BASIN AREA 3.08 ACRES
RUNOFF COEFFICIENT 0.65
PEAK DISCHARGE 7.44 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 0.3
TIME (MIN) = 27	DISCHARGE (CFS) = 0.3
TIME (MIN) = 36	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 54	DISCHARGE (CFS) = 0.3
TIME (MIN) = 63	DISCHARGE (CFS) = 0.3
TIME (MIN) = 72	DISCHARGE (CFS) = 0.3
TIME (MIN) = 81	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.4
TIME (MIN) = 99	DISCHARGE (CFS) = 0.4
TIME (MIN) = 108	DISCHARGE (CFS) = 0.4
TIME (MIN) = 117	DISCHARGE (CFS) = 0.4
TIME (MIN) = 126	DISCHARGE (CFS) = 0.4
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 144	DISCHARGE (CFS) = 0.5
TIME (MIN) = 153	DISCHARGE (CFS) = 0.5
TIME (MIN) = 162	DISCHARGE (CFS) = 0.5
TIME (MIN) = 171	DISCHARGE (CFS) = 0.6
TIME (MIN) = 180	DISCHARGE (CFS) = 0.6
TIME (MIN) = 189	DISCHARGE (CFS) = 0.6
TIME (MIN) = 198	DISCHARGE (CFS) = 0.7
TIME (MIN) = 207	DISCHARGE (CFS) = 0.8
TIME (MIN) = 216	DISCHARGE (CFS) = 1
TIME (MIN) = 225	DISCHARGE (CFS) = 1.1
TIME (MIN) = 234	DISCHARGE (CFS) = 1.6
TIME (MIN) = 243	DISCHARGE (CFS) = 3.2
TIME (MIN) = 252	DISCHARGE (CFS) = 7.44
TIME (MIN) = 261	DISCHARGE (CFS) = 1.3
TIME (MIN) = 270	DISCHARGE (CFS) = 0.9
TIME (MIN) = 279	DISCHARGE (CFS) = 0.7
TIME (MIN) = 288	DISCHARGE (CFS) = 0.6
TIME (MIN) = 297	DISCHARGE (CFS) = 0.5
TIME (MIN) = 306	DISCHARGE (CFS) = 0.4
TIME (MIN) = 315	DISCHARGE (CFS) = 0.4
TIME (MIN) = 324	DISCHARGE (CFS) = 0.4
TIME (MIN) = 333	DISCHARGE (CFS) = 0.3
TIME (MIN) = 342	DISCHARGE (CFS) = 0.3
TIME (MIN) = 351	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 369	DISCHARGE (CFS) = 0

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Project: Det-1 YR 100.gpw	Thursday, 09 / 21 / 2017

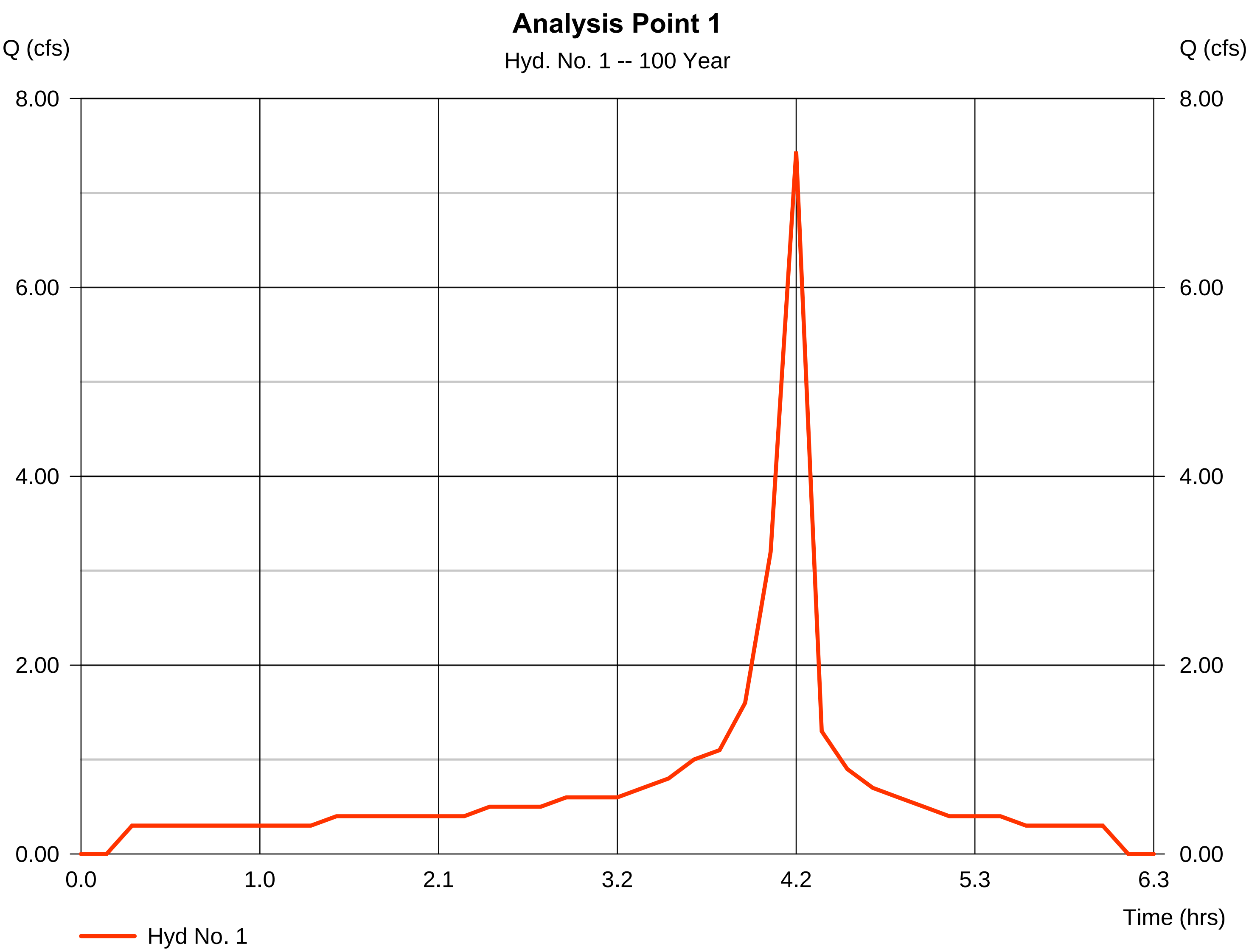
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 09 / 21 / 2017

Hyd. No. 1

Analysis Point 1

Hydrograph type	= Manual	Peak discharge	= 7.440 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.20 hrs
Time interval	= 9 min	Hyd. volume	= 16,384 cuft



Hydrograph Report

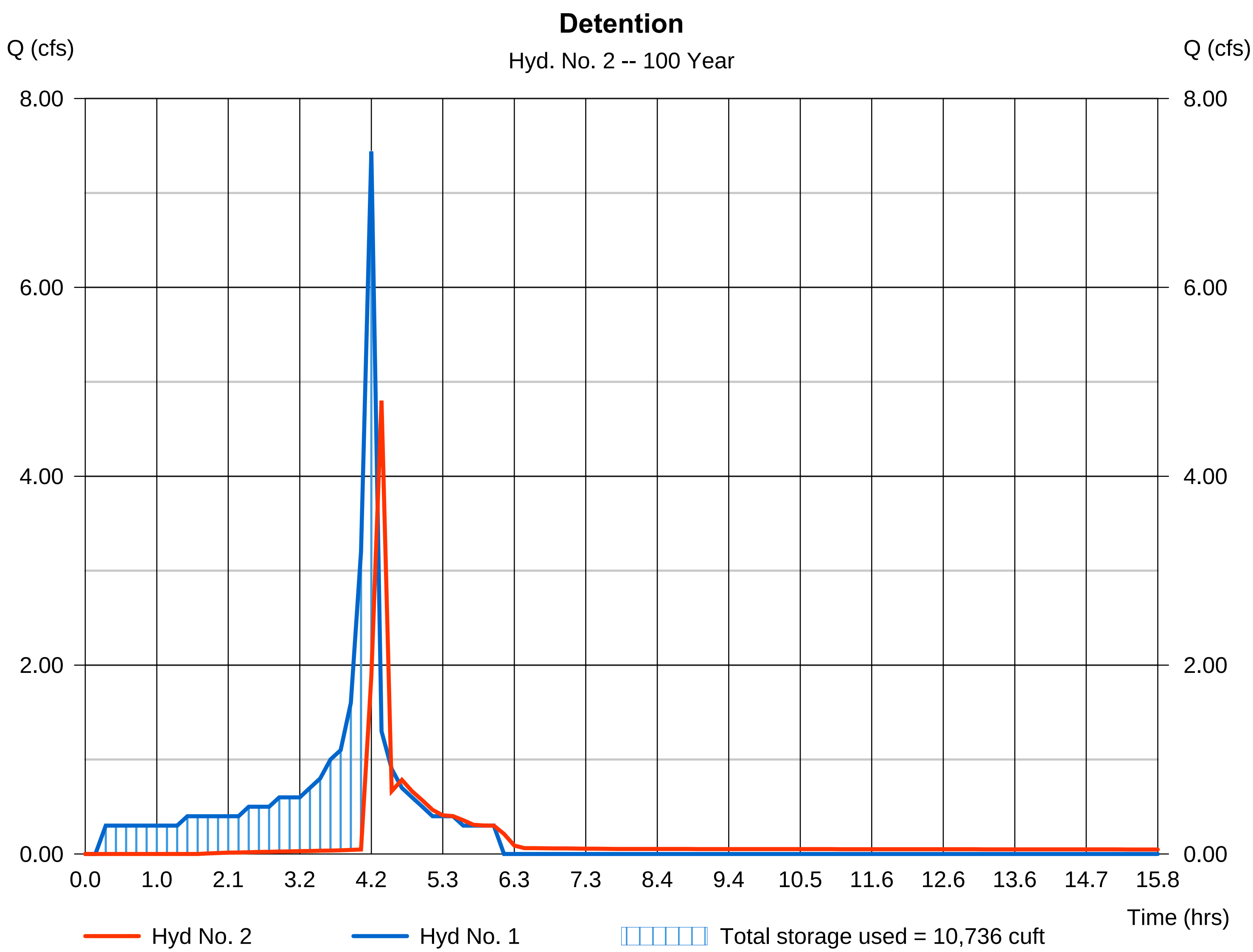
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 09 / 21 / 2017

Hyd. No. 2

Detention

Hydrograph type	= Reservoir	Peak discharge	= 4.800 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.35 hrs
Time interval	= 9 min	Hyd. volume	= 14,750 cuft
Inflow hyd. No.	= 1 - Analysis Point 1	Max. Elevation	= 305.50 ft
Reservoir name	= Detention 1	Max. Storage	= 10,736 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 09 / 21 / 2017

Pond No. 1 - Detention 1

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	302.00	n/a	0	0
1.00	303.00	n/a	3,188	3,188
2.00	304.00	n/a	3,188	6,375
3.00	305.00	n/a	3,188	9,563
3.50	305.50	n/a	1,598	11,160

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
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Span (in)	= 18.00	1.15	5.80	24.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 302.00	302.50	305.45	48.25
Length (ft)	= 273.00	0.00	0.00	2.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	0.08	Inactive	Inactive
Crest El. (ft)	= 305.00	304.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.470 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	302.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	0.000	---	0.000
1.00	3,188	303.00	0.02 ic	0.02 ic	0.00	0.00	0.00	0.00	---	---	0.000	---	0.023
2.00	6,375	304.00	0.05 ic	0.04 ic	0.00	0.00	0.00	0.00	---	---	0.000	---	0.042
3.00	9,563	305.00	0.06 ic	0.05 ic	0.00	0.00	0.00	0.01	---	---	0.000	---	0.063
3.50	11,160	305.50	7.57 ic	0.05 ic	0.00	0.00	7.39	0.13	---	---	0.000	---	7.571

APPENDIX E:

Hydrologic Information/
Excerpts from Hydrology Manual

Chapter 2

Hydrology

The design discharge depends upon many variables. Some of the more important variables are duration and intensity of rainfall; storm frequency; ground cover; and the size, imperviousness, slope, and shape of the drainage area.

2.1. Discharge Flow Methods

The designer should check with Drainage and Flood Plain Management Section, Public Works Department, to determine if there are established storm discharge flows.

If the project involves a watershed of major size or importance, flood flows may already be established through one or more of the following activities:

1. Master Plan Developments in the City and/or County
2. Studies for Development and Road Projects near the proposed project
3. Flood Insurance Studies prepared by FEMA based on existing land use at the time the study was completed. Urbanization may have caused increased flows. FEMA maps can be viewed at the SanGIS web site (www.sangis.org).
4. Recorded flows may be available from the United States Geological Survey (USGS) or the County of San Diego

If no established storm discharge flows are available, the applicable methods are:

1. Rational Method for watersheds less than 0.5 square miles – See Appendix A
2. Modified Rational Method for watersheds between 0.5 and 1.0 square miles – See Appendix A; or,
3. Natural Resources Conservation Service (NRCS) Method (formally called Soil Conservation Service (SCS) Method) for watersheds greater than 1.0 square miles – See Appendix B; or
4. Hydrologic Engineering Center (HEC) computer method.

2.2. Design Storm Frequency

Design storm frequency shall be based upon the following criteria:

1. Within floodplain and floodplain fringe areas as defined by FEMA, the runoff criteria shall be based upon a 100-year frequency storm.

2. For all drainage channels and storm water conveyance systems, which will convey drainage from a tributary area equal to or greater than one (1) square mile, the runoff criteria, shall be based upon a 100-year frequency storm.
3. For tributary areas under one (1) square mile:
    a. The storm water conveyance system shall be designed so that the combination of storm drain system capacity and overflow (streets and gutter) will be able to carry the 100-year frequency storm without damage to or flooding of adjacent existing buildings or potential building sites.
    b. The runoff criteria for the underground storm drain system shall be based upon a 50-year frequency storm.

2.3. Soil Type

For storm drain, culverts, channels, and all associated structures, Type D soil shall be used for all areas.

2.4. Other Requirements

1. Design runoff for drainage and flood control facilities within the City shall be based upon full development of the watershed area in accordance with the land uses shown on the City of San Diego, Progress Guide and General Plan.
2. When determining criteria for floodplain management and flood proofing, design runoff within the City shall be based upon existing conditions in accordance with the City Floodplain Management Requirements and FEMA Regulations.
3. Under City requirements, the minimum elevation of the finished, first floor elevation of any building is 2 feet above the 100-year frequency flood elevation.

2.5. Water Quality Considerations

Requirements for hydrologic studies specific to the design of pollution prevention controls and hydromodification management controls are detailed in the Storm Water Standards. Where the Storm Water Standards specify modifications to the guidelines stated herein on discharge flow methods, design storm frequency, or soil type, the modifications shall supersede these but only for the purposes stated in the Storm Water Standards. Where the Storm Water Standards does not specify a modification, the guidance found here in Chapter 2 shall apply.

Appendix A

Rational Method and Modified Rational Method

A.1. Rational Method (RM)

The Rational Method (RM) is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and drainage structures. The RM is recommended for analyzing the runoff response from drainage areas for watersheds less than 0.5 square miles. It should not be used in instances where there is a junction of independent drainage systems or for drainage areas greater than approximately 0.5 square mile in size. In these instances, the Modified Rational Method (MRM) should be used for junctions of independent drainage systems in watersheds up to approximately 1 square mile in size (see Section A.2); or the NRCS Hydrologic Method should be used for watersheds greater than approximately 1 square mile in size (see Appendix B).

A.1.1. Rational Method Formula

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (T_c), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed in Equation A-1.

Equation A-1. RM Formula Expression

$$Q = C\ I\ A$$

where:

Q	=	peak discharge, in cubic feet per second (cfs)
C	=	runoff coefficient expressed as that percentage of rainfall which becomes surface runoff (no units); Refer to Appendix A.1.2
I	=	average rainfall intensity for a storm duration equal to the time of concetrnatation (T_c) of the contributing draiange area, in inches per hour; Refer to Appendix A.1.3 and Appendix A.1.4
A	=	drainage area contributing to the design location, in acres

Combining the units for the expression CIA yields:

$$\left(\frac{1\,\text{acre}\times\text{inch}}{\text{hour}}\right)\left(\frac{43{,}560\,\text{ft}^2}{\text{acre}}\right)\left(\frac{1\,\text{foot}}{12\,\text{inches}}\right)\left(\frac{1\,\text{hour}}{3{,}600\,\text{seconds}}\right)\Rightarrow 1.008\,\text{cfs}$$

For practical purposes, the unit conversion coefficient difference of 0.8% can be ignored.

The RM formula is based on the assumption that for constant rainfall intensity, the peak discharge rate at a point will occur when the raindrop that falls at the most upstream point in the tributary drainage basin arrives at the point of interest.

Unlike the MRM (discussed in Appendix A.2) or the NRCS hydrologic method (discussed in Appendix B), the RM does not create hydrographs and therefore does not add separate subarea hydrographs at collection points. Instead, the RM develops peak discharges in the main line by increasing the T_c as flow travels downstream.

Characteristics of, or assumptions inherent to, the RM are listed below:

1. The discharge resulting from any I is maximum when the I lasts as long as or longer than the T_c.
2. The storm frequency of peak discharges is the same as that of I for the given T_c.
3. The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in the NRCS method).
4. The peak rate of runoff is the only information produced by using the RM.

A.1.2. Runoff Coefficient

The runoff coefficients are based on land use (see Table A–1). Soil type "D" is used throughout the City of San Diego for storm drain conveyance design. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient (Σ[CA]). Good engineering judgment should be used when applying the values presented in Table A–1, as adjustments to these values may be appropriate based on site-specific characteristics.

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C) Soil Type [(1)]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [(2)]	
80% Impervious	0.85
Industrial [(2)]	
90% Impervious	0.95

Note:

[(1)] Type D soil to be used for all areas.

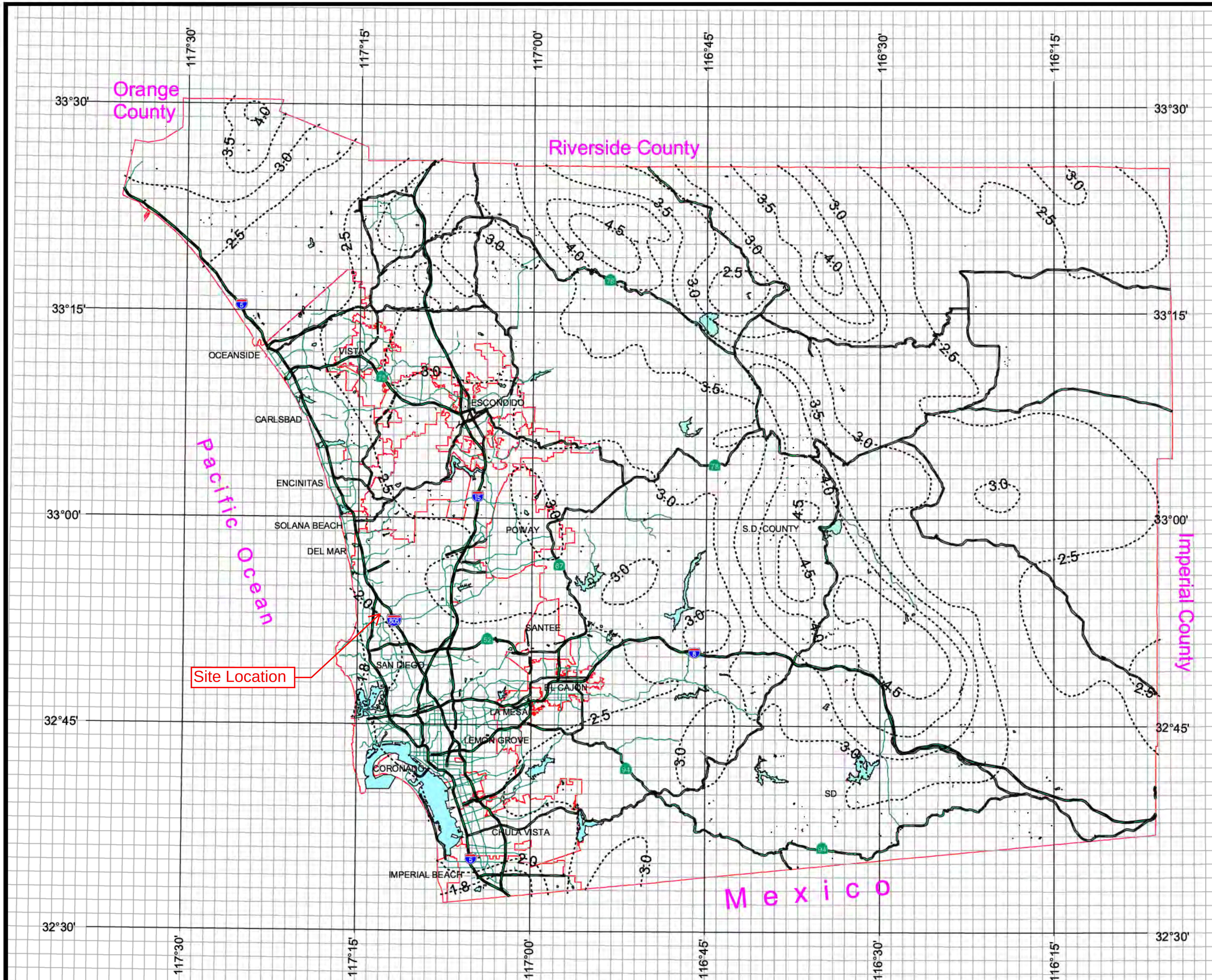
[(2)] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

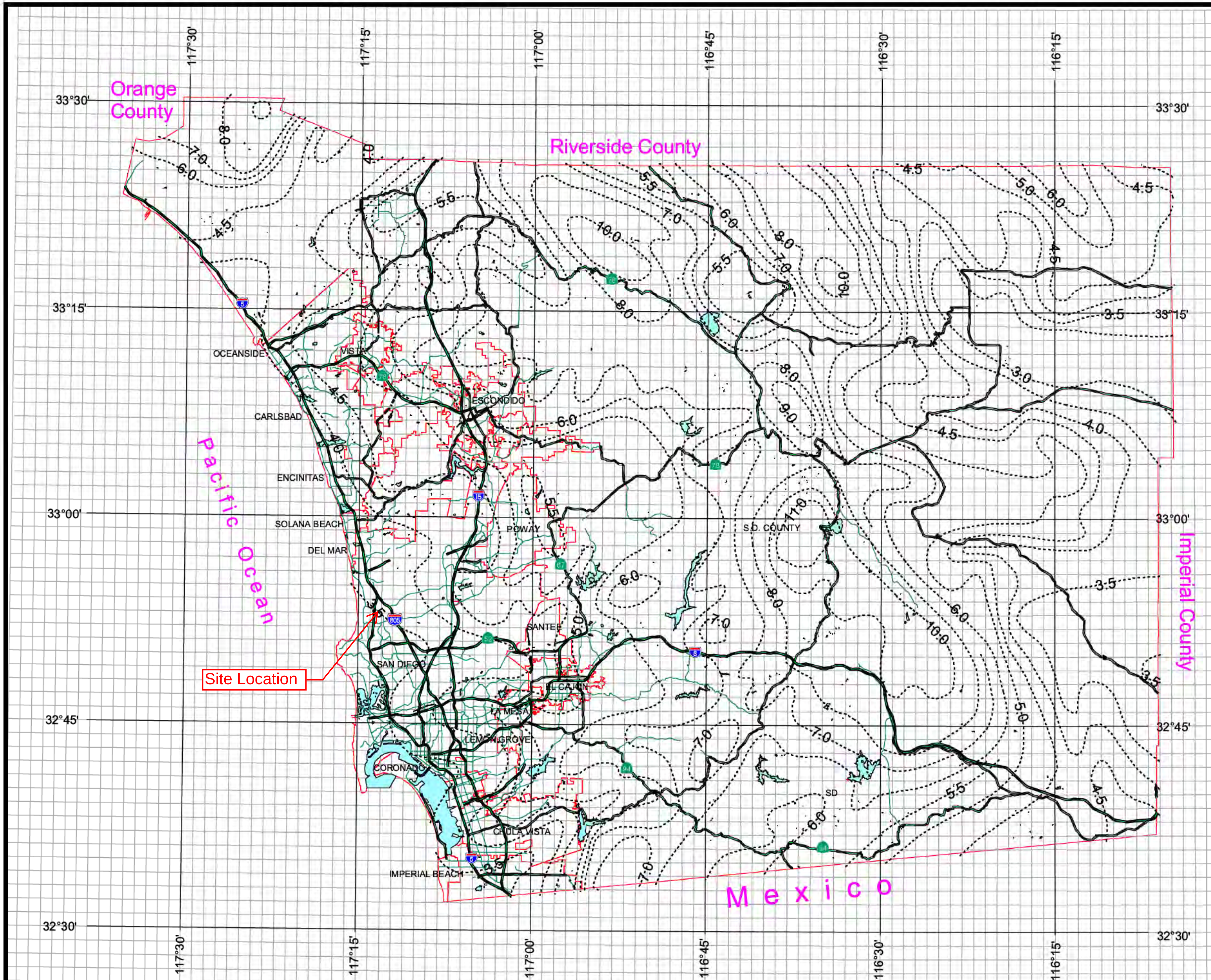
2.0	Isopluvial (inches)

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

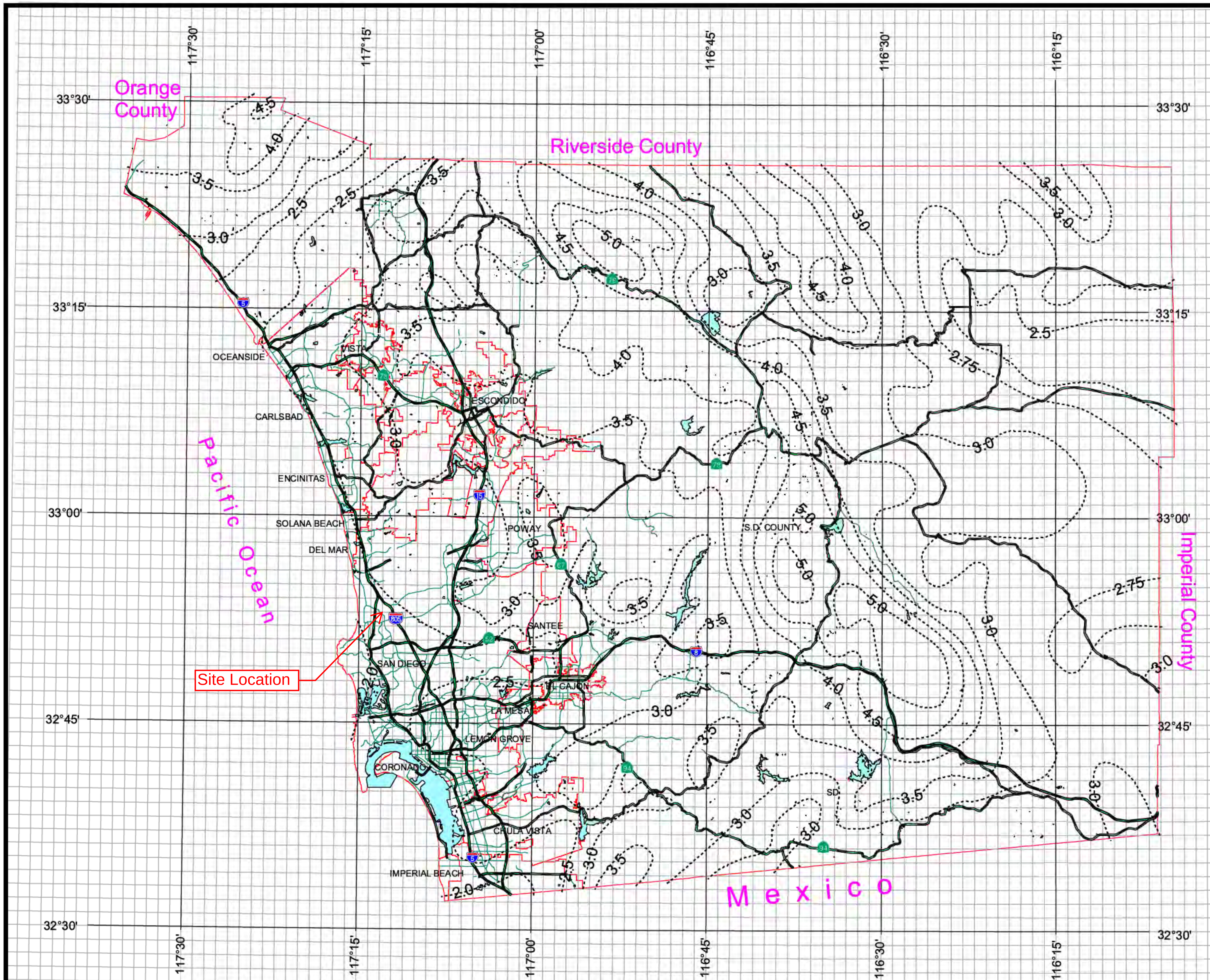
3.5	sopluvial (inches)

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

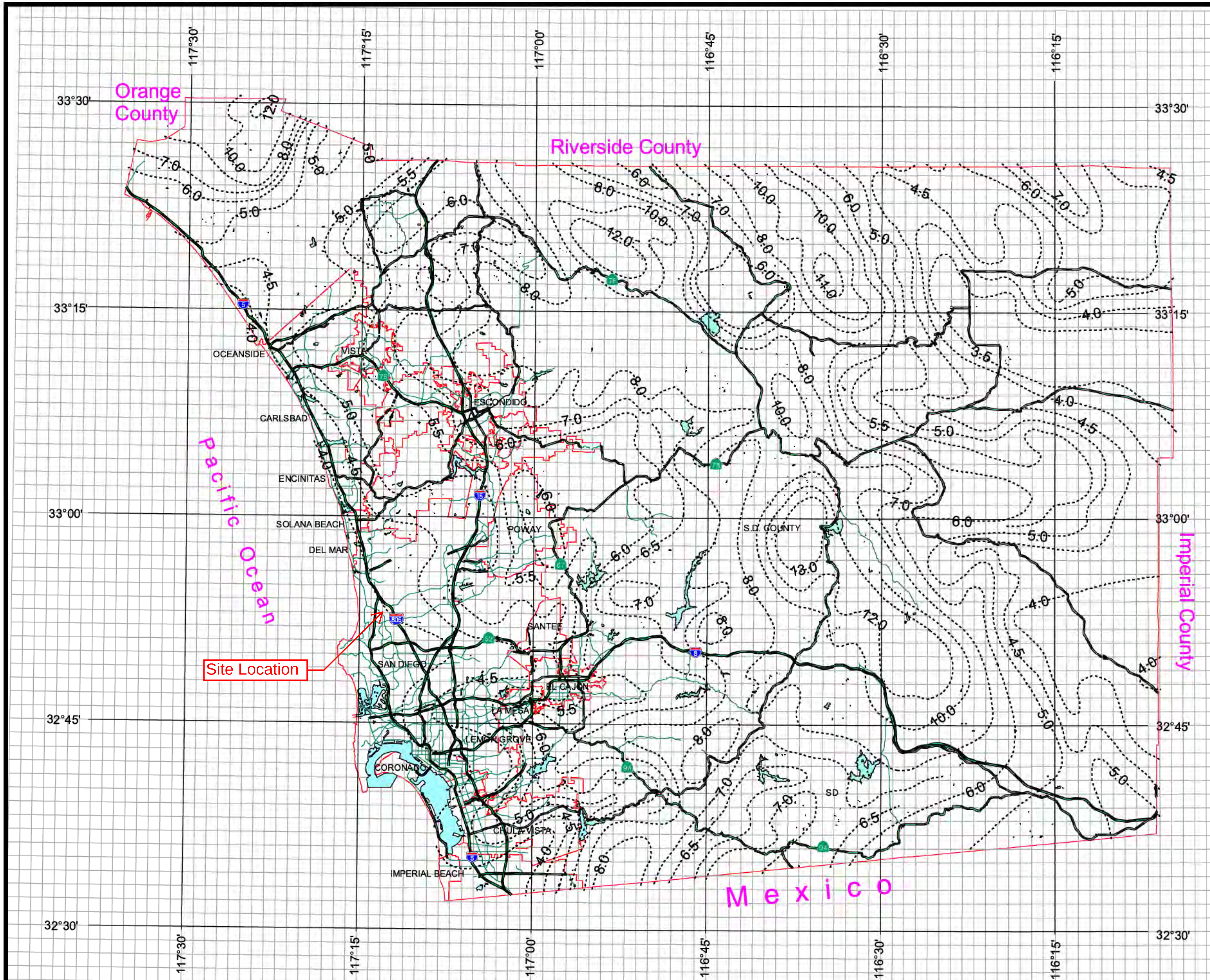
100 Year Rainfall Event - 6 Hours

2.3	Isopluvial (inches)

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials



100 Year Rainfall Event - 24 Hours

4.0	Isopluvial (inches)

DPW GIS
Department of Public Works
Geographic Information Services

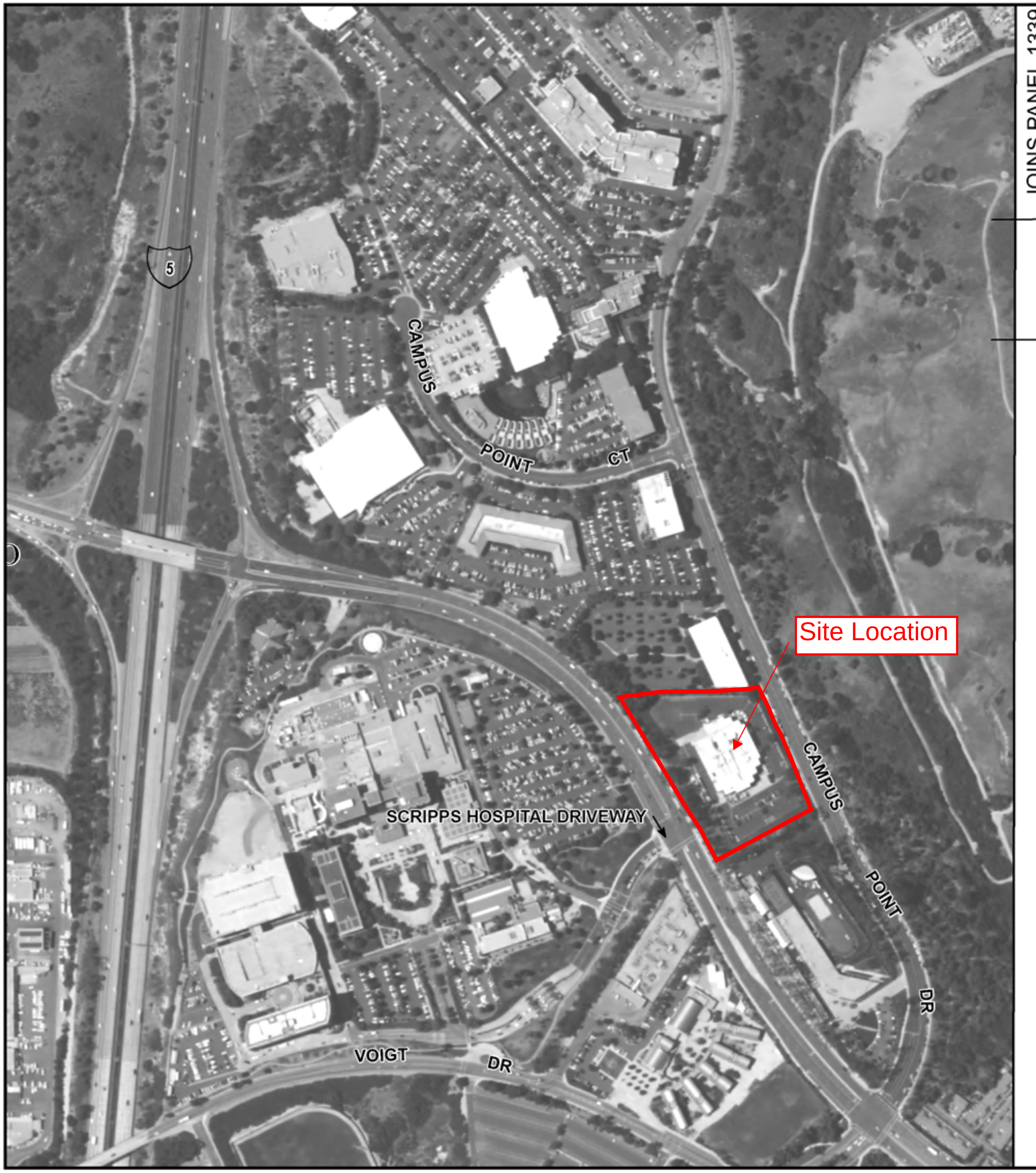
SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

APPENDIX F:

FEMA Flood Plain Map



ance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1338G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1338 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1338	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

U.S. DEPARTMENT OF HOMELAND SECURITY

MAP NUMBER
06073C1338G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Noise Analysis for the 9880 Campus Point Project San Diego, California

Prepared for
DGA Planning Architecture Interiors
2550 Fifth Avenue, Suite 115
San Diego, CA 92103

Prepared by
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San Diego, CA 92101
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RECON Number 8655
July 28, 2017

Jack T. Emerson, Noise Analyst

TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURES

TABLES

ATTACHMENTS

Acronyms

ADT	average daily traffic
AIA	Airport Influence Area
ALUCP	Airport Land Use Compatibility Plan
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFM	cubic feet per minute
City	City of San Diego
CNEL	community noise equivalent level
dB	decibel
dB(A)	A-weighted decibel
FHWA	Federal Highway Administration
HVAC	heating, ventilating, and air conditioning
kW	kilowatt
L_{eq}	one-hour equivalent noise level
$L_{eq(12)}$	12-hour equivalent noise levels
L_{pw}	sound power level
SDCRAA	San Diego County Regional Airport Authority

Executive Summary

The proposed 9880 Campus Point Project (project) site is located at 9880 Campus Point Drive in San Diego, California. The project involves construction of a new 102,649-square-foot research and development building. The project site is currently developed with a 73,000-square-foot research and development building that would be demolished as part of the project.

This report discusses potential noise impacts from the construction and operation of the project. As part of this assessment, noise levels due to vehicle traffic were calculated and evaluated against City of San Diego (City) Significance Determination Thresholds. In addition to compatibility, the potential for noise to impact adjacent uses from future on-site sources and construction activity was assessed. A summary of the findings is provided below.

Construction Noise

Construction activities would generally occur between 7:00 a.m. and 7:00 p.m. on weekdays. Hourly equivalent construction noise levels over a 12-hour period [$L_{eq(12h)}$] would be anticipated to reach 66 A-weighted decibels [dB(A)] at the property lines of the nearest residentially zoned property. While construction may be heard over other noise sources in the area, the exposure would be temporary and would not exceed the applicable regulation of 75 dB(A) $L_{eq(12h)}$ at the nearest property line of a residentially zoned property. Therefore, temporary increases in noise levels from construction activities would be less than significant.

Traffic Noise

The project would result in a less than 1 dB(A) increase in traffic noise over the existing condition along all affected roadway segments. This increase in traffic noise level would be less than perceptible; thus, the project would not contribute to a substantial increase in traffic noise.

The project would include exterior use areas and thus would not exceed exterior noise land use compatibility standards. Vehicle traffic on Genesee Avenue is anticipated to generate peak hourly noise levels and community noise equivalent levels (CNEL) between 31 to 41 dB(A) in the proposed research and development building. These interior noise levels would be consistent with state acoustical control standards and City noise land use compatibility standards. Thus, the project would be compatible with the existing noise environment.

Aircraft Noise

The project site would be located outside the 60 community noise equivalent level (CNEL) noise contour for the Marine Corps Air Station (MCAS) Miramar. According to the MCAS Miramar Airport Land Use Compatibility Plan, research and development facilities are compatible with aircraft noise levels up to 70 CNEL and conditionally compatible with noise levels up to 80 CNEL. As aircraft noise levels would not exceed the applicable compatibility criteria, the project would be compatible with noise from MCAS Miramar.

On-site Generated Noise

Several of the noise sources associated with the proposed research and development building would be located indoors, including condensers and boilers. Due to attenuation from the building envelope, indoor noise sources are not anticipated to violate the noise level limits of the Municipal Code. Outdoor noise sources associated with the project include loading and unloading operations, a cooling tower, a standby generator, and air handling units. While many of these sources are associated with the existing land use, these sources would be replaced and reoriented as part of the project.

As measured at the nearest property lines of adjacent industrial uses, the proposed equipment is anticipated to generate noise levels ranging from 51 and 65 dB(A) L_{eq}. Noise levels at the property lines of other nearby uses such as Scripps Memorial Hospital and the Preuss Performative School would reach up to 51 dB(A) L_{eq} and 46 dB(A) L_{eq}, respectively. Noise levels would be below the applicable noise level limits from City Municipal Code Section 59.5.0401. Therefore, on-site generated noise would be less than significant.

1.0 Introduction

1.1 Project Description

The 9880 Campus Point Project (project) proposes redevelopment of the existing research and development campus located at 9880 Campus Point Drive. The 4.5-acre project site is located within the University community planning area of San Diego and is bound by Genesee Avenue to the west, 10010 Campus Point Drive to the north (Scripps Health Campus Point Campus), Campus Point Drive to the east, and 9800 Campus Point Drive to the southeast (Nissan Design America Campus). Figure 1 shows the regional location of the project site. Figure 2 shows an aerial photograph of the project site and vicinity.

The project would include demolition of the two-story, approximately 73,000-square-foot research and development building and construction of a new research and development building. The new research and development building would be approximately 102,649 square feet and would include five aboveground stories and a basement. Figure 3 shows the proposed site plan for the project.

The project would replace the existing equipment and install new mechanical equipment including boilers, chillers, a cooling tower, air handling units, and a standby emergency generator. Boilers and chillers would be located in a boiler room in the basement. An external equipment yard to the northeast of the building would accommodate mechanical equipment including an approximately 1,250 kilowatt standby generator. The cooling tower is anticipated to have a rated capacity of approximately 1,000 tons and would be located in an external equipment yard to the northeast of building. The standby generator is anticipated to be approximately 1,250 kilowatt (kW) generator with weather enclosure and would also be located in an external equipment yard. External equipment yard walls are anticipated to be constructed using 8-inch concrete blocks and would screen all equipment from sight. Walls surrounding the generator would extend 12 feet above grade, and walls surrounding the cooling tower would extend 20 feet above grade. Air handlers are anticipated to be located in the basement or on the roof.

1.2 Fundamentals of Noise

Sound levels are described in units called the decibel (dB). Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3 dB decrease. However, human perception of noise has no simple correlation with acoustical energy. A change in noise levels is generally perceived as follows: 3 A-weighted dB [dB(A)] barely perceptible, 5 dB(A) readily perceptible, and 10 dB(A) perceived as a doubling or halving of noise (California Department of Transportation [Caltrans] 2013).

