CENTRUM 6 APARTMENT PROJECT

AIR QUALITY STUDY

Prepared for:

Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, CA 92121

Prepared by:

BIRDSEYE PLANNING GROUP

April 2018
Revised December 2018

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City of San Diego, California

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Centrum 6 Apartment Project
San Diego, California

AIR QUALITY STUDY

This report is an analysis of the potential air quality impacts associated with the proposed Centrum 6 Apartment Project located on an approximately 5.38-acre site located along Lightwave Avenue between Kearny Villa Road and Sunroad Centrum Lane in the City of San Diego. The site is currently designated for a commercial use and development is governed by the New Century Centre Master Plan. The report has been prepared by Birdseye Planning Group under contract to Sunroad Enterprises, Inc., at the request of the City of San Diego to support the discretionary review process. This study analyzes the potential for temporary air quality impacts associated with construction and long-term air quality impacts associated with operation of the proposed project.

PROJECT DESCRIPTION

The proposed project involves the demolition of an existing approximately 40,500-square-foot asphalt parking lot and the construction of 442 residential condominium units and one commercial condominium within a 554,640-square-foot seven-story (maximum 90 feet eight inches in overall building height) multi-family residential apartment building over three levels of parking, the lowest level being subterranean. A 3,250-square-foot leasing center would be provided, along with a 3,900-square-foot fitness center and pool area with 2,700 square-feet of amenity space. Additionally, the project would provide a total of 68,908 square feet of common open space in a terrace (3,682 square feet), and podium courtyards (which total 36,947 square feet). The project includes associated landscaping, grading, drainage, utility, and access improvements and would require grading of approximately 83 percent of the previously graded project site. Earthwork would be balanced on-site, requiring 49,800 cubic yards of cut with a maximum depth of cut at 12 feet and 5,400 cubic yards of fill. The maximum height of fill slopes would be five feet; no cut slopes are proposed.

The proposed project would begin construction in early 2020 with units complete in late 2021. Full build-out of the 554,640-square-foot seven-story multi-family residential apartment and 802-space parking garage is assumed as part of this analysis.

REGULATORY SETTING

Air pollutants are regulated at the national, State, and air basin level; each agency has a different degree of control. The United States Environmental Protection Agency (USEPA) regulates at the national level; the California Air Resources Control Board (CARB) regulates at the State level; and the San Diego Air Pollution Control District (SDAPCD) regulates air quality in San Diego County.

The federal and state governments have been empowered by the federal and state Clean Air Acts to regulate the emission of airborne pollutants and have established ambient air quality standards for the protection of public health. The USEPA is the federal agency designated to administer national air quality regulations, while CARB is the state equivalent in the California Environmental Protection Agency. Local control over air quality management is provided by CARB through multi-county and county-level Air Pollution Control Districts (APCDs) (also referred to as Air Quality Management Districts). CARB establishes statewide air quality standards and is responsible for the control of mobile emission sources, while the local APCDs are responsible for enforcing standards and regulating stationary sources. CARB has established 15 air basins statewide. The City of San Diego is located in the San Diego Air Basin (SDAB), which is under the jurisdiction of the SDAPCD.

California Air Resources Board

CARB, which became part of the California EPA (CalEPA) in 1991, is responsible for ensuring implementation of the California Clean Air Act (CCAA), meeting state requirements of the federal Clean Air Act and establishing California Ambient Air Quality Standards (CAAQSs). It is also responsible for setting emission standards for vehicles sold in California and for other emission sources such as consumer products and certain off-road equipment. CARB also established passenger vehicle fuel specifications and oversees the functions of local air pollution control districts and air quality management districts, which in turn administer air quality activities at the regional and county level. The CCAA is administered by CARB at the state level and by the Air Quality Management Districts at the regional level. Both state and federal standards are summarized in Table 1. The federal "primary" standards have been established to protect the public health. The federal "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

San Diego Air Pollution Control District

The SDAPCD was created to protect the public from the harmful effects of air pollution, achieve and maintain air quality standards, foster community involvement and develop and implement cost-effective programs that meet state and federal mandates while considering environmental and economic impacts.

Specifically, the SDAPCD is responsible for monitoring air quality and planning, implementing, and enforcing programs designed to attain and maintain state and federal ambient air quality standards in the district. Programs developed include air quality rules and regulations that regulate stationary source emissions, including area sources, point sources, and certain mobile source emissions. The SDAPCD is also responsible for establishing permitting requirements for stationary sources and ensuring that new, modified or relocated stationary sources do not create net emissions increases; and thus, are consistent with the region's air quality goals. The

Table 1
Current Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Primary Standards	California Standard
Ozone	1-Hour	---	0.09 ppm
	8-Hour	0.070 µg/m^3	0.070 µg/m^3
PM_{10}	24-Hour	150 µg/m^3	50 µg/m^3
	Annual	---	20 µg/m^3
$PM_{2.5}$	24-Hour	35 µg/m^3	---
	Annual	12 µg/m^3	12 µg/m^3
Carbon Monoxide	8-Hour	9.0 ppm	9.0 ppm
	1-Hour	35.0 ppm	20.0 ppm
Nitrogen Dioxide	Annual	0.053 ppm	0.030 ppm
	1-Hour	0.100 ppm	0.18 ppm
Sulfur Dioxide	24-Hour	---	0.04 ppm
	3-Hour	0.5 ppm (secondary)	---
	1-Hour	0.075 ppm (primary)	0.25 ppm
Lead	30-Day Average	---	1.5 µg/m^3
	3-Month Average	0.15 µg/m^3	---

ppm = parts per million
µg/m^3 = micrograms per cubic meter
Source: California Air Resources Board, http://www.arb.ca.gov/research/aaqs/aaqs2.pdf May 4, 2016.

SDAPCD provides significance thresholds in Regulation II, Rule 20.2, Table 20-2-1. "AQIA Trigger Levels." These trigger levels were established for stationary sources of air pollution and are commonly used for environmental evaluations. The SDAPCD enforces air quality rules and regulations through a variety of means, including inspections, educational or training programs, or fines, when necessary.

State Implementation Plan/Air Quality Management Plan/Regional Air Quality Strategy

The federal Clean Air Act Amendments (CAAA) mandate that states submit and implement a State Implementation Plan (SIP) for areas not meeting air quality standards. SIPs are comprehensive plans that describe how an area will attain national and state ambient air quality standards. SIPs are a compilation of new and previously submitted plans, programs (i.e., monitoring, modeling and permitting programs), district rules, state regulations and federal controls and include pollution control measures that demonstrate how the standards will be met through those measures.

State law makes CARB the lead agency for all purposes related to the SIP. Local air districts and other agencies prepare SIP elements and submit them to CARB for review and approval. CARB forwards SIP revisions to the USEPA for approval and publication in the Federal Register. Thus, the Regional Air Quality Strategy (RAQS) and Air Quality Management Plan (AQMP) prepared by SDAPCD and referenced herein become part of the SIP as the material relates to efforts ongoing in San Diego to achieve the national and state ambient air quality standards. The most recent SIP element for San Diego County was submitted in December 2016. The document identifies control measures and associated emission reductions necessary to demonstrate attainment of the 2008 Federal 8-hour ozone standard by July 20, 2018.

The San Diego RAQS was developed pursuant to California Clean Air Act (CCAA) requirements. The RAQS was initially adopted in 1991 and was updated in 1995, 1998, 2001, 2004, 2009 and 2016. The RAQS can be found at the following: http://www.sdapcd.org/content/dam/sdc/apcd/PDF/Air%20Quality%20Planning/2016%20RAQS.pdf. The RAQS identifies feasible emission control measures to provide progress in San Diego County toward attaining the State ozone standard. The pollutants addressed in the RAQS are volatile organic compounds (VOC) and oxides of nitrogen (NOx), precursors to the photochemical formation of ozone (the primary component of smog). The RAQS was initially adopted by the San Diego County Air Pollution Control Board on June 30, 1992, and amended on March 2, 1993, in response to ARB comments. At present, no attainment plan for particulate matter less than 10 microns in diameter (PM_{10}) or particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) is required by the state regulations; however, SDAPCD has adopted measures to reduce particulate matter in San Diego County. These measures range from regulation against open burning to incentive programs that introduce cleaner technology. These measures can be found in a report titled "*Measures to Reduce Particulate Matter in San Diego County*" December 2005 and can be found at: http://www.sdapcd.org/content/dam/sdc/apcd/PDF/Air%20Quality%20Planning/PM-Measures.pdf.

The RAQS relies on information from CARB and San Diego Association of Governments (SANDAG), including mobile and area source emissions, as well as information regarding projected growth in the County, to estimate future emissions and then determine strategies necessary for the reduction of emissions through regulatory controls. CARB mobile source emission projections and SANDAG growth projections are based on population and vehicle trends as well as land use plans developed by the cities and the County as part of the development of the individual General Plans. As such, projects that propose development consistent with the growth anticipated by the general plans would be consistent with the RAQS. In the event that a project would propose development which is less dense than anticipated within the General Plan, the project would likewise be consistent with the RAQS. If a project proposes development that is greater than that anticipated in the General Plan and SANDAG's growth projections, the project might conflict with the RAQS and SIP; and thus, have a potentially significant impact on air quality.

Under state law, the SDAPCD is required to prepare an AQMP for pollutants for which the SDAB is designated non-attainment. Each iteration of the SDAPCD's AQMP is an update of the previous plan and has a 20-year horizon. Currently the SDAPCD has implemented a 2012 8-hour National Ozone Implementation/Maintenance Plan, a 2007 8-hour Ozone Plan, and a 2004 Carbon Monoxide Plan. The SDAPCD adopted the 2008 8-hour Ozone Attainment Plan for San Diego County on December 16, 2016. CARB adopted the ozone plan as a revision to the California SIP on March 23, 2017. The ozone plan was submitted to the USEPA for review on April 12, 2017. Comments from the USEPA are pending. These plans are available for download on the ARB website located at the following URL: http://www.arb.ca.gov/planning/sip/planarea/sansip.htm.

ENVIRONMENTAL SETTING

REGIONAL CLIMATE

The weather of San Diego County is profoundly influenced by the Pacific Ocean and its semi-permanent high-pressure systems that result in dry, warm summers and mild, occasionally wet winters. The average minimum temperature for January ranges from the mid-40s to the high-50s degrees Fahrenheit (4 to 15 degrees Celsius) across the county. July maximum temperatures average in the mid-80s to the high-90s degrees Fahrenheit (high-20s to the high-30s degrees Celsius). Most of the county's precipitation falls from November to April, with infrequent (approximately 10 percent) precipitation during the summer. The average seasonal precipitation along the coast is approximately 10 inches (254 millimeters); the amount increases with elevations as moist air is lifted over the mountains.