Project Location

FIGURE 1
Regional Location

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Image Source: NearMaps (flown Jan 2017)

Project Boundary

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FIGURE 2

Project Location on Aerial Photograph

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Map Source: DGA Planning, Architecture, Interiors

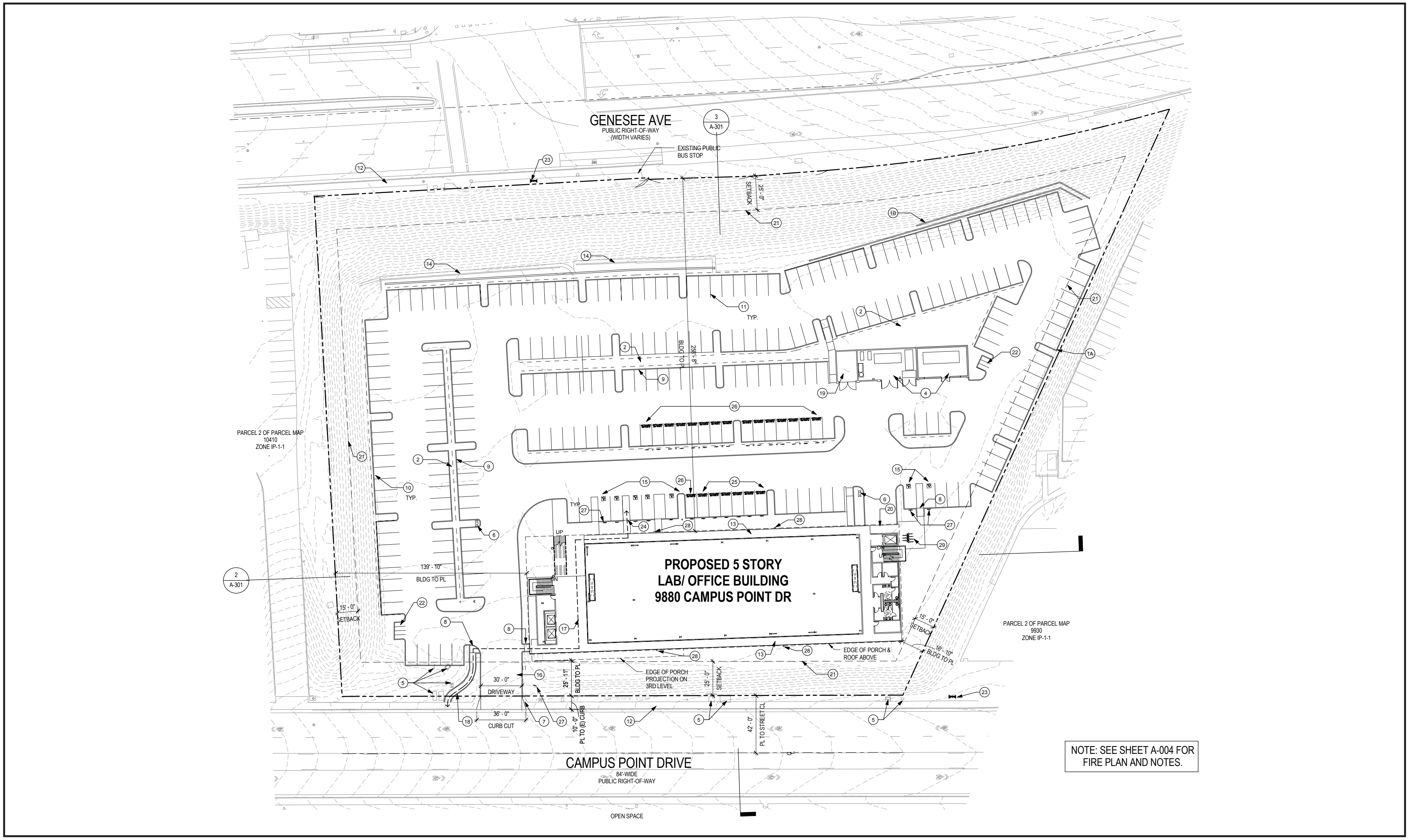

FIGURE 3
Site Plan

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In technical terms, sound levels are described as either a "sound power level" or a "sound pressure level," which while commonly confused are two distinct characteristics of sound. Both share the same unit of measure, the dB. However, sound power, expressed as L_{pw}, is the energy converted into sound by the source. As sound energy travels through the air, it creates a sound wave that exerts pressure on receivers such as an eardrum or microphone, the sound pressure level. Sound measurement instruments only measure sound pressure, and limits used in standards are generally sound pressure levels.

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale, which approximates the frequency response of the average young ear when listening to most ordinary everyday sounds, was devised. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are designated with the notation dB(A).

1.2.1 Descriptors

The impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important. In addition, most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors has been developed. The noise descriptors used for this study are the equivalent continuous noise level (L_{eq}) and the community noise equivalent level (CNEL).

The L_{eq} is the equivalent steady-state noise level in a stated period of time that is calculated by averaging the acoustic energy over a time period; when no period is specified, a 1-hour period is assumed.

The CNEL is a 24-hour equivalent sound level. The CNEL calculation applies an additional 5 dB(A) penalty to noise occurring during evening hours, between 7:00 p.m. and 10:00 p.m., and a 10 dB(A) penalty is added to noise occurring during the night, between 10:00 p.m. and 7:00 a.m. These increases for certain times are intended to account for the added sensitivity of humans to noise during the evening and night.

1.2.2 Propagation

Sound from a localized source (approximating a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern, known as geometric spreading. The sound level decreases or drops off at a rate of 6 dB(A) for each doubling of the distance.

Traffic noise is not a single, stationary point source of sound. The movement of vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval. The drop-off rate for a line source is 3 dB(A) for each doubling of distance.

The propagation of noise is also affected by the intervening ground, known as ground absorption. A hard site (such as parking lots or smooth bodies of water) receives no additional ground attenuation, and the changes in noise levels with distance (drop-off rate) are simply the geometric spreading of the source. A soft site (such as soft dirt, grass, or scattered bushes and trees) provides an additional ground attenuation value of 1.5 dB(A) per doubling of distance. Thus, a point source over a soft site would drop off at 7.5 dB(A) per doubling of distance.

2.0 Applicable Noise Standards

2.1 California Code of Regulations

Noise exposure in non-residential structures are regulated by 2016 California Green Building Standards, Chapter 5 – Nonresidential Mandatory Measures, Division 5.5 – Environmental Quality, Section 5.507 – Environmental Comfort, Subsection 5.507.4 – Acoustical Control. Pursuant to this standard, interior noise levels attributable to an airport, freeway or expressway, railroad, industrial source, or fixed-guideway source may not exceed 50 dB(A) in occupied areas during any hour of operation (24 California Code of Regulations Part 6, 5.506.7.4.2).

2.2 Noise Abatement and Control Ordinance

2.2.1 Construction Noise Level Limits

Section 59.5.0404 of the City of San Diego (City) Noise Abatement and Control Ordinance (Noise Ordinance) states that:

> A. It shall be unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays as specified in Section 21.04 of the San Diego Municipal Code, with exception of Columbus Day and Washington's Birthday, or on Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise. . .
>
> B. . . .it shall be unlawful for any person, including the City of San Diego, to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7:00 a.m. to 7:00 p.m.

The project construction would be restricted to between the hours of 7:00 a.m. and 7:00 p.m. and construction noise levels may not exceed 75 dB(A) 12-hour equivalent noise level [$L_{eq(12)}$] as assessed at or beyond the property line of a residentially zoned property.

2.2.2 Property Line Noise Level Limits

Stationary noise sources are also regulated by the City's Noise Ordinance. Section 59.5.0401 of the City's Noise Ordinance states that:

> A. It shall be unlawful for any person to cause noise by any means to the extent that the one-hour average sound level exceeds the applicable limit.
>
> B. The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts…

The applicable noise limits are summarized in Table 1.

Table 1
Stationary Source Noise Level Limits

Land Use	Time of Day	Sound Level [dB(A) L_{eq}]
Single-family Residential	7:00 a.m. to 7:00 p.m.	50
	7:00 p.m. to 10:00 p.m.	45
	10:00 p.m. to 7:00 a.m.	40
Multi-family Residential (up to a maximum density of 1 unit/2,000 square feet)	7:00 a.m. to 7:00 p.m.	55
	7:00 p.m. to 10:00 p.m.	50
	10:00 p.m. to 7:00 a.m.	45
All Other Residential	7:00 a.m. to 7:00 p.m.	60
	7:00 p.m. to 10:00 p.m.	55
	10:00 p.m. to 7:00 a.m.	50
Commercial	7:00 a.m. to 7:00 p.m.	65
	7:00 p.m. to 10:00 p.m.	60
	10:00 p.m. to 7:00 a.m.	60
Industrial or Agricultural	Anytime	75

dB(A) L_{eq} = one-hour equivalent A-weighted decibels

2.3 City of San Diego General Plan

The City's Noise Element of the General Plan specifies compatibility standards for different categories of land use. The noise land use compatibility guidelines are intended to be used for future development within San Diego to prevent future incompatibilities. The City's land use/noise compatibility guidelines are shown in Table 2.

Corporate offices and research and development facilities are considered "compatible" with exterior noise levels up to 65 CNEL and "conditionally compatible" with exterior noise levels up to 75 CNEL as long as the interior noise level is 50 CNEL.

Table 2
City of San Diego – Land Use – Noise Compatibility Guidelines

Land Use Category	Exterior Noise Exposure [dB(A) CNEL] 60	65	70	75	
Parks and Recreational					
Parks, Active and Passive Recreation					
Outdoor Spectator Sports, Golf Courses; Water Recreational Facilities; Indoor Recreation Facilities					
Agricultural					
Crop Raising & Farming; Community Gardens, Aquaculture, Dairies; Horticulture Nurseries & Greenhouses, Animal Raising, Maintain & Keeping; Commercial Stables					
Residential					
Single Dwelling Units; Mobile Homes		45			
Multiple Dwelling Units **For uses affected by aircraft noise, refer to Policies NE-D.2. & NE-D.3.*		45	45*		
Institutional					
Hospitals; Nursing Facilities; Intermediate Care Facilities; Kindergarten through Grade 12 Educational Facilities; Libraries; Museums; Places of Worship; Child Care Facilities		45			
Other Educational Facilities including Vocational/Trade Schools and Colleges and Universities)		45	45		
Cemeteries					
Retail Sales					
Building Supplies/Equipment; Food, Beverages & Groceries; Pets & Pet Supplies; Sundries, Pharmaceutical, & Convenience Sales; Wearing Apparel & Accessories			50	50	
Commercial Services					
Building Services; Business Support; Eating & Drinking; Financial Institutions; Maintenance & Repair; Personal Services; Assembly & Entertainment (includes public and religious assembly); Radio & Television Studios; Golf Course Support			50	50	
Visitor Accommodations		45	45	45	
Offices					
Business & Professional; Government; Medical, Dental & Health Practitioner; Regional & Corporate Headquarters			50	50	
Vehicle and Vehicular Equipment Sales and Services Use					
Commercial or Personal Vehicle Repair & Maintenance; Commercial or Personal Vehicle Sales & Rentals; Vehicle Equipment & Supplies Sales & Rentals; Vehicle Parking					
Wholesale, Distribution, Storage Use Category					
Equipment & Materials Storage Yards; Moving & Storage Facilities; Warehouse; Wholesale Distribution					
Industrial					
Heavy Manufacturing; Light Manufacturing; Marine Industry; Trucking & Transportation Terminals; Mining & Extractive Industries					
Research & Development				50	

Compatible	Indoor Uses	Standard construction methods should attenuate exterior noise to an acceptable indoor noise level. Refer to Section I.
	Outdoor Uses	Activities associated with the land use may be carried out.
Conditionally Compatible	Indoor Uses	Building structure must attenuate exterior noise to the indoor noise level indicated by the number for occupied areas. Refer to Section I.
	Outdoor Uses	Feasible noise mitigation techniques should be analyzed and incorporated to make the outdoor activities acceptable. Refer to Section I.
Incompatible	Indoor Uses	New construction should not be undertaken.
	Outdoor Uses	Severe noise interference makes outdoor activities unacceptable.

SOURCE: City of San Diego General Plan 2015.
dB(A) = A-weighted decibels; CNEL = community noise equivalent level

2.4 Marine Corps Air Station Miramar Airport Land Use Compatibility Plan

The project site is located within the Airport Influence Area (AIA) of Marine Corps Air Station (MCAS) Miramar. As such, the project is subject to land use policies from the MCAS Miramar Airport Land Use Compatibility Plan (ALUCP), which was last updated in 2011 by the San Diego County Regional Airport Authority (SDCRAA; 2011). Table 3 summarizes the MCAS Miramar ALUCP noise compatibility policies.

Table 3
MCAS ALUCP – Noise Compatibility Policies

Land Use Category[1]	Exterior Noise Exposure (dB CNEL)					
	50-55	55-60	60-65	65-70	70-75	75-80
Agricultural and Animal-Related						
nature preserves; wildlife preserves; horse stables; livestock breeding or farming		**A**	**A**	**A**	**A**	
zoos; animal shelters/kennels; interactive nature exhibits			**A**	**A**		
agriculture (except residences and livestock); greenhouses; fishing						**A**
Recreational						
children-oriented neighborhood parks; playgrounds			**A**			
campgrounds; recreational vehicle/motor home parks						
community parks; regional parks; golf courses; tennis courts; athletic fields; outdoor spectator sports; fairgrounds; water recreation facilities				**A**		
recreation buildings; gymnasiums; club houses; athletic clubs; dance studios				**50**	**50**	
Public						
outdoor amphitheatres		**A**	**A**			
children's schools (K-12); day care centers (>14 children)			**45**			
libraries			**45**			
auditoriums; concert halls; indoor arenas; places of worship			**45**	**45**		
adult schools; colleges; universities[2]			**45**	**45**		
prisons; reformatories				**50**		
public safety facilities (e.g., police, fire stations)				**50**	**50**	
cemeteries; cemetery chapels; mortuaries				**45** **A**	**45** **A**	
Residential, Lodging, and Care						
residential (including single-family, multi-family, and mobile homes); family day care homes (≤14 children)			**45**			
extended-stay hotels; retirement homes; assisted living; hospitals; nursing homes; intermediate care facilities			**45**			
hotels; motels; other transient lodging[3]			**45**	**45**		
Commercial and Industrial						
office buildings; medical clinics; clinical laboratories; radio, television, recording studios				**50**	**50**	
retail sales; eating/drinking establishments; movie theaters; personal services				**50**	**50** **B**	
wholesale sales; warehouses; mini/other indoor storage					**50** **C**	**50** **C**
industrial; manufacturing; research & development; auto, marine, other sales & repair services; car washes; gas stations; trucking, transportation terminals					**50** **C**	**50** **C**
extractive industry; utilities; road, rail rights-of-way; outdoor storage; public works yards; automobile parking; automobile dismantling; solid waste facilities						**50** **C**

Table 3
MCAS ALUCP – Noise Compatibility Policies

Land Use Acceptability		Interpretation/Comments
	Compatible	Indoor Uses: Standard construction methods will sufficiently attenuate exterior noise to an acceptable indoor CNEL
		Outdoor Uses: Activities associated with the land use may be carried out with essentially no interference from aircraft noise
45 50	Conditional	Indoor Uses: Building must be capable of attenuating exterior noise to the indoor CNEL indicated by the number; standard construction methods will normally suffice
		Outdoor Uses: CNEL is acceptable for outdoor activities, although some noise interference may occur.
A B C	Conditional	Indoor or Outdoor Uses: A Caution should be exercised with regard to noise-sensitive outdoor uses; these uses are likely to be disrupted by aircraft noise events; acceptability is dependent upon characteristics of the specific use[4] B Outdoor dining or gathering places incompatible above CNEL 70 dB C Sound attenuation must be provided for associated office, retail, and other noise-sensitive indoor spaces sufficient to reduce exterior noise to an interior maximum of CNEL 50 dB
	Incompatible	Indoor Uses: Unacceptable noise interference if windows are open; at exposures above 65 dB CNEL, extensive mitigation techniques required to make the indoor environment acceptable for performance of activities
		Outdoor Uses: Severe noise interference makes outdoor activities unacceptable

Notes
[1] Land uses not specifically listed shall be evaluated using the criteria for similar uses.
[2] Applies only to classrooms, offices, and related indoor uses. Laboratory facilities, gymnasiums, outdoor athletic facilities, and other uses to be evaluated as indicated for those land use categories.
[3] Hotels and motels are lodging intended for stays by an individual person of no more than 30 days consecutively and no more than 90 days total per year; facilities for longer stays are in extended-stay hotels category.
[4] Noise-sensitive land uses are ones for which the associated primary activities, whether indoor or outdoor, are susceptible to disruption by loud noise events. The most common types of noise-sensitive land uses include, but are not limited to, the following: residences, hospitals, nursing facilities, intermediate care facilities, educational facilities, libraries, museums, concert halls, places of worship, child-care facilities, and certain types of passive recreational parks and open space

SOURCE: San Diego County Regional Airport Authority 2011.
MCAS = Marine Corps Air Station; ALUCP = Airport Land Use Compatibility Plan; dB = decibels; CNEL = community noise equivalent level

2.5 CEQA Significance Determination Thresholds

The City developed and published Significance Determination Thresholds for use in California Environmental Quality Act (CEQA) determinations. The CEQA significance standards are shown in Table 4. Based on the City's 2016 Significance Determination Thresholds, a significant noise impact would occur if implementation of the project would:

1. Result or create a significant increase in the existing ambient noise levels;

2. Exposure of people to noise levels which exceed the City's adopted noise ordinance or are incompatible with Table 4;

3. Exposure of people to current or future transportation noise levels that exceed standards established in the Transportation Element of the General Plan or an adopted Airport Comprehensive Land Use Plan; or

4. Result in land uses which are not compatible with aircraft noise levels as defined by an adopted Airport Comprehensive Land Use Plan.

Table 4
Traffic Noise Significance Thresholds
[dB[A] CNEL]

Structure or Proposed Use that would be Impacted by Traffic Noise	Interior Space	Exterior Useable Space[1]	General Indication of Potential Significance
Single-family detached	45 dB	65 dB	Structure or outdoor useable area is <50 feet from the center of the closest (outside) lane on a street with existing or future ADTs >7,500
Multi-family, school, library, hospital, day care center, hotel, motel, park, convalescent home	Development Services Department ensures 45 dB pursuant to Title 24	65 dB	
Office, church, business, professional uses	n/a	70 dB	Structure or outdoor useable area is <50 feet from the center of the closest lane on a street with existing or future ADTs >20,000
Commercial, retail, industrial, outdoor spectator sports uses	n/a	75 dB	Structure or outdoor useable area is <50 feet from the center of the closest lane on a street with existing or future ADTs >40,000

ADT = average daily trips
[1] If a project is currently at or exceeds the significance thresholds for traffic noise described above and noise levels would result in less than a 3 dB increase, then the impact is not considered significant.

3.0 Existing Conditions

3.1 Surrounding Land Uses

The project site and adjacent properties to the north and southeast are zoned Industrial Park (IP-1-1). Existing uses on the project site include a two-story, approximately 73,000-square-foot research and development building. The adjacent parcel located to the north is occupied by Scripps Health Campus Point Campus corporate offices. The adjacent parcel located to the southeast is occupied by Nissan Design America Campus development facility. Parcels to the west of the project site are zoned Industrial Light (IL-2-1), which are occupied by Prebys Cardiovascular Institute of the Scripps Memorial Hospital La Jolla. Parcels to the east of the project site across Campus Point Drive are zoned single-family residential (RS-1-7). These parcels are undeveloped and are characterized by steep slopes. Parcels to the southwest of the project, south of the intersection of Genesee Avenue and Scripps Hospital Driveway, are also zoned single-family residential (RS-1-14). These parcels are occupied by University of California San Diego uses including the Preuss Performative High School, a baseball field, and several commuter parking lots.

3.2 Acoustic Environment

Existing noise levels at the project site were measured on April 11, 2017, using a Larson-Davis LxT Sound Expert Sound Level Meter, serial number 3827. The following parameters were used:

Filter:	A-weighted
Response:	Slow
Time History Period:	5 seconds
Height of Instrument:	5 feet above ground level

The meter was calibrated before and after each measurement. Two 15-minute noise level measurements were made in the vicinity of the project site, as summarized in Table 5. The locations of the noise level measurements are shown on Figure 4, and the noise measurement data are contained in Attachment 1.

Measurement 1 was located in the southwestern portion of the project parking lot, approximately 160 feet northeast of Genesee Avenue. The main source of noise at this location was vehicle traffic on Genesee Avenue. Due to the steep uphill slope on the western edge of the site only a fraction of vehicle traffic on Genesee Road is not visible from the location of Measurement 1. Measurement 1 was selected to measure ambient noise levels on the project site.

Measurement 2 was located approximately 25 feet southwest of Genesee Avenue and approximately 80 feet southeast of Scripps Hospital Driveway. The main source of noise at this location was vehicle traffic on Genesee Avenue. Measurement 2 was selected to measure traffic volumes and noise levels associated with Genesee Avenue.

Table 5
Ambient Noise Measurements

I.D.	Location	Date/Time	Noise Level [dB(A) L_{eq}]	Notes/ Noise Sources
1	In the southern portion of the project parking lot, approximately 160 feet northeast of Genesee Avenue.	April 11, 2017 11:34 a.m.–11:49 a.m.	57.8	Vehicle traffic on Genesee Avenue and aircraft
2	Approximately 25 feet southwest of Genesee Avenue and approximately 80 feet southeast of Scripps Hospital Driveway.	April 11, 2017 12:28 p.m.–12:43 p.m.	68.6	Vehicle traffic on Genesee Avenue

Image Source: NearMaps (flown Jan 2017)

Project Boundary

Noise Measurement Location

FIGURE 4

Noise Measurements

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4.0 Analysis Methodology

Noise level predictions and contour mapping were developed using noise modeling software, SoundPlan Essential (SoundPlan), version 3.0 (Navcon Engineering 2015). SoundPLAN calculates noise propagation based on the International Organization for Standardization method (ISO 9613-2 – Acoustics, Attenuation of Sound during Propagation Outdoors). The model calculates noise levels at selected receiver locations using input parameter estimates such as total noise generated by each noise source; distances between sources, barriers, and receivers; and shielding provided by intervening terrain, barriers, and structures. The model outputs can be developed as noise level contour maps or noise levels at specific receivers. In all cases, receivers were modeled at 5 feet above ground elevation, which represents the average height of the human ear.

4.1 Construction Noise Analysis

Project construction noise would be generated by diesel engine-driven construction equipment used for site preparation and grading, removal of existing structures and pavement, loading, unloading, and placing materials and paving. Diesel engine-driven trucks also would bring materials to the site and remove the soils from excavation.

Peak noise levels measured at a distance of 50 feet from a piece of heavy-duty construction equipment with a diesel engine typically range between 80 and 90 dB(A) (Federal Transit Administration 2006). However, due to variation in power and equipment movement average noise levels are typically at adjacent receivers much less than these maximum noise levels. The variation in power is accounted for through the use of acoustical use factors, which are unitless factors (usually expressed as a percentage) that represents the average noise generated by use of a piece of equipment versus its maximum noise level. Equipment movement is accounted for by modeling construction equipment as an area source distributed, with sound energy generated over the entire work area.

Excavation and grading typically includes the most pieces of heavy equipment and results in the highest noise levels at adjacent receivers. Based on previous projects with similar scope and magnitude, excavation and grading activities would involve an excavator, dozer, grader, and backhoe loaders. Table 6 summarizes reference maximum sound pressure levels and acoustical use factors from the Federal Highway Administration's (FHWA's) Road Constriction Noise Model, Version 1.1 (RCNM) (FHWA 2008). As summarized in Table 6, this analysis converted FHWA data to equivalent sound power levels for use in the SoundPlan model.

Table 6 Construction Equipment Modeled Noise Levels [dB(A)]				
Equipment	L_{max} at 50 feet	Usage Factor	L_{eq} at 50 feet	L_{pw}
Backhoe Loader	77.6	40%	73.6	105.3
Dozer	81.7	40%	77.7	109.4
Excavator	80.7	40%	76.7	108.4
Grader	85.0	40%	81.0	112.7
Cumulative Sound Power Level				115.3
SOURCE: FHWA 2008. dB(A) L_{max} = maximum A-weighted decibels dB(A)L_{eq} = one-hour equivalent continuous A-weighted decibels dB(A)L_{pw} = one-hour equivalent continuous sound power level				

Based on the size of the site, it is anticipated that up to three pieces of equipment may be active and under maximum load at a given time. Accounting for the three loudest pieces of equipment – the dozer, excavator, and grader – total sound power generated by project construction equipment would be 115 dB(A). Project excavation and grading activities were modeled as a continuously active area source encompassing the entire project site and with a sound power level of 115 dB(A) L_{pw} at 10 feet above grade.

4.2 Traffic Noise Analysis

Noise generated by future traffic was modeled using FHWA's Traffic Noise Model algorithms and reference levels. In addition to standard input, such as topography and barriers, traffic parameters include projected hourly traffic volumes and vehicle mix, distribution, and speed. Noise level contours were calculated based on the peak hour traffic volumes, which were estimated to be 10 percent of the total average daily traffic (ADT) volume. Typically, the predicted CNEL and the maximum daytime hourly L_{eq} calculated are equal. Modeling conservatively assumes flat topography with no intervening terrain between roadways and receivers.

Roadways in the vicinity of the project site include Campus Point Drive and Genesee Avenue. According to the traffic impact analysis, the existing use is estimated to generate 584 trips per day and the proposed use would generate approximately 658 trips per day. Thus, the project would result in a net increase of approximately 74 trips per day (Urban Systems Associates, Inc. 2017). Traffic noise levels were based on existing and near-term traffic volumes obtained from the project Traffic Impact Analysis. A typical vehicle classification mix of 96 percent passenger vehicles, 3 percent medium trucks, and 1 percent heavy trucks assumed. The project would not substantially alter the vehicle classifications mix on local or regional roadways. Traffic volumes on adjacent roadways and the distribution of project-generated traffic are summarized in Table 7.

Table 7 Modeled Traffic Volumes				
Roadway	Speed Limit (mph)	Traffic Volume (ADT)		
		Existing	Existing with Project	Project Contribution
Campus Point Drive				
Northeast of Genesee Road	35	11,117	11,191	74 (0.7%)
Genesee Avenue				
Northwest of Campus Point Drive	45	33,993	34,023	30 (0.1%)
Southeast of Campus Point Drive	45	30,602	30,638	36 (0.1%)
SOURCE: Urban Systems Associates, Inc. 2017. ADT = average daily traffic; mph = miles per hour				

4.3 Aircraft Noise

Aircraft noise levels are assessed against noise compatibility criteria established in the MCAS Miramar ALUCP. According to the ALUCP, research and development facilities are compatible with aircraft noise levels up to 70 CNEL and conditionally compatible with noise levels up to 80 CNEL. Noise contours are shown in Figure 5. As shown, the project site is within the airport impact area, but outside the 60 CNEL noise contour.

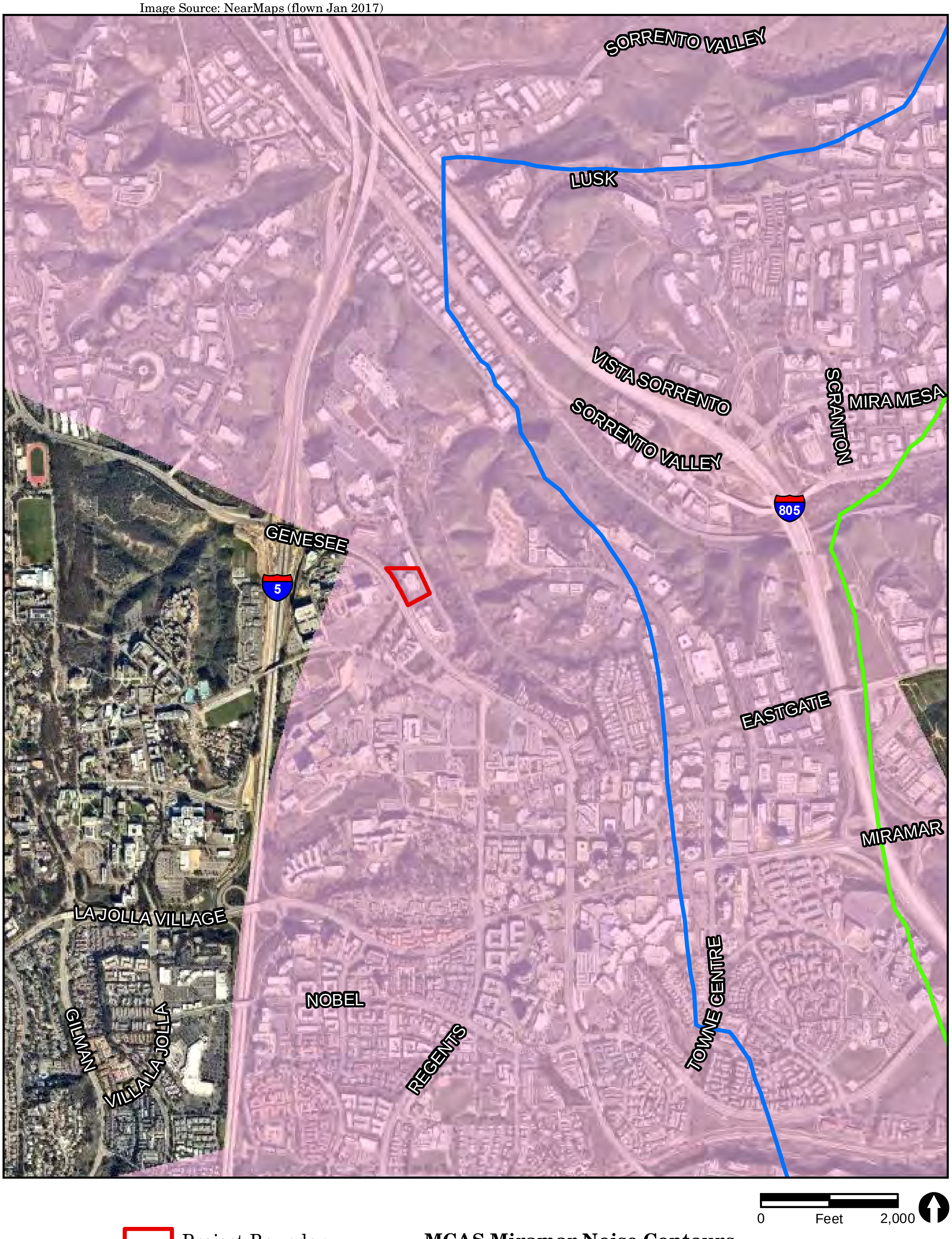
4.4 On-site Noise Source Analysis

Several noise sources associated with the proposed project would be located indoors, including boilers, chillers, and air-handling units. Due to attenuation provided by the building envelope, noise sources located within the structure are not anticipated to generate substantial noise levels at exterior locations. Thus, indoor noise sources are not anticipated to violate the noise level limits of the Municipal Code.

Outdoor noise sources such as delivery trucks idling during unloading and loading operations, mechanical equipment in the external equipment yard, and air handlers for heating, ventilation, and air conditioning (HVAC) systems are already associated with the existing use; although associated with the existing use these noise sources may be reoriented nearer to adjacent uses or may increase in intensity.

Specific shielding accounted for in the model includes shielding from the proposed building and the equipment yard wall, which is anticipated to be constructed using 8-inch concrete block and at a height of 12 feet above grade surrounding the generator and 20 feet above grade surrounding the cooling tower.

Image Source: NearMaps (flown Jan 2017)



Project Boundary
Airport Influence Area

MCAS Miramar Noise Contours
60 CNEL
65 CNEL

FIGURE 5
Airport Noise Contours

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4.4.1 Loading Operations

The project includes one at-grade loading bay near the northwest corner of the building. In order to evaluate noise from truck delivery, the analysis utilizes measurements of reference noise level taken at an Albertson's Shopping Center in San Diego, California, in 2011 (Ldn Consulting 2011). The measurements include truck drive-by noise, truck loading/unloading, and truck engine noise. The exterior noise levels for a single truck drive-by noise and a single truck's engine idling noise were measured at 66.5 dB(A) L_{eq} at a distance of 25 feet from the loading bay. The on-site maneuvering associated with the delivery trucks consists of the truck entering the site and traveling toward and backing into the loading bay. For the loading operations, a truck would take approximately 5 minutes to position itself into a bay, 30 to 45 minutes to be unloaded or loaded, and another 5 minutes to exit the bay secure doors, complete necessary paperwork, and drive out of the site. This equates to 40 to 55 minutes that it would take for one truck to complete a delivery or pickup; therefore, each loading bay is anticipated to accommodate only one truck per hour. During the loading/unloading of the truck, the engine can only idle for 5 minutes in compliance with state air quality requirements. It was assumed that each truck engine would be operating for up to 15 minutes of the total time required during the delivery process (5 minutes at arrival, 5 minutes of idling, and 5 minutes at departure). Accounting for the limited time of operation, average hourly noise levels would equate to 60.5 dB(A) L_{eq} at a distance of 25 feet for each loading bay. This sound pressure level equates to a sound power level of approximately 86 dB(A) L_{pw}. Although loading operations are anticipated to take place primarily during daytime hours, loading operations may occur during the evening and nighttime hours. For a worst-case scenario it was assumed that loading operations would take place during daytime, evening, and nighttime hours. Loading operations was modeled as a continuous noise source at 3 feet above grade and with a sound power level of 86 dB(A) L_{pw}.

4.4.2 Cooling Tower

The specific design and selection of the cooling tower system has not been completed at this stage of design. Based on review of various manufacturer specifications, a representative 1,188-ton Evapco® Model USS 212-4L28 cooling tower was assessed. This model is approximately 18 feet tall, with several distinct noise sources such as plume exhaust fans, and intake and outtake valves, and internal transformers at various elevations within the cooling tower assembly (Attachment 2). The manufacturer data sheet indicates that cooling tower noise is directional and the cooling tower generates 81 dB(A) at 50 feet from the side of the base of the boiler and 83 dB(A) at 5 feet from the top of the boiler (Evapco 2017). These sound pressure levels equate to sound power levels of approximately 96 dB(A) L_{pw} at the base of the boiler and approximately 98 at the top of the boiler. The cooling tower was modeled as two distinct continuous noise sources, one at 3 feet above grade with a sound power level of 96 dB(A) and the second at 18 feet above grade and with a sound power level of 99 dB(A) L_{pw}.

4.4.3 Standby Generator

The specific design and selection of the standby generator system has not been completed at this stage of design. Based on review of various manufacturer specifications, a representative 1,280 kW Kohler® Model 1250REOZMD generator with the base sound enclosure was assessed. The primary noise source associated with a generator is the engine. Although the generator enclosures would reach up to 12 feet tall, the engine would be located approximately 4 feet above grade (see Attachment 2). The manufacturer data sheet indicates that under peak load, the generator with a basic sound enclosure would generate up to 85 dB(A) at 23 feet. This sound pressure level equates to a sound power level of approximately 110 dB(A) L_{pw} (Kohler Power Systems 2017). The standby generator was modeled as a continuous noise source at 4 feet above grade and with a sound power level of 110 dB(A) L_{pw}.

4.4.4 Air Handling Units

The specific design and selection of the HVAC system has not been completed at this stage of design. The proposed building is anticipated to require air handling units with capacity to move approximately 200,000 cubic feet per minute (CFM) of air supplied by up to three air handling units. For modeling purposes, each of these units was modeled based on noise level data for Huntair™ Air Handler Units with a capacity of 71,400 CFM; a representative sound power level of 92.1 dB(A) L_{pw} is considered representative of a typical 71,400 CFM air handling unit (see Attachment 2). Three air handling units were modeled as a continuous noise source at 3 feet above the rooftop and evenly spaced across the rooftop, each with a sound power level of 78 dB(A) L_{pw}.

Rooftop features such as parapet walls typically provide noise attenuation. As the height and orientation of rooftop features has not been finalized, all rooftops were conservatively modeled as flat, with no features to obstruct noise propagation. For a worst-case analysis, it was assumed that the air handling units would be continuously operated at maximum capacity.

5.0 Future Acoustical Environment and Impacts

5.1 Construction Noise

Following the methodology discussed in Section 4.1, Construction Analysis Methodology, construction noise levels were modeled at a series of specific receiver locations at the property line of the nearest residentially zoned property and at the property line of the nearest residential use. Each receiver location was modeled at a height of 5 feet above grade. Table 8 summarizes the projected noise levels at the modeled receiver location. Receiver locations and ground-floor noise contours are shown on Figure 6. SoundPLAN data for construction noise modeling are contained in Attachment 3.

Image Source: NearMaps (flown Jan 2017)

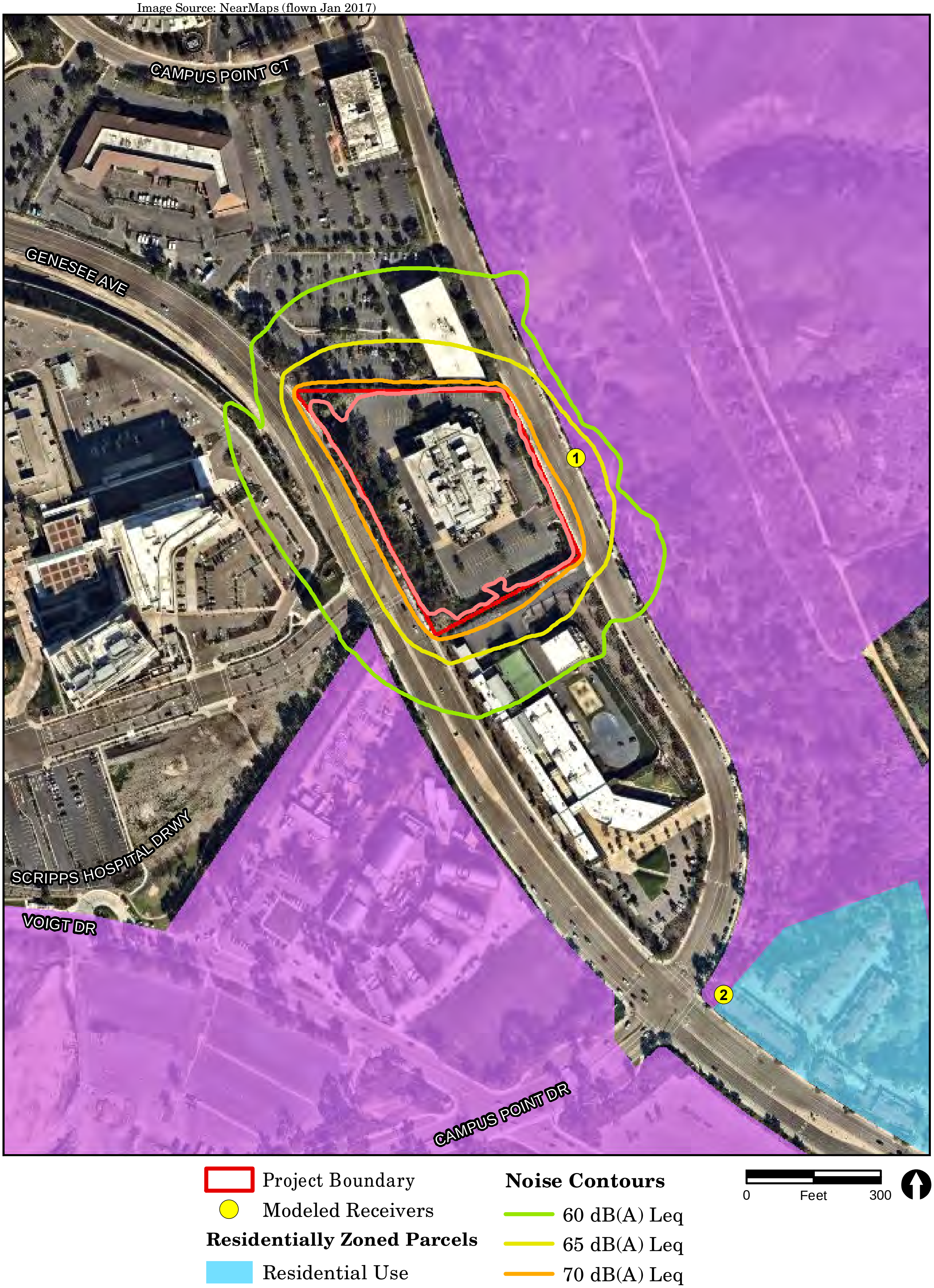

FIGURE 6

Construction Noise Contours

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Table 8 Construction Noise Levels [dB(A) $L_{eq(12)}$]		
Receiver	Description	Noise Levels [dB(A) $L_{eq(12)}$]
1	Undeveloped property across Campus Point Drive (nearest residential zone)	66
2	La Jolla Vista Townhouses Community (nearest residence)	50
dB(A) $L_{eq(12)}$ = 12-hour equivalent A-weighted decibels.		

As discussed previously, the City's Noise Ordinance regulates construction noise. Construction noise may not exceed 75 dB(A) $L_{eq(12h)}$ at or beyond the property line of a residentially zoned property. All properties in the vicinity of the project site are zoned industrial with the exception of undeveloped parcels to the east across Campus Point Drive. At the nearest residentially zoned property construction noise levels are anticipated to be 66 dB(A) $L_{eq(12h)}$. Construction noise would not exceed application noise level limits from the City's Noise Ordinance at a residential property line.

The property line of the nearest residential use is located at 9873 Leeds Street in the La Jolla Vista Townhouses community, approximately 1,015 feet southeast of the project site. At the property line of a residential use, construction noise levels are projected are anticipated to be 50 dB(A) $L_{eq(12h)}$. Thus, construction noise levels would not exceed the City's threshold. Therefore, construction noise levels would comply with applicable noise level limits from the City's Noise Ordinance at both the nearest residentially zoned property and the property line of the nearest residential use.

Construction activities would generally occur between 7:00 a.m. and 7:00 p.m. on weekdays. No nighttime construction is anticipated. Although the nearby residentially zoned properties would be exposed to construction noise levels that may be heard above ambient conditions, the exposure would be temporary and would not exceed the applicable City standard of 75 dB(A) $L_{eq(12h)}$. As construction activities associated with the project would comply with noise level limits from Noise Ordinance Section 59.5.0404, temporary increases in noise levels from construction activities would be less than significant.

5.2 Traffic Noise

5.2.1 Traffic Noise Increases

The project would increase traffic volumes on local roadways. Following the methodology discussed in Section 4.2, Traffic Noise Analysis, traffic noise levels were modeled with and without project-generated traffic. Table 9 summarizes anticipated traffic volumes with and without the project and associated noise level increases.

Table 9 Modeled Traffic Volumes					
	Traffic Volume (ADT)		Noise Level at 50 feet (CNEL)		
Roadway	Existing	Existing with Project	Existing	Existing with Project	Noise Increase
Campus Point Drive					
Northeast of Genesee Road	11,117	11,191	67	67	>1
Genesee Avenue					
Northwest of Campus Point Drive	33,993	34,023	74	74	>1
Southeast of Campus Point Drive	30,602	30,638	73	73	>1
SOURCE: Urban Systems Associates, Inc. 2017. ADT = average daily traffic; CNEL = community noise equivalent level					

As shown in Table 9, the project would result in a less than 1 dB(A) increase in traffic noise over the no project condition along all affected roadway segments. Therefore, impacts associated with project-generated traffic noise would be less than significant.

5.2.2 Traffic Noise Compatibility

The project proposes a research and development building and does not include exterior use areas. As the project does not include exterior use areas, the project would not exceed the City Significance Determination Threshold of 75 CNEL at an exterior use area.

Interior noise levels are estimated based on noise levels at the building façade. As discussed in Sections 2.1 and 2.4, the 2016 California Green Building Standards Subsection 5.507.4 requires that interior noise levels in nonresidential buildings do not exceed 50 dB(A) L_{eq}. The City General Plan interior noise land use compatibility standard for research and development also identifies 50 CNEL as the appropriate interior noise standard.

As shown in Table 9, Genesee Avenue generates noise levels of approximately 74 dB(A) CNEL at 50 feet. At its nearest point, the proposed research and development building would be approximately 280 feet northeast of the nearest lane of Genesee Avenue. Conservatively assuming no noise reduction from topography or vegetation between Genesee Avenue, noise levels at the building façades of the proposed research and development building would reach up to 66 dB(A) CNEL. According to the FHWA's Highway Traffic Noise Analysis and Abatement Guidance, buildings with masonry façades and double glazed windows can be estimated to provide a noise level reduction of 35 dB, while light-frame structures with double-glazed windows may provide noise level reductions of 25 dB (FHWA 2011). Thus, depending on building construction techniques, maximum interior noise levels would be between 31 and 41 CNEL depending on the building construction techniques. Therefore, interior noise levels would be well below acoustical control limits established by the 2016 California Green Building Standards and noise land use compatibility standards established by the City General Plan. Thus, the project would be compatible with the existing noise environment.

5.3 Aircraft Noise

As discussed in Section 4.3, Aircraft Noise, the project site is outside the 60 CNEL noise contour for MCAS Miramar. Therefore, aircraft noise levels would not exceed 60 CNEL. As aircraft noise levels would not exceed the applicable compatibility criteria, 70 CNEL, the project would be compatible with noise from MCAS Miramar.

5.4 On-site Generated Noise

Following the methodology discussed in Section 4.4, On-site Noise Source Analysis, noise levels associated with the proposed standby generator, cooling tower, loading operations, and air handlers were modeled at a series of specific receiver locations along the project site boundary and property lines and noise ground-floor contours were generated. Modeled noise levels assess the worst-case scenario in which the loading operations are active and the cooling tower, standby generator, and all air handling units are operating under peak capacity. Each receiver location was modeled at elevations corresponding to each floor of the associated development. Table 10 summarizes the projected noise levels at the modeled receivers. Receiver locations and ground-floor noise contours are shown on Figure 7. SoundPLAN data for on-site noise modeling are contained in Attachment 3.

Table 10
On-site Generated Noise Levels

Receiver	Description	Noise Levels [dB(A) L_{eq}]
1	Project Site Northern Boundary	61
2		65
3		60
4	Project Site Southern Boundary	51
5		51
6	Preuss Performative High School	46
7	Western Boundary of Scripps Memorial Hospital La Jolla	51
8		50

dB(A) $L_{eq(12)}$ = 12-hour equivalent A-weighted decibels.

As shown in Table 10, under the modeled worst-case scenario noise levels at the property lines between the project site and adjacent industrial uses would be between 51 and 65 dB(A) L_{eq}. As adjacent land uses to the north and south are industrial, the applicable noise level limits from the City's Noise Ordinance are 75 dB(A) L_{eq}. Thus, project operation is not anticipated to generate noise levels in excess of applicable noise level limits of the Municipal Code.

Image Source: NearMaps (flown Jan 2017)

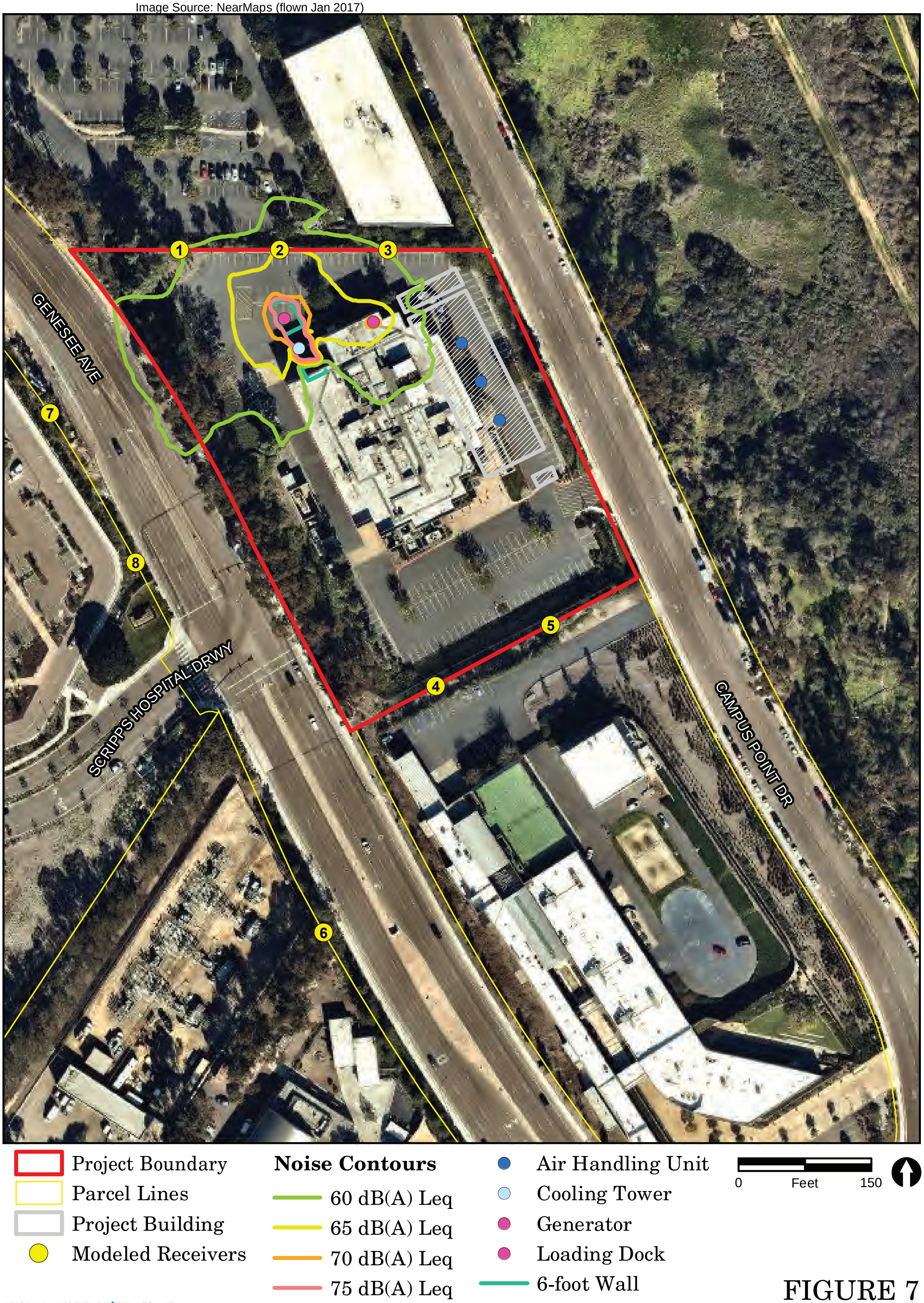

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FIGURE 7

Equipment Noise Contours

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Land uses to the west of the project site include Scripps Memorial Hospital and the Preuss Performative School. Under the modeled worst-case scenario noise levels at the nearest property line of Scripps Memorial Hospital would reach up to 51 dB(A) L_{eq} and noise levels at the property line of the Preuss Performative School would reach up to 46 dB(A) L_{eq}.

The property line of the Scripps Memorial Hospital was assessed based on the arithmetic mean of the noise level limits for industrial and commercial uses and thus applicable noise level limits would be 70 dB(A) L_{eq} during the daytime hours and 67.5 dB(A) L_{eq} during evening and nighttime hours. Project-generated noise levels, 51 dB(A) L_{eq}, would not exceed applicable noise level limits of the Municipal Code at the property line of Scripps Memorial Hospital.

The property line of the Preuss Performative School was assessed based on the arithmetic mean of the noise level limits for industrial and other residential uses and thus applicable noise level limits would be 67.5 dB(A) L_{eq} during the daytime hours and 65 dB(A) L_{eq} during evening hours. Nighttime noise level limits would not be applicable as the school does not operate after 10:00 p.m. Project-generated noise levels, 46 dB(A) L_{eq}, would not exceed applicable noise level limits of the Municipal Code at the property line of Preuss Performative School.

As noise levels associated with operation of the project would comply with applicable noise level limits from City Municipal Code Section 59.5.0401, on-site generated noise would be less than significant.

6.0 Conclusions and Noise Abatement Measures

6.1 Construction Noise

Construction activities would generally occur between 7:00 a.m. and 7:00 p.m. on weekdays. As demonstrated, construction noise levels would be anticipated to reach 66 dB(A) L_{eq} at the property lines of the nearest residentially zoned property. While construction may be heard over other noise sources in the area, the exposure would be temporary and would not exceed the applicable regulation of 75 dB(A) $L_{eq(12h)}$ at the nearest property line of a residentially zoned property. Therefore, temporary increases in noise levels from construction activities would be less than significant.

6.2 Traffic Noise Increases

The project would result in a less than 1 dB(A) increase in traffic noise over the existing condition along all affected roadway segments. This increase in noise level would be less than perceptible; thus, the project would not contribute to a substantial increase in traffic noise.

The project would include exterior use areas and thus would not exceed exterior noise land use compatibility standards. Vehicle traffic on Genesee Avenue is anticipated to generate peak L_{eq} and CNEL noise levels between 31 to 41 dB(A) in the proposed research and development building. These interior noise levels would be consistent with state acoustical control standards and City noise land use compatibility standards. Thus, the project would be compatible with the existing noise environment.

6.3 Aircraft Noise

The project site is outside the 60 CNEL noise contours for MCAS Miramar. According to the ALUCP, research and development facilities are compatible with aircraft noise levels up to 70 CNEL and conditionally compatible with noise levels up to 80 CNEL. As aircraft noise levels would not exceed the applicable compatibility criteria the project would be compatible with noise from MCAS Miramar.

6.4 On-site Generated Noise

The uses associated with the proposed research and development building would be primarily indoors. Due to attenuation from the building envelope, indoor uses are not anticipated to generate substantial exterior noise levels. Outdoor noise sources, such as delivery trucks idling during unloading, a cooling tower, a standby generator, and HVAC system air handling units, are already associated with the research and development use; however, would be reoriented as part of the project.

As measured at the nearest property lines of adjacent industrial uses, the proposed equipment is anticipated to generate noise levels ranging from 51 and 65 dB(A) L_{eq}. Noise levels at the property lines of other nearby uses such as Scripps Memorial Hospital and the Preuss Performative School would reach up to 51 dB(A) L_{eq} and 46 dB(A) L_{eq}, respectively. Noise levels would be below all applicable noise level limits from City Municipal Code Section 59.5.0401. Therefore, on-site generated noise would be less than significant.

7.0 References Cited

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ATTACHMENTS

ATTACHMENT 1

Noise Measurement Data

Summary			
Filename	LxT_Data.009		
Serial Number	3827		
Model	SoundExpert™ LxT		
Firmware Version	2.301		
User			
Location			
Job Description			
Note			
Measurement Description			
Start	2017/04/11 11:34:40		
Stop	2017/04/11 11:49:40		
Duration	0:15:00.2		
Run Time	0:14:40.3		
Pause	0:00:19.9		
Pre Calibration	2017/04/11 11:25:33		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 Octave		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	At Lmax		
Overload	121.6 dB		
	A	**C**	**Z**
Under Range Peak	**77.9**	74.9	79.9 dB
Under Range Limit	**26.0**	25.2	32.0 dB
Noise Floor	16.2	16.0	21.9 dB
Results			
LAeq	57.8 dB		
LAE	87.3 dB		
EA	59.461 µPa²h		
LApeak (max)	2017/04/11 11:42:48	91.1 dB	
LASmax	2017/04/11 11:42:48	74.7 dB	
LASmin	2017/04/11 11:44:22	46.0 dB	
SEA	-99.9 dB		
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s	
Community Noise	**Ldn**	**LDay 07:00-22:00**	
	57.8	57.8	
LCeq	70.7 dB		
LAeq	57.8 dB		
LCeq - LAeq	12.9 dB		
LAIeq	60.3 dB		
LAeq	57.8 dB		
LAIeq - LAeq	2.4 dB		
# Overloads	0		
Overload Duration	0.0 s		
# OBA Overloads	0		
OBA Overload Duration	0.0 s		
Statistics			
LAS5.00	60.7 dB		
LAS10.00	58.5 dB		
LAS33.30	54.9 dB		
LAS50.00	53.6 dB		
LAS66.60	52.1 dB		
LAS90.00	49.1 dB		

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
Direct	2016/12/05 8:48:15	-26.0
Direct	2016/12/05 8:20:31	-26.0
Direct	2016/12/05 7:57:36	-26.0
PRMLxT1	2015/06/01 14:58:37	-50.8
PRMLxT1	2015/06/01 14:58:10	-50.8
PRMLxT1	2015/03/23 12:06:20	-50.8
PRMLxT1	2015/03/03 13:49:49	-50.9
PRMLxT1	2015/03/03 13:28:13	-50.6
PRMLxT1	2015/03/03 13:27:59	-50.6
PRMLxT1	2015/03/03 13:27:25	-50.7
PRMLxT1	2015/03/03 13:27:10	-50.7
PRMLxT1	2015/03/03 13:26:55	-50.7
PRMLxT1	2015/03/03 13:26:42	-50.6
PRMLxT1	2015/03/03 13:26:28	-50.6
PRMLxT1L	2017/04/11 11:25:33	-27.9
PRMLxT1L	2017/04/11 11:25:15	-27.9
PRMLxT1L	2017/03/17 11:22:41	-27.6
PRMLxT1L	2017/03/16 10:32:58	-27.8
PRMLxT1L	2017/03/06 7:48:40	-28.0
PRMLxT1L	2017/03/03 14:41:02	-27.9
PRMLxT1L	2017/03/02 9:09:32	-28.0
PRMLxT1L	2017/03/01 14:50:51	-27.9
PRMLxT1L	2016/12/12 13:50:50	-27.6
PRMLxT1L	2016/12/05 8:55:40	-27.6
PRMLxT1L	2016/12/05 7:50:43	-26.4

Summary

Filename	LxT_Data.010		
Serial Number	3827		
Model	SoundExpert™ LxT		
Firmware Version	2.301		
User			
Location			
Job Description			
Note			
Measurement Description			
Start	2017/04/11 12:28:24		
Stop	2017/04/11 12:43:24		
Duration	0:15:00.7		
Run Time	0:15:00.7		
Pause	0:00:00.0		
Pre Calibration	2017/04/11 12:21:10		
Post Calibration	None		
Calibration Deviation	---		

Overall Settings

RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 Octave		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	At Lmax		
Overload	121.6 dB		
	A	**C**	**Z**
Under Range Peak	**77.8**	74.8	79.8 dB
Under Range Limit	**25.9**	25.2	31.9 dB
Noise Floor	16.2	16.0	21.9 dB

Results

LAeq	68.6 dB	
LAE	98.1 dB	
EA	721.694 µPa²h	
LApeak (max)	2017/04/11 12:35:56	94.3 dB
LASmax	2017/04/11 12:29:44	82.1 dB
LASmin	2017/04/11 12:41:53	53.6 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**
	68.6	68.6
LCeq	76.5 dB	
LAeq	68.6 dB	
LCeq - LAeq	7.9 dB	
LAIeq	70.3 dB	
LAeq	68.6 dB	
LAIeq - LAeq	1.7 dB	
# Overloads	0	
Overload Duration	0.0 s	
# OBA Overloads	0	
OBA Overload Duration	0.0 s	

Statistics

LAS5.00	73.3 dB
LAS10.00	72.3 dB
LAS33.30	69.2 dB
LAS50.00	65.9 dB
LAS66.60	61.9 dB
LAS90.00	56.8 dB

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
Direct	2016/12/05 8:48:15	-26.0
Direct	2016/12/05 8:20:31	-26.0
Direct	2016/12/05 7:57:36	-26.0
PRMLxT1	2015/06/01 14:58:37	-50.8
PRMLxT1	2015/06/01 14:58:10	-50.8
PRMLxT1	2015/03/23 12:06:20	-50.8
PRMLxT1	2015/03/03 13:49:49	-50.9
PRMLxT1	2015/03/03 13:28:13	-50.6
PRMLxT1	2015/03/03 13:27:59	-50.6
PRMLxT1	2015/03/03 13:27:25	-50.7
PRMLxT1	2015/03/03 13:27:10	-50.7
PRMLxT1	2015/03/03 13:26:55	-50.7
PRMLxT1	2015/03/03 13:26:42	-50.6
PRMLxT1	2015/03/03 13:26:28	-50.6
PRMLxT1L	2017/04/11 12:21:04	-27.9
PRMLxT1L	2017/04/11 12:20:28	-27.9
PRMLxT1L	2017/04/11 11:57:17	-28.0
PRMLxT1L	2017/04/11 11:56:58	-28.0
PRMLxT1L	2017/04/11 11:25:33	-27.9
PRMLxT1L	2017/04/11 11:25:15	-27.9
PRMLxT1L	2017/03/17 11:22:41	-27.6
PRMLxT1L	2017/03/16 10:32:58	-27.8
PRMLxT1L	2017/03/06 7:48:40	-28.0
PRMLxT1L	2017/03/03 14:41:02	-27.9
PRMLxT1L	2017/03/02 9:09:32	-28.0

ATTACHMENT 2

Unit Specification Sheets

Cooling Tower Data Sheet

Matt Bradshaw
VERTICAL SYSTEMS
4340 Viewridge Ave
Suite C
San Diego, CA 92123
USA
Cell Phone: 415-370-8953
Email: mbradshaw@vertisys.net

Project : Takeda CT
Equipment Reference: CT-1,2 (Plume Abatement)
Product Type : AT/UT/USS Cooling Tower

Date: 4/13/2017

Selection Criteria

Capacity (Tons):	1,000.00
Capacity (MBH):	15,000.00
Fluid Type:	Water
Flow (GPM):	3000.0
Entering Fluid Temp (°F):	93.0
Leaving Fluid Temp (°F):	83.0
Wet Bulb (°F):	72.0

IBC Design Criteria

Importance Factor (I_P)	1.0
Seismic (S_{DS})	up to 0.84 g
Wind Load (P)	up to 119 psf
:	

Product line is CTI/ECC certified. Selection is rated in accordance with CTI Standard 201 RS.

Qty	Model	Capacity (Tons)	Percent Capacity
1	USS 212-4L28	1,188.00	118.8

All Weights, Dimensions and Technical Data are Shown per Unit

Fans:	2
# Fan Motors @ HP:	(2) @ 25.00 (460/3/60)
Air Flow (CFM)	201,200
Inlet Pressure Drop (psi):	2.1
Evaporated Water Rate (gpm):	24.00

Overall Length:	28' 2.000"
Overall Width:	11' 10.000"
Overall Height:	17' 6.250"
Operating Weight (lbs):	34,220
Shipping Weight (lbs):	19,560
Heaviest Section (lbs):	6,730

	Pricing
Base Model:	83,647
Options Selected	
(2) Fan Motor: Inverter Capable, Premium Efficient	0
EVAPAK Fill	0
IBC Standard Structural Design	0
Louver Access Door	0
Plume Abatement Coil	40,685
304 Stainless Steel Upper	33,894
304 Welded Stainless Steel Cold Water Basin	21,180
5-Probe Electronic Water Level Control Package	1,929
Ladder	1,700

evapSelect Version: US Feb 2017

Vibration Switch	946
(2) Equalizer Connection; Bottom; 3"; BFW/GRVD	676
(2) Grooved Extra Connection <4" (<102 mm); Side; 2.00"	333
Total Net Price per Unit:	**184,990 USD**
Number of Units:	x 1
Total Net Price for Location:	**184,990 USD**
Estimated Inland Freight:	3,675
Freight Allowed Price:	**188,665 USD**

Sound Data (Sound Pressure Levels in dB(A))

	End	Mtr Side	Opp End	Opp Mtr Side	Top
S.P.L. dB(A) at 5'	80	81	80	81	83
S.P.L. dB(A) at 50'	65	67	65	67	72

Note 1: Sound Data shown is for 2 Cells operating at full speed

Note 2: The use of frequency inverters (Variable Frequency Drives) can increase sound levels.

Note 3: Sound option(s) selected: None

Layout Criteria

Recommended Clearances Around Units (Feet)

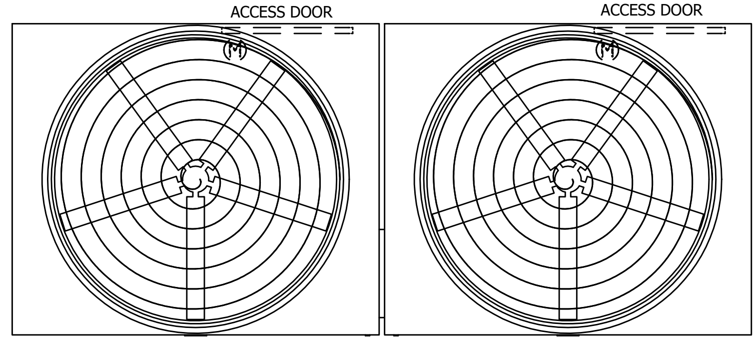
From Unit Ends to Wall:	3.00	Between Unit Ends:	3.00
From Sides to Wall:	3.00	Between Unit Sides:	6.00

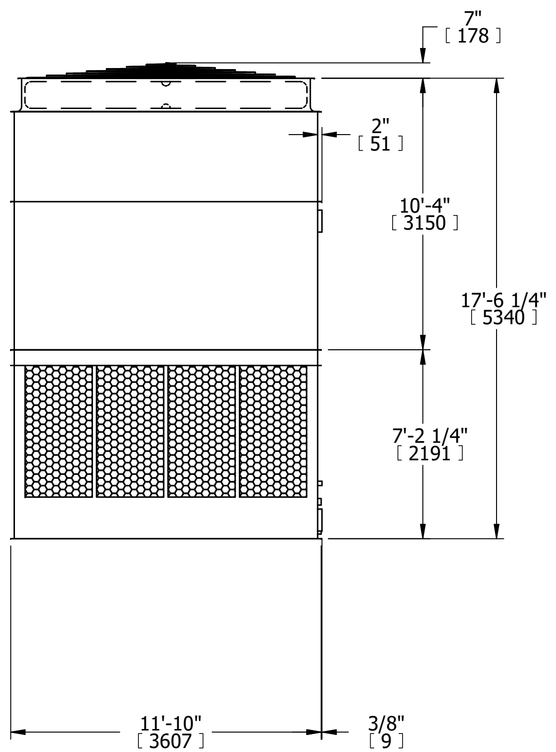
Refer to the Equipment Layout Manual or contact your Sales Representative for more details on layout criteria.

UNIT	AT Cooling Tower		EVAPCO, INC.	DWG. #	T3122848-DRE-ST	REV.	-
MODEL #	USS 212-4L28	SCALE NTS		SERIAL #		DATE	04/13/2017

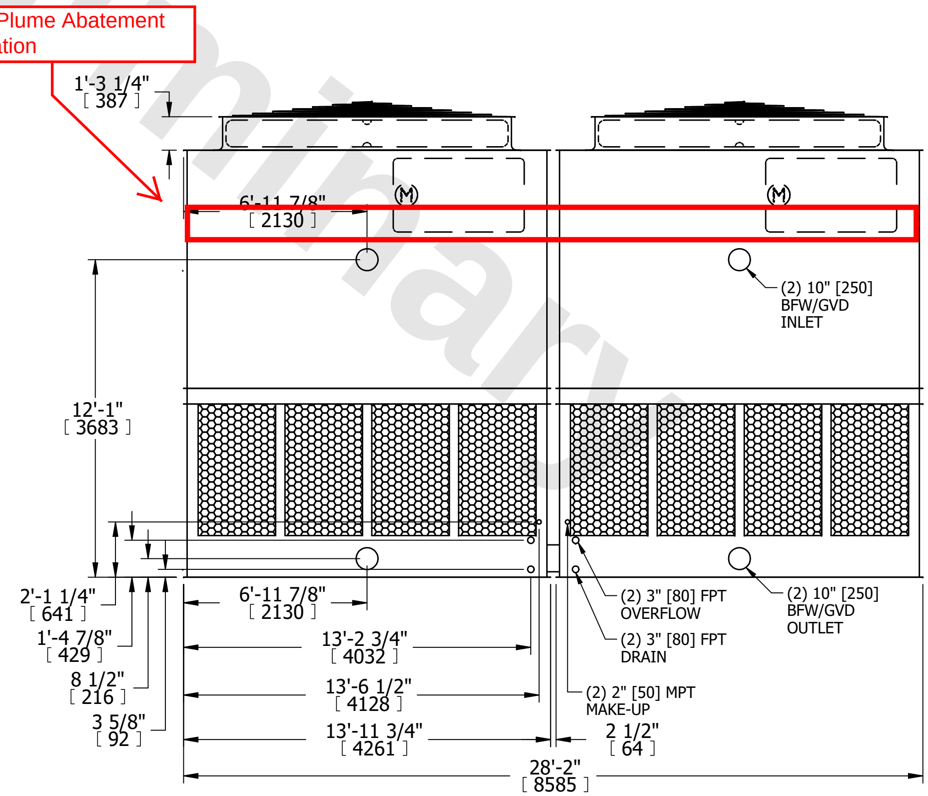
NOTES:
1. (M)- FAN MOTOR LOCATION
2. HEAVIEST SECTION IS UPPER SECTION
3. MPT DENOTES MALE PIPE THREAD
   FPT DENOTES FEMALE PIPE THREAD
   BFW DENOTES BEVELED FOR WELDING
   GVD DENOTES GROOVED
   FLG DENOTES FLANGE
4. +UNIT WEIGHT DOES NOT INCLUDE ACCESSORIES (SEE ACCESSORY DRAWINGS)
5. MAKE-UP WATER PRESSURE
   20 psi MIN [137 kPa], 50 psi MAX [344 kPa]
6. 3/4" [19MM] DIA. MOUNTING HOLES. REFER TO RECOMMENDED STEEL SUPPORT DRAWING
7. DIMENSIONS LISTED AS FOLLOWS:
   ENGLISH FT-IN
   [METRIC] [mm]

PLAN VIEW





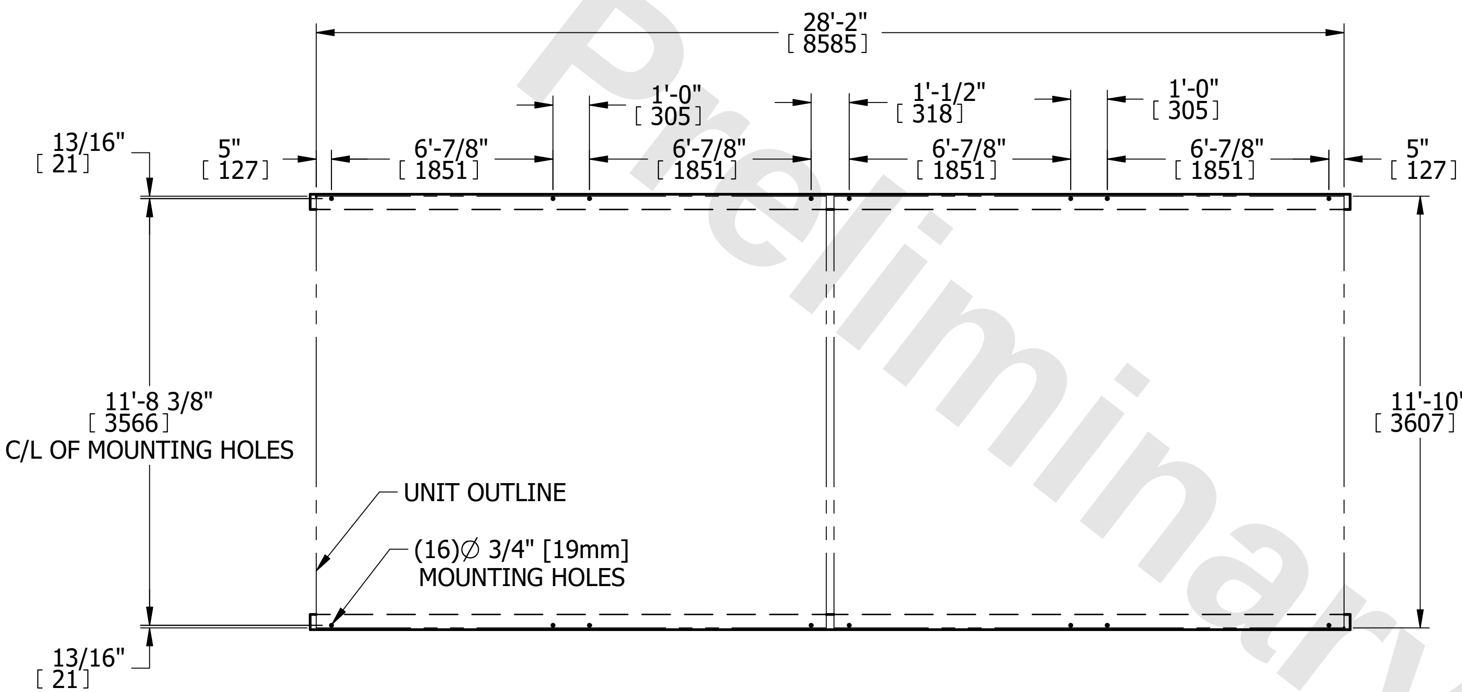
FACE B



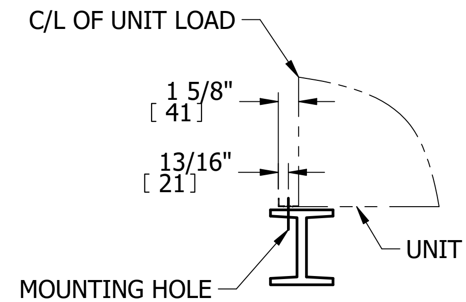
FACE A

SHIPPING WEIGHT	19560 lbs+[8875] kg+	OPERATING WEIGHT	34220 lbs+[15525] kg+	HEAVIEST SECTION WEIGHT	6730 lbs+[3055] kg+	NO. OF SHIPPING SECTIONS	4	DRAWN BY:	KDS

UNIT	EVAPCO, INC.	DWG. #	
USS 212-4L28		SLIX1228-DD	
TITLE		SCALE	DRAWN BY
STEEL SUPPORT CONFIGURATION		N.T.S.	JLG



PLAN VIEW



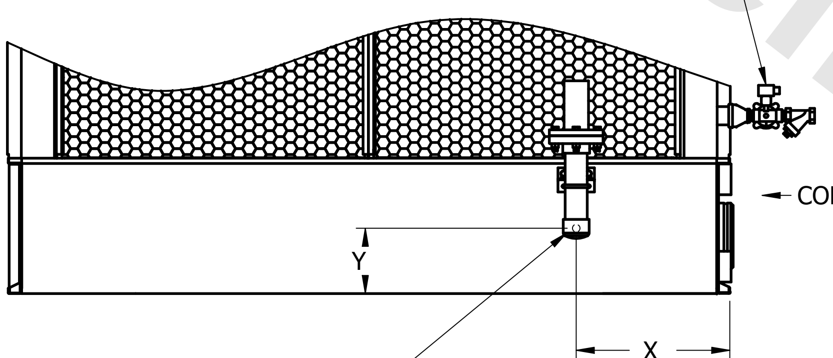
TYPICAL END VIEW

NOTES:

1. BEAMS SHOULD BE SIZED IN ACCORDANCE WITH ACCEPTED STRUCTURAL PRACTICES. MAXIMUM DEFLECTION OF BEAM UNDER UNIT TO BE 1/360 OF UNIT LENGTH NOT TO EXCEED 1/2" [13mm].
2. DEFLECTION MAY BE CALCULATED BY USING 55% OF THE OPERATING WEIGHT AS A UNIFORM LOAD ON EACH BEAM. SEE CERTIFIED PRINT FOR OPERATING WEIGHT.
3. SUPPORT BEAMS AND ANCHOR HARDWARE ARE TO BE FURNISHED BY OTHERS. ANCHOR HARDWARE TO BE ASTM A325 5/8" [16mm] BOLT OR EQUIVALENT.
4. BEAMS MUST BE LOCATED UNDER THE FULL LENGTH OF THE PAN SECTION.
5. SUPPORTING BEAM SURFACE MUST BE LEVEL. DO NOT LEVEL THE UNIT BY PLACING SHIMS BETWEEN THE UNIT MOUNTING FLANGE AND THE SUPPORTING BEAM.
6. ANCHORING ARRANGEMENT SHOWN HAS A MAXIMUM WIND RATING OF 60 PSF [2.88 KPa] ON CASED VERTICAL SURFACES.
7. THE FACTORY RECOMMENDED STEEL SUPPORT CONFIGURATION IS SHOWN. CONSULT THE FACTORY FOR ALTERNATE SUPPORT CONFIGURATIONS.
8. UNIT SHOULD BE POSITIONED ON STEEL SUCH THAT THE ANCHORING HARDWARE FULLY PENETRATES THE BEAM'S FLANGE AND CLEARS THE BEAM'S WEB.
9. FOR ALL MULTIPLE CELL UNITS, OPERATING WEIGHT OF EACH CELL IS FOUND BY DIVIDING TOTAL OPERATING WEIGHT BY THE NUMBER OF CELLS.
10. WHEN VIBRATION ISOLATION IS REQUIRED, THE VIBRATION ISOLATORS (BY OTHERS) MUST BE LOCATED UNDER THE SUPPORTING STEEL BEAMS AND NOT BETWEEN THE SUPPORTING STEEL BEAMS AND THE UNIT.
11. DIMENSIONS LISTED AS FOLLOWS: ENGLISH FT-IN
[METRIC] [mm]

UNIT	USS 212-4L28	DWG. #	ELT3MWML-DD
TITLE	ELECTRIC WATER LEVEL CONTROL LOCATION	SCALE	N.T.S.
		DRAWN BY	JLG

EVAPCO, INC.



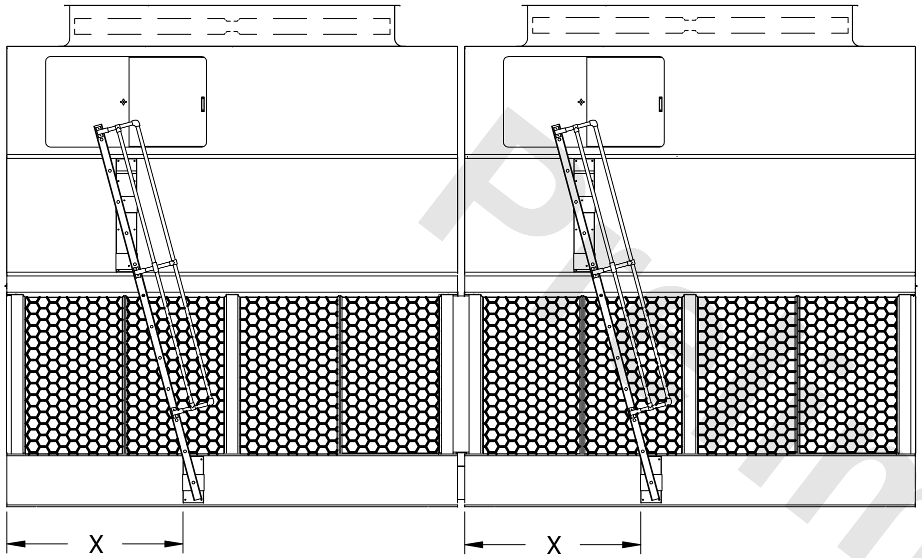
FACE B

UNIT SELECTED	BOX SIZE	VALVE			Y-STRAINER			STANDPIPE		
		QTY	SIZE	PART NO.	QTY	SIZE	PART NO.	QTY	X	Y
☐	2.4Mx9-12	1	1" [25]	017-00153P	1	1" [25]	017-00280P	1	1'-8" [508]	8 1/2" [216]
☐	2.4Mx14-21	1	1 1/2" [40]	017-00154P	1	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	2.4Mx24	2	1" [25]	017-00153P	2	1" [25]	017-00280P	1	1'-8" [508]	8 1/2" [216]
☐	2.4Mx28 (2C)	2	1 1/2" [40]	017-00154P	2	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	2.4Mx36 (3C)	3	1" [25]	017-00153P	3	1" [25]	017-00280P	1	1'-8" [508]	8 1/2" [216]
☐	2.4Mx42 (3C)	3	1 1/2" [40]	017-00154P	3	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	8.5x6-12	1	1" [25]	017-00153P	1	1" [25]	017-00280P	1	1'-8" [508]	8 1/2" [216]
☐	8.5x14-21	1	1 1/2" [40]	017-00154P	1	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	8.5x24	2	1" [25]	017-00153P	2	1" [25]	017-00280P	1	1'-8" [508]	8 1/2" [216]
☐	8.5x28 (2C)	2	1 1/2" [40]	017-00154P	2	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	8.5x36,42 (3C)	3	1 1/2" [40]	017-00154P	3	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	12x12,14	1	1 1/2" [40]	017-00154P	1	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	12x18,20	1	2" [50]	017-00155P	1	2" [50]	017-00282P	1	1'-8" [508]	8 1/2" [216]
☐	12x24,28	2	1 1/2" [40]	017-00154P	2	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	12x36 (2C)	2	2" [50]	017-00155P	2	2" [50]	017-00282P	1	1'-8" [508]	8 1/2" [216]
☐	12x40	2	2" [50]	017-00155P	2	2" [50]	017-00282P	1	1'-8" [508]	8 1/2" [216]
☐	3Mx12	1	1 1/2" [40]	017-00154P	1	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	3Mx18	1	2" [50]	017-00155P	1	2" [50]	017-00282P	1	1'-8" [508]	8 1/2" [216]
☐	3Mx24	2	1 1/2" [40]	017-00154P	2	1 1/2" [40]	017-00281P	1	1'-8" [508]	8 1/2" [216]
☐	3Mx36 (2C)	2	2" [50]	017-00155P	2	2" [50]	017-00282P	1	1'-8" [508]	8 1/2" [216]
☐	6x17	2	1" [25]	017-00153P	2	1" [25]	017-00280P	1	1'-1 1/2" [343]	8 1/2" [216]
☐	7.5x17	2	1" [25]	017-00153P	2	1" [25]	017-00280P	1	1'-1 1/2" [343]	8 1/2" [216]

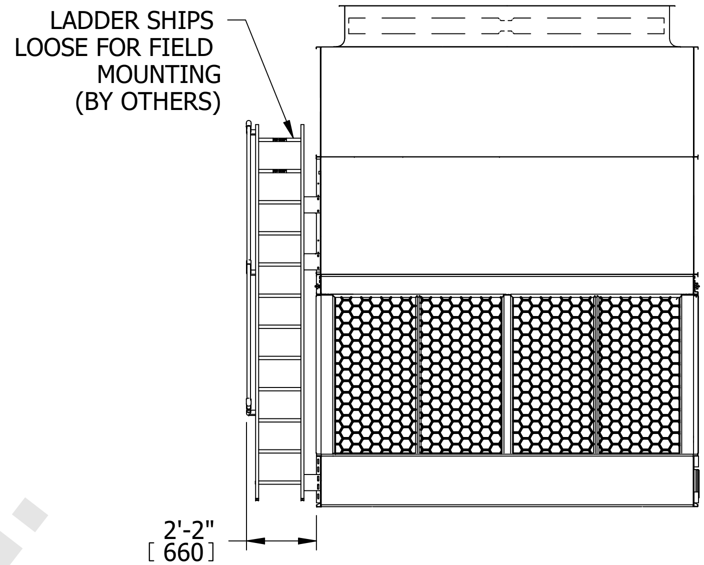
NOTES:
1. PIPING BY OTHERS.
2. LEVEL PROBE STANDPIPE ASSEMBLY, MAKE-UP VALVE AND Y-STRAINER TO SHIP LOOSE FOR FIELD MOUNTING BY OTHERS.
3. SEE CERTIFIED PRINT FOR MAKE-UP LOCATION.
4. STANDPIPE TO BE HEAT TRACED AND INSULATED FOR WINTER OPERATION (BY OTHERS).
5. THE ELECTRONIC WATER LEVEL CONTROL ON THIS UNIT WILL MAINTAIN THE PROPER OPERATING WATER LEVEL. HOWEVER, BEFORE INITIAL START-UP THE UNIT MUST BE MANUALLY FILLED TO WITHIN 1" OF THE OVERFLOW.
6. FOR EASE OF MAINTENANCE, A SHUT-OFF VALVE IS RECOMMENDED UPSTREAM OF Y-STRAINER.
7. DIMENSIONS LISTED AS FOLLOWS: ENGLISH FT-IN
[METRIC] [mm]

UNIT		DWG. #
USS 212-4L28	**EVAPCO, INC.**	LDT21228DC

TITLE	SCALE	DRAWN BY
SLOPED LADDER INSTALLATION PACKAGE	N.T.S.	TLS



FACE C



FACE B

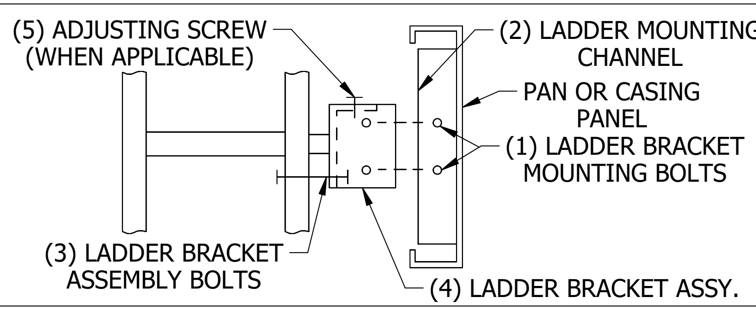
NOTE:
1. REFER TO RIGGING PACK FOR LADDER AND PLATFORM MOUNTING INSTRUCTIONS.
2. DIMENSIONS LISTED AS FOLLOWS: ENGLISH FT-IN
   [METRIC] mm

RIG LADDER BEFORE PIPING UNIT

* THE BOTTOM OF THE LADDER IS AT THE BASE OF THE UNIT. IF THE UNIT IS ELEVATED THEN A LADDER EXTENSION SHOULD BE CONSIDERED. (CONSULT FACTORY). LADDER EXTENSIONS OF UP TO 3 FEET CAN BE ADDED WITHOUT ANY ADDITIONAL SUPPORT. FOR A LADDER EXTENSION LONGER THAN 3 FEET ADDITIONAL SUPPORT MUST BE PROVIDED BY OTHERS.