The interaction of ocean, land, and the Pacific High-Pressure Zone maintains clear skies for much of the year and drives the prevailing winds. Local terrain is often the dominant factor inland and winds in inland mountainous areas tend to blow upwards in the valleys during the day and down the hills and valleys at night.

In conjunction with the onshore/offshore wind patterns, there are two types of temperature inversions (reversals of the normal decrease of temperature with height), which occur within the region that affect atmospheric dispersive capability and that act to degrade local air quality. In the summer, an inversion at about 1,100 to 2,500 feet (335 to 765 meters) is formed over the entire coastal plain when the warm air mass over land is undercut by a shallow layer of cool marine air flowing onshore. The prevailing sunny days in this region further exacerbate the smog problem by inducing additional adverse photochemical reactions. During the winter, a nightly shallow inversion layer (usually at about 800 feet or 243 meters) forms between the cooled air at the ground and the warmer air above, which can trap vehicular pollutants. The days of highest Carbon Monoxide (CO) concentrations occur during the winter months.

The predominant onshore/offshore wind pattern is sometimes interrupted by so-called Santa Ana conditions, when high pressure over the Nevada-Utah region overcomes the prevailing westerly wind direction. This draws strong, steady, hot, and dry winds from the east 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 breakdown of these conditions or if the Santa Ana is weak, prevailing northwesterly winds are reestablished which send polluted air from the Los Angeles basin ashore in the SDAB. "Smog transport from the South Coast Air Basin (the metropolitan areas of Los Angeles, Orange, San Bernardino, and Riverside counties) is a key factor on more than half the days San Diego exceeds clean air standards" (San Diego Air Pollution Control District, 2010).

Pollutants

The SDAPCD is required to monitor air pollutant levels to ensure that air quality standards are met and, if they are not met, to develop strategies to meet the standards. Depending on whether the standards are met or exceeded, the local air basin is classified as being in "attainment" or "non-attainment." San Diego County is listed as a federal non-attainment area for ozone (eight hour) and a state non-attainment area for ozone (one hour and eight-hour standards), PM_{10} and $PM_{2.5}$. As shown in Table 2, the SDAB is in attainment for the state and federal standards for nitrogen dioxide, carbon monoxide, sulfur dioxide and lead. Characteristics of ozone, carbon monoxide, nitrogen dioxide, and suspended particulates are described below.

Ozone. Ozone is produced by a photochemical reaction (triggered by sunlight) between nitrogen oxides (NO_X) and reactive organic gases (ROG)[1]. Nitrogen oxides are formed during the combustion of fuels, while reactive organic compounds are formed during combustion and evaporation of organic solvents. Because ozone requires sunlight to form, it mostly occurs in concentrations considered serious between the months of April and October. Ozone is a pungent, colorless, toxic gas with direct health effects on humans including respiratory and eye irritation and possible changes in lung functions. Groups most sensitive to ozone include children, the elderly, people with respiratory disorders, and people who exercise strenuously outdoors.

Carbon Monoxide. Carbon monoxide (CO) is a local pollutant that is found in high concentrations only near the source. The major source of carbon monoxide, a colorless, odorless,

[1] Organic compound precursors of ozone are routinely described by a number of variations of three terms: hydrocarbons (HC), organic gases (OG), and organic compounds (OC). These terms are often modified by adjectives such as total, reactive, or volatile, and result in a rather confusing array of acronyms: HC, THC (total hydrocarbons), RHC (reactive hydrocarbons), TOG (total organic gases), ROG (reactive organic gases), TOC (total organic compounds), ROC (reactive organic compounds), and VOC (volatile organic compounds). While most of these differ in some significant way from a chemical perspective, from an air quality perspective two groups are important: non-photochemically reactive in the lower atmosphere, or photochemically reactive in the lower atmosphere (HC, RHC, ROG, ROC, and VOC).

Table 2
San Diego County Attainment Status

Criteria Pollutant	Federal Designation	State Designation
Ozone (one hour)	Attainment*	Non-Attainment
Ozone (eight hour)	Non-Attainment	Non-Attainment
Carbon Monoxide	Attainment	Attainment
PM_{10}	Unclassifiable**	Non-Attainment
$PM_{2.5}$	Attainment	Non-Attainment
Nitrogen Dioxide	Attainment	Attainment
Sulfur Dioxide	Attainment	Attainment
Lead	Attainment	Attainment
Sulfates	No Federal Standard	Attainment
Hydrogen Sulfide	No Federal Standard	Unclassified
Visibility	No Federal Standard	Unclassified

** The federal 1-hour standard of 12 ppm was in effect from 1979 through June 1, 2005. The revoked standard is referenced here because it was used for such a long period and because this benchmark is addressed in State Implementation Plans (SIPs).*
*** At the time of designation, if the available data does not support a designation of attainment or non-attainment, the area is designated as unclassifiable.*
Source: San Diego Air Pollution Control District. June, 2016. http://www.sandiegocounty.gov/content/sdc/apcd/en/air-quality-planning/attainment-status.html

poisonous gas, is automobile exhaust. Elevated CO concentrations; therefore, are usually only found near areas of high traffic volumes operating in congested conditions. Carbon monoxide health effects are related to blood hemoglobin. At high concentrations, carbon monoxide reduces the amount of oxygen in the blood, causing heart difficulties in people with chronic diseases, reduced lung capacity and impaired mental abilities.

Nitrogen Dioxide. Nitrogen dioxide (NO_2) is a by-product of fuel combustion, with the primary source being motor vehicles and industrial boilers and furnaces. The principal form of nitrogen oxide produced by combustion is nitric oxide (NO), but NO reacts rapidly to form NO_2, creating the mixture of NO and NO_2 commonly called NO_X. Nitrogen dioxide is an acute irritant. A relationship between NO_2 and chronic pulmonary fibrosis may exist and an increase in bronchitis in young children at concentrations below 0.3 parts per million (ppm) may occur. Nitrogen dioxide absorbs blue light and causes a reddish-brown cast to the atmosphere and reduced visibility. It can also contribute to the formation of PM_{10} and acid rain.

Suspended Particulates. PM_{10} is particulate matter measuring no more than 10 microns in diameter, while $PM_{2.5}$ is fine particulate matter measuring no more than 2.5 microns in diameter. Suspended particulates are mostly dust particles, nitrates and sulfates. Both PM_{10} and $PM_{2.5}$ are by-products of fuel combustion and wind erosion of soil and unpaved roads and are directly emitted into the atmosphere through these processes. Suspended particulates are also created in the atmosphere through chemical reactions. The characteristics, sources, and potential health effects associated with the small particulates (those between 2.5 and 10 microns in diameter) and fine particulates ($PM_{2.5}$) can be very different. The small particulates generally come from windblown dust and dust kicked up from mobile sources. The fine particulates are generally associated with combustion processes as well as being formed in the atmosphere as a secondary pollutant through chemical reactions. Fine particulate matter is more likely to penetrate deeply into the lungs and poses a health threat to all groups, but particularly to the elderly, children, and those with respiratory problems. More than half of the small and fine particulate matter that is inhaled into the lungs remains there. These materials can damage health by interfering with the body's mechanisms for clearing the respiratory tract or by acting as carriers of an absorbed toxic substance.

Toxic Air Contaminants/Diesel Particulate Matter. Hazardous air pollutants, also known as toxic air pollutants (TACs) or air toxics, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Examples of toxic air pollutants include:

- benzene, which is found in gasoline;
- perchloroethylene, which is emitted from some dry-cleaning facilities; and
- methylene chloride, which is used as a solvent.

Transportation related emissions are focused on particulate matter constituents within diesel exhaust and TAC constituents that comprise a portion of total organic gas (TOG) emissions from both diesel and gasoline fueled vehicles. Diesel engine emissions are comprised of exhaust particulate matter and TOGs which are collectively defined for the purpose of an HRA, as Diesel Particulate Matter (DPM). DPM and TOG emissions from both diesel and gasoline fueled vehicles is typically composed of carbon particles and carcinogenic substances including polycyclic aromatic hydrocarbons, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene. Diesel exhaust also contains gaseous pollutants, including volatile organic compounds and oxides of nitrogen (NO_x).

SENSITIVE RECEPTORS

Sensitive receptors include, but are not limited to, hospitals, schools, daycare facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to air pollutants. Ambient air quality standards have been established to represent the levels of air quality considered sufficient, with an adequate margin of safety, to protect public health and welfare. They are designed to protect that segment of the public most susceptible to respiratory distress, such as children; the elderly; persons engaged in strenuous work or exercise and people with cardiovascular and chronic respiratory diseases. The nearest receptors are multifamily residences located along the east side of Ariva Way east and southeast of the project site.

Monitored Air Quality

The SDAPCD monitors air quality conditions at locations throughout the SDAB. For this analysis, data from the San Diego Kearny Villa Road monitoring station located east of the site were used to characterize existing ozone and $PM_{2.5}$ conditions in the vicinity of the project site. A summary of the data recorded at the Kearny Villa Road monitoring station from 2014 through 2016 is presented in Table 3.

Table 3
Ambient Air Quality Data

Pollutant	2014	2015	2016
Ozone, ppm - Worst 8-Hour Average	0.082	0.070	0.075
Number of days of State 1-hour exceedances (>0.070 ppm)	4	0	3
Number of days of Federal exceedances (>0.070 ppm)[1]	4	0	3
Particulate Matter <10 microns, $\mu g/m^3$ Worst 24 Hours*	39	39	36
Number of samples of State exceedances (>50 $\mu g/m^3$)	0	0	*
Number of samples of Federal exceedances (>150 $\mu g/m^3$)	0	0	0
Particulate Matter <2.5 microns, $\mu g/m^3$ Worst 24 Hours	20.2	25.7	19.4
Number of samples of State exceedances (No Standard)	0	0	0
Number of samples of Federal exceedances (>35 $\mu g/m^3$)	0	0	0

[1] – Federal O3 standard reduced from 75 ppm to 70 ppm in October 2015
*Insufficient data to determine number of exceedances
Data from the San Diego Kearny Villa Road, 6125 A Kearny Villa Road Station in San Diego.
Source: California Air Resources Board, 2014, 2015, 2016 Air Quality Data Summaries available at: http://www.arb.ca.gov/adam/topfour/topfourdisplay.php Accessed April 26, 2018.

AIR QUALITY IMPACT ANALYSIS

METHODOLOGY AND SIGNIFICANCE THRESHOLDS

Air quality modeling was performed in general accordance with the methodologies outlined in the SDAPCD 2009 RAQS to identify both construction and operational emissions associated with the proposed project. All emissions were calculated using the California Emissions Estimator Model (CalEEMod) software version 2016.3.2 which incorporates current air emission data, planning methods and protocol approved by CARB.