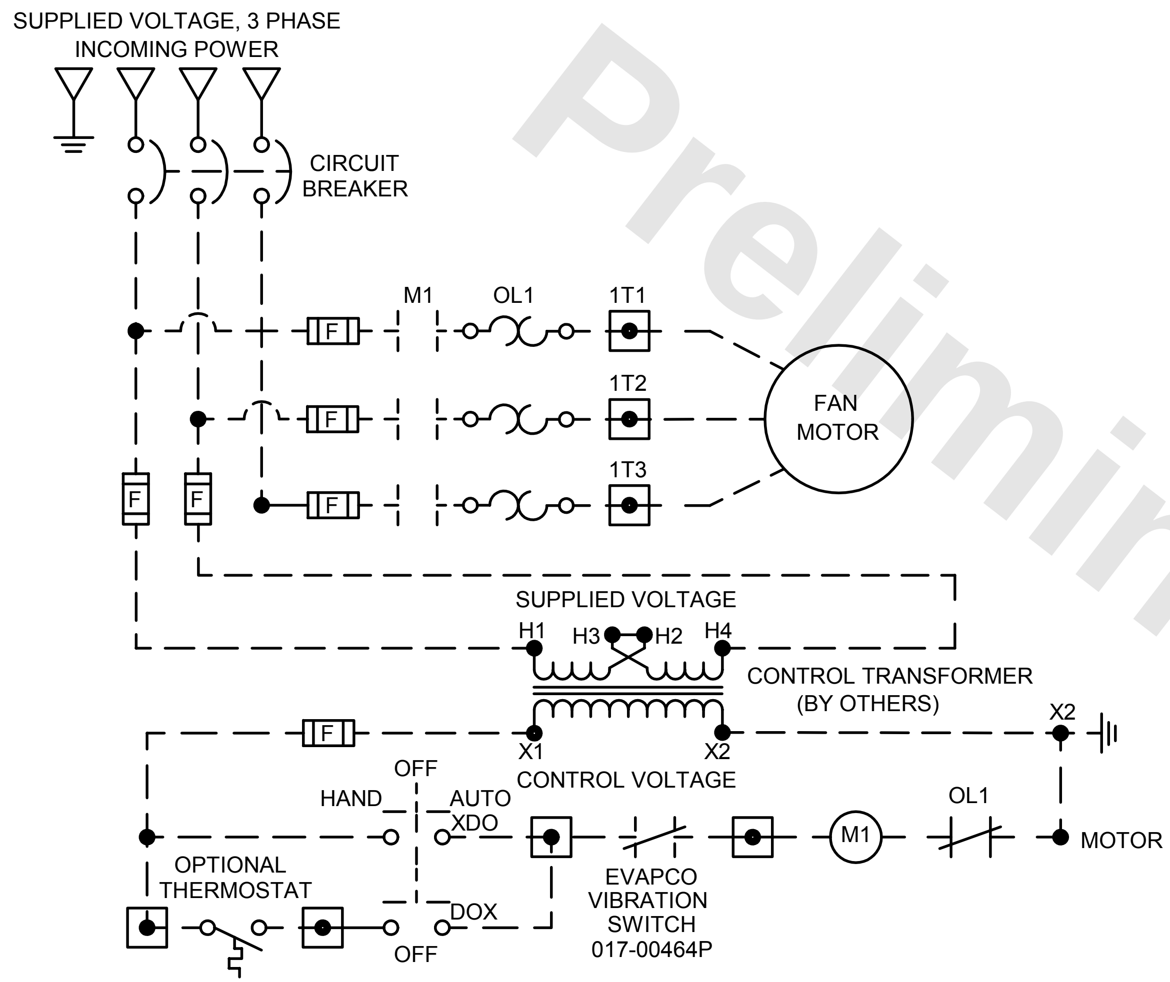
MODEL #	X DIM	
	FT-IN	[mm]
AT/USS 212-128, 328 AT 212-2I28, 2J28, 2K28, 2L28, 2M28	5'-15/16"	1548
AT/USS 212-228, 428, 628, 828 AT 212-3I28, 3J28, 3K28, 3L28, 3M28, 3N28	5'-2"	1575
AT/USS 212-528, 728, 928 AT 212-4I28, 4J28, 4K28, 4L28, 4M28, 4N28	5'-2 1/8"	1578

CUSTOMER INSTALLATION NOTES:
A. REMOVE LADDER BRACKET MOUNTING BOLTS (1) FROM LADDER MOUNTING CHANNELS (2) ON PAN CASING SECTIONS.
B. LOOSEN, BUT DO NOT REMOVE, LADDER BRACKET ASSY. BOLTS (3).
C. TO ASSEMBLE, SLIDE LADDER BRACKET ASSY. (4) OVER LADDER MOUNTING CHANNELS (2) LOCATED ON PAN AND CASING (DO NOT REMOVE LADDER BRACKET ASSY. (4) FROM LADDER.)
D. ALIGN HOLES AND REINSTALL LADDER BRACKET MOUNTING BOLTS (1) THROUGH LADDER BRACKET ASSY. (4) AND LADDER MOUNTING CHANNELS (2).
E. TIGHTEN ALL BOLTS.
F. TIGHTEN ADJUSTING SCREW (5) IN THE ADJUSTABLE MOUNTING BRACKETS WHEN APPLICABLE.



EVAPCO, INC.

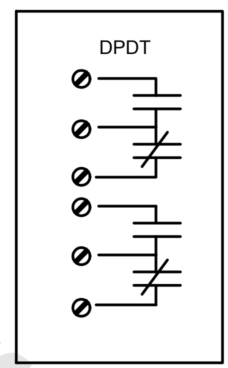
TITLE	DESCRIPTION:		DWG. #
VIBRATION SWITCH	USS 212-4L28	SINGLE SPEED	04/13/2017 V1AU0000-EE



SWITCH CONTACT RATING:

15 AMPS, 125, OR 480 Vac; 1/8 HP, 125 Vac; 1/4 HP, 250 Vac; 1/2 AMP, 125 Vdc; 1/4 AMP, 250 Vdc.

WIRING DIAGRAM:



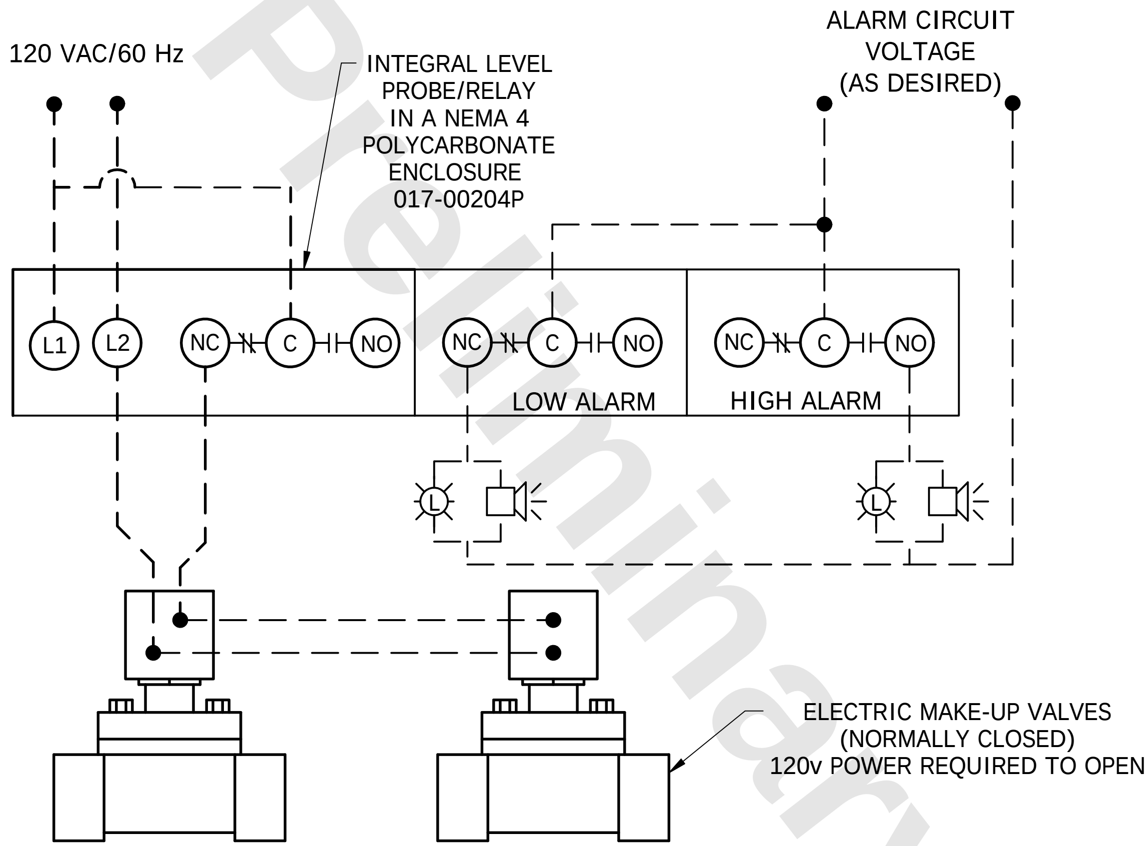
NOTES:

1. DASHED LINES INDICATE WIRING(BY OTHERS)

ADJUSTMENT

ADJUST THE SWITCH SO THAT DURING FULL SPEED START-UP AND UNDER NORMAL CONDITIONS, THE CONTACTS DO NOT TRIP. FIRST, WITH THE MOTOR OFF, TURN THE ADJUSTMENT SCREW COUNTER-CLOCKWISE (MORE SENSITIVE DIRECTION) UNTIL THE SWITCH TRIPS. NEXT, TURN THE ADJUSTMENT SCREW CLOCKWISE 1/8 TURN (LESS SENSITIVE DIRECTION). RESET THE SWITCH BY DEPRESSING THE PUSH-BUTTON RESET LOCATED ON TOP OF THE SWITCH. START THE MOTOR ON FULL SPEED. IF THE MOTOR TRIPS THE SWITCH, THEN TURN THE ADJUSTMENT SCREW CLOCKWISE AN ADDITIONAL 1/8 TURN. RESET THE SWITCH AND START THE MOTOR AGAIN. REPEAT THE ABOVE PROCEDURE UNTIL THE MOTOR CONTINUES TO RUN.

UNIT USS 212-4L28	EVAPCO, INC.	DWG. # D2IX0000-B	
TITLE ELECTRIC WATER LEVEL CONTROL WIRING		SCALE N.T.S.	DRAWN BY JLG



NOTES:
1. DASHED LINES INDICATE WIRING BY OTHERS.
2. TYPICAL WIRING PER PROBE.

Model: **1250REOZMD**

KOHLER. Power Systems

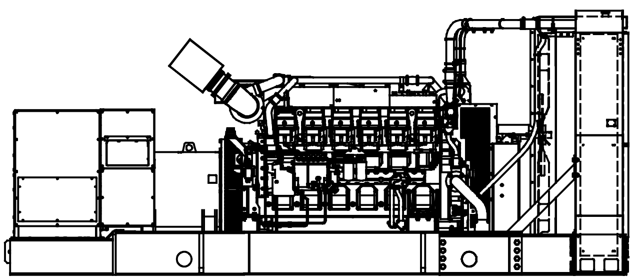
380–4160 V **Diesel**

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Tier 2 EPA-Certified for Stationary Emergency Applications

Ratings Range

		60 Hz
Standby:	**kW**	940–1280
	kVA	1175–1600
Prime:	**kW**	860–1160
	kVA	1075–1450



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- A standard one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
  - The pilot-excited, permanent magnet (PM) alternator provides superior short-circuit capability.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Kohler designed controllers for guaranteed system integration and remote communication. See Controllers on page 3.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - An electronic, isochronous governor delivers precise frequency regulation.
  - Multiple circuit breaker configurations.

Generator Set Ratings

				150°C Rise Standby Rating		130°C Rise Standby Rating		125°C Rise Prime Rating		105°C Rise Prime Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
7M4046	220/380	3	60	940/1175	1785	940/1175	1785	860/1075	1633	860/1075	1633
	240/416	3	60	1180/1475	2047	1110/1388	1926	1090/1363	1891	1020/1275	1770
	277/480	3	60	1250/1563	1879	1220/1525	1834	1140/1425	1714	1120/1400	1684
7M4048	220/380	3	60	1030/1288	1956	1030/1288	1956	940/1175	1785	940/1175	1785
	240/416	3	60	1250/1563	2169	1180/1475	2047	1140/1425	1978	1100/1375	1908
	277/480	3	60	1270/1588	1909	1270/1588	1909	1160/1450	1744	1160/1450	1744
7M4050	220/380	3	60	1160/1450	2203	1160/1450	2203	1060/1325	2013	1060/1325	2013
	240/416	3	60	1280/1600	2221	1280/1600	2221	1160/1450	2012	1160/1450	2012
	277/480	3	60	1280/1600	1925	1280/1600	1925	1160/1450	1744	1160/1450	1744
7M4052	220/380	3	60	1280/1600	2431	1280/1600	2431	1160/1450	2203	1160/1450	2203
	240/416	3	60	1280/1600	2221	1280/1600	2221	1160/1450	2012	1160/1450	2012
	277/480	3	60	1280/1600	1925	1280/1600	1925	1160/1450	1744	1160/1450	1744
7M4172	220/380	3	60	1270/1588	2412	1260/1575	2393	1160/1450	2203	1160/1450	2203
7M4174	220/380	3	60	1280/1600	2431	1280/1600	2431	1160/1450	2203	1160/1450	2203
7M4288	347/600	3	60	1280/1600	1540	1280/1600	1540	1160/1450	1395	1160/1450	1395
7M4366	2400/4160	3	60	1280/1600	222	1280/1600	222	1160/1450	201	1160/1450	201
7M4368	2400/4160	3	60	1280/1600	222	1280/1600	222	1160/1450	201	1160/1450	201

RATINGS: All three-phase units are rated at 0.8 power factor. *Standby Ratings:* The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. *Prime Power Ratings:* At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. For limited running time and continuous ratings, consult the factory. Obtain technical information bulletin (TIB-101) for ratings guidelines, complete ratings definitions, and site condition derates. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

Alternator Specifications

Specifications		Alternator
Type		4-Pole, Rotating-Field
Exciter type		Brushless, Permanent-Magnet Pilot Exciter
Voltage regulator		Solid State, Volts/Hz
Insulation:		NEMA MG1
Material		Class H, Synthetic, Nonhygroscopic
Temperature rise		130°C, 150°C Standby
Bearing: quantity, type		1, Sealed
Coupling		Flexible Disc
Amortisseur windings		Full
Rotor balancing		125%
Voltage regulation, no-load to full-load		Controller Dependent
One-step load acceptance at 60 Hz		100% of Rating
Unbalanced load capability		100% of Rated Standby Current
Peak motor starting kVA:		(35% dip for voltages below)
480 V	7M4046 (4 bus bar)	3900
480 V	7M4048 (4 bus bar)	3700
480 V	7M4050 (4 bus bar)	4500
480 V	7M4052 (4 bus bar)	5500
380 V	7M4172 (4 bus bar)	2600
380 V	7M4174 (4 bus bar)	4200
600 V	7M4288 (4 bus bar)	5400
4160 V	7M4366 (6 lead)	3900
4160 V	7M4368 (6 lead)	4900

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- Digital solid-state, volts-per-hertz voltage regulator with ±0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Application Data

Engine

Engine Specifications	
Manufacturer	Mitsubishi
Engine model	S12R-Y2PTAW-1
Engine type	4-Cycle, Turbocharged
Cylinder arrangement	12 V
Displacement, L (cu. in.)	49.0 (2992)
Bore and stroke, mm (in.)	170 x 180 (6.69 x 7.09)
Compression ratio	14.5:1
Piston speed, m/min. (ft./min.)	648 (2126)
Main bearings: quantity, type	7, Precision Half-Shell
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	1403 (1881)
Cylinder head material	Cast Iron
Crankshaft material	Forged Steel
Governor type	Electronic
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m^3/min. (cfm)	356 (12570)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	497 (927)
Maximum allowable back pressure, kPa (in. Hg)	5.9 (1.7)
Exhaust outlet size at engine hookup, mm (in.)	See ADV drawing

Engine Electrical

Engine Electrical System	
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	24
Ampere rating	30
Starter motor rated voltage (DC)	Dual, 24
Battery, recommended cold cranking amps (CCA):	
Quantity, CCA rating each	Four, 1150
Battery voltage (DC)	12

Fuel

Fuel System	
Fuel supply line, min. ID, mm (in.)	19 (0.75)
Fuel return line, min. ID, mm (in.)	19 (0.75)
Max. fuel flow, Lph (gph)	480 (127)
Max. fuel pump restriction, kPa (in. Hg)	10 (3.0)
Max. return line restriction, kPa (in. Hg)	20 (5.9)
Fuel filter: quantity, type	4, Secondary
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.)	150 (159)
Oil pan capacity with filter, L (qt.)	180 (190)
Oil filter: quantity, type	4, Cartridge
Oil cooler	Water-Cooled

Application Data

Cooling

Radiator System	
Ambient temperature, °C (°F)*	40 (104)
Engine jacket water capacity, L (gal.)	130 (34)
Radiator system capacity, including engine, L (gal.)	327 (86)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	340 (90)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	511 (29045)
Heat rejected to charge cooler water at rated kW, dry exhaust, kW (Btu/min.)	511 (29045)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	1829 (72)
Fan kWm (HP)	57 (76)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

High Ambient Radiator System	
Ambient temperature, °C (°F)*	50 (122)
Engine water capacity, L (gal.)	130 (34)
Radiator system capacity, including engine, L (gal.)	341 (90)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	340 (90)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	511 (29045)
Heat rejected to charge cooler water at rated kW, dry exhaust, kW (Btu/min.)	511 (29045)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	1829 (72)
Fan kWm (HP)	57 (76)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

* Enclosure with enclosed silencer reduces ambient temperature capability by 5°C (9°F).

Remote Radiator System†	
Exhaust manifold type	Dry
Connection sizes:	
Jacket water engine inlet, mm (in.)	95 (3.75)
Jacket water engine outlet, mm (in.)	95 (3.75)
Intercooler water engine inlet, mm (in.)	83 (3.25)
Intercooler water engine outlet, mm (in.)	83 (3.25)
Static head allowable above engine, kPa (ft. H_2O)	98 (32.8)

† Contact your local distributor for cooling system options and specifications based on your specific requirements.

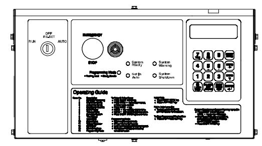
Operation Requirements

Air Requirements	
Radiator-cooled cooling air, m^3/min. (scfm)‡	1756 (62000)
High ambient radiator-cooled cooling air, m^3/min. (scfm)‡	1699 (60000)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m^3/min. (scfm)‡	677 (23900)
Combustion air, m^3/min. (cfm)	135 (4767)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	118 (6703)
Alternator, kW (Btu/min.)	71 (4038)

‡ Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

Fuel Consumption	
Diesel, Lph (gph) at % load	**Standby Rating**
100%	392 (103.4)
75%	284 (75.1)
50%	193 (51.0)
25%	110 (29.2)
Diesel, Lph (gph) at % load	**Prime Rating**
100%	344 (90.9)
75%	259 (68.4)
50%	176 (46.4)
25%	105 (27.6)

Controllers

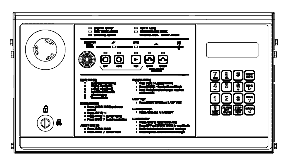


Decision-Maker® 550 Controller

Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities.

- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-46 for additional controller features and accessories.



Decision-Maker® 6000 Paralleling Controller

Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities for paralleling multiple generator sets.

- Paralleling capability with first-on logic, synchronizer, kW and kVAR load sharing, and protective relays
- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-107 for additional controller features and accessories.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales and service outlet in the
US and Canada, phone 1-800-544-2444
KOHLERPower.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Standard Features

- Alternator Protection
- Alternator Strip Heater (standard on 3300 volt and above)
- Customer Connection (standard with Decision-Maker® 6000 controller only)
- Local Emergency Stop Switch
- Oil Drain Extension
- Operation and Installation Literature
- Radiator Core Guard

Available Options

Approvals and Listings

- ❑ California OSHPD Approval
- ❑ CSA Approval
- ❑ IBC Seismic Certification
- ❑ UL 2200 Listing

Enclosed Unit

- ❑ Sound Enclosure/Fuel Tank Package
- ❑ Weather Enclosure/Fuel Tank Package

Open Unit

- ❑ Exhaust Silencer, Hospital (kit: PA-361626)
- ❑ Exhaust Silencer, Critical (kit: PA-361617)
- ❑ Flexible Exhaust Connector, Stainless Steel

Fuel System

- ❑ Flexible Fuel Lines
- ❑ Fuel Pressure Gauge
- ❑ Fuel/Water Separator

Controller

- ❑ Common Failure Relay
- ❑ Communication Products and PC Software
- ❑ Customer Connection (Decision-Maker® 550 controller only)
- ❑ Decision-Maker® Paralleling System (DPS) (Decision-Maker® 6000 controller only)
- ❑ Dry Contact (isolated alarm)
- ❑ Prime Power Switch
- ❑ Remote Audiovisual Alarm Panel (Decision-Maker® 550 controller only)
- ❑ Remote Emergency Stop
- ❑ Remote Mounting Cable
- ❑ Remote Serial Annunciator Panel
- ❑ Run Relay

Cooling System

- ❑ Block Heater; 9000 W, 208 V, 1 Ph
- ❑ Block Heater; 9000 W, 240 V, (Select 1 Ph or 3 Ph)
- ❑ Block Heater; 9000 W, 380 V, 3 Ph
- ❑ Block Heater; 9000 W, 480 V, (Select 1 Ph or 3 Ph)
  Recommended for Ambient Temperatures Below 20°C (68°F)
- ❑ High Ambient Radiator
- ❑ Remote Radiator Cooling Setup

Electrical System

- ❑ Alternator Strip Heater (available up to 600 volt)
- ❑ Battery
- ❑ Battery Charger, Equalize/Float Type
- ❑ Battery Heater
- ❑ Battery Rack and Cables
- ❑ Line Circuit Breaker (NEMA type 1 enclosure)
- ❑ Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)

Paralleling System

- ❑ Remote Voltage Adjustment Control
- ❑ Voltage Sensing (Decision-Maker® 6000 controller only)

Miscellaneous

- ❑ Air Cleaner, Heavy Duty
- ❑ Air Cleaner Restriction Indicator
- ❑ Crankcase Emission Canister
- ❑ Engine Fluids (oil and coolant) Added
- ❑ Oil Temperature Gauge
- ❑ Rated Power Factor Testing
- ❑ Spring Isolators

Literature

- ❑ General Maintenance
- ❑ NFPA 110
- ❑ Overhaul
- ❑ Production

Warranty

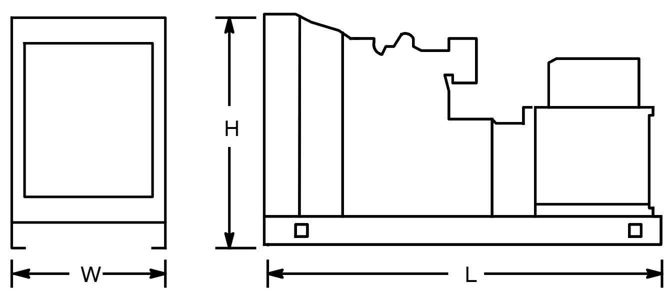
- ❑ 2-Year Basic
- ❑ 2-Year Prime
- ❑ 5-Year Basic
- ❑ 5-Year Comprehensive
- ❑ 10-Year Major Components

Other Options

- ❑ ______________________________
- ❑ ______________________________
- ❑ ______________________________
- ❑ ______________________________

Dimensions and Weights

Overall Size, L x W x H, max., mm (in.):	6353 x 2232 x 2490 (250.1 x 87.9 x 98.0)
Weight (radiator model), wet, max., kg (lb.):	12020 (26500)



Note: This drawing is provided for reference only and should not be used for planning the installation. Contact your local distributor for more detailed information.

DISTRIBUTED BY:

KOHLER. POWER SYSTEMS

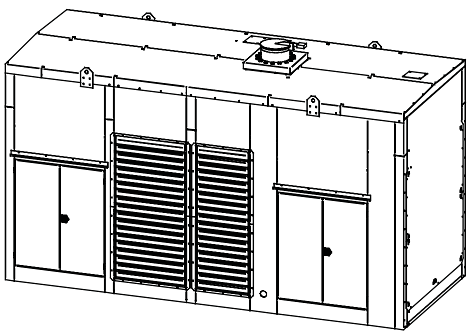
Steel/Galvaneel Steel Enclosure and Subbase Fuel Tank Package

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Applicable to the following:
1250-2250REOZDD
1250-2000REOZMD

Weather Enclosure Standard Features

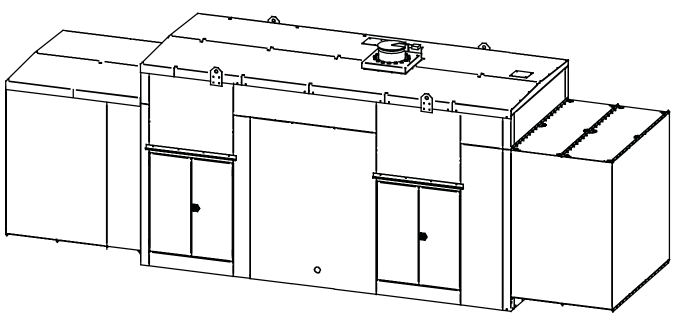
- Internal or external silencer, flexible exhaust connector, and rain cap.
- Mounts to lift base or subbase fuel tank. Steel or galvaneel steel construction with hinged and removable doors.
- Fade-, scratch-, and corrosion-resistant Kohler® cream beige powder-baked finish.
- Lockable, flush-mounted door latches.
- Air inlet louvers reduce rain and snow entry.



Weather Enclosure with Internal Silencer shown

Sound Enclosures Standard Features

- Includes all of the weather enclosure features with the addition of acoustic insulation material.
- Vertical air inlet and outlet hoods with 90 degree angles to redirect air and reduce noise.
- Acoustic insulation that meets UL 94 HF1 flammability classification.
- Sound enclosure level 1 that offers sound reduction of 15 dB(A) at 7 m (23 ft.) using 51 mm (2 in.) of acoustic insulation and acoustic-lined air inlet hoods.
- Sound enclosure level 2 that offers sound reduction of 25 dB(A) at 7 m (23 ft.) using 51 mm (2 in.) of acoustic insulation, acoustic-lined air inlet hoods, and acoustic-lined air discharge hood.



Sound Enclosure Level 1 and Level 2 with Internal Silencer shown

Subbase Fuel Tank Features

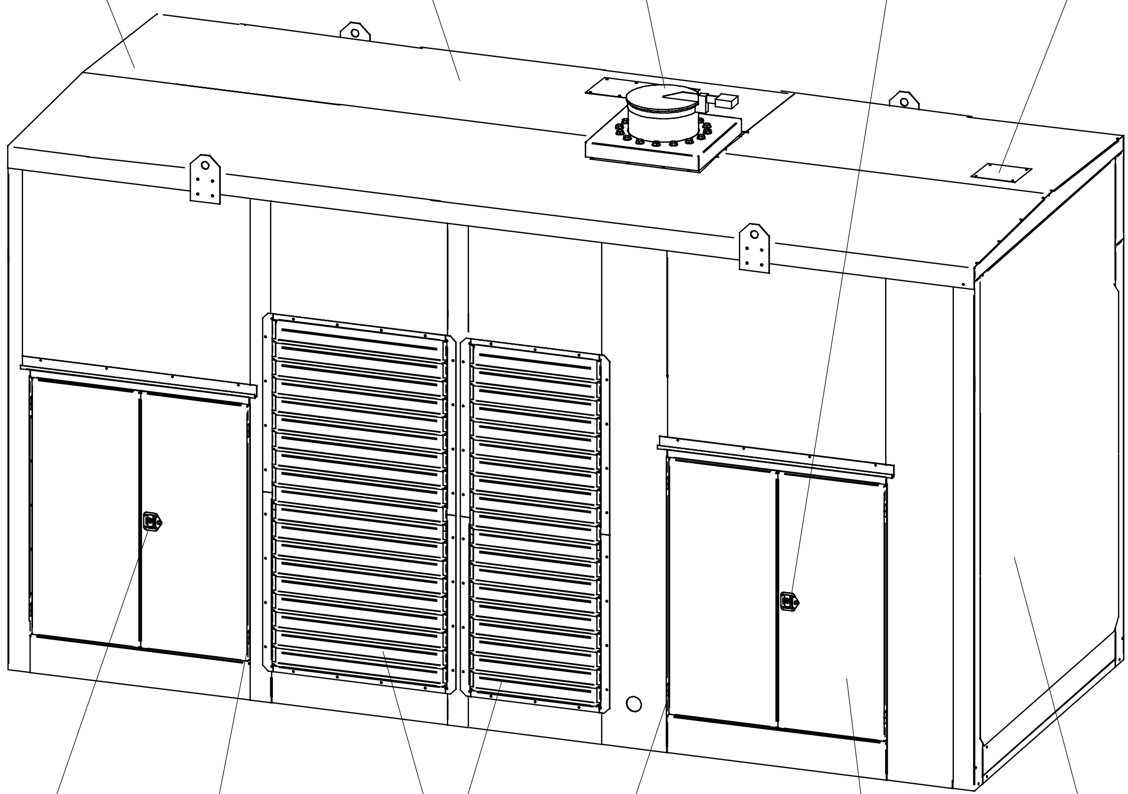
- The above-ground rectangular secondary containment tank mounts directly to the generator set, below the generator set skid (subbase).
- Both the inner and outer tanks have emergency relief vents.
- Flexible fuel lines are provided with subbase fuel tank selection.
- The containment tank's double-wall construction protects against fuel leaks or ruptures. The inner (primary) tank is sealed inside the outer (secondary) tank. The outer tank contains the fuel if the inner tank leaks or ruptures.

Enclosure and Subbase Fuel Tank Combinations

There are six enclosure configurations available with the subbase fuel tanks.

Weather Enclosure with External Silencer
Sound Enclosure Level 1 with External Silencer
Sound Enclosure Level 2 with External Silencer
Weather Enclosure with Internal Silencer
Sound Enclosure Level 1 with Internal Silencer
Sound Enclosure Level 2 with Internal Silencer

Steel/Galvaneel Steel Weather Enclosure



Enclosure ships assembled on subbase fuel tank or lifting base.

Note: Sample model shown, other models are similar.

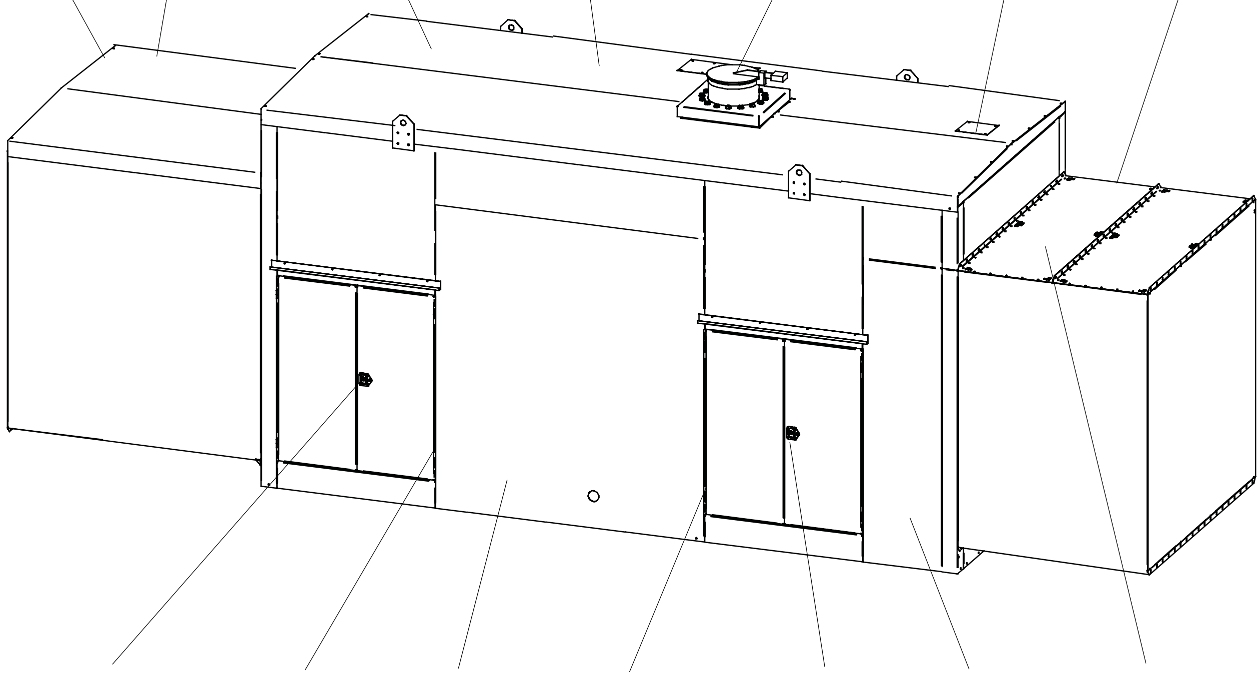
1500-21715-A

Steel/Galvaneel Steel Weather Enclosure Features

- Heavy-duty formed panels, solid construction. Preassembled package offering corrosion resistant (galvaneel steel), dent resilient structure mounting directly to lift base or fuel tank.
- Powder-baked paint. Superior finish, durability, and appearance.
- Internal critical exhaust silencer. Offers maximum component life, operator safety, and includes rain shield and cap. Models with external silencer are also available.

  NOTE: Installing an additional length of exhaust tail pipe may increase backpressure levels. Please refer to the generator set spec sheet for the maximum backpressure value.
- Service access. Multi-personnel doors for easy access to generator set control and servicing of the fuel fill, fuel gauge, oil fill, and battery.
- Interchangeable modular panel construction allows design flexibility without compromising building standards.
- Bolted panels facilitate service, future modification upgrades, or field replacement.
- Cooling/combustion air intake. Weather protective designs using fixed air inlet louvers. Sized for maximum cooling airflow.
- Cooling air discharge. Weather protective design featuring horizontal air discharge. Exhausts air through a removable punched air outlet grille.

Level 1 and Level 2 Steel/Galvaneel Steel Sound Enclosure



Enclosure ships assembled on subbase fuel tank or lifting base.

Note: Sample model shown, other models are similar.

1500-21715-A

Level 1 and Level 2 Sound Enclosure Features

- Heavy-duty formed panels, solid construction. Preassembled package offering corrosion resistant, dent resilient structure mounting directly to lift base or fuel tank.
- Powder-baked paint. Superior finish, durability, and appearance.
- Internal exhaust silencer offering maximum component life and operator safety. Models with external silencer are also available.

  NOTE: Installing an additional length of exhaust tail pipe may increase backpressure levels. Please refer to the generator set spec sheet for the maximum backpressure value.
- Service access. Multi-personnel doors for easy access to generator set control and servicing of the fuel fill, fuel gauge, oil fill, and battery.
- Interchangeable modular panel construction. Allows complete serviceability or replacement without compromising enclosure design.
- Bolted panels facilitate service, future modification upgrades, or field replacement.
- Cooling/combustion air intake. Attenuated models offering 90° vertical air inlet hood redirects air to reduce noise.
- Cooling air discharge. Attenuated models offering 90° vertical air outlet hood. Redirects cooling air up and above enclosure to reduce noise.

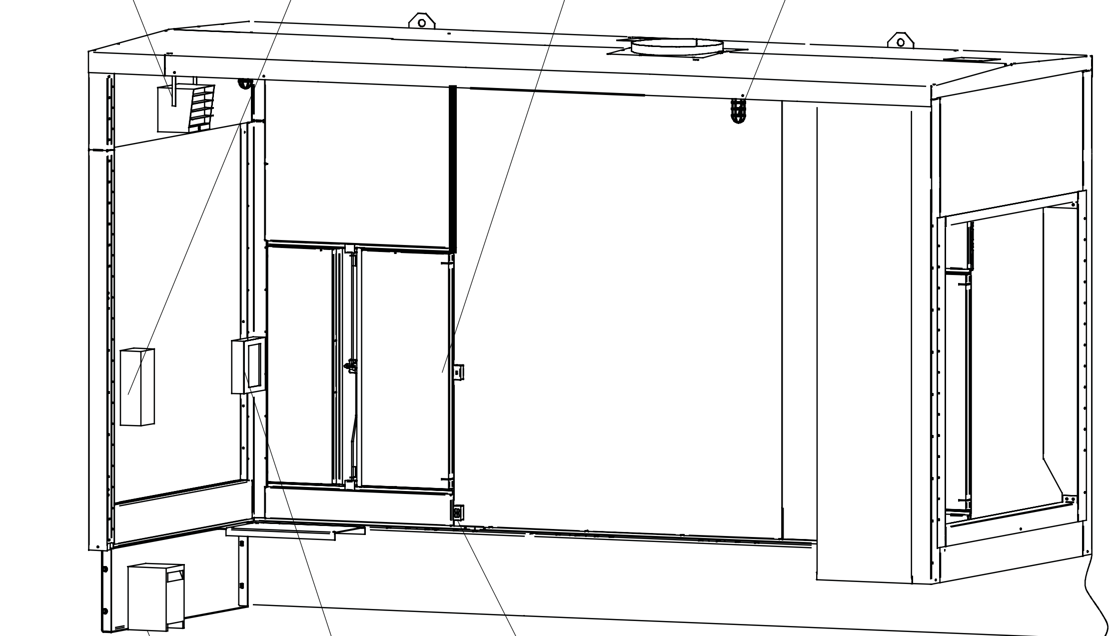
Level 1 Sound Enclosure Features

- Attenuated design using a critical silencer. Acoustic insulation UL 94 HF1 listed for flame resistance; design offering 15 dB(A) attenuation using 51 mm (2 in.) of mechanically restrained acoustic insulation.

Level 2 Sound Enclosure Features

- Attenuated design using a hospital silencer. Acoustic insulation UL 94 HF1 listed for flame resistance; design offering 25 dB(A) attenuation using 51 mm (2 in.) of mechanically restrained acoustic insulation.
- Perforated interior liner and acoustic-lined air discharge hood.

Steel/Galvaneel Steel Weather and Sound Enclosure Options



Note: Sample model shown, other models are similar.

1500-21709-A

Enclosure Construction Type Options

- ❑ **Steel Enclosure**
- ❑ **Galvaneel Steel Enclosure**

Enclosure Silencer Options

- ❑ **External Critical Silencer**, weather enclosure
- ❑ **External Critical Silencer**, sound enclosure, level 1
- ❑ **External Hospital Silencer**, sound enclosure, level 2

- ❑ **Internal Critical Silencer**, weather enclosure
- ❑ **Internal Critical Silencer**, sound enclosure, level 1
- ❑ **Internal Hospital Silencer**, sound enclosure, level 2

Steel/Galvaneel Steel Weather and Sound Enclosure Options, continued

Electrical Accessories

DC Light Package

- ❑ **DC Light Package (DLP).** Prewired qty. 2, internal 24 VDC light package offering an economical alternative light source within the enclosure, as a complement to the BEP or a source of light when AC power is not available. Battery drain limited with fuse protection and controlled through a 0–60 minute, spring-wound, no-hold timer.
- ❑ Additional 24 VDC lights, qty. 2

Basic Electrical Package (BEP)

Distribution Panel/Load Center. Prewired AC power distribution of all factory-installed features including block heater, two GFCI-protected internal 120-volt service receptacles, internal lighting, and commercial grade wall switch. The single-phase or three-phase load center powered by building source power and protected by a main circuit breaker, rated for 100 amps or 200 amps with 12 branch circuits for future expansion. AC power distribution installed in accordance with NEC and all wiring within EMT thin wall conduit. Incandescent or fluorescent AC lights located within UL-listed fixtures designed for wet locations.

- ❑ BEP, single-phase load center, 120/208/240 VAC
- ❑ BEP, three-phase load center, 120/208/240 VAC
- ❑ 100 amp rated main circuit breaker (available with 1250–2250REOZDD models only)
- ❑ 200 amp rated main circuit breaker
- ❑ BEP with two 4-foot florescent lights
- ❑ BEP with three AC incandescent lights
- ❑ Additional AC lights (qty. 2)
- ❑ Additional GFCI duplex receptacles (qty. 2) internal mounted
- ❑ Additional GFCI duplex receptacles (qty. 2) external mounted

- ❑ **Emergency Lights.** Mounted inside the enclosure with batteries, dual-head base.

Heater, 5 kW Ceiling Mounted. Electrical utility heater prewired to load center internal to enclosure. Rated at 17100 Btu. Includes adjustable louvers offering down flow and horizontal air tuning, built-in thermostat with automatic fan delay controls.

- ❑ Heater, single phase at 208 or 240 VAC
- ❑ Heater, three phase at 208 or 240 VAC

- ❑ **Exhaust Fan.** Mounted inside the enclosure.

Miscellaneous Enclosure Accessories

- ❑ **Viewing Window.** Control panel viewing window.

Emergency Stop Switch. Generator set emergency stop switch (break glass, pushbutton style).

- ❑ Emergency stop switch, qty. 1
- ❑ Emergency stop switch, qty. 2

Battery Charger, Mounted. Mounting and prewiring of DC output and AC input when optional BEP is selected. Battery charger located inside the enclosure and accessible through an access door.

- ❑ Battery charger with alarms
- ❑ Battery charger without alarms

- ❑ **Door Latches for Padlocks.** Door latches for padlocks on each door.

- ❑ **Automatic Door Holders.** Door holders for each door.

- ❑ **Panic Bars.** Internal release handle for each door.

For Weather Enclosure Packages only

- ❑ **Outlet Hood for Weather Enclosure only.** Outlet 90° hood.

- ❑ **Motorized Outlet Hood.** Outlet 90° hood with galvaneel steel construction.

- ❑ **Motorized Inlet Louvers.** Inlet 45° louvers with galvaneel steel construction.

- ❑ **Gravity Outlet Dampers.** Outlet 90° louvers with galvaneel steel construction.

- ❑ **Walkway.** Steel staircase with a supported platform attached. Designed to provide access to elevated doors. Not assembled.

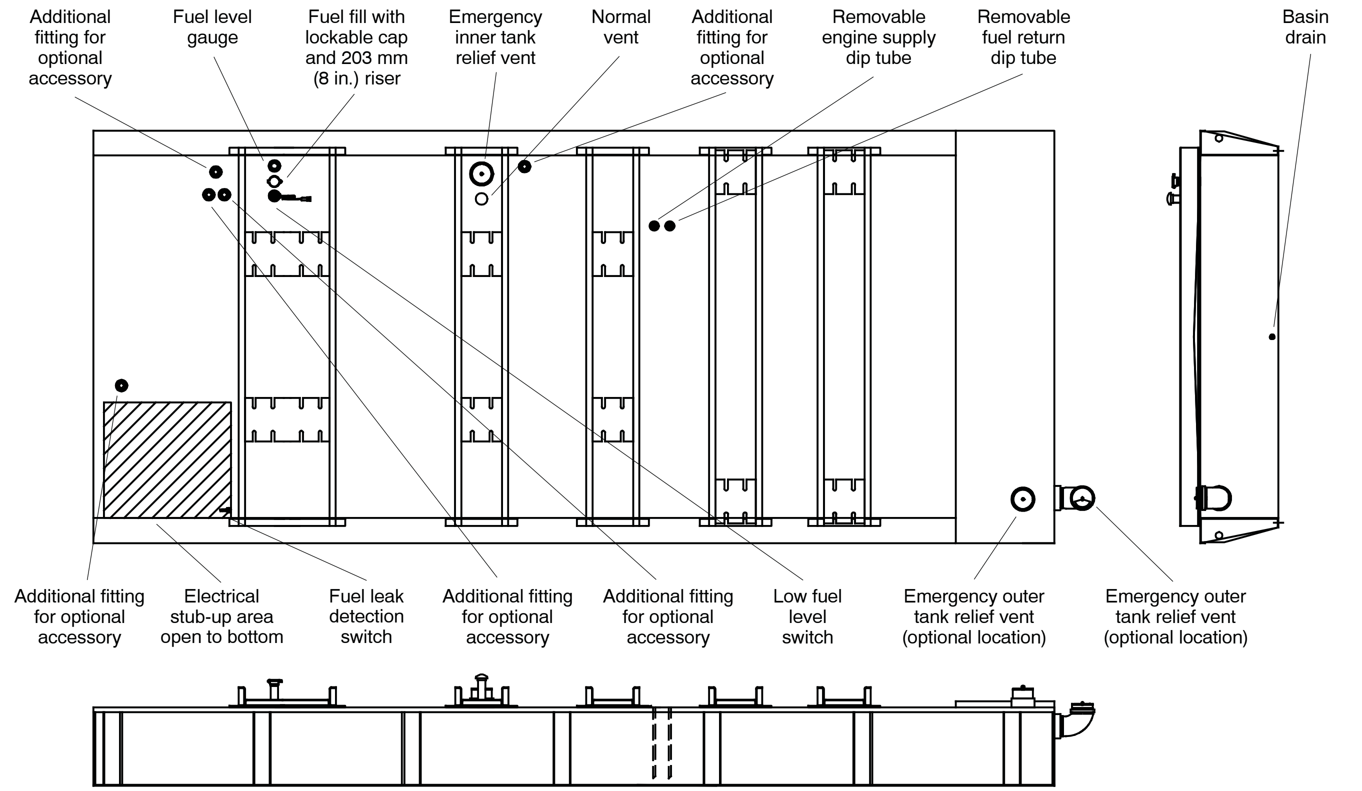
Stepdown Transformer. 480 volt primary and 120/208 volt secondary. Mounted in electrical stub-up area.

- ❑ 37.5 kVA, single-phase
- ❑ 45 kVA, three-phase
- ❑ 50 kVA, single-phase
- ❑ 75 kVA, three-phase

Disconnect. Disconnect switch for transformer.

- ❑ 37.5 kVA, single-phase
- ❑ 45 kVA, three-phase
- ❑ 50 kVA, single-phase
- ❑ 75 kVA, three-phase

Subbase Fuel Tank



Note: Sample model shown, other models are similar.

7000-22447

Standard Subbase Fuel Tank Features

- Extended operation. Usable tank capacities of 2501-35095 L (660-9260 gal.).
- UL listed. Secondary containment generator set base tank meeting UL 142 requirements.
- NFPA compliant. Designed to comply with the installation standards of NFPA 30 and NFPA 37.
- Integral external lift lugs. Enables crane with spreader-bar lifting of the complete package (empty tank, mounted generator set, and enclosure) to ensure safety.
- Emergency pressure relief vents. Vents ensure adequate venting of inner and outer tank under extreme pressure and/or emergency conditions.
- Normal vent with cap. Vent is raised above lockable fuel fill.
- Low fuel level switch. Annunciates a 50% low fuel level condition at generator set control.
- Leak detection switch. Annunciates a contained primary tank fuel leak condition at generator set control.
- Electrical stub-up.

Available Subbase Fuel Tank Accessories

Tank Accessories

Alarm Panels

- ❑ Alarm panel located inside the enclosure.
- ❑ Three alarm panel for high, low, and fuel leak mounted inside the enclosure.
- ❑ Three alarm panel for high, low, and fuel leak with alarm horn and switch mounted next to generator set control panel outside the enclosure.

- ❑ **Supply Fuel Transfer System.** Electronic Control Module (ECM) with 15 Lpm (4 gpm) and 1/3 hp motor, solenoid valve, fuel strainer and critical high shutdown. Mounted, plumbed, and wired as a Modular Fuel Transfer System. (1250/1600 kW models only)
- ❑ **Supply Fuel Transfer System.** Electronic Control Module (ECM) with 26.5 Lpm (7 gpm) and 1/3 hp motor, solenoid valve, fuel strainer and critical high shutdown. Mounted, plumbed, and wired as a Modular Fuel Transfer System. (1750-2250 kW models only)

- ❑ **Return Fuel Transfer System.** A 26.5 Lpm (7 gpm) pump returns fuel to the main tank. Option adder to Modular Supply Fuel Transfer System. (1250/1600 kW models only)
- ❑ **Return Fuel Transfer System.** A 38 Lpm (10 gpm) pump returns fuel to the main tank. Option adder to Modular Supply Fuel Transfer System. (1750-2250 kW models only)

State Tank Accessories

- ❑ **Fill Pipe Extension** to within 152mm (6 in.) of bottom.

Fill/Spill Containment. Above ground fill/spill container for fuel overfill spills during fill-up. External mount or internal mount.

- ❑ 19 L (5 gal.)
- ❑ 19 L (5 gal.) with 95% shutoff
- ❑ 19 L (5 gal.) will fill to within of 152 mm (6 in.) of bottom
- ❑ 26.5 L (7 gal.) (FDEP Approved)
- ❑ 26.5 L (7 gal.) with 95% shutoff (FDEP Approved)

Normal Vent Options

- ❑ 3.6 m (12 ft.) vent above grade without spill containment
- ❑ 3.6 m (12 ft.) vent above grade with spill containment

High Fuel Switch

- ❑ High fuel level float switch
- ❑ High fuel level float switch (FDEP Approved)

Fuel in Containment

- ❑ Fuel in containment switch (FDEP Approved)

Fuel Supply Options

- ❑ Fire safety valve (installed on fuel supply)
- ❑ Ball valve (installed on fuel supply)

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	1250/1500REOZDD with 40°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m (23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7011 (276)	2743 (108)	4153 (164)	18160 (40000)	305 (12)	—
2501 (660)	7/5.5				19477 (42900)		
3790 (1000)	10.5/8.5			4255 (168)	19704 (43400)	406 (16)	
4738 (1250)	13/11			4331 (171)	19840 (43700)	483 (19)	
5875 (1550)	16/13.5			4420 (174)	19976 (44000)	572 (22.5)	
7580 (2000)	21/17.5	7494 (295)		4509 (178)	20339 (44800)	660 (26)	
10157 (2680)	28/24	9322 (367)			20975 (46200)		
13455 (3550)	37.5/31.5	11685 (460)			21837 (48100)		
17813 (4700)	49.5/42	10922 (430)		5074 (200)	22927 (50500)	914 (36)	
21717 (5730)	60.5/51	12878 (507)			23699 (52200)		
25772 (6800)	72/60.5	10415 (410)	3658 (144)	5239 (207)	25606 (56400)		
30434 (8030)	85/72	12040 (474)			26423 (58200)		
35095 (9260)	98/83	13691 (539)			27285 (60100)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	10669 (420)	2743 (108)	4153 (164)	19749 (43500)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	7/5.5				21066 (46400)		
3790 (1000)	10.5/8.5			4255 (168)	21293 (46900)	406 (16)	
4738 (1250)	13/11			4331 (171)	21429 (47200)	483 (19)	
5875 (1550)	16/13.5			4420 (174)	21565 (47500)	572 (22.5)	
7580 (2000)	21/17.5			4509 (178)	21928 (48300)	660 (26)	
10157 (2680)	28/24	11456 (451)			22564 (49700)		
13455 (3550)	37.5/31.5	13818 (544)			23426 (51600)		
17813 (4700)	49.5/42	13056 (514)		5074 (200)	24516 (54000)	914 (36)	
21717 (5730)	60.5/51	15012 (591)			25288 (55700)		
25772 (6800)	72/60.5	12548 (494)	3658 (144)	5239 (207)	27195 (59900)		
30434 (8030)	85/72	14174 (558)			28012 (61700)		
35095 (9260)	98/83	15285 (623)			28847 (63600)		

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	1250/1500REOZDD with 50°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m (23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7011 (276)	3200 (126)	4153 (164)	18932 (41700)	305 (12)	—
2501 (660)	7/5.5				20385 (44900)		
3790 (1000)	10.5/8.5			4204 (166)	20566 (45300)	356 (14)	
4738 (1250)	13/11			4268 (168)	20702 (45600)	419 (16.5)	
5875 (1550)	16/13.5			4344 (171)	20884 (46000)	495 (19.5)	
7580 (2000)	21/17.5			4471 (176)	21111 (46500)	622 (24.5)	
10157 (2680)	28/24	8205 (323)		4509 (178)	21656 (47700)	660 (26)	
13455 (3550)	37.5/31.5	10211 (402)			22473 (49500)		
17813 (4700)	49.5/42	9551 (376)		5074 (200)	23608 (52000)	914 (36)	
21717 (5730)	60.5/51	11176 (440)			24334 (53600)		
25772 (6800)	72/60.5	12878 (507)			25106 (55300)		
30434 (8030)	85/72	12040 (474)	3658 (144)	5239 (207)	26968 (59400)		
35095 (9260)	98/83	13691 (539)			27785 (61200)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	12497 (492)	3200 (126)	4153 (164)	20612 (45400)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	7/5.5				22064 (48600)		
3790 (1000)	10.5/8.5			4204 (166)	22246 (49000)	356 (14)	
4738 (1250)	13/11			4268 (168)	22382 (49300)	419 (16.5)	
5875 (1550)	16/13.5			4344 (174)	22564 (49700)	495 (19.5)	
7580 (2000)	21/17.5			4471 (176)	22791 (50200)	622 (24.5)	
10157 (2680)	28/24			4509 (178)	23336 (51400)	660 (26)	
13455 (3550)	37.5/31.5	13259 (522)			24153 (53200)		
17813 (4700)	49.5/42	12599 (496)		5074 (200)	25288 (55700)	914 (36)	
21717 (5730)	60.5/51	14224 (560)			26014 (57300)		
25772 (6800)	72/60.5	15926 (627)			26786 (59000)		
30434 (8030)	85/72	15088 (594)	3658 (144)	5239 (207)	28647 (63100)		
35095 (9260)	98/83	16739 (659)			29465 (64900)		

* Data in table is for reference only. Refer to your authorized Kohler distributor for enclosure and subbase fuel tank specification details.
† Max. weight includes the generator set (wet), enclosure, silencer, and tank (no fuel).

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	1750REOZDD with 40°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m (23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7011 (276)	2743 (108)	4179 (165)	18614 (41000)	305 (12)	—
2501 (660)	5				19931 (43900)		
3790 (1000)	8			4280 (169)	20158 (44400)	406 (16)	
4738 (1250)	10			4357 (172)	20294 (44700)	483 (19)	
5875 (1550)	12.5			4445 (175)	20430 (45000)	572 (22.5)	
7580 (2000)	16	7494 (295)		4534 (179)	20793 (45800)	660 (26)	
10157 (2680)	21.5	9322 (367)			21429 (47200)		
13455 (3550)	28.5	11685 (460)			22291 (49100)		
17813 (4700)	37.5	10922 (430)		5100 (201)	23381 (51500)	914 (36)	
21717 (5730)	46	12878 (507)			24153 (53200)		
25772 (6800)	54.5	10415 (410)	3658 (144)	5308 (209)	25878 (57000)		
30434 (8030)	64.5	12040 (474)			26695 (58800)		
35095 (9260)	74.5	13691 (539)			27512 (60600)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	12497 (492)	2743 (108)	4179 (165)	20203 (44500)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	5				21520 (47400)		
3790 (1000)	8			4280 (169)	21747 (47900)	406 (16)	
4738 (1250)	10			4357 (172)	21883 (48200)	483 (19)	
5875 (1550)	12.5			4445 (175)	22019 (48500)	572 (22.5)	
7580 (2000)	16			4534 (179)	22382 (49300)	660 (26)	
10157 (2680)	21.5				23018 (50700)		
13455 (3550)	28.5	14732 (580)			23880 (52600)		
17813 (4700)	37.5	13970 (550)		5100 (201)	24970 (55000)	914 (36)	
21717 (5730)	46	15926 (627)			25742 (56700)		
25772 (6800)	54.5	13492 (530)	3658 (144)	5308 (209)	27467 (60500)		
30434 (8030)	64.5	15088 (594)			28284 (62300)		
35095 (9260)	74.5	16739 (659)			29101 (64100)		

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	1750REOZDD with 50°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m (23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7011 (276)	3200 (126)	4179 (165)	19386 (42700)	305 (12)	—
2501 (660)	5				20839 (45900)		
3790 (1000)	8			4230 (167)	21020 (46300)	356 (14)	
4738 (1250)	10			4369 (172)	21156 (46600)	419 (16.5)	
5875 (1550)	12.5			4496 (177)	21338 (47000)	495 (19.5)	
7580 (2000)	16			4534 (179)	21565 (47500)	622 (24.5)	
10157 (2680)	21.5	8205 (323)			22110 (48700)	660 (26)	
13455 (3550)	28.5	10211 (402)		5100 (201)	22927 (50500)		
17813 (4700)	37.5	9551 (376)			24062 (53000)	914 (36)	
21717 (5730)	46	11176 (440)			24788 (54600)		
25772 (6800)	54.5	12878 (507)		5265 (208)	25560 (56300)		
30434 (8030)	64.5	12040 (474)	3658 (144)		27422 (60400)		
35095 (9260)	74.5	13691 (539)			28239 (62200)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	12497 (492)	3200 (126)	4179 (165)	21066 (46400)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	5				22518 (49600)		
3790 (1000)	8			4230 (167)	23426 (51600)	356 (14)	
4738 (1250)	10			4369 (172)	23563 (51900)	419 (16.5)	
5875 (1550)	12.5			4496 (177)	23699 (52200)	495 (19.5)	
7580 (2000)	16			4534 (179)	24062 (53000)	622 (24.5)	
10157 (2680)	21.5				24698 (54400)	660 (26)	
13455 (3550)	28.5	13259 (522)		5100 (201)	25560 (56300)		
17813 (4700)	37.5	12599 (496)			26650 (58700)	914 (36)	
21717 (5730)	46	14224 (560)			27422 (60400)		
25772 (6800)	54.5	15926 (627)			29147 (64200)		
30434 (8030)	64.5	15088 (594)	3658 (144)	5265 (208)	29964 (66000)		
35095 (9260)	74.5	16739 (659)			30781 (67800)		

* Data in table is for reference only. Refer to your authorized Kohler distributor for enclosure and subbase fuel tank specification details.
† Max. weight includes the generator set (wet), enclosure, silencer, and tank (no fuel).

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	2000REOZDD with 40°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m(23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7620 (300)	2743 (108)	4280 (169)	20339 (44800)	305 (12)	—
2501 (660)	4				21701 (47800)		
3790 (1000)	6.5			4331 (171)	21883 (48200)	356 (14)	
4738 (1250)	8			4407 (174)	22064 (48600)	432 (17)	
5875 (1550)	10			4484 (177)	22201 (48900)	508 (20)	
7580 (2000)	13.5	8509 (335)		4534 (179)	22609 (49800)	559 (22)	
10157 (2680)	18	10770 (424)			23381 (51500)		
13455 (3550)	24	13666 (538)			24334 (53600)		
17813 (4700)	31.5	10795 (425)		5201 (205)	25061 (55200)	914 (36)	
21717 (5730)	38.5	12751 (502)			25833 (56900)		
25772 (6800)	45.5	10338 (407)	3658 (144)	5409 (213)	27830 (61300)		
30434 (8030)	54	11964 (471)			28647 (63100)		
35095 (9260)	62.5	13564 (534)			29465 (64900)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	12497 (492)	2743 (108)	4280 (169)	22110 (48700)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	4				23472 (51700)		
3790 (1000)	6.5			4331 (171)	23653 (52100)	356 (14)	
4738 (1250)	8			4407 (174)	23835 (52500)	432 (17)	
5875 (1550)	10			4484 (177)	23971 (52800)	508 (20)	
7580 (2000)	13.5			4534 (179)	24380 (53700)	559 (22)	
10157 (2680)	18	13513 (532)			25152 (55400)		
13455 (3550)	24	16409 (646)			26105 (57500)		
17813 (4700)	31.5	13539 (533)		5201 (205)	26831 (59100)	914 (36)	
21717 (5730)	38.5	15494 (610)			27603 (60800)		
25772 (6800)	45.5	13081 (515)	3658 (144)	5409 (213)	29601 (65200)		
30434 (8030)	54	14707 (579)			30418 (67000)		
35095 (9260)	62.5	16307 (642)			31235 (68800)		

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	2000REOZDD w/ 50°C and 2250REOZDD w/ 40/50°C Rad.				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m(23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7620 (300)	3200 (126)	4280 (169)	21156 (46600)	305 (12)	—
2501 (660)	4				22609 (49800)		
3790 (1000)	6.5/6			4293 (170)	22882 (50400)	318 (12.5)	
4738 (1250)	8/7.5			4357 (172)	23018 (50700)	381 (15)	
5875 (1550)	10/9			4420 (174)	23154 (51000)	445 (17.5)	
7580 (2000)	13.5/12			4522 (178)	23381 (51500)	546 (21.5)	
10157 (2680)	18/16	9373 (369)		4534 (179)	24062 (53000)	559 (22)	
13455 (3550)	24/21.5	12294 (484)			25015 (55100)		
17813 (4700)	31.5/28.5	9398 (370)		5201 (205)	25787 (56800)	914 (36)	
21717 (5730)	38.5/35	11024 (434)			26514 (58400)		
25772 (6800)	45.5/41.5	10338 (407)	3658 (144)	5366 (212)	28829 (63500)		
30434 (8030)	54/49	11964 (471)			29646 (65300)		
35095 (9260)	62.5/56.5	13564 (534)			30463 (67100)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	13107 (516)	3200 (126)	4280 (169)	23018 (50700)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	4				24471 (53900)		
3790 (1000)	6.5/6			4293 (170)	24743 (54500)	318 (12.5)	
4738 (1250)	8/7.5			4357 (172)	24879 (54800)	381 (15)	
5875 (1550)	10/9			4420 (174)	25015 (55100)	445 (17.5)	
7580 (2000)	13.5/12			4522 (178)	25242 (55600)	546 (21.5)	
10157 (2680)	18/16			4534 (179)	25923 (57100)	559 (22)	
13455 (3550)	24/21.5	15342 (604)			26877 (59290)		
17813 (4700)	31.5/28.5	13107 (516)		5201 (205)	27649 (60900)	914 (36)	
21717 (5730)	38.5/35	14072 (554)			28375 (62500)		
25772 (6800)	45.5/41.5	13386 (527)	3658 (144)	5366 (212)	30690 (67600)		
30434 (8030)	54/49	15012 (591)			31508 (69400)		
35095 (9260)	62.5/56.5	16612 (654)			32325 (71200)		

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† Max. weight includes the generator set (wet), enclosure, silencer, and tank (no fuel).

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	1250REOZMD with 40°C/50°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m (23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	6858 (270)	2743 (108)	3950 (156)	15981 (35200)	305 (12)	—
2501 (660)	6				17525 (38000)		
3790 (1000)	9.5			4052 (160)	17434 (38400)	406 (16)	
4738 (1250)	12			4128 (163)	17615 (38800)	483 (19)	
5875 (1550)	15			4230 (167)	17797 (39200)	584 (23	
7580 (2000)	19	7366 (290)		4306 (170)	18115 (39900)	660 (26)	
10157 (2680)	25.5	9221 (363)			18796 (41400)		
13455 (3550)	34	9068 (357)		4509 (178)	19204 (42300)	864 (34)	
17813 (4700)	45	11405 (449)			20112 (44300)		
21717 (5730)	55	12751 (502)		4560 (180)	20839 (45900)	914 (36)	
25772 (6800)	65.5	10262 (404)	3658 (144)	5036 (199)	23381 (51500)		
30434 (8030)	77.5	11888 (468)			24198 (53300)		
35095 (9260)	89.5	13564 (534)			25015 (55100)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	10973 (432)	2743 (108)	3950 (156)	17434 (38400)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	6				18705 (41200)		
3790 (1000)	9.5			4052 (160)	18886 (41600)	406 (16)	
4738 (1250)	12			4128 (163)	19068 (42000)	483 (19)	
5875 (1550)	15			4230 (167)	19250 (42400)	584 (23	
7580 (2000)	19			4306 (170)	19567 (43100)	660 (26)	
10157 (2680)	25.5	11507 (453)			20248 (44600)		
13455 (3550)	34	11354 (447)		4509 (178)	20657 (45500)	864 (34)	
17813 (4700)	45	13691 (539)			21565 (47500)		
21717 (5730)	55	15037 (592)		4560 (180)	22291 (49100)	914 (36)	
25772 (6800)	65.5	12548 (494)	3658 (144)	5036 (199)	24834 (54700)		
30434 (8030)	77.5	14174 (558)			25651 (56500)		
35095 (9260)	89.5	15850 (624)			26468 (58300)		

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	1600REOZMD with 40°C/50°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m (23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7316 (288)	2743 (108)	4280 (169)	18705 (41200)	305 (12)	—
2501 (660)	5				20021 (44100)		
3790 (1000)	7.5			4357 (172)	20203 (44500)	381 (15)	
4738 (1250)	9.5			4420 (174)	20339 (44800)	445 (17.5)	
5875 (1550)	12			4509 (178)	20521 (45200)	533 (21)	
7580 (2000)	15.5	7874 (310)		4585 (181)	20884 (46000)	610 (24)	
10157 (2680)	20.5	9906 (390)			21565 (47500)		
13455 (3550)	27.5	12497 (492)			22473 (49500)		
17813 (4700)	36.5	10795 (425)		5201 (205)	23426 (51600)	914 (36)	
21717 (5730)	44.5	12751 (502)			24198 (53300)		
25772 (6800)	52.5	10287 (405)	3658 (144)	5417 (214)	26241 (57800)		
30434 (8030)	62	11913 (469)			27058 (59600)		
35095 (9260)	72	13589 (535)			27921 (61500)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	12192 (480)	2743 (108)	4280 (169)	20430 (45000)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	5				21747 (47900)		
3790 (1000)	7.5			4357 (172)	21928 (48300)	381 (15)	
4738 (1250)	9.5			4420 (174)	22064 (48600)	445 (17.5)	
5875 (1550)	12			4509 (178)	22246 (49000)	533 (21)	
7580 (2000)	15.5			4585 (181)	22609 (49800)	610 (24)	
10157 (2680)	20.5	12650 (498)			23290 (51300)		
13455 (3550)	27.5	15240 (600)			24198 (53300)		
17813 (4700)	36.5	13539 (533)		5201 (205)	25152 (55400)	914 (36)	
21717 (5730)	44.5	15494 (610)			25923 (57100)		
25772 (6800)	52.5	13031 (513)	3658 (144)	5417 (214)	27966 (61600)		
30434 (8030)	62	14656 (577)			28784 (63400)		
35095 (9260)	72	16333 (643)			29646 (65300)		

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† Max. weight includes the generator set (wet), enclosure, silencer, and tank (no fuel).

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Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load	1750/2000REOZMD with 40°C/50°C Radiator				Fuel Tank Height, mm (in.)	Sound Pressure Reduction at 7 m (23 ft.)
		Max. Dimensions, mm (in.)			Max. Weight, †, kg (lb.)		
		Length	Width	Height			
Weather Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	7316 (288)	3048 (120)	4306 (170)	21066 (46400)	305 (12)	—
2501 (660)	4.5/5.4				22473 (49500)		
3790 (1000)	7/6			4344 (171)	22655 (49900)	343 (13.5)	
4738 (1250)	8.5/7.5			4407 (174)	22791 (50200)	406 (16)	
5875 (1550)	10.5/9.5			4484 (177)	22972 (50600)	483 (19)	
7580 (2000)	14/12			4598 (181)	23199 (51100)	597 (23.5)	
10157 (2680)	18.5/16.5	8890 (350)		4611 (182)	23835 (52500)	610 (24)	
13455 (3550)	25/22	11253 (443)			24698 (54400)		
17813 (4700)	33/29	9729 (383)		5227 (206)	25696 (56600)	914 (36)	
21717 (5730)	40/35.5	11481 (452)			26423 (58200)		
25772 (6800)	48.42	13285 (523)			27195 (59900)		
30434 (8030)	56.5/50	11862 (467)	3658 (144)	5392 (213)	29555 (65100)		
35095 (9260)	65/57.5	13589 (535)			30373 (66900)		
Sound Enclosure with Internal Silencer and Subbase Fuel Tank *							
Lifting Base	0	12802 (504)	3048 (120)	4306 (170)	22836 (50300)	305 (12)	Level 1 −15dB(A) or Level 2 −25 dB(A)
2501 (660)	4.5/5.4				24244 (53400)		
3790 (1000)	7/6			4344 (171)	24425 (53800)	343 (13.5)	
4738 (1250)	8.5/7.5			4407 (174)	24561 (54100)	406 (16)	
5875 (1550)	10.5/9.5			4484 (177)	24743 (54500)	483 (19)	
7580 (2000)	14/12			4598 (181)	24970 (55000)	597 (23.5)	
10157 (2680)	18.5/16.5			4611 (182)	25606 (56400)	610 (24)	
13455 (3550)	25/22	14301 (563)			26468 (58300)		
17813 (4700)	33/29	12802 (504)		5227 (206)	27467 (60500)	914 (36)	
21717 (5730)	40/35.5	14529 (572)			28193 (62100)		
25772 (6800)	48.42	16333 (643)			28965 (63800)		
30434 (8030)	56.5/50	14910 (587)	3658 (144)	5392 (213)	31326 (69000)		
35095 (9260)	65/57.5	16637 (655)			32143 (70800)		

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† Max. weight includes the generator set (wet), enclosure, silencer, and tank (no fuel).

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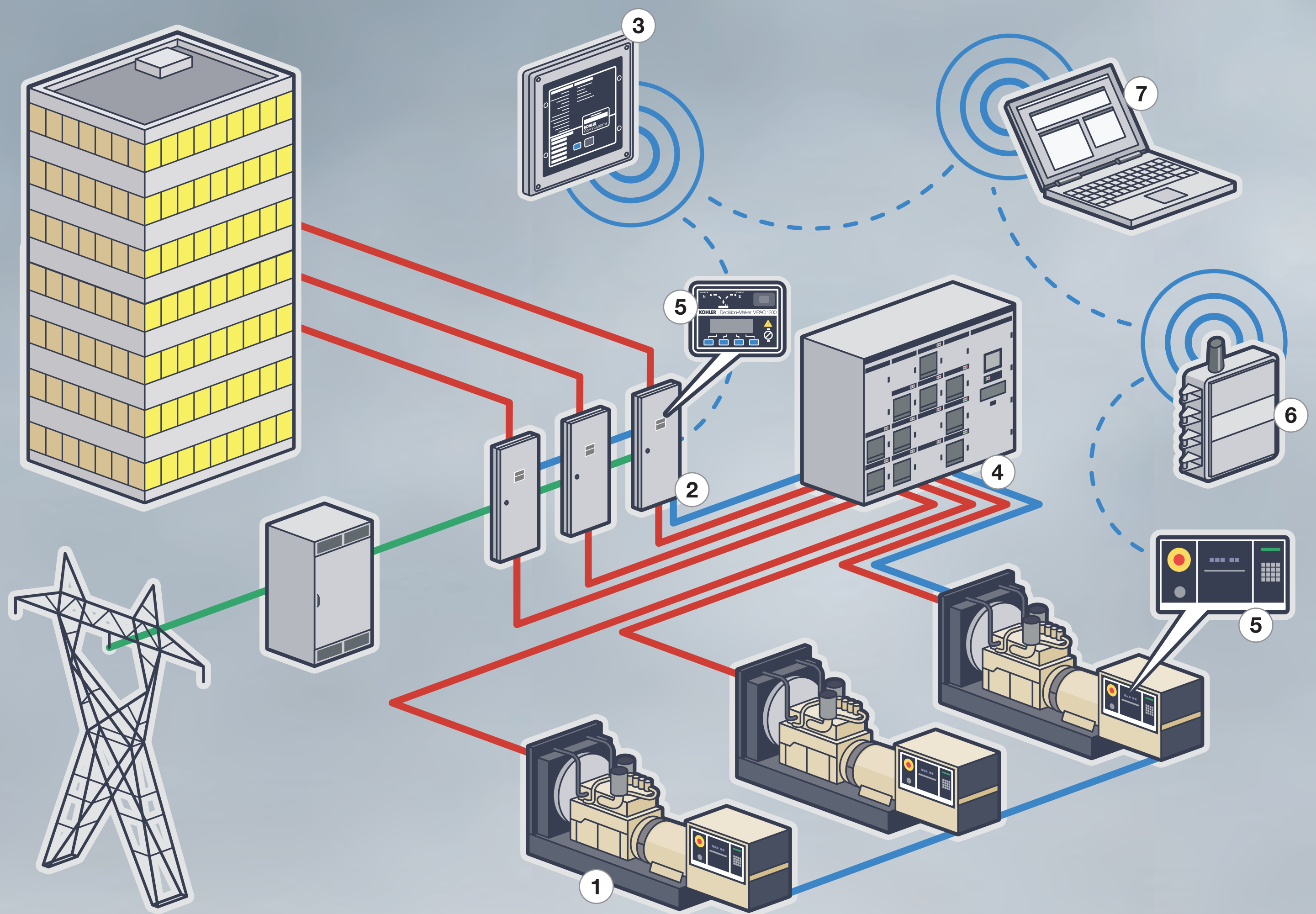
GENERATORS | TRANSFER SWITCHES | SWITCHGEAR | CONTROLS

TOTAL SYSTEM INTEGRATION EVERYTHING WORKS TOGETHER. NO IFS, ANDS OR BUTS.

Look, a power system is only as good as the parts that define it. That's why we engineer every detail down to the last bolt. This isn't your typical power system. It's a KOHLER® industrial power system that's loaded with designed and manufactured components from Kohler including generators, transfer switches, switchgear, controllers and more. But the best part? We customize each power system to your specs.

Specifying has never been easier.



1 **KOHLER® GENERATOR**
Gas generators 25-400 kW
Diesel generators 10-3250 kW

2 **KOHLER AUTOMATIC TRANSFER SWITCH**
Open, closed and programmed transition operating modes; standard, bypass-isolation and service-entrance switch configurations

3 **KOHLER REMOTE ANNUNCIATOR**
Remote monitoring and testing of transfer switches

4 **KOHLER PARALLELING SWITCHGEAR**
Low and medium voltage

5 **KOHLER DECISION-MAKER® CONTROLLER**
Control, monitor and system diagnostics

6 **KOHLER WIRELESS MONITOR**
Performance monitoring around the clock

7 **KOHLER MONITORING SOFTWARE**
Monitors generators and transfer switches from a PC

SERVICE AND SUPPORT
THE HELP YOU NEED. ANY TIME, ANYWHERE.

You're never too far from Kohler. Across the world, more than 800 locations are ready to provide sales, installation and aftermarket support services. And each one offers expertise in power specifications, equipment and integration. There's no question they can't answer. We should know, we trained them ourselves.

Plus, if you ever need assistance in the middle of the night, we'll take care of you. KOHLER Power professionals are available to offer troubleshooting, advice, service and support.

KOHLER POWER SYSTEMS

1 Headquarters and Manufacturing – Kohler, Wisconsin

2 Headquarters EMEA

3 Headquarters Asia-Pacific and Manufacturing – Singapore

4 Manufacturing Facility – India

5 Manufacturing Facility – China

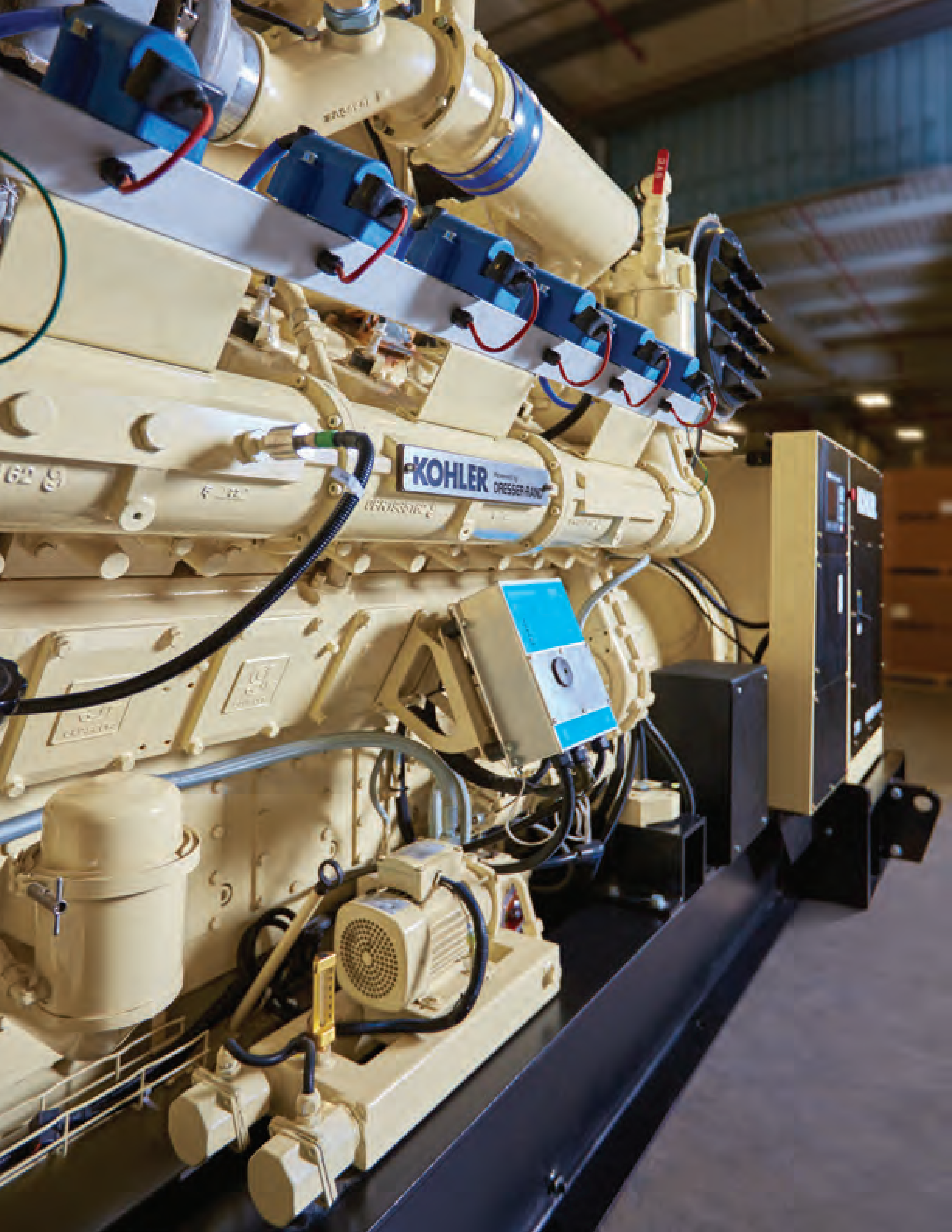
● Sales Offices, Dealers and Distributors

SDMO (Kohler-Owned)

6 Headquarters and Three Manufacturing Facilities – France

7 Manufacturing Facility – Brazil

○ Sales Offices, Dealers and Distributors


KOHLER
Powered by
DRESSER-RAND

POWER SOLUTIONS CENTER

SIZING AND SPECIFYING HAVE NEVER BEEN EASIER.

Power Solutions Center is Kohler's all new, easy-to-use specifying and sizing software with exclusive drag-and-drop load management. It's so simple and intuitive – if you can drag a mouse, you can size a generator. Download it free at KohlerPower.com.

STANDARD FEATURES

QUICK DRAG-AND-DROP LOAD MANAGEMENT

- Build system with generators, transfer switches and transformers
- Duplicate or delete loads with a click of the mouse
- Automatically calculate harmonic load analysis

AUTOMATIC ONE-LINE DIAGRAM AND STEPS REPORT

- Instantly display and print easy-to-read diagrams
- See parameters that fall outside specified limits

PRE-POPULATED ENGINEERING TOOLS

- Get tools for exhaust, fuel line and room sizing in seconds
- Add lighting, air conditioning, elevators and other equipment

OPTIMUM GENERATOR SET RESULTS

- Review a selection of generator set options
- Display generator performance details

SUMMARIES, REPORTS AND TECHNICAL DOCUMENTS

- Display or print diagrams and detailed sizing reports
- Download spec sheets, diagrams and BIM models instantly

QUICK, HASSLE-FREE ESTIMATES AND INFO

- Click to connect with your KOHLER distributor

SECURE FILE STORAGE

- Store files on your local computer
- Share files online or by email
- Works whether you're online or offline

GAS GENERATORS

CUSTOM MADE TO MEET YOUR NEEDS.

25-400 kW

From light commercial use to heavy industrial applications, KOHLER® gas generators are customized to your specifications. Kohler was the first generator manufacturer to offer EPA factory-certified ratings in 180- to 400-kW generators. Now, every size from 25 to 400 kW is available EPA-certified, which saves you big dollars on site certification. Plus, these generators are capable of tying into your natural gas utility or LP supply – so you'll never have to think about fuel again.

STANDARD FEATURES

TESTED AND APPROVED

KOHLER generators meet tough industry testing and quality standards (UL, CSA, IBC, NFPA).

ONE-STEP FULL-LOAD ACCEPTANCE

Our gas generators accept full load to keep you up and running.

ULTIMATE PERFORMANCE

Our 1800-rpm engines run quietly, offer extended life and provide great fuel efficiency.

FACTORY-CERTIFIED GENERATORS

Every size KOHLER gas generator is available EPA-certified, ECM-controlled and designed to meet the latest spark-ignited emission requirements.

LOWER EMISSIONS

Compared to diesel-fueled generators, KOHLER gas generators significantly reduce carbon monoxide and particulate emissions.

1 EMISSION-CERTIFIED

Three-way catalyst reduces nitrogen oxides, carbon monoxide and hydrocarbon emissions

2 FUEL SYSTEMS

Available with natural gas, LP, single or dual fuel and liquid withdrawal systems

3 HIGH-AMBIENT COOLING

Designed to meet extreme operating conditions

4 KOHLER PMG ALTERNATORS

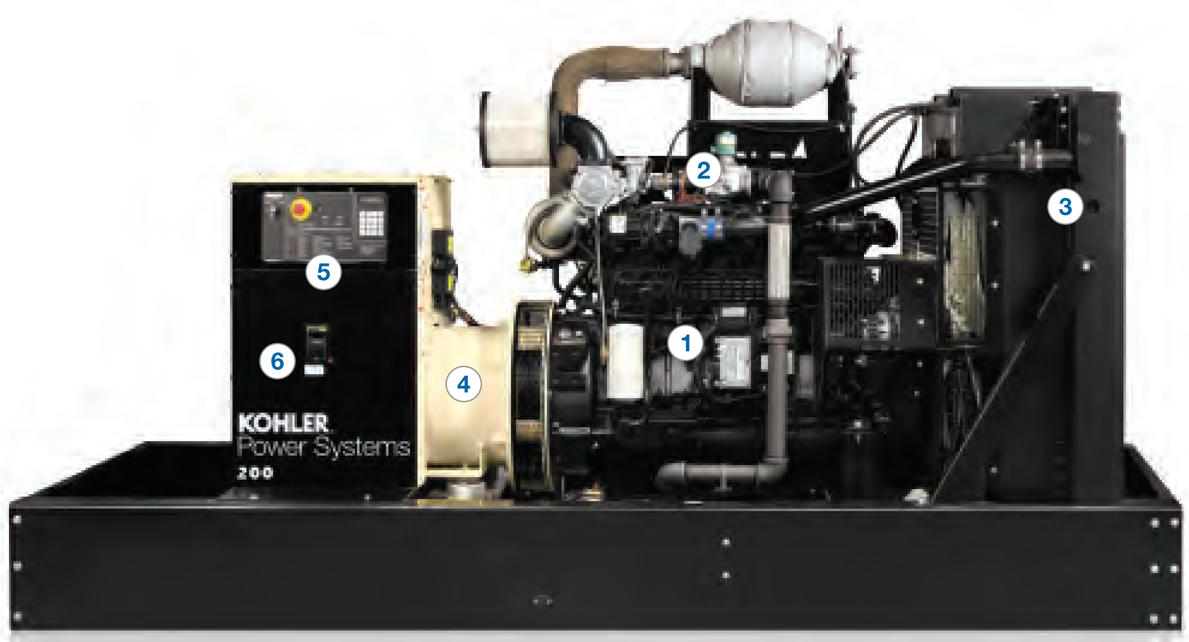
Provide advanced short-circuit capability and meet NEMA MG 1, IEEE and ANSI standards

5 KOHLER DECISION-MAKER® CONTROLLERS

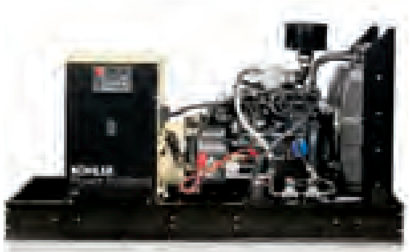
Available with basic, advanced and paralleling options

6 OPTIONS AND ACCESSORIES

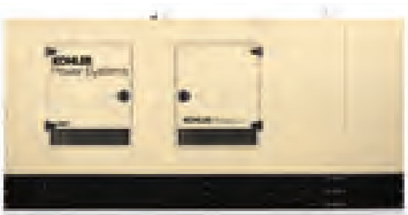
Improved motor-starting alternators, multiple circuit breakers, enclosures, block heaters and more



200REZXB



25REZG



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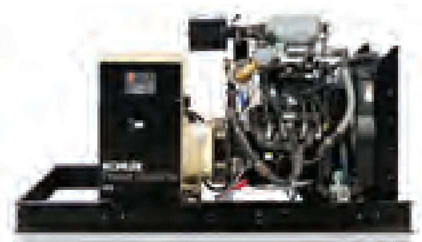


125REZGB

MODEL	NG STANDBY 60 Hz (kW/kVA)	LP STANDBY 60 Hz (kW/kVA)	NG PRIME 60 Hz (kW/kVA)	LP PRIME	RPM	Emissions
25REZG	25/31	25/31			1800	EPA-certified
30REZG	30/38	30/38	27/33	27/33	1800	EPA-certified
40REZG	39/49	40/50			1800	EPA-certified
45REZG	42/53	45/56	37/46	41/51	1800	EPA-certified
50REZGB	53/66	55/69			1800	EPA-certified
60REZGB	60/75	64/80	54/67	56/70	1800	EPA-certified
80REZGD	80/100				1800	EPA-certified
100REZGD	100/125	100/125			1800	EPA-certified
125REZGC	128/160	106/133			1800	EPA-certified
150REZGC	150/188	139/174			1800	EPA-certified
180REZXB	190/238	130/163	164/205		1800	EPA-certified
180RZXB	190/238	130/163	164/205		1800	
200REZXB	200/250	130/163	175/219		1800	EPA-certified
200RZXB	200/250	130/163	174/219		1800	
250REZXB	260/325	170/213	235/294		1800	EPA-certified
250RZXB	260/325	175/219	235/294		1800	
300REZXB	300/375	210/263	270/338		1800	EPA-certified
300RZXB	300/375	210/263	270/338		1800	
350REZXB	355/444	240/300	300/375		1800	EPA-certified
350RZXB	355/444	240/300	300/375		1800	
400REZXB	400/500	260/325	360/450		1800	EPA-certified
400RZXB	400/500	260/325	360/450		1800	

Ratings based on 3-phase, 480 V
50 Hz non-emissions models and single-phase ratings are also available
For additional technical specifications, visit KohlerPower.com.

LARGE GAS GENERATORS

THE RIGHT POWER – AND THE RIGHT POWER RATING. **400-1300** kW

KOHLER® large gas generators are custom-designed and targeted to fit your specific requirements. Many "one size fits all" models are built for continuous power, which limits their power rating for standby and prime applications. In contrast, every KOHLER generator is designed to work specifically for standby, prime or continuous applications – whatever you need. That means greater power efficiency and cost savings.

To power these proven generators, each engine is specially tuned to the generator system for optimal power efficiency. Plus, we've simplified the installation process – every model* is available EPA-certified to meet operational requirements on pipeline natural gas. There's no need to certify or recertify.

*Except the 1300REZCK model, which is available EPA-compliant.

STANDARD FEATURES

PROVEN ENGINE

Engines are specially tuned to optimize system performance, accept a wide range of input fuels and are highly resistant to fuel contamination.

TESTED AND APPROVED

KOHLER generators meet tough industry testing and quality standards (UL, CSA, NFPA).

ULTIMATE PERFORMANCE

1800-rpm engines run quietly, offer extended life and provide cost-effective performance.