As referenced, construction activities would include demolition of an existing parking lot, clearing and vegetation removal, grading, construction of the buildings/utilities, parking garage and related improvements as well as paving driveways and parking areas. Construction activities would require the use of equipment that would generate criteria air pollutant emissions. For modeling purposes, it was assumed that all construction equipment used would be diesel-powered. Construction emissions associated with development of the proposed project were quantified by estimating the types of equipment, including the number of individual pieces of equipment, that would be used on-site during each of the construction phases as well as off-site haul trips to remove demolition debris. Construction emissions are analyzed using the regional thresholds established by the SDAPCD and published under Rule 20-2.

Operational emissions include mobile source emissions, energy emissions and area source emissions. Mobile source emissions are generated by motor vehicle trips associated with operation of the project. Emissions attributable to energy use include electricity and natural gas consumption for space and water heating. Area source emissions are generated by landscape maintenance equipment, use of consumer products and painting. To determine whether a regional air quality impact would occur, the increase in emissions would be compared with the SDAPCD recommended regional thresholds for operational emissions.

Thresholds of Significance. Based on City of San Diego Significance Determination Thresholds Guidelines, a project would have a significant air quality impact if it would:

a) *Conflict with or obstruct implementation of the applicable air quality plan;*
b) *Violate any air quality standard or contribute substantially to an existing or projected air quality violation;*
c) *Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);*
d) *Expose sensitive receptors to substantial pollutant concentrations;*
e) *Create objectionable odors affecting a substantial number of people. or*
f) *Release substantial quantities of air contaminants beyond the boundaries of the premises upon which the stationary source emitting the contaminants is located.*

A significant adverse air quality impact may occur when a project individually or cumulatively interferes with progress toward the attainment of the ozone standard by generating emissions that equal or exceed the established long term quantitative thresholds for pollutants or exceed a state or federal ambient air quality standard for any criteria pollutant.

As referenced, the SDAPCD has established thresholds in Rule 20.2 for new or modified stationary sources (SDAPCD, 2015). With the exception of Volatile Organic Compounds (VOCs) and $PM_{2.5}$ thresholds, the City of San Diego screening quantities shown in the *California Environmental Quality Act Significance Determination Thresholds,* Table A-2, (City of San Diego, 2016) incorporate screening level thresholds from Rule 20.2 for use in air quality reports and for determining CEQA air quality impacts. The City does not show a standard for $PM_{2.5}$ but does include a threshold for Reactive Organic Gas/Volatile Organic Compounds (ROG/VOC) emissions. Collectively, the standards shown in Table A-2 of the City's 2016 CEQA Determination Thresholds and the $PM_{2.5}$ threshold shown in Table 20.2-1 of SDAPCD Rule 20.2, are used herein to determine whether project emissions would cause a significant air quality impact. The construction and operational emission thresholds for pollutants evaluated are as follows:

- Carbon Monoxide (CO) - 550 pounds/day;
- Nitrogen Oxides (NOx) - 100 pounds/day;
- Particulate Matter (PM_{10}) - 100 pounds/day;
- Particulate Matter ($PM_{2.5}$) - 67 pounds/day;
- Sulfur Oxides (SOx) - 250 pounds/day; and
- Volatile Organic Compounds(VOCs)/Reactive Organic Gases(ROGs) - 137 pounds/day.

CONSTRUCTION EMISSIONS

Project construction would generate temporary air pollutant emissions. These impacts are associated with fugitive dust (PM_{10} and $PM_{2.5}$) from soil disturbance and exhaust emissions (NO_x and CO) from heavy construction vehicles. For the purpose of estimating emissions, it was assumed that approximately 2 acres would be disturbed daily during overall construction. The number of haul trips to remove demolition debris were estimated based on tonnage. As noted, construction would generally consist of construction/demolition waste, vegetation removal, site preparation, construction of the building improvements, paving and the application of architectural coating (painting).

Site preparation and grading would involve the greatest concentration of heavy equipment use and the highest potential for fugitive dust emissions. The project would be required to comply with SDAPCD Rules 52 and 54 which identify measures to reduce fugitive dust and is required to be implemented at all construction sites located within the SDAB. Therefore, the following conditions, which are required to reduce fugitive dust in compliance with SDAPCD Rules 52 and 54, were included in CalEEMod for site preparation and grading phases of construction.

1. **Minimization of Disturbance.** Construction contractors should minimize the area disturbed by clearing, grading, earth moving, or excavation operations to prevent excessive amounts of dust.

2. **Soil Treatment.** Construction contractors should treat all graded and excavated material, exposed soil areas and active portions of the construction site, including unpaved on-site roadways to minimize fugitive dust. Treatment shall include, but not necessarily be limited to, periodic watering, application of environmentally safe soil stabilization materials, and/or roll compaction as appropriate. Watering shall be done as often as necessary, and at least twice daily, preferably in the late morning and after work is done for the day. Note – it was assumed watering would occur three times daily for modeling purposes.

3. **Soil Stabilization.** Construction contractors should monitor all graded and/or excavated inactive areas of the construction site at least weekly for dust stabilization. Soil stabilization methods, such as water and roll compaction, and environmentally safe dust control materials shall be applied to portions of the construction site that are inactive for over four days. If no further grading or excavation operations are planned for the area,

the area shall be seeded and watered until landscape growth is evident, or periodically treated with environmentally safe dust suppressants, to prevent excessive fugitive dust.

4. **No Grading During High Winds.** Construction contractors should stop all clearing, grading, earth moving, and excavation operations during periods of high winds (20 miles per hour or greater, as measured continuously over a one-hour period).

5. **Street Sweeping.** Construction contractors should sweep all on-site driveways and adjacent streets and roads at least once per day, preferably at the end of the day, if visible soil material is carried over to adjacent streets and roads.

Construction is assumed to begin in early 2020 and be completed by mid-2021. In addition to SDAPCD Rules 52 and 54 requirements, emissions modeling also accounts for the use of low-VOC paint (150 g/L for non-flat coatings) as required by SDAPCD Rule 67. Further, emissions modeling assumed the painting phase would overlap with building construction and paving phases to reduce daily VOC/ROG emissions. Table 4 summarizes the estimated maximum daily emissions of pollutants occurring during the construction period.

As shown in Table 4, construction of the proposed project would not exceed the SDAPCD regional construction emission thresholds for daily emissions. Thus, the project construction would not conflict with the SIP, RAQS or AQMP, violate an air quality standard or contribute to an existing or projected violation, result in a cumulatively considerable increase in ozone or particulate matter emissions or expose receptors to substantial pollutant concentrations (thresholds a-d).

Table 4
Estimated Maximum Daily Construction Emissions

Construction Phase		Maximum Emissions (lbs/day)				
	ROG	NO_x	CO	SOx	PM_{10}	$PM_{2.5}$
2020 Maximum lbs/day	*4.7*	49.7	33.6	0.08	9.9	6.3
2021 Maximum lbs/day	*120.1*	*33.6*	*36.0*	*0.09*	*5.9*	2.6
City of San Diego Screening Thresholds	*137*	*100*	*550*	*250*	*100*	67
Threshold Exceeded 2017	**No**	**No**	**No**	**No**	**No**	**No**
Threshold Exceeded 2018	**No**	**No**	**No**	**No**	**No**	**No**

See Appendix for CalEEMod ver. 2016.3.2 computer model output for the demolition of existing development. Summer emissions shown.

Construction-Related Toxic Air Contaminant Impacts. The greatest potential for toxic air contaminant emissions would be related to diesel particulate emissions associated with heavy equipment operations during construction of the proposed project. According to South Coast Air Quality Management District (SCAQMD) methodology, health effects from carcinogenic air toxics are usually described in terms of "individual cancer risk". The California Office of Environmental Health Hazard Assessment (OEHHA) health risk guidance states that a residential receptor should be evaluated based on a 30-year exposure period. "Individual Cancer Risk" is the likelihood that a person exposed to concentrations of toxic air contaminants over a 70-year lifetime will contract cancer, based on the use of standard risk-assessment methodology. Given the short-term construction schedule, the proposed project would not result in a long-term (i.e., 30 or 70 year) exposure to a substantial source of toxic air contaminant emissions; and thus, would not be exposed to the related individual cancer risk. Therefore, no significant short-term toxic air contaminant impacts would occur during construction of the proposed project.

LONG-TERM REGIONAL (OPERATIONAL) IMPACTS

Regional Pollutant Emissions

Table 5 summarizes emissions associated with operation of the proposed project. Operational emissions include emissions from electricity consumption (energy sources), vehicle trips (mobile sources), area sources, landscape equipment and evaporative emissions as the structures are repainted over the life of the project. The majority of operational emissions are associated with vehicle trips to and from the project site. As shown in Table 5, the net change in emissions would not exceed the SDAPCD thresholds for ROG, NO_X, CO, SO_X, PM_{10} or $PM_{2.5}$. Therefore, the project's regional air quality impacts (including impacts related to criteria pollutants, sensitive receptors and violations of air quality standards per threshold c-d) would be less than significant.

Table 5
Estimated Operational Emissions

	Estimated Emissions (lbs/day)					
	ROG	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Proposed Project						
Area	12.9	0.4	36.6	0.01	0.2	0.2
Energy	0.09	0.8	0.3	0.01	0.06	0.06
Mobile	6.1	25.1	71.6	0.2	18.1	4.9
Maximum lbs/day	**19.1**	**26.3**	**108.6**	**0.22**	**18.3**	**5.2**
SDAPCD Thresholds	*137*	*100*	*550*	*250*	*100*	67
Threshold Exceeded?	**No**	**No**	**No**	**No**	**No**	**No**

See Appendix for CalEEMod ver. 2016.3.2 computer model output for the demolition of existing development. Summer emissions shown.

Objectionable Odors

The proposed project would involve the use of diesel powered construction equipment. Diesel exhaust may be noticeable temporarily at adjacent properties; however, construction activities would be temporary. The project does not include industrial or agricultural uses that are typically associated with objectionable odors. Therefore, impacts associated with objectionable odors (significance threshold e) would be less than significant.

Local Carbon Monoxide Emissions

As previously discussed, carbon monoxide is a colorless, odorless, poisonous gas that may be found in high concentrations near areas of high traffic volumes. CO emissions are a function of vehicle idling time, meteorological conditions, and traffic flow. The SDAB is in attainment of state and federal CO standards. The 1110 Beardsley Street monitoring site is the closest station to the project site that provides CO data. The maximum 8-hour average CO level recorded in 2012 (the last year data were recorded) was 1.81 parts per million (ppm). Concentrations are below the 9 ppm state and federal 8-hour standard.

Although CO is not a regional air quality concern in SDAB, elevated CO levels can occur at or near intersections that experience severe traffic congestion. A localized air quality impact is considered significant if the additional CO emissions resulting from the project create a "hot spot" where the California 1-hour standard of 20.0 ppm or the 8-hour standard of 9 ppm is exceeded. This can occur at severely congested intersections during cold winter temperatures. Screening for possible elevated CO levels is recommended for severely congested intersections experiencing levels of service E or F with project traffic where a significant project traffic impact may occur. The potential for CO hotspots is based on the University of California Davis CO Protocol defined in the Transportation Project-Level Carbon Monoxide Protocol Revised December 1997 UCD-ITS-RR-97. Section 4.7 of the protocol provides specific criteria for performing a screening level CO review for projects within a CO attainment area. Specifically, project-related traffic that would worsen the LOS at intersections operating at LOS E or F, would be subject to a detailed evaluation. If not, no further review is necessary.

The Traffic Access Analysis prepared for the project (Kimley-Horn and Associates, April 2018) stated that per City of San Diego significance thresholds, no significant direct or cumulative project impacts to study area intersections or roadway segments were calculated under existing, near-term cumulative or horizon year conditions. Thus, no mitigation measures are required. Based on these findings, receptors would not be exposed to substantial pollutant concentrations (threshold d) related to CO hotspots. No further evaluation with respect to CO hotspots is required.

SIP/AQMP/RAQS Consistency

As noted, the RAQS relies on information from CARB and SANDAG, including projected growth in the County, mobile, area and all other source emissions to project future emissions and determine from that the strategies necessary for the reduction of stationary source emissions through regulatory controls. Projects that propose development that is consistent with the growth anticipated by the general plan is consistent with the SIP, AQMP and RAQS. The proposed project involves the construction of 442 apartment units on a 5.38-acre site. The site is zoned CC-1-3. The proposed project is allowed in the CC-1-3 zone and as referenced, is governed by the New Century Centre Master Plan. The project is intended to provide housing and is expected to serve existing residents within the San Diego region. The project would be developed consistent with the approved master; and thus, would not induce growth or cause the population to increase beyond what is planned within the region. Operation of the proposed project would house residents within the region and is not expected to increase the local population. The project would be consistent with the SIP, AQMP and RAQS and significance threshold (a - air quality plans) referenced above. Impacts related to this threshold would be less than significant.

REFERENCES

California Air Resources Board. *Ambient Air Quality Standards.* Updated May 2016. http://www.arb.ca.gov/research/aaqs/aaqs2.pdf

California Air Resources Board, *San Diego Air Quality Management Plans*, December 2016 http://www.arb.ca.gov/planning/sip/planarea/sansip.htm

California Air Resources Board. *2014, 2015, & 2016 Annual Air Quality Data Summaries.* http://www.arb.ca.gov/adam/topfour/topfour1.php. Accessed May 30, 2017.

California Emission Estimator Model Users Guide. September 2016.

City of San Diego, *California Environmental Quality Act Significance Determination Thresholds*, Development Services Department, January 2011.

Kimley-Horn and Associates, Inc., Centrum 6 Access Analysis, April 2018.

San Diego Air Pollution Control District. *Smog in San Diego Fact Sheet*. January 2010.

San Diego Air Pollution Control District. *Regional Air Quality Strategy*, December 2016. http://www.sdapcd.org/content/dam/sdc/apcd/PDF/Air%20Quality%20Planning/2016%20RAQS.pdf.

University of California Davis, *Transportation Project-Level Carbon Monoxide Protocol Revised*, December 1997.

Appendix A

CalEEMod Air Emission Model Results –
Summer Emissions for Construction and Operation

Centrum 6 Apartment Project

San Diego Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Unenclosed Parking with Elevator	802.00	Space	7.22	320,800.00	0
Apartments Mid Rise	442.00	Dwelling Unit	11.63	554,640.00	1264

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	40
Climate Zone	13			**Operational Year**	2021
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

Project Characteristics -

Land Use - Default for builidng sqaure feet was overridden.

Construction Phase - Painting phase extended to reduce ROG emissions

Grading - Assumes 5.38 acre would be disturbed daily.

Area Coating - Assumes residential paint would be 150 g/L VOC per SDAPCD Rule 67.

Construction Off-road Equipment Mitigation -

Area Mitigation -

Water Mitigation -

Waste Mitigation -

Demolition -

Architectural Coating - SDAPCD Rule 67

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	150.00
tblArchitecturalCoating	EF_Residential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Residential_Interior	250.00	150.00
tblAreaMitigation	UseLowVOCPaintParkingCheck	False	True
tblConstructionPhase	NumDays	20.00	80.00
tblConstructionPhase	PhaseEndDate	7/14/2021	9/8/2021
tblConstructionPhase	PhaseStartDate	6/17/2021	5/20/2021
tblGrading	AcresOfGrading	75.00	5.38
tblGrading	AcresOfGrading	0.00	5.38
tblGrading	MaterialExported	0.00	760.00
tblLandUse	LandUseSquareFeet	442,000.00	554,640.00

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					
2020	4.5235	50.2470	32.5618	0.0926	18.9614	2.2069	21.1683	10.0786	2.0307	12.1093	0.0000	9,311.1080	9,311.1080	1.9475	0.0000	9,334.9521
2021	134.7736	28.6330	31.1855	0.0910	4.3983	1.0057	5.4040	1.1819	0.9454	2.1274	0.0000	9,156.3005	9,156.3005	0.9295	0.0000	9,179.5377
Maximum	**134.7736**	**50.2470**	**32.5618**	**0.0926**	**18.9614**	**2.2069**	**21.1683**	**10.0786**	**2.0307**	**12.1093**	**0.0000**	**9,311.1080**	**9,311.1080**	**1.9475**	**0.0000**	**9,334.9521**

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					
2020	4.5235	50.2470	32.5618	0.0926	7.5864	2.2069	9.7933	3.9823	2.0307	6.0130	0.0000	9,311.1080	9,311.1080	1.9475	0.0000	9,334.9521
2021	134.7736	28.6330	31.1855	0.0910	4.3983	1.0057	5.4040	1.1819	0.9454	2.1274	0.0000	9,156.3005	9,156.3005	0.9295	0.0000	9,179.5377
Maximum	**134.7736**	**50.2470**	**32.5618**	**0.0926**	**7.5864**	**2.2069**	**9.7933**	**3.9823**	**2.0307**	**6.0130**	**0.0000**	**9,311.1080**	**9,311.1080**	**1.9475**	**0.0000**	**9,334.9521**

	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**	**48.70**	**0.00**	**42.81**	**54.14**	**0.00**	**42.82**	**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	694.3477	13.6326	871.6120	1.5147		117.2746	117.2746		117.2746	117.2746	12,275.1050	5,213.8357	17,488.9406	11.3920	0.9655	18,061.4680
Energy	0.0970	0.8290	0.3528	5.2900e-003		0.0670	0.0670		0.0670	0.0670		1,058.3410	1,058.3410	0.0203	0.0194	1,064.6302
Mobile	5.2017	21.2668	61.5436	0.2118	17.7960	0.1721	17.9681	4.7564	0.1608	4.9172		21,501.5126	21,501.5126	1.1003		21,529.0193
Total	**699.6464**	**35.7284**	**933.5083**	**1.7317**	**17.7960**	**117.5137**	**135.3097**	**4.7564**	**117.5024**	**122.2588**	**12,275.1050**	**27,773.6893**	**40,048.7943**	**12.5125**	**0.9849**	**40,655.1175**

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	17.9131	0.4226	36.6270	1.9300e-003		0.2017	0.2017		0.2017	0.2017	0.0000	65.8357	65.8357	0.0641	0.0000	67.4380
Energy	0.0970	0.8290	0.3528	5.2900e-003		0.0670	0.0670		0.0670	0.0670		1,058.3410	1,058.3410	0.0203	0.0194	1,064.6302
Mobile	5.2017	21.2668	61.5436	0.2118	17.7960	0.1721	17.9681	4.7564	0.1608	4.9172		21,501.5126	21,501.5126	1.1003		21,529.0193
Total	**23.2118**	**22.5184**	**98.5233**	**0.2190**	**17.7960**	**0.4408**	**18.2368**	**4.7564**	**0.4296**	**5.1860**	**0.0000**	**22,625.6893**	**22,625.6893**	**1.1847**	**0.0194**	**22,661.0875**

	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	**96.68**	**36.97**	**89.45**	**87.36**	**0.00**	**99.62**	**86.52**	**0.00**	**99.63**	**95.76**	**100.00**	**18.54**	**43.50**	**90.53**	**98.03**	**44.26**

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	1/2/2020	1/29/2020	5	20	
2	Site Preparation	Site Preparation	1/30/2020	2/12/2020	5	10	
3	Grading	Grading	2/13/2020	3/25/2020	5	30	
4	Building Construction	Building Construction	3/26/2020	5/19/2021	5	300	
5	Paving	Paving	5/20/2021	6/16/2021	5	20	
6	Architectural Coating Phase	Architectural Coating	5/20/2021	9/8/2021	5	80	

Acres of Grading (Site Preparation Phase): 5.38

Acres of Grading (Grading Phase): 5.38

Acres of Paving: 7.22

Residential Indoor: 1,123,146; Residential Outdoor: 374,382; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 19,248 (Architectural Coating – sqft)

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	2	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	2	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 Phase	Air Compressors	1	6.00	78	0.48
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Grading	Scrapers	2	8.00	367	0.48

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	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	95.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	453.00	100.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating Phase	1	91.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Demolition - 2020

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					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	3.3121	33.2010	21.7532	0.0388		1.6587	1.6587		1.5419	1.5419		3,747.7049	3,747.7049	1.0580		3,774.1536
Total	**3.3121**	**33.2010**	**21.7532**	**0.0388**	**0.0000**	**1.6587**	**1.6587**	**0.0000**	**1.5419**	**1.5419**		**3,747.7049**	**3,747.7049**	**1.0580**		**3,774.1536**

3.2 Demolition - 2020

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	0.0550	0.0371	0.4252	1.2700e-003	0.1232	8.6000e-004	0.1241	0.0327	8.0000e-004	0.0335		126.4121	126.4121	3.7700e-003		126.5064
Total	**0.0550**	**0.0371**	**0.4252**	**1.2700e-003**	**0.1232**	**8.6000e-004**	**0.1241**	**0.0327**	**8.0000e-004**	**0.0335**		**126.4121**	**126.4121**	**3.7700e-003**		**126.5064**