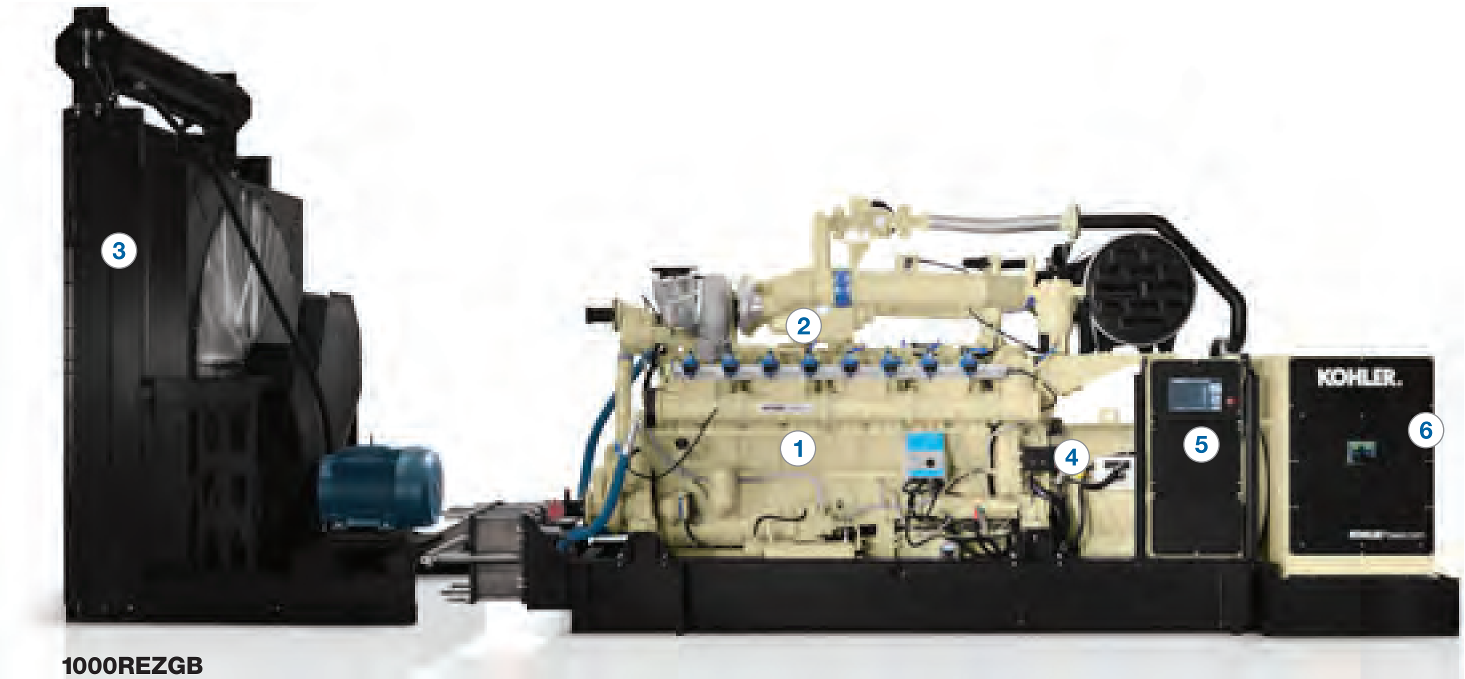
CLEAN RUNNING

KOHLER large gas generators run cleanly and need no after treatment to meet strict EPA emissions standards.

LOWER EMISSIONS

Compared to diesel-fueled generators, KOHLER gas generators significantly reduce nitrogen oxide and particulate emissions.

1. **EMISSION-CERTIFIED**
   Clean-running engines need no after treatment to meet EPA emissions standards
2. **FUEL SYSTEMS**
   Standard configuration for natural gas; capable of a wide range of non-pipeline fuels
3. **HIGH-AMBIENT COOLING**
   Designed to meet extreme operating conditions
4. **EFFICIENT PMG ALTERNATORS**
   Provide advanced short-circuit capability and meet NEMA MG 1, IEEE and ANSI standards
5. **KOHLER DECISION-MAKER® CONTROLLER**
   Large-screen controller for paralleling, load management and generator management
6. **OPTIONS AND ACCESSORIES**
   Improved motor-starting alternators, multiple circuit breakers, enclosures, block heaters and more



1000REZGB

MODEL	NG STANDBY 60 Hz (kW/kVA)	NG PRIME 60 Hz (kW/kVA)	NG CONTINUOUS 60 Hz (kW/kVA)	RPM	Emissions
500REZK	500/625	435/543		1800	EPA-certified
750REZK	750/937	630/787		1800	EPA-certified
1000REZK	1000/1250	880/1100		1800	EPA-certified
400REZCK			435	1800	EPA-certified
600REZCK			675	1800	EPA-certified
800REZCK			875	1800	EPA-certified
1000REZCK			1030	1800	EPA-certified
1300REZCK			1310	1800	EPA-compliant

Ratings based on 3-phase, 480 V. Continuous rating at power factor of 1.0
For additional technical specifications, visit KohlerPower.com

CONTINUOUS-POWER MODELS: BUILT FOR EFFICIENCY

- Available EPA-certified (model 1300REZCK is EPA-compliant-capable) and ECM-controlled and meet the latest spark-ignited emission requirements for emergency operation.
- Offer high electrical efficiencies.
- Built to run at up to a 100% load factor over the life of the generator.
- Factory cooling options allow for up to 40°C ambient operation.

PRIME-POWER MODELS: BUILT FOR LOAD ACCEPTANCE

- Available EPA-certified and ECM-controlled and meet the latest spark-ignited emission requirements for non-emergency operation.
- Built to run at up to a 90% load factor over the life of the generator; meet ISO-8528 G1 power quality standards even through a 53% load step.
- Capable of accepting rated load in one step.
- Factory cooling options allow for up to 50°C ambient operation.

EMERGENCY STANDBY MODELS: BUILT TO LAST

- Available EPA-certified and ECM-controlled and meet the latest spark-ignited emission requirements for emergency operation.
- Built to run at up to an 85% load factor over the life of the generator; meet ISO-8528 G1 power quality standards even through a 53% load step.
- Capable of accepting rated load in one step.
- Factory cooling options allow for up to 50°C ambient operation.

DIESEL GENERATORS

BRED FOR THE TOUGHEST JOBS ON EARTH.

10-3250 kW

These generators are tough as nails and made to power all of your applications (simple to complex), including healthcare, gas stations, data centers, airports and more. KOHLER® diesel generators come loaded with power and are available in a range of sizes up to 3250 kW.

Of course, the diesel generators we make are available EPA-certified. And you can customize them any way you like with a variety of accessories.

STANDARD FEATURES

TESTED AND APPROVED

KOHLER generators meet tough industry testing and quality standards (UL, CSA, IBC, NFPA).

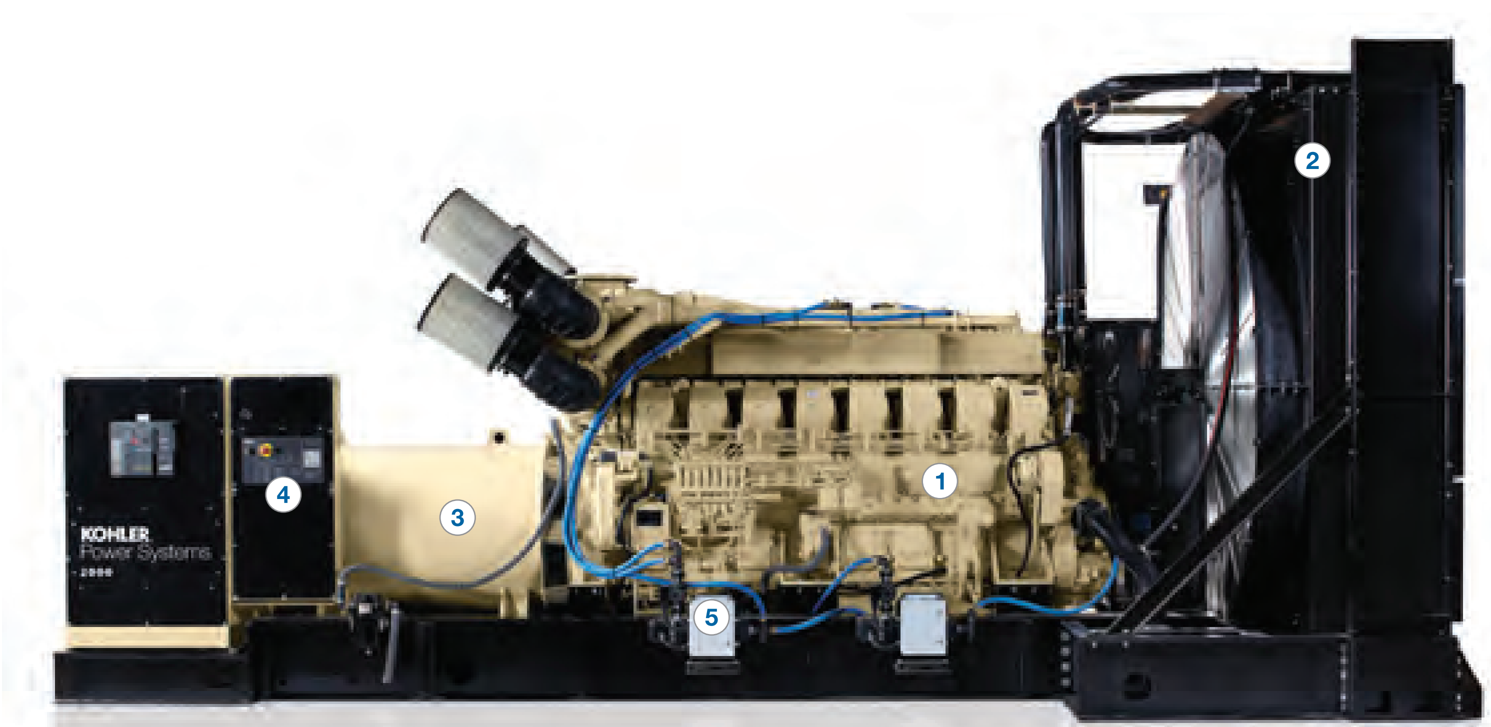
RAPID RESPONSE

Our generators power up in 10 seconds or less and deliver quality power during voltage and frequency changes.

EASY INSTALLATION

Our quickest install ever – large stub-up areas; easy access to fuel, load and exhaust locations.

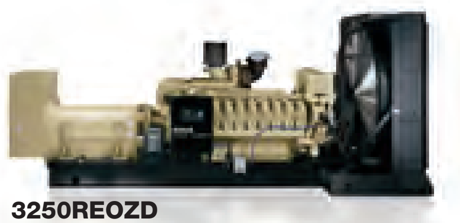
1. **EMISSION-CERTIFIED**
   EPA-certified, industrial-grade engines meet the latest emissions requirements
2. **HIGH-AMBIENT COOLING**
   Designed to meet your extreme operating conditions
3. **KOHLER PMG ALTERNATORS**
   Provide advanced short-circuit capability and meet NEMA MG 1, IEEE and ANSI standards
4. **KOHLER DECISION-MAKER® CONTROLS**
   Available with a variety of controls – basic, advanced and paralleling
5. **OPTIONS AND ACCESSORIES**
   Improved motor-starting alternators, heavy-duty air cleaners, enclosures, fuel tanks, block heaters, multiple circuit breakers and more



2000REOZMD

30REOZJC

500REOZJ



3250REOZD

MODEL	STANDBY 60 Hz (kW/kVA)	PRIME 60 Hz (kW/kVA)	RPM	Engine Manufacturer	EPA Emissions
10REOZDC	10/12.5	9/11.3	1800	Yanmar	Tier 4i
15REOZK	17/21.3	15/18.8	1800	Kohler	Tier 4i
20REOZK	24/30	21/26.3	1800	Kohler	Tier 4i
30REOZK	31/39	28/25	1800	Kohler	Tier 4i
30REOZK4	30/37.5	28/35	1800	Kohler	Tier 4
40REOZK	42/52	37/46	1800	Kohler	Tier 3
40REOZK4	40/50	36/45	1800	Kohler	Tier 4
48REOZK4	48/60	43/53	1800	Kohler	Tier 4
50REOZK	52/65	47/58	1800	Kohler	Tier 3
60REOZK	60/75	54/67	1800	Kohler	Tier 3
80REOZJF	83/104	76/95	1800	John Deere	Tier 3
100REOZJF	102/128	92/115	1800	John Deere	Tier 3
125REOZJG	128/160	116/145	1800	John Deere	Tier 3
125REOZJ4	130/163	117/146	1800	John Deere	Tier 4
150REOZJF	154/193	140/175	1800	John Deere	Tier 3
150REOZJ4	154/193	139/174	1800	John Deere	Tier 4
180REOZJG	180/225	165/206	1800	John Deere	Tier 3
200REOZJF	200/250	180/225	1800	John Deere	Tier 3
230REOZJE	230/288	205/256	1800	John Deere	Tier 3
250REOZJE	255/319	230/288	1800	John Deere	Tier 3
275REOZJE	280/350	255/319	1800	John Deere	Tier 3
300REOZJ	300/375		1800	John Deere	Tier 3
350REOZJB	360/450		1800	John Deere	Tier 3
400REOZJB	410/513		1800	John Deere	Tier 3
500REOZJB	510/638		1800	John Deere	Tier 2
500REOZVC	515/644	460/575	1800	Volvo	Tier 2
550REOZVB	550/688	500/625	1800	Volvo	Tier 2
600REOZVB	600/750	555/694	1800	Volvo	Tier 2

MODEL	STANDBY 60 Hz (kW/kVA)	PRIME 60 Hz (kW/kVA)	RPM	Engine Manufacturer	EPA Emissions
700REOZDE	700/785	630/788	1800	MTU	Tier 2
750REOZMD	760/950	690/863	1800	Mitsubishi	Tier 2
800REOZDE	800/1000	725/906	1800	MTU	Tier 2
800REOZMD	810/1013	730/913	1800	Mitsubishi	Tier 2
800ROZMC	810/1013	730/913	1800	Mitsubishi	
900REOZDE	910/1136	830/1038	1800	MTU	Tier 2
900REOZMD	970/1213	915/1144	1800	Mitsubishi	Tier 2
1000REOZDE	1000/1250	910/1138	1800	MTU	Tier 2
1000REOZMD	1020/1275	925/1156	1800	Mitsubishi	Tier 2
1000ROZMC	1020/1275	925/1156	1800	Mitsubishi	
1250REOZDD	1300/1625	1180/1475	1800	MTU	Tier 2
1250ROZMC	1280/1600	1160/1450	1800	Mitsubishi	
1250REOZMD	1280/1600	1160/1450	1800	Mitsubishi	Tier 2
1500REOZDD	1560/1950	1400/1750	1800	MTU	Tier 2
1600ROZMC	1600/2000	1450/1813	1800	Mitsubishi	
1600REOZMD	1600/2000	1450/1813	1800	Mitsubishi	Tier 2
1750REOZDC	1760/2200	1600/2000	1800	MTU	Tier 2
1750REOZMD	1780/2225	1620/2025	1800	Mitsubishi	Tier 2
2000REOZDD	2060/2575	1850/2313	1800	MTU	Tier 2
2000ROZMC	2000/2500	1820/2275	1800	Mitsubishi	
2000REOZMD	2000/2500	1820/2275	1800	Mitsubishi	Tier 2
2250REOZDD	2250/2813	2050/2563	1800	MTU	Tier 2
2500REOZDB	2500/3125	2270/2838	1800	MTU	Tier 2
2800REOZDB	2800/3500	2540/3175	1800	MTU	Tier 2
3000REOZD	3000/3500	2800/3500	1800	MTU	Tier 2
3250REOZD	3250/3500	2800/3500	1800	MTU	Tier 2

1) Stationary emergency ratings based on 3-phase, 480 V

2) 50 Hz non-emissions models are also available. Please contact the factory

3) Single-phase ratings also available

For additional technical specifications, visit KohlerPower.com

KOHLER® FAST-RESPONSE® ALTERNATORS

ALL THE BELLS AND WHISTLES. NO EXTRA CHARGE.

More than 90 years ago, Kohler unleashed its first alternator – and we've been raising the bar ever since. Today we're proud to manufacture KOHLER Fast-Response Permanent Magnet Generator (PMG) alternators – a breakthrough in speed technology. Built to perform, these revolutionary alternators offer fast response to load changes.

On some other gensets, PMG alternators come as a costly upgrade. Not so with Kohler. All of our 35- to 300-kW units are factory-equipped with our Fast-Response PMG alternators. Which means you get all the bells and whistles with no expensive upcharge.

STANDARD FEATURES

TRUSTED RELIABILITY

Greaseless bearing and Class H insulation provide extra thermal protection for lasting reliability.

ULTIMATE PERFORMANCE

High-power density design makes Kohler an industry leader in motor-starting capability.

TESTED AND APPROVED

Our alternators meet NEMA MG 1, IEEE and ANSI standards for temperature rise and motor-starting capability.

CLEAN POWER

Experience the rewards of clean power with precise voltage, current and frequency control.

DURABLE SHORT-CIRCUIT RATINGS

The very definition of performance. Our alternators sustain short-circuit currents up to 300% of the rated current – for up to 10 seconds.

1 PMG–BRUSHLESS ALTERNATOR

Features brushless permanent magnet exciter for fast load response

2 RECONNECTABLE LEADS

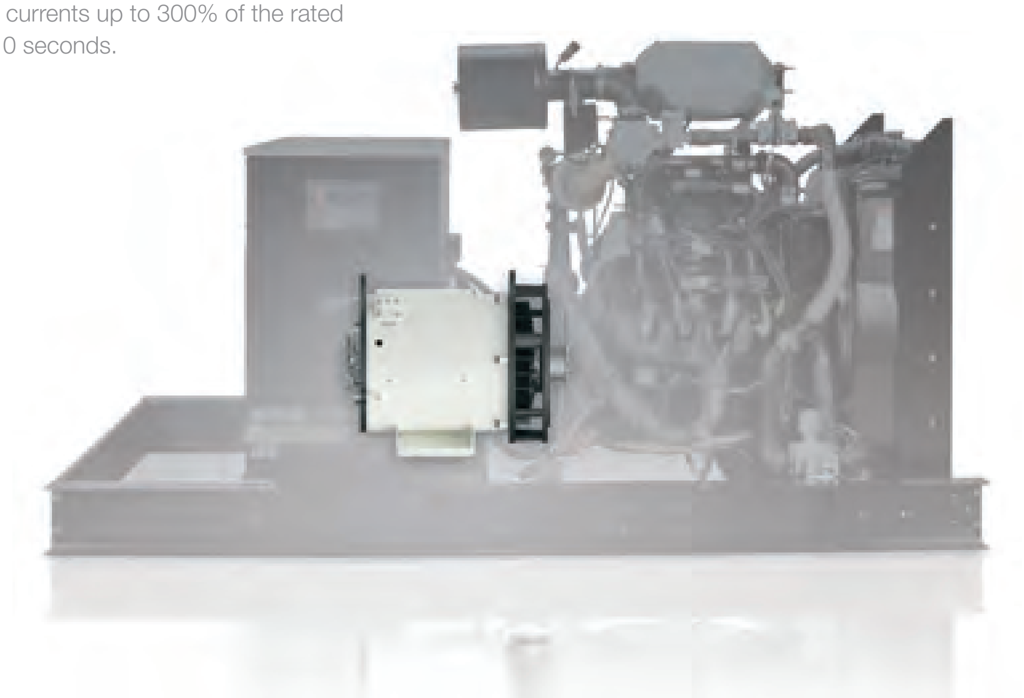
Designed with 4-lead dedicated voltages and 12-lead optional voltage connections

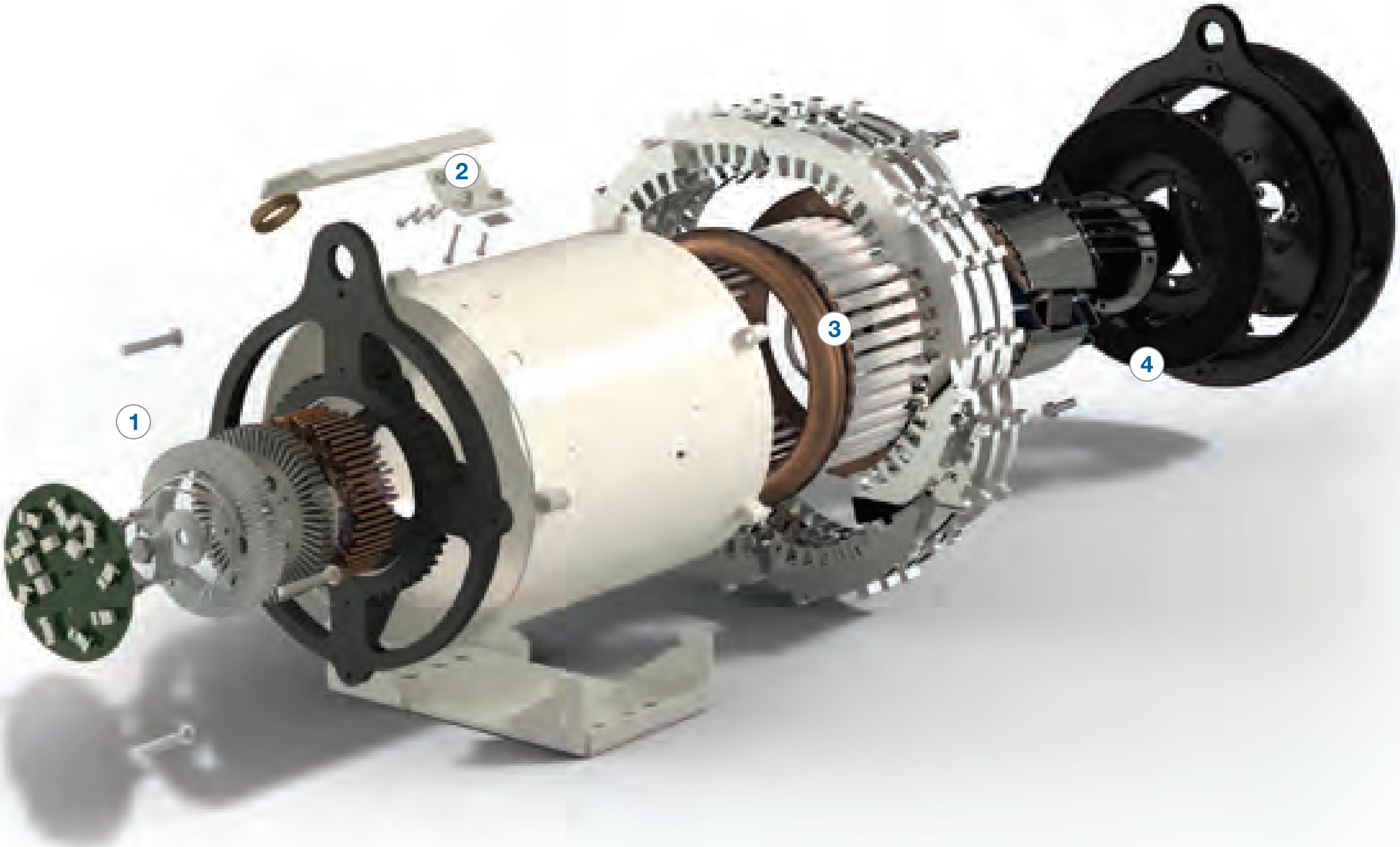
3 VACUUM-IMPREGNATED WINDINGS

Fungus-resistant epoxy varnish ensures reliability in tough environments

4 ROTOR

Two-thirds pitch stator and skewed rotor deliver clean power and superior voltage waveform

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KOHLER® DECISION-MAKER® CONTROLS

TECHNOLOGY SO ADVANCED, IT'S EASY.

At Kohler, we don't do one size fits all. With our Decision-Maker controls, we design custom packages, tailored to your needs – from basic controls to multiple generator paralleling.

Plus, Kohler makes each controller easy to operate with user-friendly displays and keypad functions. And if that weren't enough, our complete line of Decision-Maker controllers features advanced network communications for remote monitoring as well as adjustable parameters to accommodate your specific application.

STANDARD FEATURES

TESTED AND APPROVED

Our controls meet NFPA, UL and CE standards.

INTEGRAL VOLTAGE REGULATOR

KOHLER controls deliver precise voltage regulation (.05%–0.25%) to protect your sensitive equipment from poor power quality.

SEAMLESS SYSTEM INTEGRATION

Every controller works with our automatic transfer switches and switchgear for complete system integration.

ALTERNATOR PROTECTION

This must-have technology protects the alternator from thermal overload.

REMOTE COMMUNICATIONS

MONITOR SOFTWARE

Monitors and controls generator sets and transfer switches from your personal computer.

POWERSCAN™

Provides system monitoring around the clock using wireless technology to send messages to your phone, fax and email.

REMOTE ANNUNCIATOR

Offers an economical solution for remote annunciation of faults and status conditions for NFPA-110 compliance.

1. **EMERGENCY STOP BUTTON**
   Turns off generator immediately
2. **CONTROL BUTTONS**
   Control synchronizing breakers and generator operation (Off/Auto/Run)
3. **STATUS INDICATORS**
   Display generator mode, breaker and synchronization status
4. **DIGITAL ALPHA/ NUMERIC DISPLAY**
   Displays faults, warnings, codes and metering
5. **KEY SWITCH**
   Secures your program settings
6. **PUSH-BUTTON KEYPAD**
   Sets custom parameters, displays menus, resets faults and more

REMOTE ANNUNCIATOR

DECISION-MAKER 6000

3000

550

6000

8000

Decision-Maker Model®	3000	550	6000	8000	3500
Integral voltage regulator	x	x	x		x
Engine diagnostics	x	x	x	x	x
Engine starting aid	x	x	x		x
Event and data logging	x	x	x	x	x
Programming access via laptop	x	x	x	x	x
Key switch		x	x		
USER INTERFACE					
Alphanumeric digital display	x	x	x		
Monochromatic graphical display					x
Color graphical display				x	
Emergency stop (local)				x	x
Emegency stop (remote)	x	x	x	x	x
Exercise function		x	x		x
COMMUNICATIONS					
Local and remote area network capability	x	x	x	x	x
Monitoring software	o	o	o	x	

Decision-Maker Model	3000	550	6000	8000	3500
PARALLELING					
Remote input for external paralleling controller		x		x	x
Dead bus paralleling			x	x	x
Dead field paralleling				x	
Synchronizer			x	x	x
Real and reactive load sharing			x	x	x
First-on logic			x	x	x
Circuit breaker control			x	x	x
Base load control			x	x	x
Var/power factor control			x	x	x
Load management			o	x	x
Generator management			o	x	x

KEY: **STANDARD** = x / **OPTION** = o

COMMON FEATURES

INPUTS AND OUTPUTS

All models include digital and analog input and output with option for additional inputs/outputs

ENGINE STATUS AND CONDITION INDICATORS

Oil pressure/temperature
Coolant temperature
Engine speed
Number of starts
Battery voltage

ALTERNATOR STATUS AND CONDITION

Voltage, L-L and L-N for all phases
Current/frequency for all phases
Total kW/kVA and KVAr
kWh
Power factor*
Per phase kW/kVA and KVAr*

ENGINE PROTECTION – SHUTDOWN/INDICATION

High engine coolant temperature
Low coolant level
Low oil pressure
Overcrank
High/low fuel level/pressure
Overspeed
Load shed output*

ALTERNATOR PROTECTION – SHUTDOWN/INDICATION

Over- and under-voltage/frequency
Overcurrent
Overpower
Locked rotor**
Reverse power/var*

*Except Decision-Maker 3000. **Except Decision-Maker 8000

DECISION-MAKER® PARALLELING SYSTEM

TOTAL INTEGRATION. FROM TOP TO BOTTOM

When it comes to paralleling systems, Kohler offers 100% integration. Our Decision-Maker Paralleling System (DPS) is designed, engineered and factory-tested as a complete system, not built from parts from multiple manufacturers like some competitive products.

Comprised of KOHLER® generators, controls and switchboards, DPS delivers dependable power across multiple applications.

STANDARD FEATURES

REDUNDANT BACKUP POWER
Total and complete protection. If one genset needs servicing, the DPS makes power available to your most critical loads.

EASY EXPANSION
Purchase a system that fits your budget today. And, in the future, we'll expand on your DPS instead of completely replacing it.

OPERATIONAL SAVINGS
Saving has never been easier. The DPS automatically turns off generators when your needs are low.

FAST LEAD TIMES
Our DPS is a standard product, no customization necessary. So you'll get it faster than custom paralleling systems.

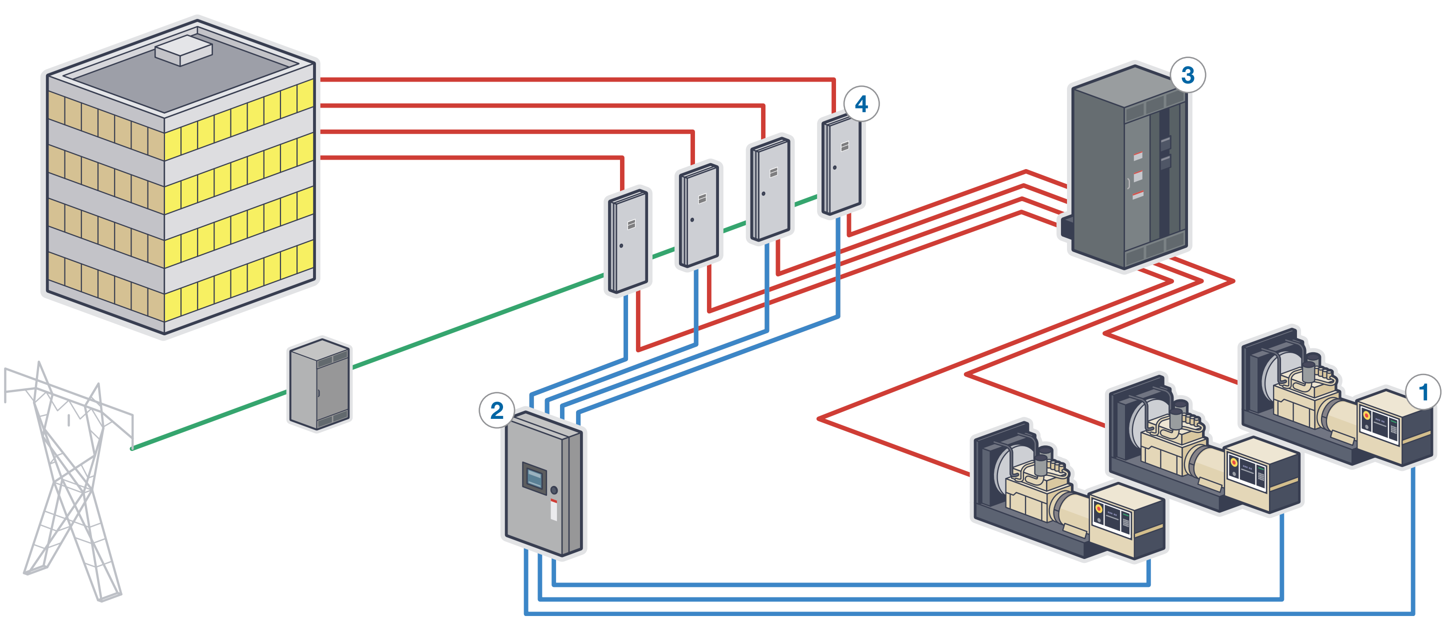
OPTIONAL FUEL TYPES
Mix and match any fuel you want. Available for use with diesel, natural gas and LP fuel types in the same system.

1. **KOHLER DECISION-MAKER 6000 CONTROLLER**
   Enables load sharing and synchronization for up to eight generator sets in the KOHLER DPS

2. **MASTER CONTROL PANEL**
   Handles load add/shed, number of gensets online, monitors event logging and alarms

3. **POWER DISTRIBUTION SWITCHBOARD**
   Accommodates paralleling and distribution breakers

4. **AUTOMATIC TRANSFER SWITCH**
   Intelligently selects the power source and transfers loads



SUB - BASE FUEL TANKS

BUILT TO MATCH YOUR ENVIRONMENTAL NEEDS.

If it's environmental protection you want, you're in the right place. KOHLER® tanks feature two containment walls to keep your fuel where it should be – inside. Plus, they're coated with Power Armor Plus™ (a textured epoxy-based, rubberized finish) for heavy-duty durability.

STANDARD FEATURES

ENVIRONMENTAL PROTECTION

Our tanks are UL-approved secondary containment tanks and can be configured to meet cUL, IBC and other required codes.

MULTIPLE RUNTIMES

Usable tank capacities provide 12 to 72 hours of operation.

CUSTOM OPTIONS

Choose from alarm panels, spill-fill containments, high-fuel switches, tank markings and more.

EXCELLENT PROTECTION

Our new Power Armor Plus – polyurea textured coating eliminates the need for exterior epoxy treatment and provides excellent abrasion resistance and corrosion protection.

1. **STATE TANK OPTIONS**
   Spill-fill containments, three-alarm panel, fuel basin switch and tank markings
2. **EMERGENCY PRESSURE RELIEF VENTS**
   Ensure proper venting of inner and outer tank during extreme conditions
3. **NORMAL VENT WITH CAP**
   Raised above the lockable fuel fill cap
4. **ELECTRICAL STUB-UP**
   Features large stub-up area for easy installation
5. **LEAK DETECTION SWITCH**
   Annunciates a contained primary tank fuel leak at generator control
6. **FUEL SWITCH**
   Interfaces with controller to provide fuel level indication

ENCLOSURES

REDUCE THE RACKET. AND PUT MOTHER NATURE IN HER PLACE.

If you want to keep the weather out and the noise in, there's really only one way to go. KOHLER® enclosures are bolstered by industrial steel or heavy-duty aluminum and acoustic insulation to protect your investment and keep the noise down. In addition, we coat every unit with Power Armor™ (a textured industrial finish) for heavy-duty durability in harsh conditions.

UL 2200 and IBC-certified packages are available.

STANDARD FEATURES

CUSTOM OPTIONS

Multiple weather/sound enclosure options are available on 10- to 3250-kW generators.

QUIET PERFORMANCE

Our enclosures offer acoustic insulation to meet your quiet applications.

CERTIFIED PACKAGES

Enclosures are UL2200-tested and approved, IBC-certified and meet 150-mph wind rating.

ADVANCED CORROSION PROTECTION

Power Armor is a textured automotive-grade finish that surpasses a 2,500 hour salt spray exposure test.

1. **ADVANCED DOOR SYSTEM**
   Hinged doors, door handles and door holders provide security, protection and easy access for service
2. **SERVICE ACCESS**
   Multiple personnel doors and removable panels offer easy access to generator control, fuel fill, fuel gauge, oil fill and battery
3. **INTERNAL EXHAUST SYSTEM**
   Features insulated exhaust silencer for improved aesthetics, safety and noise reduction
4. **OIL AND RADIATOR DRAINS**
   Provide an easier, quicker way to service your generator
5. **AVAILABLE ACCESSORIES**
   Electrical packages, lighting, heaters, motorized louvers, stairs and more

400REOZJ

80REZGD

2000REOZMD

Sound Levels			
KW	**Engine Manufacturer**	**Weather Enclosure dBA**	**Sound Enclosure dBA**
10-20 kW	Yanmar	77	68
25-150 kW	GM	77-88	69-74
20-300 kW	John Deere	80-94	68-75
350-500 kW	John Deere	90-94	73-75
500-600 kW	Volvo	94-95	75
700-1000 kW	MTU	93-98	75
1250-3250 kW	MTU/Mitsubishi	95-101	75-85

Sound level full load dBA @ 23 feet.

AUTOMATIC TRANSFER SWITCHES

FORGET THE FORECAST. WE HAVE YOU COVERED.

Bridging the gap between loss of utility and standby power is no small task, which is why KOHLER® automatic transfer switches are essential to KOHLER power systems.

Kohler's latest generation of transfer switches – featuring MPAC® controllers – are loaded with technology to ensure transfer of power from the utility to the generator and back. When the grid fails, power is transferred to the standby system. And then it's back to business as usual.

STANDARD FEATURES

MULTIPLE APPLICATIONS

Find the perfect option. KOHLER transfer switches are available in standard, bypass-isolation and service-entrance configurations with open, closed and programmed transition operating modes, from 30 to 4000 amps.

SEAMLESS SYSTEM INTEGRATION

Everything works together. KOHLER transfer switches are designed to interface perfectly with KOHLER generators and switchgear.

ADVANCED COMMUNICATIONS

Every transfer switch comes fully loaded with the technology to do the job. Ethernet and Modbus communications capabilities are available.

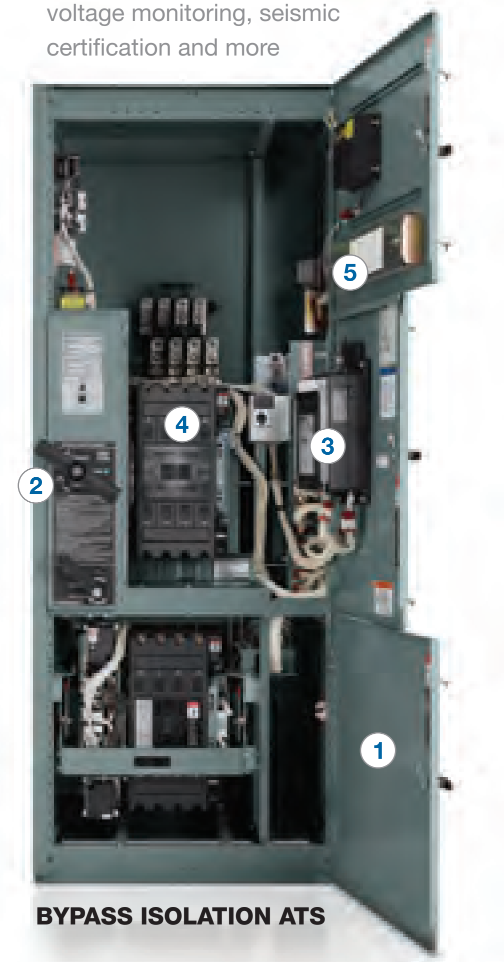
CERTIFIED PACKAGES

Transfer switches are UL-listed and have CSA and IBC certifications available.

1. **CERTIFIED ENCLOSURES**
   Meet NEMA Type 1, 3R, 12, 4 and 4X enclosure standards
2. **BYPASS OPERATION**
   Eliminates interruption to the loads during maintenance
3. **MPAC DIGITAL CONTROLLER**
   Provides a full array of features including communications, I/O, load management and other advanced functionality
4. **HEAVY-DUTY CONTACTOR**
   Choose from any breaker, specific breaker and current limiting fuse-rated mechanisms
5. **AVAILABLE ACCESSORIES**
   Anti-condensation heater, voltage surge suppressor, line-to-neutral voltage monitoring, seismic certification and more

STANDARD ATS

SERVICE-ENTRANCE ATS



BYPASS ISOLATION ATS

KOHLER® PRODUCT SERIES	DECISION-MAKER® MPAC® 750	DECISION-MAKER MPAC 1200	DECISION-MAKER MPAC 1500
Comparison Features	**Basic**	**Advanced**	**Mission-Critical**
Amperage	Up to 1000 A	Up to 4000 A	Up to 4000 A
Phases	Single/Three	Single/Three	Single/Three
Poles	2, 3, 4	2, 3, 4	2, 3, 4
Voltage range	115-480 V	115-600 V	115-600 V
Product Type			
Standard open transition	Yes	Yes	Yes
Standard delayed transition		Yes	Yes
Standard closed transition		Yes	Yes
Bypass-isolation open transition			Yes
Bypass-isolation delayed transition			Yes
Bypass-isolation closed transition			Yes
Service entrance			Yes
Withstand and Close-On Ratings (WCR)			
WCR – Specific breaker	30-65 kA	30-65 kA	22-100 kA
WCR – Any breaker		10-100 kA	10-100 kA
WCR – Current-limiting fuses		100-200 kA	100-200 kA
Short-time withstand rating		36-65 kA	36-65 kA

PARALLELING SWITCHGEAR

LOAD IT UP. ANYWAY YOU WANT.

Whether your needs are for emergency, prime power, interruptible rate or peak shaving applications, Kohler has the switchgear to back them all up. When it's time to spec, our team will take care of you every step of the way – from concept to startup. And we will engineer custom switchgear to meet your needs.

Now when it comes to flexibility in generator paralleling, KOHLER® PD-Series paralleling switchgear is the way to go. If utility power ever fluctuates or fails, your KOHLER switchgear automatically reacts to the situation, engages the generators and connects them to your facility.

STANDARD FEATURES

CUSTOM DESIGN
Tailor-made from top to bottom. Our switchgear is engineered to specifically meet your unique application.

SEAMLESS SYSTEM INTEGRATION
It's simple really. Our switchgear works with the entire KOHLER power system – generators, automatic transfer switches and more.

CERTIFIED PACKAGES
All KOHLER switchgear is cUL-listed and IBC-certified.

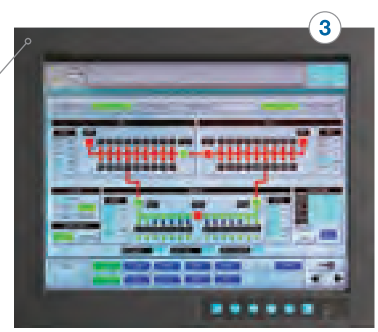
DESIGN SUPPORT
Need help? Our experts are ready to assist in switchgear design.

1 **CIRCUIT BREAKERS**
Choose from a variety of paralleling and distribution circuit breakers

2 **CUSTOM OPTIONS**
Choose from controls, meters, protective relays and more

3 **CONTROL CENTER**
Features color touch screen, USB port for downloading reports, Modbus communications, Web server and more

4 **LOW AND MEDIUM VOLTAGES**
Available up to 13.8 kV



PD-2000

Features	PD-2000	PD-3000	PD-4000
Low-voltage switchboard (UL/cUL 891)	x		
Low-voltage switchgear (UL/cUL 1558)		x	
Medium-voltage metal-clad switchgear (UL/cUL-listed)			x
NEMA 1	x	x	x
NEMA 3R	x	x	x
Short-circuit rating up to 200 kA		x	x
Short-circuit rating up to 150 kA	x		
Bus rating up to 10,000 A	x		
Bus rating up to 9200 A		x	
Bus rating up to 6000 A			x
Maximum voltage 600 V	x	x	
Maximum voltage 15 kV			x
60 Hz	x	x	x
50 Hz	x	x	x
Parallel up to 32 generators	x	x	x
15" color touch screen (optional touch screen sizes available)	x	x	x
Customizable controls, relays and metering	x	x	x

Modes of Operation			
Emergency standby	x	x	x
Prime power	x	x	x
Base load (peak shave)	x	x	x
Import (peak shave)	x	x	x
Isolate (interruptible rate)	x	x	x
Customizable sequence of operation	x	x	x

MOBILE GENERATORS

TAKE YOUR POWER ANYWHERE.

35-500 kW

Quiet, reliable KOHLER® mobile generators give you dependable power anywhere, from remote construction sites to public events to storm recovery. Tough to the core, they're built to withstand the elements and run for long hours in prime and standby applications. Upgrade your rental fleet with hard-working mobile units. They're loaded with features for power that works wherever you go.

STANDARD FEATURES

DIESEL MOBILE GENERATORS

EASY ON THE ENVIRONMENT

EPA-emission-certified for non-road use with 110% containment of fuel, oil and coolant. Tier 4 Final engines with lower operating costs* give you heavy-duty power for any demanding application.

ENGINES FOR THE FUTURE

KOHLER Diesel KDI engines have no DPF (diesel particulate filter) for a smaller overall footprint without DPF maintenance. Cooled EGR helps achieve the industry's toughest emissions standards. Ultra-efficient performance provides savings. John Deere engines have Integrated Emissions Control systems – cooled EGR, exhaust filter and SCR – that result in high power density, high torque and lower fuel consumption.

GASEOUS MOBILE GENERATORS

INNOVATIVE PROPANE TANK SYSTEM

LP gas is reliable, readily available, refills just like diesel and produces less smog-producing carbon monoxide. Easily switch to natural gas or external propane for extended power supply.