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					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	3.3121	33.2010	21.7532	0.0388		1.6587	1.6587		1.5419	1.5419	0.0000	3,747.7049	3,747.7049	1.0580		3,774.1536
Total	**3.3121**	**33.2010**	**21.7532**	**0.0388**	**0.0000**	**1.6587**	**1.6587**	**0.0000**	**1.5419**	**1.5419**	**0.0000**	**3,747.7049**	**3,747.7049**	**1.0580**		**3,774.1536**

3.2 Demolition - 2020

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	0.0550	0.0371	0.4252	1.2700e-003	0.1232	8.6000e-004	0.1241	0.0327	8.0000e-004	0.0335		126.4121	126.4121	3.7700e-003		126.5064
Total	**0.0550**	**0.0371**	**0.4252**	**1.2700e-003**	**0.1232**	**8.6000e-004**	**0.1241**	**0.0327**	**8.0000e-004**	**0.0335**		**126.4121**	**126.4121**	**3.7700e-003**		**126.5064**

3.3 Site Preparation - 2020

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					18.6475	0.0000	18.6475	9.9939	0.0000	9.9939			0.0000			0.0000
Off-Road	4.0765	42.4173	21.5136	0.0380		2.1974	2.1974		2.0216	2.0216		3,685.1016	3,685.1016	1.1918		3,714.8975
Total	**4.0765**	**42.4173**	**21.5136**	**0.0380**	**18.6475**	**2.1974**	**20.8449**	**9.9939**	**2.0216**	**12.0155**		**3,685.1016**	**3,685.1016**	**1.1918**		**3,714.8975**

3.3 Site Preparation - 2020

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	0.0751	2.6502	0.6017	7.4400e-003	0.1660	8.4600e-003	0.1745	0.0455	8.0900e-003	0.0536		813.5103	813.5103	0.0717		815.3018
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	0.0661	0.0445	0.5102	1.5200e-003	0.1479	1.0400e-003	0.1489	0.0392	9.6000e-004	0.0402		151.6945	151.6945	4.5300e-003		151.8077
Total	**0.1411**	**2.6947**	**1.1120**	**8.9600e-003**	**0.3139**	**9.5000e-003**	**0.3234**	**0.0847**	**9.0500e-003**	**0.0938**		**965.2048**	**965.2048**	**0.0762**		**967.1095**

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					7.2725	0.0000	7.2725	3.8976	0.0000	3.8976			0.0000			0.0000
Off-Road	4.0765	42.4173	21.5136	0.0380		2.1974	2.1974		2.0216	2.0216	0.0000	3,685.1016	3,685.1016	1.1918		3,714.8975
Total	**4.0765**	**42.4173**	**21.5136**	**0.0380**	**7.2725**	**2.1974**	**9.4699**	**3.8976**	**2.0216**	**5.9192**	**0.0000**	**3,685.1016**	**3,685.1016**	**1.1918**		**3,714.8975**

3.3 Site Preparation - 2020

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	0.0751	2.6502	0.6017	7.4400e-003	0.1660	8.4600e-003	0.1745	0.0455	8.0900e-003	0.0536		813.5103	813.5103	0.0717		815.3018
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	0.0661	0.0445	0.5102	1.5200e-003	0.1479	1.0400e-003	0.1489	0.0392	9.6000e-004	0.0402		151.6945	151.6945	4.5300e-003		151.8077
Total	**0.1411**	**2.6947**	**1.1120**	**8.9600e-003**	**0.3139**	**9.5000e-003**	**0.3234**	**0.0847**	**9.0500e-003**	**0.0938**		**965.2048**	**965.2048**	**0.0762**		**967.1095**

3.4 Grading - 2020

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					6.2123	0.0000	6.2123	3.3308	0.0000	3.3308			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000		6,005.8653	6,005.8653	1.9424		6,054.4257
Total	**4.4501**	**50.1975**	**31.9583**	**0.0620**	**6.2123**	**2.1739**	**8.3862**	**3.3308**	**2.0000**	**5.3308**		**6,005.8653**	**6,005.8653**	**1.9424**		**6,054.4257**

3.4 Grading - 2020

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	0.0734	0.0495	0.5669	1.6900e-003	0.1643	1.1500e-003	0.1655	0.0436	1.0600e-003	0.0446		168.5494	168.5494	5.0300e-003		168.6752
Total	**0.0734**	**0.0495**	**0.5669**	**1.6900e-003**	**0.1643**	**1.1500e-003**	**0.1655**	**0.0436**	**1.0600e-003**	**0.0446**		**168.5494**	**168.5494**	**5.0300e-003**		**168.6752**

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					2.4228	0.0000	2.4228	1.2990	0.0000	1.2990			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000	0.0000	6,005.865 3	6,005.865 3	1.9424		6,054.425 7
Total	**4.4501**	**50.1975**	**31.9583**	**0.0620**	**2.4228**	**2.1739**	**4.5967**	**1.2990**	**2.0000**	**3.2990**	**0.0000**	**6,005.865 3**	**6,005.865 3**	**1.9424**		**6,054.425 7**

3.4 Grading - 2020

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	0.0734	0.0495	0.5669	1.6900e-003	0.1643	1.1500e-003	0.1655	0.0436	1.0600e-003	0.0446		168.5494	168.5494	5.0300e-003		168.6752
Total	**0.0734**	**0.0495**	**0.5669**	**1.6900e-003**	**0.1643**	**1.1500e-003**	**0.1655**	**0.0436**	**1.0600e-003**	**0.0446**		**168.5494**	**168.5494**	**5.0300e-003**		**168.6752**

3.5 Building Construction - 2020

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	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503		2,553.0631	2,553.0631	0.6229		2,568.6345
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**		**2,553.0631**	**2,553.0631**	**0.6229**		**2,568.6345**

3.5 Building Construction - 2020

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	0.3737	11.2758	2.8726	0.0274	0.6770	0.0552	0.7321	0.1949	0.0528	0.2477		2,940.400 8	2,940.400 8	0.2169		2,945.823 6
Worker	1.6623	1.1200	12.8407	0.0383	3.7213	0.0261	3.7474	0.9871	0.0241	1.0111		3,817.644 2	3,817.644 2	0.1140		3,820.494 0
Total	**2.0360**	**12.3958**	**15.7133**	**0.0657**	**4.3983**	**0.0813**	**4.4795**	**1.1819**	**0.0768**	**1.2588**		**6,758.045 0**	**6,758.045 0**	**0.3309**		**6,766.317 6**

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	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503	0.0000	2,553.063 1	2,553.063 1	0.6229		2,568.634 5
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**	**0.0000**	**2,553.063 1**	**2,553.063 1**	**0.6229**		**2,568.634 5**

3.5 Building Construction - 2020

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	0.3737	11.2758	2.8726	0.0274	0.6770	0.0552	0.7321	0.1949	0.0528	0.2477		2,940.400 8	2,940.400 8	0.2169		2,945.823 6
Worker	1.6623	1.1200	12.8407	0.0383	3.7213	0.0261	3.7474	0.9871	0.0241	1.0111		3,817.644 2	3,817.644 2	0.1140		3,820.494 0
Total	**2.0360**	**12.3958**	**15.7133**	**0.0657**	**4.3983**	**0.0813**	**4.4795**	**1.1819**	**0.0768**	**1.2588**		**6,758.045 0**	**6,758.045 0**	**0.3309**		**6,766.317 6**

3.5 Building Construction - 2021

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	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.363 9	2,553.363 9	0.6160		2,568.764 3
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**		**2,553.363 9**	**2,553.363 9**	**0.6160**		**2,568.764 3**

3.5 Building Construction - 2021

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	0.3024	10.1830	2.5950	0.0271	0.6770	0.0214	0.6984	0.1949	0.0205	0.2153		2,913.519 5	2,913.519 5	0.2082		2,918.724 0
Worker	1.5669	1.0180	12.0153	0.0370	3.7213	0.0257	3.7470	0.9871	0.0237	1.0107		3,689.417 2	3,689.417 2	0.1053		3,692.049 5
Total	**1.8693**	**11.2009**	**14.6103**	**0.0641**	**4.3983**	**0.0471**	**4.4453**	**1.1819**	**0.0441**	**1.2261**		**6,602.936 6**	**6,602.936 6**	**0.3135**		**6,610.773 5**

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	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.363 9	2,553.363 9	0.6160		2,568.764 3
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**	**0.0000**	**2,553.363 9**	**2,553.363 9**	**0.6160**		**2,568.764 3**

3.5 Building Construction - 2021

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	0.3024	10.1830	2.5950	0.0271	0.6770	0.0214	0.6984	0.1949	0.0205	0.2153		2,913.519 5	2,913.519 5	0.2082		2,918.724 0
Worker	1.5669	1.0180	12.0153	0.0370	3.7213	0.0257	3.7470	0.9871	0.0237	1.0107		3,689.417 2	3,689.417 2	0.1053		3,692.049 5
Total	**1.8693**	**11.2009**	**14.6103**	**0.0641**	**4.3983**	**0.0471**	**4.4453**	**1.1819**	**0.0441**	**1.2261**		**6,602.936 6**	**6,602.936 6**	**0.3135**		**6,610.773 5**

3.6 Paving - 2021

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	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.210 9	2,207.210 9	0.7139		2,225.057 3
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**		**2,207.210 9**	**2,207.210 9**	**0.7139**		**2,225.057 3**

3.6 Paving - 2021

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	0.0519	0.0337	0.3979	1.2300e-003	0.1232	8.5000e-004	0.1241	0.0327	7.8000e-004	0.0335		122.1661	122.1661	3.4900e-003		122.2533
Total	**0.0519**	**0.0337**	**0.3979**	**1.2300e-003**	**0.1232**	**8.5000e-004**	**0.1241**	**0.0327**	**7.8000e-004**	**0.0335**		**122.1661**	**122.1661**	**3.4900e-003**		**122.2533**

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	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235	0.0000	2,207.2109	2,207.2109	0.7139		2,225.0573
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**	**0.0000**	**2,207.2109**	**2,207.2109**	**0.7139**		**2,225.0573**

3.6 Paving - 2021

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	0.0519	0.0337	0.3979	1.2300e-003	0.1232	8.5000e-004	0.1241	0.0327	7.8000e-004	0.0335		122.1661	122.1661	3.4900e-003		122.2533
Total	**0.0519**	**0.0337**	**0.3979**	**1.2300e-003**	**0.1232**	**8.5000e-004**	**0.1241**	**0.0327**	**7.8000e-004**	**0.0335**		**122.1661**	**122.1661**	**3.4900e-003**		**122.2533**

3.7 Architectural Coating Phase - 2021

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	132.9325					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e-003		0.0941	0.0941		0.0941	0.0941		281.4481	281.4481	0.0193		281.9309
Total	**133.1514**	**1.5268**	**1.8176**	**2.9700e-003**		**0.0941**	**0.0941**		**0.0941**	**0.0941**		**281.4481**	**281.4481**	**0.0193**		**281.9309**

3.7 Architectural Coating Phase - 2021

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	0.3148	0.2045	2.4137	7.4400e-003	0.7475	5.1600e-003	0.7527	0.1983	4.7600e-003	0.2030		741.1412	741.1412	0.0212		741.6700
Total	**0.3148**	**0.2045**	**2.4137**	**7.4400e-003**	**0.7475**	**5.1600e-003**	**0.7527**	**0.1983**	**4.7600e-003**	**0.2030**		**741.1412**	**741.1412**	**0.0212**		**741.6700**

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	132.9325					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e-003		0.0941	0.0941		0.0941	0.0941	0.0000	281.4481	281.4481	0.0193		281.9309
Total	**133.1514**	**1.5268**	**1.8176**	**2.9700e-003**		**0.0941**	**0.0941**		**0.0941**	**0.0941**	**0.0000**	**281.4481**	**281.4481**	**0.0193**		**281.9309**

3.7 Architectural Coating Phase - 2021

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	0.3148	0.2045	2.4137	7.4400e-003	0.7475	5.1600e-003	0.7527	0.1983	4.7600e-003	0.2030		741.1412	741.1412	0.0212		741.6700
Total	**0.3148**	**0.2045**	**2.4137**	**7.4400e-003**	**0.7475**	**5.1600e-003**	**0.7527**	**0.1983**	**4.7600e-003**	**0.2030**		**741.1412**	**741.1412**	**0.0212**		**741.6700**

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	5.2017	21.2668	61.5436	0.2118	17.7960	0.1721	17.9681	4.7564	0.1608	4.9172		21,501.5126	21,501.5126	1.1003		21,529.0193
Unmitigated	5.2017	21.2668	61.5436	0.2118	17.7960	0.1721	17.9681	4.7564	0.1608	4.9172		21,501.5126	21,501.5126	1.1003		21,529.0193

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	2,939.30	2,824.38	2590.12	8,203,287	8,203,287
Unenclosed Parking with Elevator	0.00	0.00	0.00		
Total	2,939.30	2,824.38	2,590.12	8,203,287	8,203,287

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
Apartments Mid Rise	10.80	7.30	7.50	41.60	18.80	39.60	86	11	3
Unenclosed Parking with	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments Mid Rise	0.593936	0.041843	0.182569	0.108325	0.016436	0.005513	0.015940	0.023523	0.001912	0.001972	0.006090	0.000748	0.001193
Unenclosed Parking with Elevator	0.593936	0.041843	0.182569	0.108325	0.016436	0.005513	0.015940	0.023523	0.001912	0.001972	0.006090	0.000748	0.001193

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	0.0970	0.8290	0.3528	5.2900e-003		0.0670	0.0670		0.0670	0.0670		1,058.3410	1,058.3410	0.0203	0.0194	1,064.6302
NaturalGas Unmitigated	0.0970	0.8290	0.3528	5.2900e-003		0.0670	0.0670		0.0670	0.0670		1,058.3410	1,058.3410	0.0203	0.0194	1,064.6302

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					
Apartments Mid Rise	8995.9	0.0970	0.8290	0.3528	5.2900e-003		0.0670	0.0670		0.0670	0.0670		1,058.3410	1,058.3410	0.0203	0.0194	1,064.6302
Unenclosed Parking with Elevator	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
Total		**0.0970**	**0.8290**	**0.3528**	**5.2900e-003**		**0.0670**	**0.0670**		**0.0670**	**0.0670**		**1,058.3410**	**1,058.3410**	**0.0203**	**0.0194**	**1,064.6302**

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					
Apartments Mid Rise	8.9959	0.0970	0.8290	0.3528	5.2900e-003		0.0670	0.0670		0.0670	0.0670		1,058.3410	1,058.3410	0.0203	0.0194	1,064.6302
Unenclosed Parking with Elevator	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
Total		**0.0970**	**0.8290**	**0.3528**	**5.2900e-003**		**0.0670**	**0.0670**		**0.0670**	**0.0670**		**1,058.3410**	**1,058.3410**	**0.0203**	**0.0194**	**1,064.6302**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Residential Interior

Use Low VOC Paint - Residential Exterior

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

No Hearths Installed

	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	17.9131	0.4226	36.6270	1.9300e-003		0.2017	0.2017		0.2017	0.2017	0.0000	65.8357	65.8357	0.0641	0.0000	67.4380
Unmitigated	694.3477	13.6326	871.6120	1.5147		117.2746	117.2746		117.2746	117.2746	12,275.1050	5,213.8357	17,488.9406	11.3920	0.9655	18,061.4680

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	4.8152					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	11.9829					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	676.4346	13.2100	834.9850	1.5128		117.0729	117.0729		117.0729	117.0729	12,275.1050	5,148.0000	17,423.1050	11.3279	0.9655	17,994.0299
Landscaping	1.1149	0.4226	36.6270	1.9300e-003		0.2017	0.2017		0.2017	0.2017		65.8357	65.8357	0.0641		67.4380
Total	**694.3477**	**13.6326**	**871.6120**	**1.5147**		**117.2746**	**117.2746**		**117.2746**	**117.2746**	**12,275.1050**	**5,213.8357**	**17,488.9406**	**11.3920**	**0.9655**	**18,061.4680**

6.2 Area by SubCategory

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	4.8152					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	11.9829					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	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
Landscaping	1.1149	0.4226	36.6270	1.9300e-003		0.2017	0.2017		0.2017	0.2017		65.8357	65.8357	0.0641		67.4380
Total	**17.9131**	**0.4226**	**36.6270**	**1.9300e-003**		**0.2017**	**0.2017**		**0.2017**	**0.2017**	**0.0000**	**65.8357**	**65.8357**	**0.0641**	**0.0000**	**67.4380**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

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

Kimley»Horn

MEMORANDUM

To:	Ismail Elhamad City of San Diego
From:	David Park, P.E. Kimley-Horn and Associates, Inc.
Date:	April 18, 2018
Subject:	Centrum 6: Proposed Driveway at Lightwave Avenue Observation

This memorandum has been prepared to discuss the field observation findings for the proposed Centrum 6 driveway to be located 250-feet east of Kearny Villa Road on Lightwave Avenue.

Figure 1 shows the view from the proposed Centrum 6 driveway looking towards the T-intersection of Kearny Villa Road and Lightwave Avenue. As shown in the picture, there is clear sight visibility to the intersection. Drivers using the Centrum 6 driveway would be able to see vehicles turning onto Lightwave Avenue and be able to identify appropriate opportunities to turn onto Lightwave Avenue.

Figure 2 shows the view from the southbound left-turn lane at the intersection of Kearny Villa Road and Lightwave Avenue. Vehicles turning from Kearny Villa Road would have clear visibility of Lightwave Avenue and the proposed Centrum 6 driveway (located behind the construction sign). Vehicles would be able to identify vehicles turning into and out of the proposed Centrum 6 driveway and can you use either of the two eastbound lanes to navigate along Lightwave Avenue.

In addition to the proposed Centrum 6 driveway, field observation was conducted at a similar driveway just to the south of the project. The observed driveway is located on the south side of Spectrum Center Boulevard 250-feet east of Kearny Villa Road. Left-turns are permitted into and out of the driveway. No safety issues were observed with the location of the existing intersection.

In summary, vehicles exiting and approaching the proposed Centrum 6 driveway would have the sight visibility to negotiate the new driveway. Field observation from a similar driveway condition also did not exhibit any unsafe driving conditions. Therefore, we do not anticipate any inherent safety issues with the placing the Centrum 6 driveway at its proposed location.

Kimley»Horn

Figure 1: View of Kearny Villa Rd / Lightwave Ave intersection from proposed driveway

Figure 2: View of proposed driveway location from southbound left-turn lane on Kearny Villa Rd.

REPORT
PRELIMINARY GEOTECHNICAL INVESTIGATION

Sunroad Centrum 6
Spectrum Center Boulevard and Lightwave Avenue
San Diego, California

PREPARED FOR

Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, California 92121

PREPARED BY

NOVA Services, Inc.
4373 Viewridge Avenue, Suite B
San Diego, CA 92123

November 14, 2017
NOVA Project 1015310

NOVA

GEOTECHNICAL ■ MATERIALS ■ SPECIAL INSPECTIONS

SBE ■ SLBE ■ SCOOP

Mr. Craig Bachmann, Director of Construction
Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, California 92121

November 14, 2017
Project No. 1015310

Subject: Report
Preliminary Geotechnical Investigation
Sunroad Centrum 6
Spectrum Center Boulevard and Lightwave Avenue
San Diego, California

Dear Mr. Bachmann:

NOVA Services, Inc. (NOVA) is pleased to forward herewith the above-referenced report. Work related to this report was completed by NOVA for Sunroad Enterprises in accordance with your request.

NOVA appreciates the opportunity to provide construction and design services to Sunroad Enterprises on its projects. Should you have any questions regarding this report or other matters, please contact the undersigned at (858) 292-7575.

Sincerely,

NOVA Services, Inc.

Wail Mokhtar
Project Manager

Bryan Miller-Hicks, C.E.G. 1323
Senior Geologist

PROFESSIONAL GEOLOGIST
BRYAN MILLER-HICKS
No. 1323
CERTIFIED ENGINEERING GEOLOGIST
Exp. 5/31/19
STATE OF CALIFORNIA

John F. O'Brien, P.E., G.E.
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
JOHN F. O'BRIEN
651
expires 3-31-2019
GEOTECHNICAL
STATE OF CALIFORNIA

REPORT
PRELIMINARY GEOTECHNICAL INVESTIGATION

Sunroad Centrum 6
Kearny Villa Road and Lightwave Avenue, San Diego, California

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1.0 INTRODUCTION

1.1 Terms of Reference

1.1.1 General

This report provides recommendations for the design of foundations and development of permanent stormwater infiltration Best Management Practices (‘BMPs’) for the multi-family residential development now known as Sunroad Centrum 6. The work reported herein was completed by NOVA Services, Inc. (NOVA) for Sunroad Enterprises.

Sunroad Centrum 6 is sited on an undeveloped parcel located at the southeast corner of Kearny Villa Road and Lightwave Avenue in San Diego (hereafter, “the site”). Figure 1-1 depicts the site vicinity.