LOWER OPERATING COSTS

KOHLER mobile generators with propane engines offer a 15%-20% reduction in hourly fuel costs.**

GENERATOR PARALLELING BOX

The KOHLER Mobile Paralleling Box lets you parallel differently sized KOHLER mobile generators to meet job requirements. It eliminates the need to size circuit breakers to specific generator output or invest in motorized breakers on generators that may never be paralleled. Each box can parallel two generators with the Decision-Maker® 3500 controller.

*Available on 35/45REOZT4.
**Fuel cost savings compared to diesel fuel and based on December 2013 rates published by the U.S. Energy Information Administration.

1. **LIFTING EYE**
   Convenient single-point lifting eye
2. **KOHLER DECISION-MAKER 3500 CONTROLLER**
   User-friendly LCD display and advanced network communications
3. **REMOVABLE HOUSING**
   Patent-pending housing is easy to remove – just unscrew bolts from the base*
4. **ON-BOARD FUEL TANK**
   24-hour runtime tanks are standard on diesel models, optional on gaseous models
5. **RUGGED TRAILER**
   Tough commercial trailer with electric braking system
6. **TWO-WAY FUEL VALVE**
   Easily switches among onboard LP, external LP or natural gas fuel (gaseous model); switches between on-board and external fuel tank draw (optional on diesel models)*

*Available on Tier 4F and gaseous models only.

125REZGT

Model	Standby 60 Hz (kW/kVA)	Prime 60 Hz (kW/kVA)	Fuel	EPA Emissions
35REOZT4	30/37.5	28/35	Diesel	Tier 4F
45REOZT4	40/50	36/45	Diesel	Tier 4F
55REOZT4	48/60	43/53	Diesel	Tier 4F
60REOZT	65/81	59/74	Diesel	Tier 3
100REOZT	105/131	96/120	Diesel	Tier 3
145REOZT4	130/163	117/146	Diesel	Tier 4F
150REOZT	155/194	140/175	Diesel	Tier 3
175REOZT4	154/193	139/174	Diesel	Tier 4F
200REOZT	210/263	190/238	Diesel	Tier 3
500REOZT	510/638	460/575	Diesel	Tier 2
30REZGT	28/35	25/31	LP/NG	EPA-Certified
50REZGT	42/52	40/50	LP/NG	EPA-Certified
70REZGT	62/77	56/70	LP/NG	EPA-Certified
125REZGT	105/131	95/119	LP/NG	EPA-Certified

MOBILE PARALLELING BOX

SPEC YOUR JOB AT **KOHLERPOWER.COM**

For more information, call **800.544.2444**
or visit **KohlerPower.com/Industrial**

KOHLER. Power Systems

ISO 9001 KOHLER. POWER SYSTEMS
NATIONALLY REGISTERED

Printed in U.S.A.
G12-18 8/16

MECHANICAL EQUIPMENT SOUND DATA FACTORY TESTING

MODEL NO.	MAX CFM	MANUFACTURER	EQUIPMENT TYPE	NOISE TYPE	DB BY OCTAVE BAND								dB
					63	125	250	500	1000	2000	4000	8000	
VIBRO-ACOUSTIC RFL-MV	29,500	HUNTAIR	PWL		87	80	81	79	66	61	58	52	89.1
VIBRO-ACOUSTIC RFL-MV	36,400	HUNTAIR	PWL		89	81	80	80	68	61	60	54	90.5
VIBRO-ACOUSTIC RFL-MV	52,400	HUNTAIR	PWL		90	82	79	76	68	62	60	55	91.1
VIBRO-ACOUSTIC RFL-MV	57,500	HUNTAIR	PWL		90	82	78	75	66	60	58	53	91.0
VIBRO-ACOUSTIC RFL-MV	64,400	HUNTAIR	PWL		90	82	82	82	70	63	62	56	91.7
VIBRO-ACOUSTIC RFL-MV	**71,400**	**HUNTAIR**	**PWL**		**91**	**83**	**79**	**77**	**70**	**63**	**61**	**56**	**92.1**
VIBRO-ACOUSTIC RFL-MV	73,100	HUNTAIR	PWL		90	82	82	82	70	63	62	56	91.7
VIBRO-ACOUSTIC RFL-MV	75,300	HUNTAIR	PWL		91	83	81	83	72	64	63	57	92.6
VIBRO-ACOUSTIC RFL-MV	93,900	HUNTAIR	PWL		91	83	85	82	70	64	61	55	92.9

ATTACHMENT 3

SoundPLAN Data

Construction Equipment Noise Levels

Total Equipment

Phase	Piece	Number
Grading	Backhoe Loaders	3
	Dozer	1
	Excavators	1
	Graders	1

Maximum Simultaneously Active Equipment Noise Level

Phase	Piece	Maximum Noise Level (dB[A] at 50 feet)	Acoustical Usage Factor	Average Noise Level (dB[A] at 50 feet)	Reference Distance (Feet)	Directionality Factor (1 = in air) (2 = over flat plane) (4 = against wall) (8 = corner of a room)	Sound Power Level (dBA)	Active	Sound Power Level SPL (dBA)
Grading	Backhoe Loaders	77.6	0.4	73.6	50	2	105.3	0	0.0
	Dozer	81.7	0.4	77.7			109.4	1	109.4
	Excavators	80.7	0.4	76.7			108.4	1	108.4
	Graders	85.0	0.4	81.0			112.7	1	112.7
									115.3

Modeling Results Table - Construction Noise

Receiver	Description	Noise Level dB(A)
		1st Floor
1	Undeveloped property across Campus Point Dr.	66
2	La Jolla Vista Townhouses Community	50

FHWA RD-77-108

Traffic Noise Prediction Model

Data Input Sheet

Project Name : 9880 Campus Point Project
Project Number : 8655
Modeled Condition : With and Without Event

Surface Refelction: Hard
Assessment Metric: CNEL
Peak ratio to ADT: 10.00
Traffic Desc. (Peak or ADT) : ADT

Segment	Roadway	Segment	Traffic Vol.	Speed (Mph)	Distance to CL	% Autos	%MT	% HT	Day %	Eve %	Night %	K-Factor
1	Campus Point Drive	*Northeast of Genesee Avenue - Without Project*	11,117	35	50	96.00	3.00	1.00	80.00	10.00	10.00	
2	Campus Point Drive	*Northeast of Genesee Avenue - With Project*	11,191	35	50	96.00	3.00	1.00	80.00	10.00	10.00	
3	Genesee Avenue	*Northwest of Campus Point Drive - Without Project*	33,993	45	50	96.00	3.00	1.00	80.00	10.00	10.00	
4	Genesee Avenue	*Northwest of Campus Point Drive - With Project*	34,023	45	50	96.00	3.00	1.00	80.00	10.00	10.00	
5	Genesee Avenue	*Southeast of Campus Point Drive - Without Project*	30,602	45	50	96.00	3.00	1.00	80.00	10.00	10.00	
6	Genesee Avenue	*Southeast of Campus Point Drive - With Project*	30,638	45	50	96.00	3.00	1.00	80.00	10.00	10.00	
7	Genesee Avenue	*Northwest of Campus Point Drive - With Project*	34,023	45	280	96.00	3.00	1.00	80.00	10.00	10.00	

FHWA RD-77-108

Traffic Noise Prediction Model

Predicted Noise Levels

Project Name : 9880 Campus Point Project
Project Number : 8655
Modeled Condition : With and Without Event
Assessment Metric: CNEL

			Noise Levels, dBA CNEL				Distance to Traffic Noise Level Contours, Feet					
Segment	Roadway	Segment	Auto	MT	HT	Total	75 dB	70 dB	65 dB	60 dB	55 dB	50 dB
1	Campus Point Drive	Northeast of Genesee Avenue - Without Project	64.4	59.0	59.5	67	7	22	71	223	706	2,233
2	Campus Point Drive	Northeast of Genesee Avenue - With Project	64.4	59.1	59.5	67	7	22	71	223	706	2,233
3	Genesee Avenue	Northwest of Campus Point Drive - Without Project	72.4	65.6	65.3	74	39	123	388	1,227	3,881	12,274
4	Genesee Avenue	Northwest of Campus Point Drive - With Project	72.4	65.6	65.3	74	39	123	388	1,227	3,881	12,274
5	Genesee Avenue	Southeast of Campus Point Drive - Without Project	71.9	65.1	64.9	73	35	109	346	1,094	3,459	10,939
6	Genesee Avenue	Southeast of Campus Point Drive - With Project	71.9	65.1	64.9	73	35	109	346	1,094	3,459	10,939

Equipment Noise Levels

Specifications

Unit	Noise Level	Location
Cooling Tower	81	5' from Side
	83	5' from top
Generator	85	23' from Side

SPL Calculations

Type	Reference Leq (dBA)	Reference Distance (Feet)	Directionality Factor (1 = in air) (2 = over flat plane) (4 = against wall) (8 = corner of a room)	Sound Power Level SPL (dBA)
Cooling Tower Base	81	5	1	96
Cooling Tower Top	83	5	1	98
Generator	85	23	2	110

SoundPLAN Input

Source Name	Reference Sound Power Level
AIR-1	92.1
AIR-2	92.1
AIR-3	92.1
DOCK-1	86.1
GEN-1	110.0
COOL-TOP	98.0
COOL-GROUND	96.0

Modeling Results Table - Onsite Noise

Receiver	Description	Noise Level dB(A)
		1st Floor
BOUND-1	Project Site Northern Boundary, Western Location	61
BOUND-2	Project Site Northern Boundary, Central Location	65
BOUND-3	Project Site Northern Boundary, Eastern Location	60
BOUND-4	Project Site Southern Boundary, Eastern Location	51
BOUND-5	Project Site Southern Boundary, Western Location	51
CLASS	Preuss Performative High School	46
PREBY-1	Scripps Memorial Hospital La Jolla Western Boundary, Northern Location	51
PREBY-2	Scripps Memorial Hospital La Jolla Western Boundary, Southern Location	50

9880 CAMPUS POINT
ACCESS ANALYSIS

Prepared For: DGA and the City of San Diego

REGISTERED PROFESSIONAL ENGINEER
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PLANNING & TRAFFIC ENGINEERING

(858) 560-4911

8451 Miralani Drive, Suite A
San Diego, CA 92126

www.UrbanSystems.net

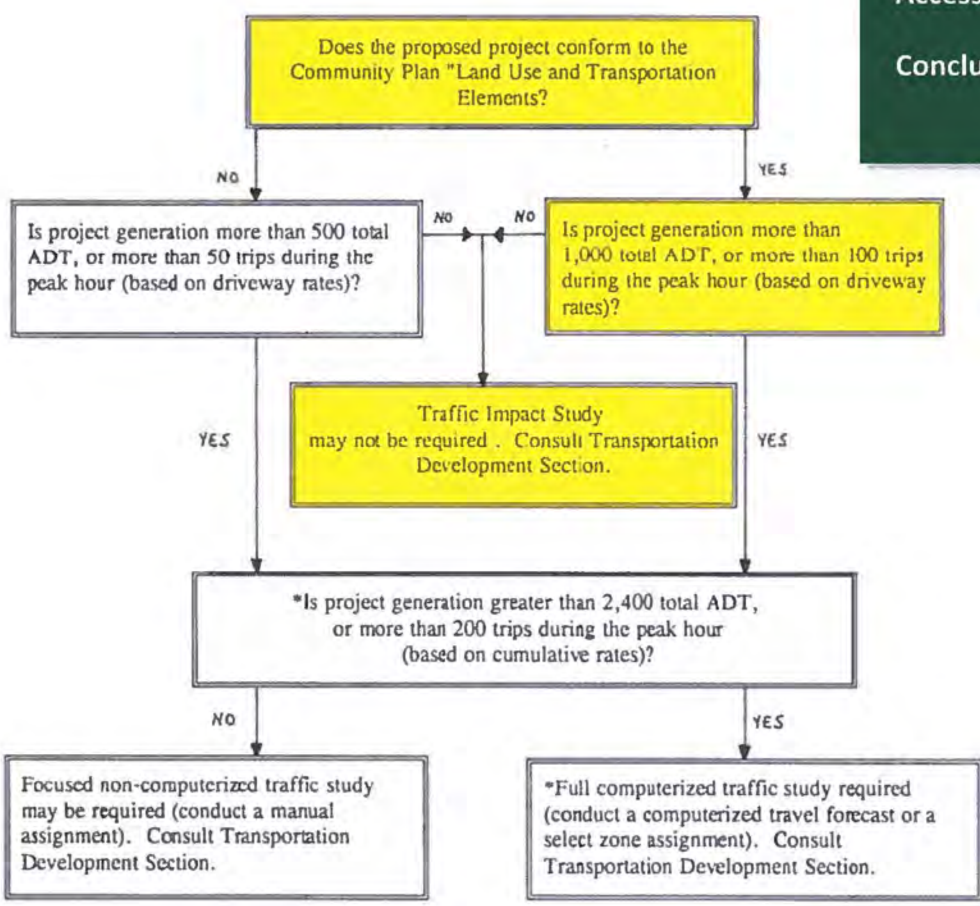
1.0 INTRODUCTION

Urban Systems Associates, Inc. has prepared an Access Analysis for the proposed redevelopment of an already existing scientific research facility located at **9880 Campus Point Drive** in the San Diego area.

Scoping

Scoping efforts were made for the proposed project; a Scoping Memo was prepared and sent to City Staff. A copy of the Scoping Memo can be found in **Appendix A**.

TRAFFIC IMPACT STUDY
REQUIREMENT FLOW CHART



*To conform with the 1991 Congestion Management Program Enhanced California Environmental Quality Act (CEQA) review process for traffic analysis

Table of Contents

Study Purpose and Background

The purpose of this study is to examine potential traffic operational issues on the surrounding area as a direct result of the proposed project.

The existing site is currently occupied by a 72,818-square foot (S.F.) scientific research facility. The proposed project will redevelop the existing use into an 82,190 S.F. scientific research facility. A site plan is provided in **Figure 1**. It is expected that a Site Development Permit will be necessary for the expansion of the existing site.

Figure 2 shows the proposed project location, study area, study intersections and study street segments.

The site is located east of Interstate 5 and bounded by Genesee Avenue to the Southwest and Campus Point Drive to Northeast.

Figure 1: Proposed Project Site Plan

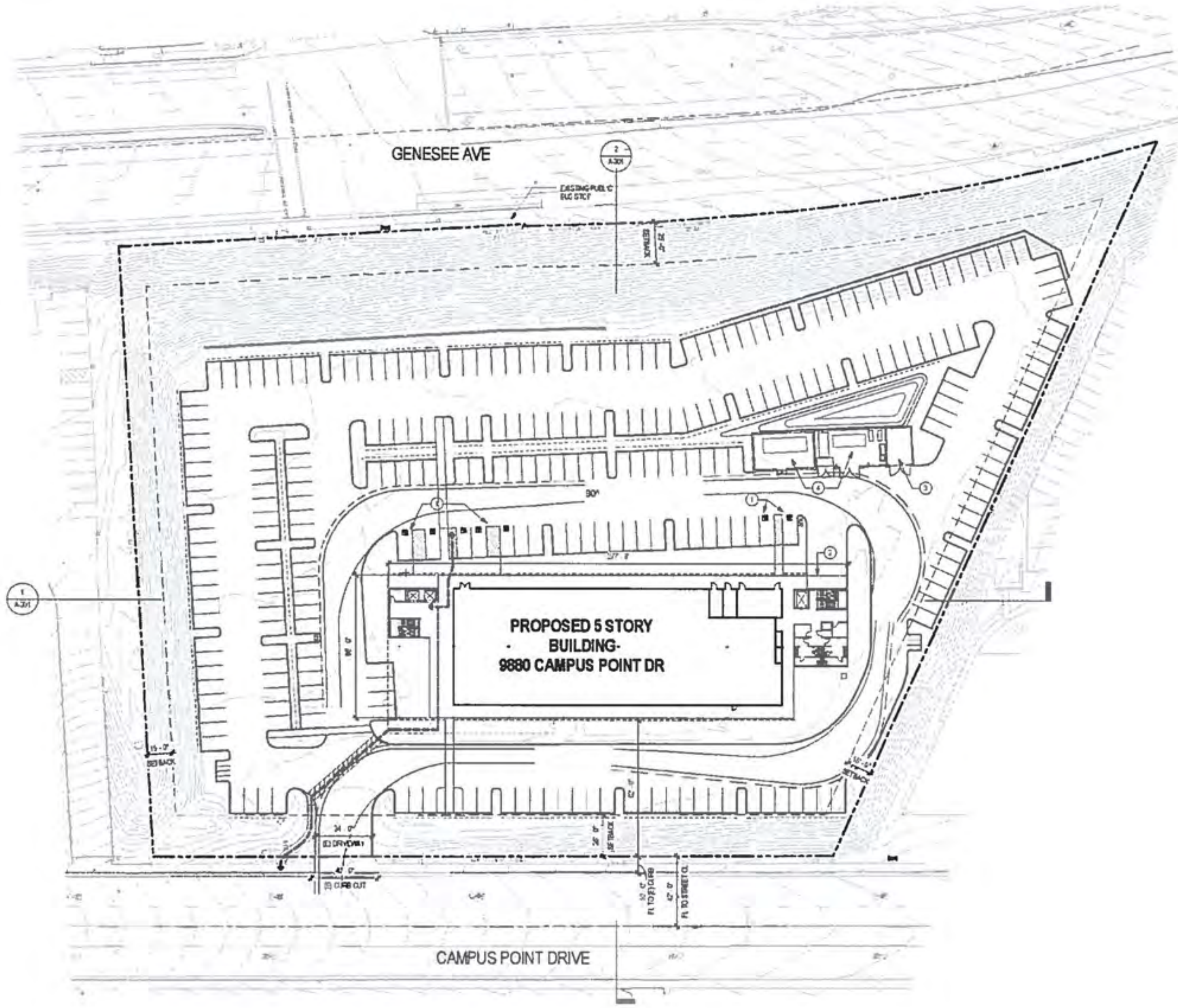


Figure 2: Project Study Area

2.0 Proposed Project

The proposed project will redevelop an existing 72,818 S.F. scientific research facility with an 82,190 S.F. scientific research facility. The project is located on the west side of Campus Point Drive and just north of Genesee Avenue. The proposed project was analyzed using the City of San Diego, *Traffic Impact Study Manual* guidelines, dated July 1998.

Trip Generation and Project Distribution

Based on the location of the project, the *City of San Diego, Trip Generation Manual (May 2003)* was used for establishing trip generation. As shown in **Table 1**, the proposed 82,190 S.F. scientific research facility is replacing an existing 72,818 S.F. scientific research facility and is anticipated to generate a net total project average daily traffic (ADT) of **74** trips with **12 A.M (11** In / **2** Out) peak hour trips and **10 P.M. (1** In / **9** Out) peak hour trips.

Figure 3 shows the proposed projects trip distribution. These trip distribution percentages were taken from a SANDAG Series 11 select zone forecast that was prepared for the Campus Point Master Plan (dated September 21, 2016). The project is anticipated to distribute 100% of its traffic south onto Campus Point Dr. At the intersection of Genesee Avenue and Campus Point Drive, the project is anticipated to distribute 41% of traffic onto Genesee Avenue between Scripps Hospital Driveway and Campus Drive, 49% of traffic onto Genesee Avenue between Campus Point Drive and Regents Road, and 10% of traffic onto Campus Point Drive between Genesee Avenue and Voigt Drive.

Figure 3 also shows the Project Only ADT volumes.

Table 1: Project Trip Generation Table

Land Use	Intensity	Rate*	ADT	AM						PM					
				Peak %*	Vol.	In %	Out%	In	Out	Peak %*	Vol.	In %	Out%	In	Out
Proposed Trips Trips															
Science Research & Development	82 /KSF	8 /KSF	658	16%	105	90%	10%	95	11	14%	92	10%	90%	9	83
Existing Trips															
Science Research & Development	73 /KSF	8 /KSF	584	16%	93	90%	10%	84	9	14%	82	10%	90%	8	74
Net Total (Proposed - Exisiting)			74		12			11	2		10			1	9

Source:

*Rates taken from the City of San Diego Trip Generation Manual, May 2003

Note:

ADT= Average Daily Trips

KSF = 1,000 Square Feet

Figure 3: Project Trip Distribution and Project Only Traffic Volumes

Legend

= Project Location

= Study Intersection

XX,XXX = Average Daily Traffic Volume

XX% = Project Distribution Percentage

3.0 Existing Conditions

To analyze Existing conditions, traffic volumes were taken from the Campus Pointe Master Plan. These counts were conducted on September 19, 2012. New counts were also obtained. However, due to substantial construction activity in the area disrupting ordinary traffic patterns, older traffic counts from another recent traffic study were utilized.

Existing count data, both new counts and old counts, and signal timing sheets can be found in **Appendix A**.

Street Segments

The following street segments were analyzed in the Existing and Existing With Project analysis:

- Campus Point Drive (between Campus Point Court and Genesee Avenue)
- Genesee Avenue (between Scripps Hospital Driveway and Campus Point Drive)
- Genesee Avenue (between Campus Point Drive and Regents Road)

See **Figure 4** for street classification graphics.

Street Classification

Campus Point Drive - is oriented in a north-south direction and has a functional classification of a three (3) lane Collector (one lane northbound and two lanes southbound) with a two-way/center left turn lane. North of Campus Point Court, the road narrows to a two-lane Collector road with a two-way left turn lane. The University City Community Plan identifies the ultimate classification for this roadway as a 4-lane Collector. No bike lanes exist on Campus Point Drive, but sharrows are provided between Genesee Avenue and Campus Point Court. Parking is currently permitted on both sides of Campus Point Drive. The posted speed limit is 35 miles per hour. Campus Point Drive is approximately 64 feet wide (curb-to-curb) just north of Genesee Avenue and narrows to 45 feet wide (curb-to-curb) past Campus Point Court. A cul-de-sac currently exists at the north end of Campus Point Drive where the public street terminates.

Genesee Avenue - is oriented in a north-south direction and its functional classification is a six-lane Prime Arterial from I-5 NB ramps to Regents Road and as a six-lane Major Arterial from Regents Road to La Jolla Village Drive. Genesee Avenue is currently built to its ultimate classification in this study area as shown in the University Community Plan. A raised median is currently provided on Genesee Avenue and on-street parking is prohibited. The posted speed limit ranges from 40 miles per hour south of Regents Road to 50 miles per hour near the I-5

Interchange. A bike lane exists on Genesee Avenue between I-5 and La Jolla Village Drive. Bike lanes exist on both sides of Genesee Ave. between Campus Point Dr. and Regents Rd.

Figure 5 displays the Existing volumes for the study street segments.

For this analysis, street classification thresholds are based off *"Table 2: Roadway Classifications, Level of Service and Average Daily Traffic"* found in the *City of San Diego Traffic Impact Study Manual,* dated July 1998.

Based on Existing volumes and the City's street classification thresholds, all study street segments in the Existing condition are anticipated to operate at an acceptable level of service (LOS) C or better. See **Table 2** for the Existing street segment analysis.

Table 2: Existing Street Segment Levels of Service

Road	Segment	Standard	Class.	Cap.	Volume	V/C	LOS
Campus Point Drive	Campus Point Court to Genesee Avenue	SD	3-C	22,500	11,117	0.49	C
Genesee Avenue	Scripps Hosptial Driveway to Campus Point	SD	PA	60,000	33,993	0.57	B
	Campus Point Drive to Regents Road	SD	PA	60,000	30,602	0.51	B

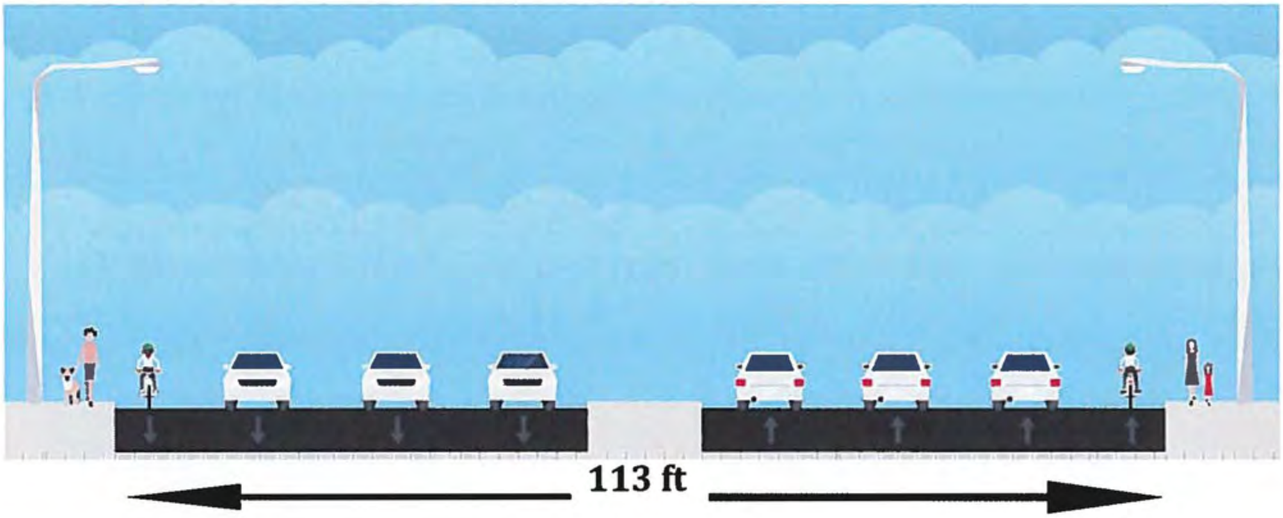
Legend:

Class. = Functional Class
Cap. = Capacity
LOS = Level of Service
PA = 6 Lane Prime Arterial
3-C = 3 Lane Collector

Count Date: September 19, 2012

Figure 4: Street Classifications

Genesee Avenue (6 Lane Prime Arterial)



Campus Point Drive (3 Lane Collector)

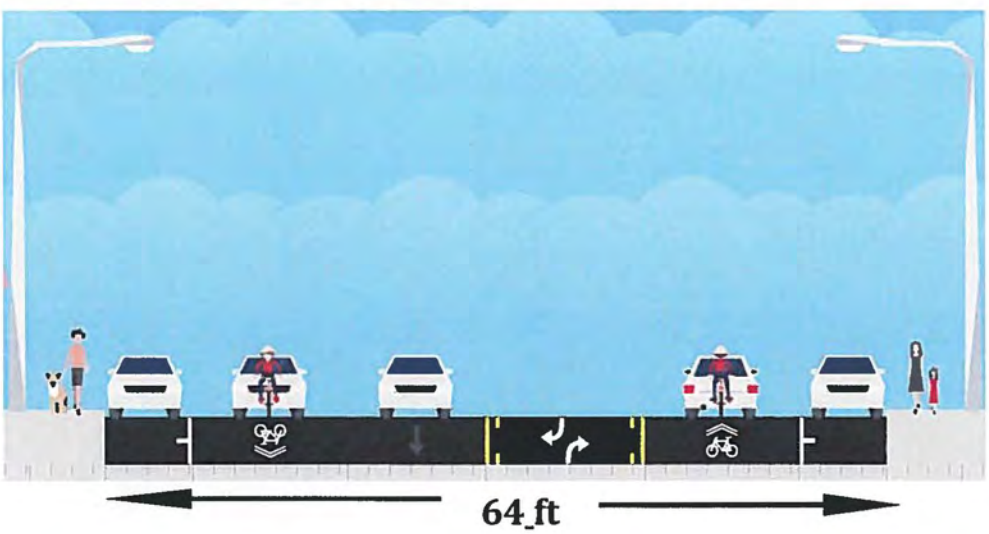


Figure 5: Existing Average Daily Traffic Volumes

Intersections

The following intersections were analyzed in this study for both Existing and Existing With Project conditions:

- Project Driveway at Campus Point Drive
- Genesee Avenue at Campus Point Drive

Existing Peak hour traffic volumes at the study intersections can be found in **Figure 6**. The average delay and levels of service at the study intersections in the AM and PM peak hour were analyzed using a software package called *Synchro*, which is an application of the Highway Capacity Manual methodology. HCM 2000 methodology was used for Genesee Ave. at Campus Point Dr. since HCM 2010 expects strict NEMA phasing to properly calculate. HCM 2010 methodology was used to analyze Project Driveway at Campus Point Dr. Refer to **Table 3** for the Existing intersection levels of service analysis. As shown in the table, the study intersections currently operate at an acceptable LOS D or better in both the AM and PM peak hour setting. It should be noted that bikes and pedestrians were included in the intersection analysis, based on count data obtained. Existing Synchro worksheets can be found in **Appendix B.**

Table 3: Existing Intersection LOS Summary

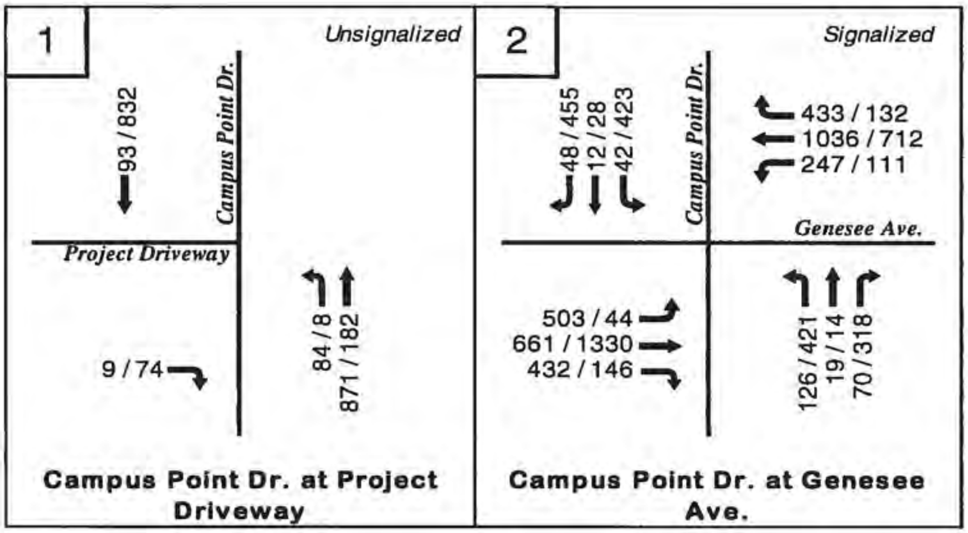
Number	Intersection	Control	AM Peak Hour		PM Peak Hour	
			Delay	LOS	Delay	LOS
1	Campus Point Dr. at Project Driveway	Unsignalized	8.6	A	12.6	B
2	Campus Point Dr. at Genesee Ave. [1]	Signalized	38.9	D	43.3	D

Notes:

LOS = Level of Service

1 = HCM 2000 Methodology used due to HCM 2010 not being able to calculate restricted NEMA phasing

Figure 6: Existing Peak Hour Traffic Volumes



XX / XX = AM / PM Peak hour volumes

Transit

Bus stops servicing MTS Route 979 are approximately 0.3 miles from the proposed project and bus stops servicing MTS Route 978 are approximately 1.3 miles from the proposed project. These bus routes are a part of the North University City route and the Torrey Pines route which connect to the Sorrento Valley COASTER Station. See **Appendix C** for transit information.

Pedestrians

Pedestrian access to and from the proposed project is currently provided via sidewalks on both sides of Campus Dr. as well as Genesee Ave. Crosswalks are also located at the intersection of Genesee Ave. and Campus Point Dr. on all legs except for the west leg.

Bicycles

Class II bike lanes currently exist along both sides of Genesee Ave. and Class III bike routes (sharrow lanes) exist along Campus Point Dr.

Collision History

Collision data was collected and reviewed from a web based software called *TIMS (Transportation Injury Mapping System)* produced by the Safe Transportation Research and Education Center (SafeTREC) at the University of California, Berkeley, utilizing data from Statewide Integrated Traffic Records System (SWITRS). Data was looked at for the past five consecutive years. There has been a total of four (4) reported accidents within the project study area. Three (3) of these accident reports involved a bicycle. The proposed project would not add any unusual or substandard design features or mitigation measures expected to impact this situation. Please see **Appendix D** for collision data.

4.0 Existing With Project Conditions

The Existing With Project traffic volumes were derived by adding the proposed project only traffic volumes with the Existing traffic volumes. This was done to determine if the addition of the proposed project would create any significant impacts.

Street Segments

Figure 7 displays the Existing With Project volumes for the study street segments.

Based on Existing With Project volumes and the City's street classification thresholds, all study street segments are anticipated to operate at an acceptable level of service (LOS) D or better. See **Table 4** for the Existing With Project street segment analysis.

Existing and Existing With Project street segment comparison can be found in **Table 5**

Figure 7: Existing With Project Average Daily Traffic

Table 4: Existing With Project Street Segment Analysis

Road	Segment	Standard	Class.	Cap.	Volume	V/C	LOS
Campus Point Drive	Campus Point Court to Genesee Avenue	SD	3-C	22,500	11,191	0.50	C
Genesee Avenue	Scripps Hosptial Driveway to Campus Point	SD	PA	60,000	34,023	0.57	B
	Campus Point Drive to Regents Road	SD	PA	60,000	30,638	0.51	B

Legend:

Class. = Functional Class

Cap. = Capacity

LOS = Level of Service

PA = 6 Lane Prime Arterial

3-C = 3 Lane Collector

Table 5: Existing and Existing With Project Street Segment Comparison Summary

Road	Segment	Cap.	Class.	Existing			Existing + Project			Δ V/C	Is this impact Significant?
				LOS	Volume	V/C	LOS	Volume	V/C		
Campus Point Drive	Campus Point Court to Genesee Avenue	22,500	3-C	C	11,117	0.49	C	11,191	0.50	0.003	***NO***
Genesee Avenue	Scripps Hosptial Driveway to Campus Point Drive	60,000	PA	B	33,993	0.57	B	34,023	0.57	0.001	***NO***
	Campus Point Drive to Regents Road	60,000	PA	B	30,602	0.51	B	30,638	0.51	0.001	***NO***

Legend:

LOS= Level of Service

V/C= Volume to Capacity Ratio

ΔV/C= Change in V/C ratio

PA = 6 Lane Prime Arterial

3-C= 3 lane Collector Road

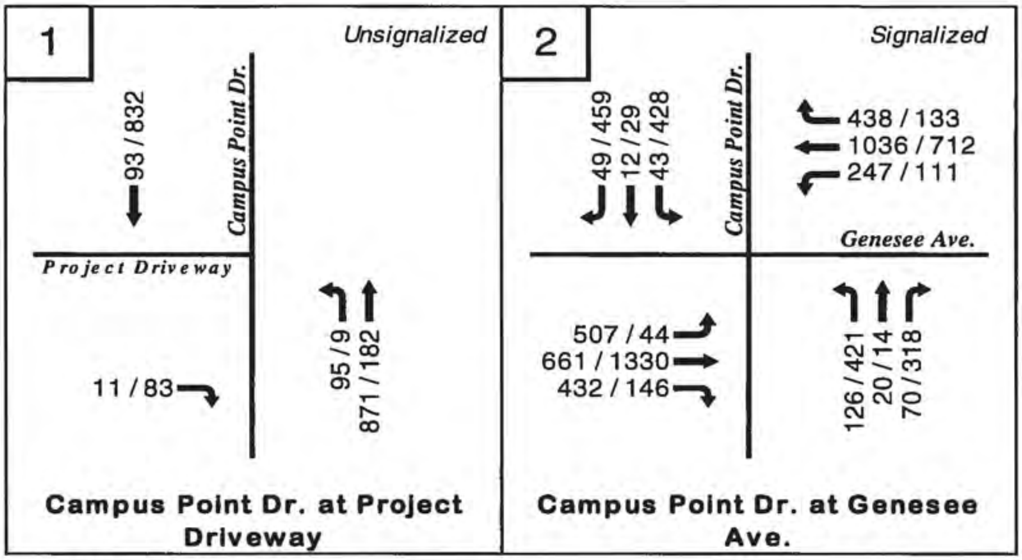
Intersections

Existing With Project peak hour traffic volumes at the study intersections can be found in **Figure 8.** The Existing With Project intersection levels of service analysis can be found in **Table 6.** As shown in the table, the study intersections currently operate at an acceptable LOS D or better in both the AM and PM peak hour setting.

Table 7 displays the Existing and Existing With Project intersection LOS comparison summary.

See **Appendix E** for Existing With Project Synchro worksheets.

1Figure 8: Existing With Project Peak Hour Traffic Volumes



XX / XX = AM / PM Peak hour volumes

Table 6: Existing With Project Intersection LOS Summary

Number	Intersection	Control	AM Peak Hour		PM Peak Hour	
			Delay	LOS	Delay	LOS
1	Campus Point Dr. at Project Driveway	Unsignalized	8.6	A	12.7	B
2	Campus Point Dr. at Genesee Ave. [1]	Signalized	39.1	D	43.3	D

Notes:

Delay = seconds per vehicle

LOS = Level of Service

1 = HCM 2000 Methodology used due to HCM 2010 not being able to calculate restricted NEMA phasing

Table 7: Existing and Existing With Project LOS Comparison Summary

#	Intersection	Existing				Existing + Project (Buildout)							
		AM Peak Hour		PM Peak Hour		AM Peak Hour		Δ	S ?	PM Peak Hour		Δ	S ?
		Delay	LOS	Delay	LOS	Delay	LOS			Delay	LOS		
1	Campus Point Dr. at Project Driveway	8.6	A	12.6	B	8.6	A	0.0	No	12.7	B	0.1	No
2	Campus Point Dr. at Genesee Ave. [1]	38.9	D	43.3	D	39.1	D	0.2	No	43.3	D	0.0	No

Notes:

LOS = Level of Service
Δ = Change
S = Significant
1 = HCM 2000 Methodology used due to HCM 2010 not being able to calculate restricted NEMA phasing

5.0 Project Access

The proposed project has one (1) main access point that is located on the west side of Campus Point Dr. All project traffic will be distributed through this access point and travel along Campus Point Dr. to and from the intersection of Genesee Ave. and Campus Point Dr. As shown in **Table 6**, this access point is expected to operate at an acceptable level of service with the addition of project traffic.

6.0 Conclusion

The proposed project will redevelop an existing 72,818 S.F. scientific research facility with an 82,190 S.F. scientific research facility. The project is located on the west side of Campus Drive and just north of Genesee Avenue.

Street Segments

Based on the analysis, the study street segments are expected to operate acceptably and no significant impacts are anticipated with and without the proposed project.

Intersections

Based on the analysis, the study intersections are anticipated to operate at an acceptable LOS D or better for both the AM and PM peak hours in the Existing and Existing With Project scenarios.

As shown in this Access Analysis, the study street segments and study intersections are not significantly impacted as a result of the proposed project.

URBAN SYSTEMS ASSOCIATES, INC.
PLANNING & TRAFFIC ENGINEERING, MARKETING & PROJECT SUPPORT
CONSULTANTS TO INDUSTRY AND GOVERNMENT

MEMO

ATTN:	*Farah Mahzari*		*E-Mail:* ▼ *AlbertoE@sandiego.gov*
FROM:	*Justin P. Schlaefli, PE TE PTOE President*		*TOTAL PAGES:* 3
DATE:	*June 15, 2017*	*TIME: 8:58:16 AM*	*JOB NUMBER: 001217*

SUBJECT: 9880 Campus Point Drive – TDM Plan

The proposed 9880 Campus Point Drive project would redevelop an existing 72,818 sf scientific research facility with an 82,190 sf scientific research facility. The project is located on the west side of Campus Point Drive and just north of Genesee Avenue. Per the access analysis dated April 14, 2017, no significant transportation impacts would result from the minor increase of 74 average daily trips with 12 additional AM peak hour trips and 10 additional PM trips. However, in order to meet the goals of the Community Plan and the Climate Action Plan, the following TDM requirements will be applied to the project.

TDM Concept:

Transportation Demand Management (TDM) is a general term used to describe the strategies that can be implemented to influence the travel behavior, mode, and frequency of individuals to improve the efficiency of transportation network facilities with emphasis on peak-hour period trips. These strategies emphasize on providing users with sustainable alternatives of transportation that can improve environmental quality by means of reduced greenhouse gas emissions, improved energy conservation and usage, and improved mobility for commuters.

A common denominator for the inefficiency of current transportation facilities, high levels of greenhouse gas emissions, lack of promotion for conservation and efficient usage of energy, and low-usage of alternative modes of transportation is the Single-Occupancy Vehicle (SOV). TDM strategies aim to reduce SOV trips at peak-hour periods by promoting and implementing a series of initiatives that maximize the use of pedestrian, bicycle, public transportation, non-SOV modes, among other transportation alternatives. In other words, TDM strategies aim towards a shift in peak-hour period trips from SOV modes to non-SOV modes, providing public with transportation alternatives to their daily commutes.

The following TDM program includes several strategies and techniques that aid in reducing vehicular trips and associated air quality impacts and greenhouse gas emissions. The intent of this TDM program is to reduce peak period vehicle trips by creating series of incentives that maximizes use of pedestrian and bicycle travel, transit, and carpools.

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TDM Plan:

The following TDM measures and incentives shall be incorporated into the Spectrum 3 and 4 project in order to meet the goals of the Climate Action Plan:

- Unbundled/Paid Parking: The project will manage parking by either unbundling parking whereby parking spaces would be leased separately from the rental for the development or by charging employees market-rate for single-occupancy vehicle parking for the life of the project. If paid parking is selected, the project will provide reserved, discounted, or free spaces for registered carpools or vanpools.
- Telework Program: The applicant will encourage and work with tenants to allow employees to work from home or a non-office location one or more days a week.
- Flexible or alternative work hours: The applicant will encourage and work with tenants to allow employees to offset work hours from the typical 9-5 standard and shift commute travel to off-peak hours.
- On-site bikesharing: An onsite bikeshare station will be incorporated into the project site.
- Participation in SANDAG iCommute: The applicant will encourage and work with tenants to participate in the SANDAG iCommute program to promote RideMatcher services to employees.
- Transit Subsidies: The applicant will work with tenants to provide subsidized transit passes, vanpool vehicles or fares to reduce the cost of these high-capacity modes and create cost-competitive alternatives that make SOV commutes seem more expensive by comparison. The goal of this subsidy/incentive is to reduce the cost of transit passes by 25% for qualified employees.

In addition to the TDM measures discussed above intended to meet the requirements of the Climate Action Plan, the proposed project may incorporate the following TDM strategies.

- Bike and Walk Facilities: Implement secure workplace parking for bikes, as well as shower and locker facilities that can also be made available for those who walk to work.
- Preferred Parking for Carpoolers: Provide preferred spaces for carpool and vanpool vehicles consistent with the Municipal Code.
- Guaranteed-Ride-Home: This employer may participate in the iCommute program (or equivalent) which provides benefits to allow for up to three free taxi rides or rental cars for unplanned trips home that cannot be accommodated by the employee's normal commute mode (e.g., working late past last scheduled bus, carpool passenger with sick child at school).
- Compressed Workweek: Enable employees to compress regularly scheduled hours into fewer work days per week
- User Information: The employer may provide information on available alternatives to driving alone, through a designated Employee Transportation Coordinator; use of print marketing; information kiosks; websites; ride-matching services; and/or participating in employee-oriented informational/educational sessions on available transportation options. The Transportation Coordinator will be responsible for providing information to employees regarding all TDM programs as well as assisting employees in signing up for applicable programs. The Coordinator will also conduct appropriate orientations and/or regular employee engagement sessions which will orient and remind employees of alternative transportation options as well as providing additional information.
- Provide a bicycle repair station
- Coordinate with Uber/Lyft, or comparable services, to provide reduced cost rideshare (if feasible)

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Monitoring and Reporting Program:

In order to ensure the proposed TDM strategies are adequately implemented and maintained, a TDM Monitoring and Reporting Program will be conducted. The TDM Monitoring Program will analyze the TDM program and its effectiveness annually for a five-year period, including, to the extent feasible, quantifying the effectiveness of the individual components of the program. The Monitoring efforts will include conducting average daily vehicle (counts) and peak hour counts at the project site. Data relating to transit usage, carpool/vanpool usage, transit and other subsidies will also be collected that will be supplemented by on-site surveys. This information will be broken down into estimated percentages of number of employees participating in each TDM strategy. A TDM Monitoring Report will be prepared and submitted to the City Engineer on the first anniversary of the issuance of a certificate of occupancy for the project and on such date each year thereafter during the five-year monitoring period.