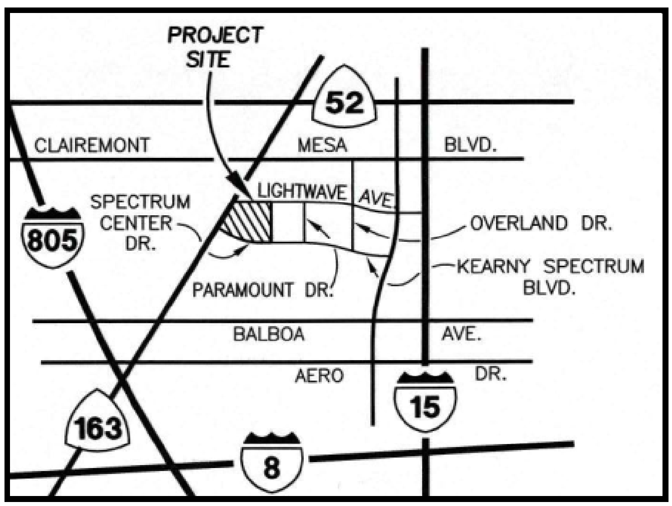


Figure 1-1. Vicinity Map

1.2 Objective, Scope, and Limitations of This Work

1.2.1 Objective

The objective of the work reported herein is twofold, namely: (i) to provide recommendations for the development of foundations for structures and related earthwork; and, (ii) to provide recommendations for siting and design of permanent stormwater infiltration Best Management Practices (‘BMPs’).

1.2.2 Scope

In order to accomplish this objective, NOVA undertook the scope of services as described below.

- Task 1, Background Review. Reviewed background data, principally prior site-specific geotechnical reporting, topographic maps, and geologic data. Preliminary development plans were reviewed. Structural design for the proposed development is not yet available.

- Task 2, Supplemental Infiltration Testing. Conducted infiltration testing at the design location of stormwater infiltration BMPs. This testing supplements similar work by NOVA in 2016.

- Task 3, Engineering Evaluations. Utilizing existing site data and information gained from coordination with the Architect, Structural Engineer, and Civil Engineer, NOVA completed engineering evaluations related to foundations and stormwater infiltration.

- Task 4, Reporting. Preparation of this report provides recommendations related to design and construction of foundations and permanent stormwater infiltration BMPs.

1.2.3 Limitations

The recommendations for design and construction included in this report are not final. These recommendations are developed by NOVA using judgment and opinion and based on the information available at the time of the report. NOVA can finalize its recommendations only by observing actual subsurface conditions revealed during construction. NOVA cannot assume responsibility or liability for the report's recommendations if NOVA does not perform construction observation.

This report does not address any environmental assessment or investigation for the presence or absence of hazardous, toxic or regulated materials in the soil, groundwater, or surface water within or beyond the site.

1.3 Understood Use of This Report

NOVA expects that the findings and recommendations provided herein will be utilized by the Design Team in certain decision-making regarding design and construction of the planned development.

NOVA's recommendations are based on our current understanding and assumptions regarding project development. Effective use of this report by the Design Team should include review by NOVA of the final design. Such review is important for both (i) conformance with the recommendations provided herein, and (ii) consistency with NOVA's understanding of the planned development.

1.4 Report Organization

The remainder of this report is organized as abstracted below.

- Section 2 reviews available project information.
- Section 3 describes field exploration by NOVA.
- Section 4 describes the surface and subsurface conditions.
- Section 5 reviews geologic and soil hazards that may affect the site.
- Section 6 provides recommendations for earthwork and foundation design.
- Section 7 discusses design and implementation of temporary shoring.
- Section 8 provides recommendations for development of pavements.
- Section 9 provides recommendations for development of stormwater infiltration BMPs.
- Section 10 provides a list of the principal references utilized in the development of the report.

Figures that directly support discussion in the text are embedded therein. Larger scale plots of subsurface information are provided as Plates immediately following the text of the report. The report is supported by five appendices. Appendix A provides guidance regarding the use and limitations of the report. Appendices B and E provide boring logs by NOVA and Geocon, respectively. Appendix C provides infiltration worksheets. Appendix D provides records of laboratory testing by NOVA.

2.0 PROJECT INFORMATION

2.1 Site Description

2.1.1 Location

The planned development will be located on an approximately three-acre parcel located at the southeast corner of the intersection of Kearney Villa Road and Lightwave Avenue in San Diego. Figure 2-1 depicts the location and limits of the site.

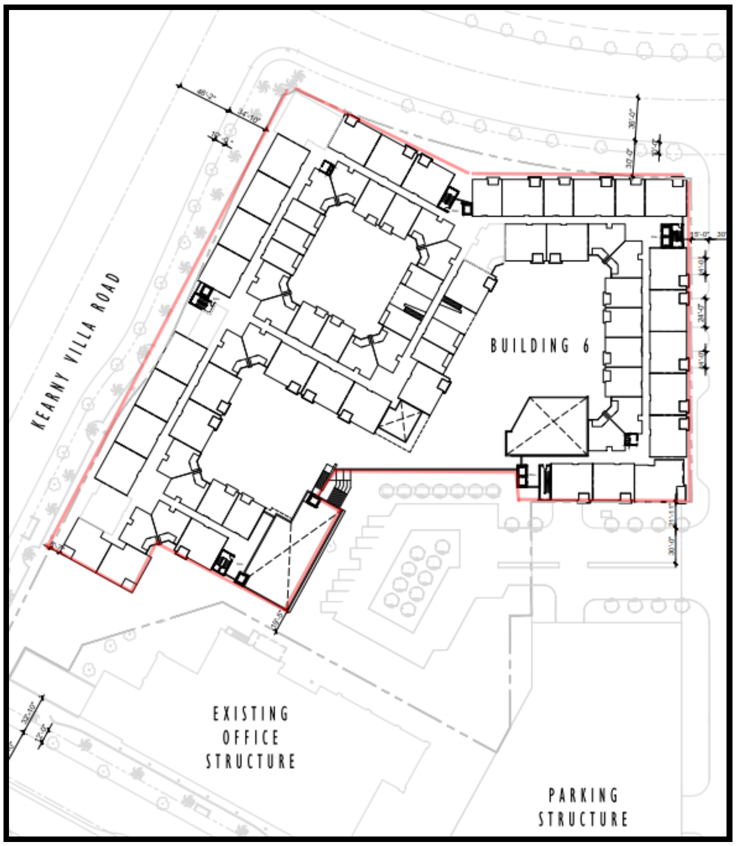


Figure 2-1. Site Location and Limits
(source: KTGY 2017)

2.1.2 Site Use

Current

The site itself is currently cleared and undeveloped. For the past several years the site has been used as a parking and materials staging area for construction in the near vicinity. Figure 2-2 (following page) provides a 2015 aerial view of the site showing the approximate limits of the planned residential development and its use as a construction support area.

Figure 2-2. Aerial Photo Depicting Current Site Use
(source: adapted from Google Earth 2015)

Historic

The site and the area around it were used by General Dynamics from the 1950’s until 1998 when the 232–acre site area was sold to Lennar Partners for development as a planned business community. When the site area was owned by General Dynamics, the property was used by its missile defense business unit until the company exited that business in 1992.

2.2 Planned Development

2.2.1 Architectural

NOVA’s understanding of current architectural planning for the development is based upon review of preliminary architectural documentation by KTGY Architects (reference, *Sunroad Centrum 6 & 7, Schematic Design*, KTGY Architects + Planners, 2017-0142, July 26, 2017 (hereafter, “KTGY 2017”)

Concept/feasibility level design by KTGY Architecture + Planning (KTGY) indicates that the 550-unit residential development will rise to seven levels above ground- about 85 feet above the surrounding ground. Four levels of apartment units will be developed atop three levels of parking for about 770 cars. The parking will include one level below grade. Figures 2-3 and 2-4 (following page) reproduce architectural graphics that depict the planned structure, including development of the structure above the parking deck.

Figure 2-3. Conceptual Development Plan
(source: KTGY 2017)

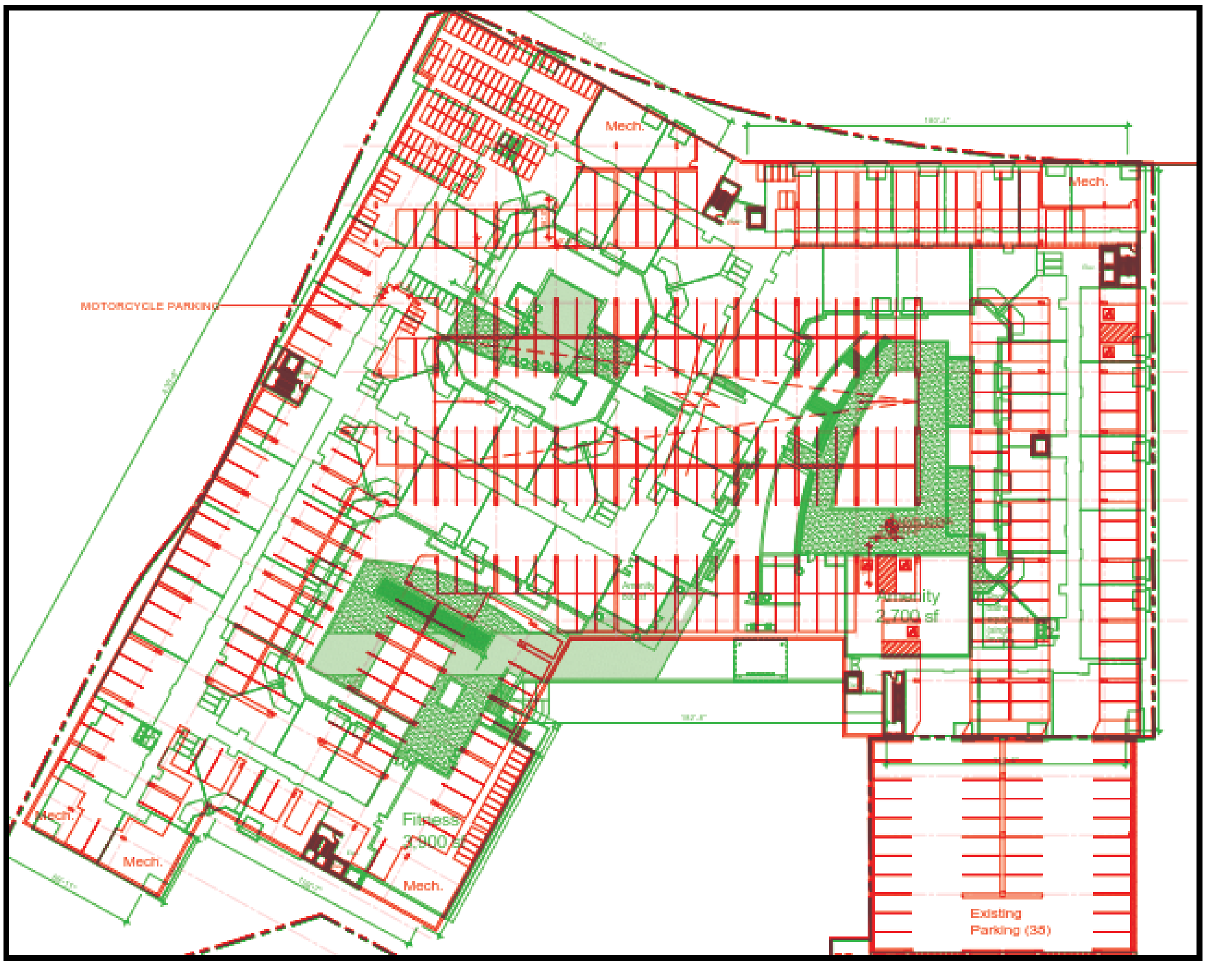


Figure 2-4. Extent of the Subterranean Level
(source: KTGY 2017)

2.2.2 Structural

Design is in preliminary stages. No detail regarding structural design is currently available.