Waste Management Plan for the 9880 Campus Point Project San Diego, California

Prepared for
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Prepared by
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RECON Number 8655
July 28, 2017

Nick Larkin, Environmental Analyst

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FIGURES

TABLES

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ATTACHMENTS

1.0 Introduction

The purpose of this Waste Management Plan (WMP) for the 9880 Campus Point project (project) is to identify the solid waste impacts generated by construction and operation of the project, and to identify measures to reduce those impacts.

The WMP addresses all four phases of site development, including the Demolition Phase, Grading Phase, Construction Phase, and the Occupancy (post-construction) Phase. The WMP addresses the amount of waste that would be generated by project activities during each phase; waste reduction goals, and the recommended techniques to achieve the waste reduction goals. More specifically, for each phase, the WMP includes the following:

- Tons of waste anticipated to be generated.
- Material/type and amount of waste anticipated to be diverted.
- Project features that would reduce the amount of waste generated.
- Project features that would divert or limit the generation of waste.
- Source separation techniques for waste generated.
- How materials shall be reused on-site.
- Name and location of recycling, reuse, or landfill facilities where waste shall be taken.

2.0 Existing Conditions

The 4.49-acre project site is located on Campus Point Drive within the University community planning area of the City of San Diego. The project site is surrounded by Campus Point Drive to the east, Genesee Avenue to the west, and existing development to the north and south. The project site is currently configured with a two-story 72,818-square-foot building used for scientific research. Figures 1 and 2 depict the regional location and the project vicinity on an aerial photograph, respectively.

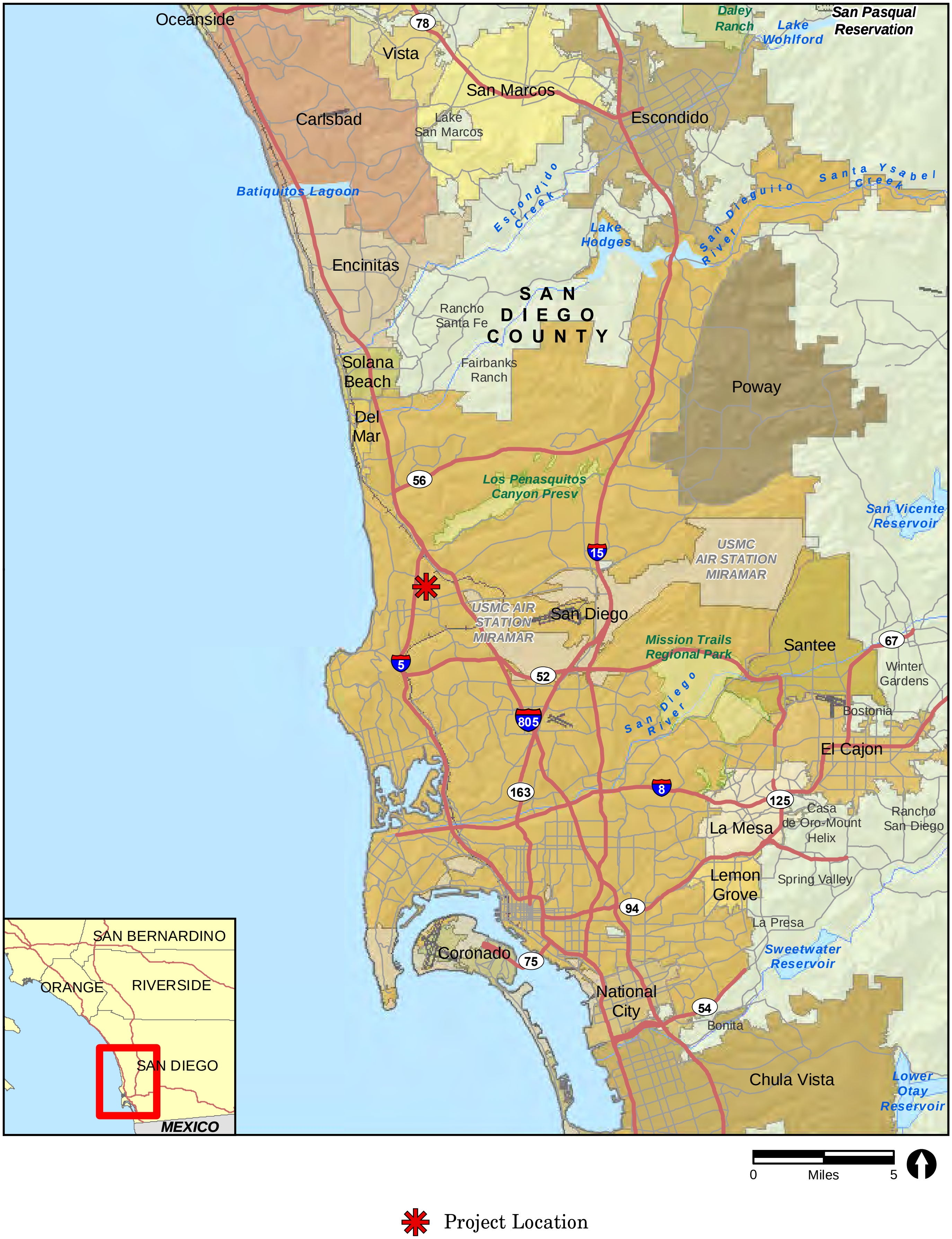

FIGURE 1

Regional Location

RECON

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Image Source: NearMaps (flown Jan 2017)

Project Boundary

RECON

FIGURE 2

Project Location on Aerial Photograph

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3.0 Proposed Conditions

The existing structure would be demolished and would be replaced with a five-story building totaling 82,190 square feet for office/research space. In addition, a 20,459-square-foot basement would be constructed that would house building amenities, equipment, and a vivarium. Total square footage of the structure including the basement area would be 102,649 square feet.

The proposed structure would be surrounded by an approximately 88,119-square-foot paved parking lot, and 5,291 square feet of pedestrian hardscape. The proposed site plan is shown on Figure 3. The project would be consistent with the existing zoning and the University Community Plan as it is located within the IP-1-1 (Industrial Park) zone and Community Plan Implementation Overlay Zone (CPIOZ) Area B.

4.0 Regulatory Framework

4.1 State Regulations

The California State Legislature has enacted several bills intended to promote waste diversion. In 1989, Assembly Bill (AB) 939, the Integrated Waste Management Act—as modified in 2010 by Senate Bill 1016—mandated that all local governments reduce disposal waste in landfills from generators within their borders by 50 percent by the year 2000 (State of California 1989, 2010).

AB 341, approved October 2011, sets a statewide policy goal of 75 percent waste diversion by the year 2020 (State of California 2011). This bill also created a mandatory commercial recycling requirement that would hold local jurisdictions responsible for implementing and to be in compliance with the 75 percent diversion rate through outreach and monitoring programs.

AB 1826, approved September 2014, requires businesses in California to arrange for recycling services for organic waste including food waste, green waste, landscape and pruning waste, nonhazardous wood waste, and food-soiled paper waste that is mixed in with food waste. The law is effective on and after January 1, 2016 for businesses that generate greater than 8 cubic yards of organic waste per week; effective January 1, 2017 for businesses that generate greater than 4 cubic yards of organic waste per week; effective January 1, 2019 for businesses that generate greater than 4 cubic yards of commercial solid waste per week; and, if a 50 percent statewide reduction in organic waste from 2014 has not yet been achieved, the law will be effective January 1, 2020 for businesses that generate greater than 2 cubic yards of commercial solid waste per week (State of California 2014). Strategies for compliance are discussed in Section 6.2, Waste Reduction Measures.

Map Source: DGA Planning, Architecture, Interiors

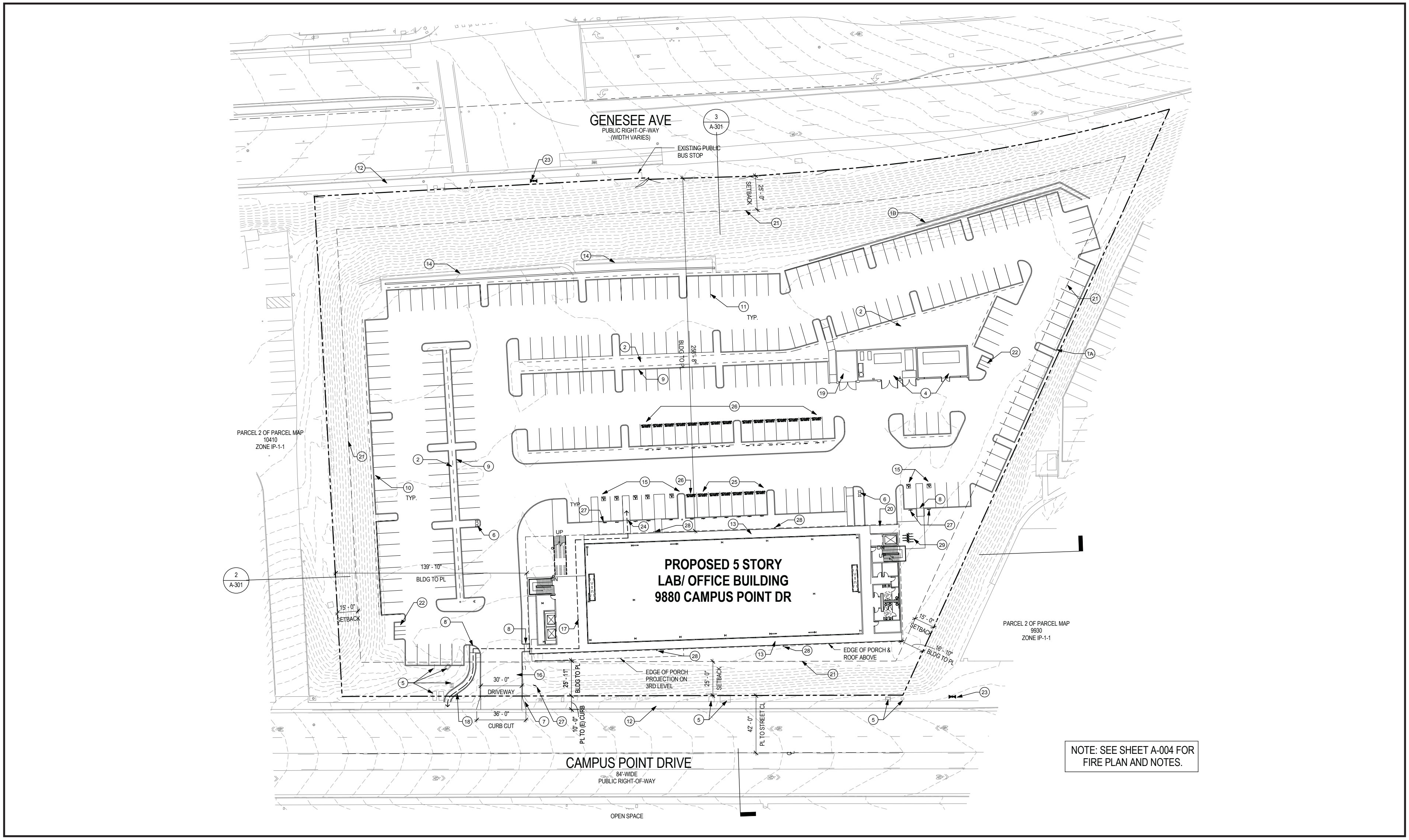

FIGURE 3

Site Plan

RECON

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4.2 City of San Diego Requirements

All landfills within the San Diego region are approaching capacity and are due to close within the next 3 to 20 years. In compliance with the state policies, the City of San Diego (City) Environmental Services Department (ESD) developed the Source Reduction and Recycling Element, which describes local waste management policies and programs. The City's Recycling Ordinance, adopted November 2007, require on-site recyclable collection for residential and commercial uses (City of San Diego 2007a). The ordinance requires recycling of plastic and glass bottles and jars, paper, newspaper, metal containers, and cardboard. The focus of the ordinance is on education, with responsibility shared between the ESD, haulers, and building owners and managers. On-site technical assistance, educational materials, templates, and service provider lists are provided by the ESD. Property owners and managers provide on-site recycling services and educational materials annually and to new tenants. Strategies for compliance are discussed in Section 6.2, Waste Reduction Measures.

The City's Refuse and Recyclable Materials Storage Regulations, adopted December 2007, indicate the minimum exterior refuse and recyclable material storage areas required at residential and commercial properties (City of San Diego 2007b). These are intended to provide permanent, adequate, and convenient space for the storage and collection of refuse and recyclable materials; encourage recycling of solid waste to reduce the amount of waste material entering landfills; and meet the recycling goals established by the City Council and mandated by the state of California. These regulations are discussed further in Section 6.3, Exterior Storage.

In July 2008, the Construction and Demolition (C&D) Debris Deposit Ordinance was adopted by the City (City of San Diego 2008). The ordinance, which was updated in July 2016, requires that the majority of construction, demolition, and remodeling projects requiring building, combination, or demolition permits pay a refundable C&D Debris Recycling Deposit and divert at least 65 percent of their waste by recycling, reusing, or donating reusable materials. The ordinance is designed to keep C&D materials out of local landfills. Requirements are discussed further in Section 5.4.2, Contractor Education and Responsibilities.

In December 2013, City Council adopted the Zero Waste Objective, implementing the 75 percent diversion of waste target goal from landfills by the year 2020 and zero waste by 2040. An additional City target of 90 percent diversion by 2035 is proposed in the City's Climate Action Plan.

5.0 Demolition, Grading, and Construction Waste

According to the Waste Composition Study prepared by the ESD, C&D waste constituted the largest single component of disposed waste in San Diego in 2000 (City of San Diego 2000). Of the almost 590,000 tons of waste disposed of that year, C&D waste was composed of 34 percent.

5.1 Demolition

The project site is currently configured with a two-story building totaling 72,818 square feet surrounded by 90,099 square feet of pavement that would be demolished as part of the project.

Existing Asphalt:

Based on the ESD C&D Debris Conversion Rate Table (see Attachment 1), estimated asphalt to be removed total 1,167.95 tons as shown in the calculation below:

$$\text{90,099 square feet} \times \text{0.5 foot} = \text{45,049.5 cubic feet}$$

$$\frac{45{,}049.5\ cubic\ feet}{27\ cubic\ feet} = \text{1,668.5 cubic yards} \times 0.70\ \frac{tons}{unit} = \text{1,167.95 tons}$$

Estimated demolition waste from the existing building is based on a 2009 study by the U.S. Environmental Protection Agency (U.S. EPA) where a sample of nonresidential demolition projects generated an average of 158 pounds of waste per square foot (U.S. EPA 2009). Based on this generation rate, existing building demolition will produce 5,752.62 tons as shown in the calculation below.

Existing Buildings:

$$\text{72,818 square feet} \times \frac{158\ pounds}{square\ foot} \times \frac{1\ ton}{2{,}000\ pounds} = \text{5,752.62 tons}$$

Estimates of building material type and amounts are based on the specific characteristics of the buildings to be demolished. Nearest handling facilities are based on the ESD 2016 Certified C&D Recycling Facilities Directory (Attachment 2). Estimates have a degree of uncertainty and would be revised as the project progresses and demolition debris is more specifically identified and weighed.

Estimates of material type and amounts are included in Table 1.

Table 1 Projected Materials Generated by Demolition Activities					
Material	Tons Generated[1]	Percent Diverted	Nearest Handling Facility[2]	Tons Diverted	Tons Disposed
Paved Areas					
Asphalt	1,167.95	100	Hanson Aggregates West–Miramar	1,167.95	0
Subtotal	*1,167.95*			*1,167.95*	*0*
Existing Buildings					
Concrete Paving	4,406.3	100	Hanson Aggregates West–Miramar	4,406.3	0
Building Materials (doors, windows, cabinets, etc.)	14.7	100	Habitat for Humanity ReStore	14.7	0
Tile	55.4	100	Enniss Incorporated	55.4	0
Carpet	681.4	100	DFS Flooring	681.4	0
Carpet Padding/Foam	23.0	100	DFS Flooring	23	0
Drywall (5/8" thick)	492.9	66	EDCO Recovery & Transfer	325.3	32.30
Ceiling Tiles	78.9	100	IMS Recycling Services	78.9	0
Subtotal	*5752.62*			*5,585*	*32.30*
TOTAL	**6,920.57**			**6,888.27 (99.5%)**	**32.30 (0.5%)**
NOTE: Totals may vary due to independent rounding. Portions of material types are based on specific characteristics of buildings to be demolished [1]ESD C&D Debris Conversion Rate Table (see Attachment 1). [2]City of San Diego ESD 2017 Certified C&D Recycling Facility Directory (see Attachment 2).					

5.2 Grading

Implementation of the project would require an export of approximately 21,000 cubic yards for basement excavation. Based on the ESD C&D Debris Conversion Rate Table, grading soil weighs approximately 1.3 tons per cubic yard (see Attachment 1). Therefore, project grading would result in a net export of 27,300 tons, as shown in the calculation below.

Export Soil:

Based on the ESD C&D Debris Conversion Rate Table (see Attachment 1), estimated soil to be exported from the project site totals 27,300 tons, as shown in the calculation below:

$$21{,}000 \text{ cubic yards} \times 1.3\frac{tons}{unit} = 27{,}300 \text{ tons}$$

All exported soil would be recycled using the City of San Diego Clean Fill Dirt Program or the Hanson Aggregates West – Miramar facility.

Additionally, the project would require disposal of approximately 20,000 cubic yards of landscape debris consisting of existing vegetation and trees on-site. Based on the ESD C&D Debris Conversion Rate Table, grading soil weighs approximately 0.15 ton per cubic yard (see Attachment 1). Therefore, project grading would result in a net export of 3,000 tons of landscape debris, as shown in the calculation below:

$$20{,}000 \text{ cubic yards} \times 0.15\frac{tons}{unit} = 3{,}000 \text{ tons}$$

All landscaping debris removed during the grading phase would be taken to the Miramar Greenery facility for 100 percent composting (Table 2).

Table 2
Grading Waste Generation, Diversion, and Disposal

Material	Tons Generated[1]	Percent Diverted	Nearest Handling Facility[2]	Tons Diverted	Tons Disposed
Export Soil	27,300	100	Hanson Aggregates West – Miramar	27,300	0
Landscape Debris	3,000	100	Miramar Greenery	3,000	0

[1]ESD C&D Debris Conversion Rate Table (see Attachment 1).
[2]City of San Diego ESD 2017 Certified C&D Recycling Facility Directory (see Attachment 2).

5.3 Construction

The proposed 5-story building plus basement would total approximately 102,649 square feet and would be surrounded by approximately 88,119 square feet of surface parking areas and 5,291 square feet of hardscape for pedestrian uses. The development would also construct one 384-square-foot recycling/trash enclosure (Table 3). Sidewalks, surface parking, and pedestrian hardscape are not anticipated to generate waste from construction (i.e., no structure content). According to a 1998 study by the U.S. EPA, a sample of non-residential construction projects, including office and restaurant space, generated an average of 3.9 pounds of construction waste per square foot (U.S. EPA 1998). Based on this generation rate, the total proposed building construction area (including 384 square feet of trash and recycling enclosures) is estimated to generate 200.91 tons of waste during construction (see calculation below).

$$103{,}033 \text{ square feet} \times \frac{3.9\ pounds}{square\ foot} \times \frac{1\ ton}{2{,}000\ pounds} = 200.91 \text{ tons}$$

Table 3 shows the estimated tons of construction waste that would be generated during the construction phase of the project.

Table 3
Estimated Construction Waste

Construction Type	Square Footage	Generation Rate (pounds per square foot)	Tons Generated
Proposed Building	102,649	3.9	200.17
One trash and recycling enclosure	384	3.9	0.75
Subtotal	*103,033*	--	*200.91*
Surface parking/hardscape	93,410	--	–
Total	**196,443**	–	**200.91**

NOTE: Totals may vary due to independent rounding.

Estimates of material types and portions are based on similar non-residential developments. The types of construction waste anticipated to be generated include the following:

- Asphalt and concrete
- Brick/masonry/tile
- Carpet, padding/foam
- Corrugated cardboard
- Metals
- Clean wood
- Drywall
- Trash/garbage

Estimates of material types and portions are based on similar nonresidential developments. The types of construction waste and materials anticipated to be generated are shown in Table 4.

Table 4
Construction Waste Diversion and Disposal by Material Type

Material Type	Estimated Waste (tons)[1]	Percent Diverted[2]	Nearest Handling Facility[1]	Estimated Diversion (tons)	Estimated Disposal (tons)
Asphalt and Concrete	28	100	Hanson Aggregates West–Miramar	28	0
Metals	45	100	IMS Recycling Services	45	0
Brick/Masonry/Tile	14	100	Hanson Aggregates West–Miramar	14	0
Clean Wood/Wood Pallets	8	100	Miramar Greenery	8	0
Carpet, Padding/Foam	16	100	DFS Flooring	16	0
Drywall	45	62	EDCO Recover & Transfer	28	17
Corrugated Cardboard	12	100	Allan Company Miramar Recycling	12	0
Trash/Garbage	33	0	Miramar Landfill	0	33
Total	**201**			**150 (75%)**	**50 (25%)**

NOTE: Totals may vary due to independent rounding.
[1]Portions of material types based on demolition estimates of similar residential developments.
[2]City of San Diego ESD 2016 Certified C&D Recycling Facility Directory (see Attachment 2).

5.4 Waste Diversion

Waste diversion would be conducted through source separation rather than mixed debris diversion. With mixed debris diversion, all material waste is disposed of in a single container for transport to a mixed C&D recycling facility where 65 percent is diverted for recycling. With source-separated diversion, materials are separated on-site before transport to appropriate facilities that accept specific material types and a greater diversion rate is achieved. Recyclable waste material would be separated on-site into material-specific containers and diverted to an approved recycler selected from ESD's directory of facilities that recycle specific waste materials from construction (see Attachment 2). These facilities achieve a 100 percent diversion rate for most materials and a 62 percent diversion rate for drywall. Given the waste reduction target of 75 percent, the majority of waste must be handled at facilities other than landfills.

With implementation of the diversion procedures and outlined in Table 4, it is estimated that 75 percent of the waste generated during the construction phase of the project would be diverted to appropriate facilities for reuse. A total of 50 tons of drywall and trash/garbage, equivalent to 25 percent of the total construction waste, would be disposed of in the landfill.

5.4.1 Total Diversion

Table 5 summarizes the amount of waste estimated to be generated and diverted by each phase of the project. Of the 37,421.57 tons estimated to be produced, 37,338.27 tons would be diverted during the demolition and construction phases, primarily through source separation. This would result in 99.78 percent of waste material diverted from the landfill for reuse.

Table 5
Total Waste Generated, Diverted, and Disposed of by Phase

Phase	Tons Generated	Tons Diverted		Tons Disposed	
Demolition	6,920.57	6,888.27	(99.53%)	32.30	(0.47%)
Grading	30,300.00	30,300.00	(100.0%)	0.00	(0%)
Construction	201.00	150.00	(75%)	50.00	(25%)
Total	**37,421.57**	**37,338.27**	**(99.78%)**	**82.30**	**(0.22%)**
NOTE: Totals may vary due to independent rounding.					

5.4.2 Contractor Education and Responsibilities

A Solid Waste Management Coordinator (SWMC) for the project would be designated to ensure that all contractors and subcontractors are educated and that procedures for waste reduction and recycling efforts are implemented. Specific responsibilities of the SWMC would include the following:

- Review of the WMP at the preconstruction meeting, including the SWMC responsibilities.
- Distribute the WMP to all contractors when they first begin work on-site and when training workers, subcontractors, and suppliers on proper waste management procedures applicable to the project.

- Work with the contractors to estimate the quantities of each type of material that would be salvaged, recycled, or disposed of as waste, then assist in documentation.
- Use detailed material estimates to reduce risk of unplanned and potentially wasteful material cuts.
- Review and enforce procedures for source-separated receptacles. Containers of various sizes shall:
  - Be placed in readily accessible areas that will minimize misuse or contamination.
  - Be clearly labeled with a list of acceptable and unacceptable materials, the same as the materials recycled at the receiving material recovery facility or recycling processor.
  - Contain no more than 10 percent non-recyclable materials, by volume.
  - Be inspected daily to remove contaminants and evaluate discarded material for reuse on-site.
- Review and enforce procedures for transportation of materials to appropriate recipients selected from ESD's directory of facilities that recycle C&D materials (see Tables 1 and 4; Attachment 2).
- Ensure removal of C&D waste materials from the project site at least once every week to ensure no over-topping of containers. The accumulation and burning of on-site construction, demolition, and land-clearing waste materials will be prohibited.
- Document the return or reuse of excess materials and packaging to enhance the diversion rate.
- Coordinate implementation of a "buy recycled" program for green construction products, including incorporating mulch and compost into the landscaping.
- Coordinate implementation of solid waste mitigation with other requirements such as storm water requirements, which may include specifications such as the placement of bins to minimize the possibility of runoff contamination.

The SWMC would ensure that the project meets the following state law and City Municipal Code requirements. Adjustments would be made as needed to maintain conformance:

- The City's C&D Debris Diversion Deposit Program, which requires a refundable deposit based on the tonnage of the expected recyclable waste materials as part of the building permit requirements (City of San Diego 2008).
- The City's Recycling Ordinance, which requires that collection of recyclable materials is provided (City of San Diego 2007a).

- The City's Storage Ordinance, which requires that areas for recyclable material collection must be provided (City of San Diego 2007b).
- The name and contact information of the waste contractor provided to ESD at least 10 days prior to the start of any work and updated within 5 days of any changes.

6.0 Occupancy–Operational Waste

6.1 Waste Generation

The estimated annual waste to be generated during occupancy of the project is based on findings from large office buildings reported by the California Environmental Protection Agency (State of California 2006). Table 6 summarizes the estimated occupancy phase waste generation, which amounts to a total of approximately 82.1 tons of waste per year, based on 82,190 square feet of habitable building space (excluding the 20,459 square feet of non-occupied basement). As discussed in Section 6.2, Waste Reduction Measures, an ongoing plan to manage waste disposal in order to meet state and City waste reduction goals would be implemented by the applicant (or applicant's successor in interest).

Table 6
Occupational Phase Annual Waste Generation

Land Use	Amount (square feet)	Annual Generation Rate[1]	Waste Generated
Office	82,190	1,998 pounds per thousand square feet	82.1 tons
TOTAL			**82.1 tons**

[1]California Environmental Protection Agency (State of California 2006).

6.2 Waste Reduction Measures

According to the City Waste Management Guidelines (City of San Diego 2013), compliance with the City's Recycling Ordinances is expected to provide a minimum recycling service volume of 40 percent for large complexes. Therefore, waste anticipated to be diverted during the occupancy phase would be approximately 32.84 tons per year. The remaining 49.26 tons per year would not exceed the 60 ton-per-year threshold of significance for a cumulative impact on solid waste services in the City (City of San Diego 2016).

6.3 Exterior Storage

This WMP follows the City's Municipal Code on-site refuse and recyclable material storage space requirements (City of San Diego 2007b). Table 7 shows the exterior storage area requirements for non-residential developments. As the project would include a total of 82,190 square feet of non-residential uses, a minimum of 192 square feet of refuse storage area and a minimum of 192 square feet of recyclable material storage area would be required. The total exterior refuse and recyclable material storage requirement for the project would be 384 square feet. According to the site plans, the project would include one 384-square-foot recycling/trash enclosure, which would satisfy this requirement.

Table 7
Minimum Exterior Refuse and Recyclable Material Storage Areas for Non-Residential Development

Gross Floor Area per Development (square feet)	Minimum Refuse Storage Area per Development (square feet)	Minimum Recyclable Material Storage Area per Development (square feet)	Total Minimum Storage Area per Development (square feet)
0–5,000	12	12	24
5,001–10,000	24	24	48
10,001–25,000	48	48	96
25,001–50,000	96	96	192
50,001–75,000	144	144	288
75,001–100,000	192	192	384
100,000+	192 plus 48 square feet for every 25,000 square feet of building area above 100,001	192 plus 48 square feet for every 25,000 square feet of building area above 100,001	384 plus 96 square feet for every 25,000 square feet of building area above 100,001
Project Total	**192**	**192**	**384**

SOURCE: City of San Diego Municipal Code, Article 2, Division 8: Refuse and Recyclable Material Storage Regulations, Section 142.0830, Table 142-08C; effective, January 2000.

6.4 Organic Waste Recycling

The project would incorporate landscaping and landscape maintenance. Drought-tolerant plants would be used to reduce the amount of green waste produced. Collection of organic waste and its disposal at recycling centers that accept organic waste would further reduce the waste generated by the project during occupancy. An ongoing WMP would include a means for handling landscaping and other organic waste materials.

7.0 Conclusion

7.1 Demolition, Grading, and Construction Waste

A total of approximately 37,421.57 tons of material would be generated and 37,338.27 tons of material would be diverted through recycling at source-separated facilities that achieve a 100 percent diversion rates. When necessary, mixed debris would be recycled at a lower diversion rate, leaving 82.30 tons to be disposed of. This amounts to a 99.78 percent reduction in solid waste, which would be diverted from the landfill.

7.2 Occupancy–Operational Waste

The project would include 82,190 square feet of habitable building space for non-residential uses, generating approximately 82.1 tons of waste per year; and would be required to provide a minimum of 192 square feet of exterior refuse area and the same amount of recyclable material storage area (total of 384 square feet; see Table 7). The applicant (or applicant's successor in interest) would implement ongoing waste reduction measures as prescribed in this WMP to ensure that the waste is minimized and the operation of the project complies with City ordinances. According to the City of San Diego Waste Management Guidelines (City of San Diego 2013), compliance with existing ordinances is expected to achieve a 40 percent diversion rate. The project would not exceed the 60 ton-per-year City threshold of significance for having a cumulative impact on solid waste services.

7.3 Overall Compliance

With implementation of the strategies outlined in this WMP and compliance with all applicable City ordinances, solid waste impacts would be reduced to below a level of significance regarding collection, diversion, and disposal of waste generated from C&D, grading, and occupancy. During occupancy, an ongoing WMP would include provisions to provide adequate exterior storage space for refuse, recyclable, and landscape and green waste materials.

This WMP outlines strategies to achieve 99.78 percent of waste being diverted from disposal during C&D of the project. This would reduce the anticipated impact of waste disposal to below the direct impact threshold of significance. The occupancy phase would not exceed the 60 ton-per-year City threshold of significance for having a cumulative impact on solid waste services.

8.0 References Cited

California, State of

1989 Assembly Bill 939. Integrated Waste Management Act.

2006 Waste Disposal and Diversion Findings for Selected Industry Groups. California Environmental Protection Agency, Integrated Waste Management Board. June.

2010 Senate Bill 1016. Solid Waste Per Capita Disposal Measurement Act.

2011 Assembly Bill 341. Jobs and Recycling.

2014 Assembly Bill 1826. Solid Waste: Organic Waste.

2016 CalRecycle – Estimated Solid Waste Generation Rates. https://www2.calrecycle.ca.gov/WasteCharacterization/General/Rates#Commercial Accessed on December 22, 2016.

San Diego, City of

2000 Waste Composition Study 1999-2000. Final Report. San Diego Environmental Services Department. November 2000.

2007a Recycling Ordinance. San Diego Municipal Code Chapter 6, Article 6, Division 7. November 20, 2007.

2007b Refuse and Recyclable Materials Storage Regulations. Municipal Code Chapter 14, Article 2, Division 8. December 9, 2007.

2008 Construction and Demolition Debris Diversion Deposit Program. San Diego Municipal Code Chapter 6, Article 6, Division 6.

2013 California Environmental Quality Act – Guidelines for a Waste Management Plan. June 2013. https://www.sandiego.gov/sites/default/files/legacy/environmental-services/pdf/recycling/wmpguidelines.pdf Accessed on December 22, 2016

2016 Significance Determination Thresholds. California Environmental Quality Act. July.

United States Environmental Protection Agency (U.S. EPA)

1998 Characterization of Building-Related Construction and Demolition Debris in the United States. Municipal and Industrial Solid Waste Division. Office of Solid Waste. Report No. EPA530-R-98-010. June.

2009 Estimating 2003 Building-Related Construction and Demolition Materials Amounts. March.

ATTACHMENTS

ATTACHMENT 1

City of San Diego Environmental Services Department
Construction & Demolition Debris Conversion Rate Table

CITY OF SAN DIEGO
CONSTRUCTION & DEMOLITION (C&D) DEBRIS
CONVERSION RATE TABLE

This worksheet lists materials typically generated from a construction or demolition project and provides formulas for converting common units (i.e., cubic yards, square feet, and board feet) to tons. It should be used for preparing your Waste Management Form, which requires that quantities be provided in tons.

Step 1
Enter the estimated quantity for each applicable material in Column I, based on units of cubic yards (cy), square feet (sq ft), or board feet (bd ft).
Step 2
Multiply by Tons/Unit figure listed in Column II. Enter the result for each material in Column III. If using Excel version, column III will automatically calculate tons.
Step 3
Enter quantities for each separated material from Column III on this worksheet into the corresponding section of your Waste Management Form.

For your final calculations, use the actual quantities, based on weight tags, gate receipts, or other documents.

		Column I			Column II		Column III
Category	**Material**	**Volume**	**Unit**		**Tons/Unit**		**Tons**
Asphalt/Concrete	Asphalt (broken)		cy	x	0.70	=	
	Concrete (broken)		cy	x	1.20	=	
	Concrete (solid slab)		cy	x	1.30	=	
Brick/Masonry/Tile	Brick (broken)		cy	x	0.70	=	
	Brick (whole, palletized)		cy	x	1.51	=	
	Masonry Brick (broken)		cy	x	0.60	=	
	Tile		sq ft	x	0.00175	=	
Building Materials (doors, windows, cabinets, etc.)			cy	x	0.15	=	
Cardboard (flat)			cy	x	0.05	=	
Carpet	By square foot		sq ft	x	0.0005	=	
	By cubic yard		cy	x	0.30	=	
Carpet Padding/Foam			sq ft	x	0.000125	=	
Ceiling Tiles	Whole (palletized)		sq ft	x	0.0003	=	
	Loose		cy	x	0.09	=	
Drywall (new or used)	1/2" (by square foot)		sq ft	x	0.0008	=	
	5/8" (by square foot)		sq ft	x	0.00105	=	
	Demo/used (by cubic yd)		cy	x	0.25	=	
Earth	Loose/Dry		cy	x	1.20	=	
	Excavated/Wet		cy	x	1.30	=	
	Sand (loose)		cy	x	1.20	=	
Landscape Debris (brush, trees, etc)			cy	x	0.15	=	
Mixed Debris	Construction		cy	x	0.18	=	
	Demolition		cy	x	1.19	=	
Scrap metal			cy	x	0.51	=	
Shingles, asphalt			cy	x	0.22	=	
Stone (crushed)			cy	x	2.35	=	
Unpainted Wood & Pallets	By board foot		bd ft	x	0.001375	=	
	By cubic yard		cy	x	0.15	=	
Garbage/Trash			cy	x	0.18	=	
Other (estimated weight)			cy	x	estimate	=	
			cy	x	estimate	=	
			cy	x	estimate	=	
			cy	x	estimate	=	

Total All ____________________

ATTACHMENT 2

City of San Diego 2016 Construction & Demolition
Recycling Facility Directory

2017 Certified Construction & Demolition Recycling Facility Directory

These facilities are certified by the City of San Diego to accept materials listed in each category. Hazardous materials are not accepted. The diversion rate for these materials shall be considered 100%, except mixed C&D debris which updates quarterly. The City is not responsible for changes in facility information. Please call ahead to confirm details such as accepted materials, days and hours of operation, limitations on vehicle types, and cost. For more information visit: www.recyclingworks.com.

Please note: In order to receive recycling credit, Mixed C&D Facility and transfer station receipts must: *-be coded as construction & demolition (C&D) debris* *-have project address or permit number on receipt* **Make sure to notify weighmaster that your load is subject to the City of San Diego C&D Ordinance.* *Note about landfills: Miramar Landfill and other landfills do not recycle mixed C&D debris.*	Mixed C&D Debris	Asphalt/Concrete	Brick/Block/Rock	Building Materials for Reuse	Cardboard	Carpet	Carpet Padding	Ceiling Tile	Ceramic Tile/Porcelain	Clean Fill Dirt	Clean Wood/Green Waste	Drywall	Industrial Plastics	Lamps/Light Fixtures	Metal	Mixed Inerts	Styrofoam Blocks
EDCO Recovery & Transfer 3660 Dalbergia St, San Diego, CA 92113 619-234-7774 | www.edcodisposal.com/public-disposal	67%											•					
EDCO Station Transfer Station & Buy Back Center 8184 Commercial St, La Mesa, CA 91942 619-466-3355 | www.edcodisposal.com/public-disposal	67%				•							•			•		
EDCO CDI Recycling & Buy Back Center 224 S. Las Posas Rd, San Marcos, CA 92078 760-744-2700 | www.edcodisposal.com/public-disposal	88%				•										•		
Escondido Resource Recovery 1044 W. Washington Ave, Escondido 760-745-3203 | www.edcodisposal.com/public-disposal	67%																
Fallbrook Transfer Station & Buy Back Center 550 W. Aviation Rd, Fallbrook, CA 92028 760-728-6114 | www.edcodisposal.com/public-disposal	67%				•										•		
Otay C&D/Inert Debris Processing Facility 1700 Maxwell Rd, Chula Vista, CA 91913 619-421-3773 | www.sd.disposal.com	69%																
Ramona Transfer Station & Buy Back Center 324 Maple St, Ramona, CA 92065 760-789-0516 | www.edcodisposal.com/public-disposal	67%				•										•		
SANCO Resource Recovery & Buy Back Center 6750 Federal Blvd, Lemon Grove, CA 91945 619-287-5696 | www.edcodisposal.com/public-disposal	67%				•										•		
All American Recycling 10805 Kenney St, Santee, CA 92071 619-508-1155 (Must call for appointment)						•											
Allan Company 6733 Consolidated Wy, San Diego, CA 92121 858-578-9300 | www.allancompany.com/facilities.htm					•										•		
Allan Company Miramar Recycling 5165 Convoy St, San Diego, CA 92111 858-268-8971 | www.allancompany.com/facilities.htm					•										•		
AMS 4674 Cardin St, San Diego, CA 92111 858-541-1977 | www.a-m-s.com								•									

	Mixed C&D Debris	Asphalt/Concrete	Brick/Block/Rock	Building Materials for Reuse	Cardboard	Carpet	Carpet Padding	Ceiling Tile	Ceramic Tile/Porcelain	Clean Fill Dirt	Clean Wood/Green Waste	Drywall	Industrial Plastics	Lamps/Light Fixtures	Metal	Mixed Inerts	Styrofoam Blocks
Armstrong World Industries, Inc. 300 S. Myrida St, Pensacola, FL 32505 877-276-7876 (Press 1, Then 8) www.armstrong.com/commceilingsna								•									
Cactus Recycling 8710 Avenida De La Fuente, San Diego, CA 92154 619-661-1283 | www.cactusrecycling.com					•								•		•		•
DFS Flooring 10178 Willow Creek Road, San Diego, CA 92131 858-630-5200 | www.dfsflooring.com						•	•										
Duco Metals 220 Bingham Drive Suite 100, San Marcos, CA 92069 760-747-6330 | www.ducometals.com															•		
Enniss Incorporated 12421 Vigilante Rd, Lakeside, CA 92040 619-443-9024 | www.ennissinc.com		•	•						•	•							
Escondido Sand and Gravel 500 N. Tulip St, Escondido, CA 92025 760-432-4690 | www.weirasphalt.com/esg		•															
Habitat for Humanity ReStore 10222 San Diego Mission Rd, San Diego, CA 92108 619-516-5267 | www.sdhfh.org/restore.php				•													
Hanson Aggregates West – Lakeside Plant 12560 Highway 67, Lakeside, CA 92040 858-547-2141		•															
Hanson Aggregates West – Miramar 9229 Harris Plant Rd, San Diego, CA 92126 858-974-3849		•								•							
HVAC Exchange 2675 Faivre St, Chula Vista, CA 91911 619-423-1855 | www.thehvacexchange.com															•		
IMS Recycling Services 2740 Boston Ave, San Diego, CA 92113 619-423-1564 | www.imsrecyclingservices.com					•								•				
IMS Recycling Services 2697 Main St, San Diego, CA 92113 619-231-2521 | www.imsrecyclingservices.com													•		•		
Inland Pacific Resource Recovery 12650 Slaughterhouse Canyon Rd, Lakeside, CA 92040 619-390-1418											•						
Lamp Disposal Solutions 1405 30th Street, San Diego, CA 92154 858-569-1807 | www.lampdisposalsolutions.com														•			
Los Angeles Fiber Company 4920 S. Boyle Ave, Vernon, CA 90058 323-589-5637 | www.lafiber.com						•	•										

	Mixed C&D Debris	Asphalt/Concrete	Brick/Block/Rock	Building Materials for Reuse	Cardboard	Carpet	Carpet Padding	Ceiling Tile	Ceramic Tile/Porcelain	Clean Fill Dirt	Clean Wood/Green Waste	Drywall	Industrial Plastics	Lamps/Light Fixtures	Metal	Mixed Inerts	Styrofoam Blocks
Miramar Greenery, City of San Diego 5180 Convoy St, San Diego, CA 92111 858-694-7000 | www.sandiego.gov/environmental-services/miramar/greenery.shtml											•						
Moody's 3210 Oceanside Blvd., Oceanside, CA 92056 760-433-3316		•								•						•	
Otay Valley Rock, LLC 2041 Heritage Rd, Chula Vista, CA 91913 619-591-4717 | www.otayrock.com		•															
Reclaimed Aggregates Chula Vista 855 Energy Wy, Chula Vista, CA 91913 619-656-1836		•														•	
Reconstruction Warehouse 3650 Hancock St., San Diego, CA 92110 619-795-7326 | www.recowarehouse.com				•													
Robertson's Ready Mix 2094 Willow Glen Dr, El Cajon, CA 92019 619-593-1856		•								•						•	
Romero General Construction Corp. 8354 Nelson Wy, Escondido, CA 92026 760-749-9312 | www.romerogc.com/crushing/nelsonway.htm		•															
SA Recycling 3055 Commercial St., San Diego, CA 92113 619-238-6740 | www.sarecycling.com															•		
SA Recycling 1211 S. 32nd St., San Diego, CA 92113 619-234-6691 | www.sarecycling.com															•		
Universal Waste Disposal 8051 Wing Avenue, El Cajon, CA 92020 619-438-1093 | www.universalwastedisposal.com														•			
Vulcan Carol Canyon Landfill and Recycle Site 10051 Black Mountain Rd, San Diego, CA 92126 858-530-9465 | www.vulcanmaterials.com		•	•							•						•	
Vulcan Otay Asphalt Recycle Center 7522 Paseo de la Fuente, San Diego, CA 92154 619-571-1945 | www.vulcanmaterials.com		•															