Figure 2-5 provides an elevation view of the planned development. The structure will rise about 85 feet above the surrounding ground, with five levels of residential apartments set atop three levels of parking. A single below grade garage level is planned.

Though the structural design has not yet begun, NOVA expects that the apartments will be developed in 'Type III over Type I' construction. This design concept allows up to six levels (or 85 feet) of Type III wood framed structure to rise above a Type I reinforced concrete podium. NOVA thus expects that the garage levels will be constructed of reinforced concrete. The residential units above the garage will be wood framed, sitting atop a three-level reinforced concrete podium.

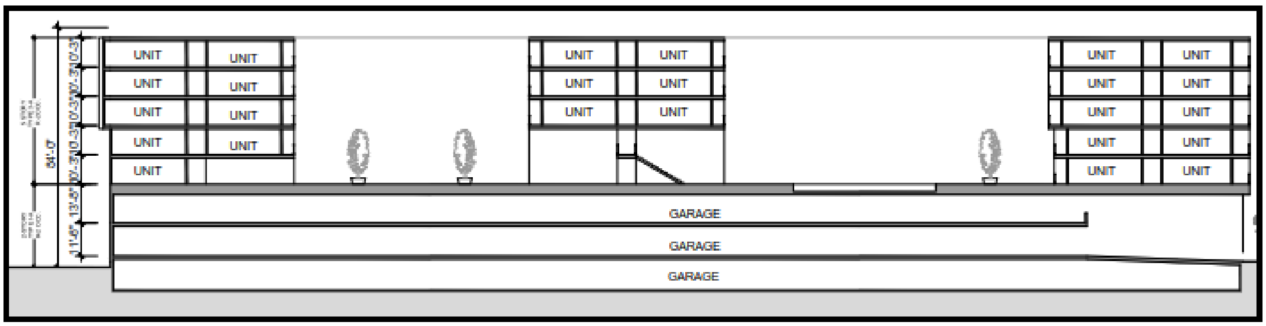


Figure 2-5. Elevation View
(source: KTGY 2017)

Similar structures have been founded on both post-tensioned and conventionally reinforced slab foundations. NOVA expects the average bearing stress across ground supported foundations of similar structures will be in the range of 600 to 800 pounds per square foot (psf). NOVA anticipates that maximum column loads will be on the order of 650 kips, to include about 550 kips dead load (DL).

2.2.3 Potential for Earthwork

The project will include substantial earthwork. Excavation to about 12 feet depth will be required across the limits of the subterranean parking garage.

2.2.4 Stormwater BMPs

Current planning for stormwater BMP's includes bioretention basins provided in the Storm Drain Plan provided by Stevens Cresto Engineering, Inc. (SCE 2016).

Planning also anticipates the use of several biofiltration areas. The areas are planned to be installed at the general locations depicted in Figure 3-2 (Section 3 of this report).

2.3 Previous Geotechnical Documentation

2.3.1 General

With the exception of site-specific infiltration testing conducted in as a part of Task 2 for this report, recommendations provided herein have been developed utilizing prior site-specific geotechnical reporting by NOVA and others. This reporting is listed in the following subsections.

2.3.2 Prior Reporting by Others

Geotechnical Investigation, Sunroad Spectrum Phase 1, Building Pads A, B, 1 Through 6, And Parking Structure, San Diego, CA, Geocon Inc., November 13, 2000 ("Geocon 2000").

Update Geotechnical Investigation, Sunroad Centrum, Spectrum Center Boulevard and Kearney Villa Road, San Diego, CA, Geocon Inc., Project No. 06505-22-02, Mar 22, 2005 ("Geocon 2005").

Geotechnical Investigation, Centrum 2, Spectrum Center Boulevard and Kearney Villa Road, San Diego, CA, Geocon Inc., Project No. 06505-52-04, Nov 22, 2010 ("Geocon 2010").

Additional Geotechnical Recommendations, Sunroad Centrum 2, Spectrum Center Boulevard and Kearny Villa Rd., San Diego, CA, Geocon Inc., November 23, 2011 ("Geocon 2011").

2.3.3 Prior Reporting by NOVA

Addendum Geotechnical Investigation, Sunroad Parking Structure, Spectrum Ctr. Boulevard & Kearney Villa Road, San Diego, California, NOVA Services, Inc., Project 2014116, February 25, 2014 ("NOVA 2014").

Report, Percolation-Infiltration Study, Centrum Place, Spectrum Ctr., Boulevard And Kearny Villa Road, NOVA Services, Inc., Project 1015310.1, May 27, 2016 ("NOVA 2016").

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Overview

Characterization of the subsurface within the limits of the planned Sunroad Centrum 6 development is developed in three series of site characterization, as described below.

1. Geocon 2005. The findings of a preliminary geotechnical investigation addressing different planning for use of the site is provided in *Update Geotechnical Investigation, Sunroad Centrum, San Diego, California*, Geocon Incorporated, Project 0605-22-02, March 22, 2005 (hereafter, 'Geocon 2005'). The work included borings extending to 60 feet below ground surface.

2. NOVA 2016. NOVA completed a series of six engineering borings and three percolation tests in April 2016. The scope of that work was focused towards assessment of infiltration and undertaken in recognition of work already reported in Geocon 2005, intending to supplement that information. The findings of the work are provided in *Report, Percolation-Infiltration Study, Centrum Place, Spectrum Ctr., Boulevard and Kearny Villa Road*, NOVA Services, Inc., Project 1015310.1, May 27, 2016 (hereafter, 'NOVA 2016').

3. NOVA 2017. Work related to Task 2 of this report included completion of percolation testing at the currently planned locations of stormwater infiltration BMPs.

The following subsections describe findings of each of the above studies.

3.2 Geocon 2005

Geocon 2005 reports the findings of a preliminary geotechnical investigation, addressing development of the site area for office towers and subterranean parking. The work reported in Geocon 2005 included borings and related laboratory testing within the limits of the planned Sunroad Centrum 6 development. The report incorporates the findings of previous subsurface exploration in the site area.

Table 3-1 abstracts the indications of the borings reported in Geocon 2005. Figure 3-1 (following page) describes the location of these borings relative to the planned Centrum 6 development. Plate 1, provided at the end of this report, depicts the locations of these borings in larger scale.

Table 3-1. Abstract of the Engineering Borings Reported in Geocon 2005

Boring Reference	Approximate Ground Surface Elevation (feet, msl)	Total Depth Below Ground Surface (feet)	Thickness of Fill (feet)
B-1A	+417	60	1
B-2A	+417	60	10
B-4	+416	14	4
B-4A	+417	45	1
B-5	+418	10	2
B-6	+416	11	2
B-7	+417	10	7
B-17	+417	10	2

Notes: No groundwater was encountered in any of the borings

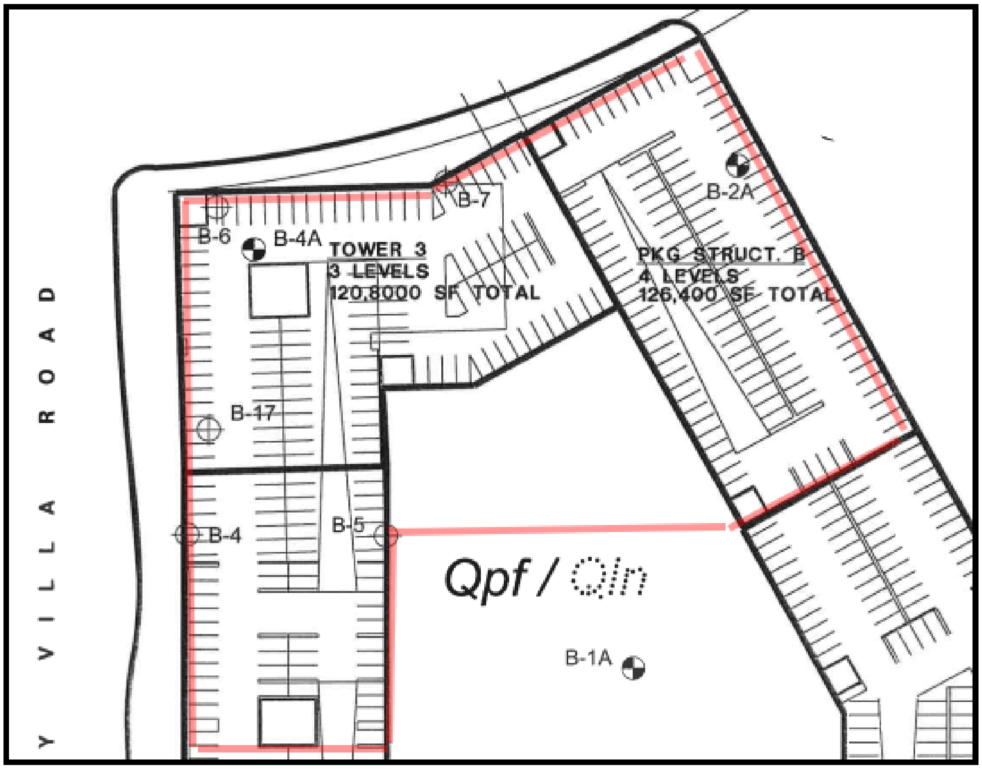


Figure 3-1. Location of 2005 Borings by Geocon
(source: Geocon 2005)

3.3 NOVA 2016 and NOVA 2017

3.3.1 General

NOVA conducted its field exploration in two events, as described below.

1. Event 1, April 27 and April 28, 2016. This work included six engineering borings (referenced as B-1 through B-6) and three percolation test borings (referenced as P-1 through P-3).

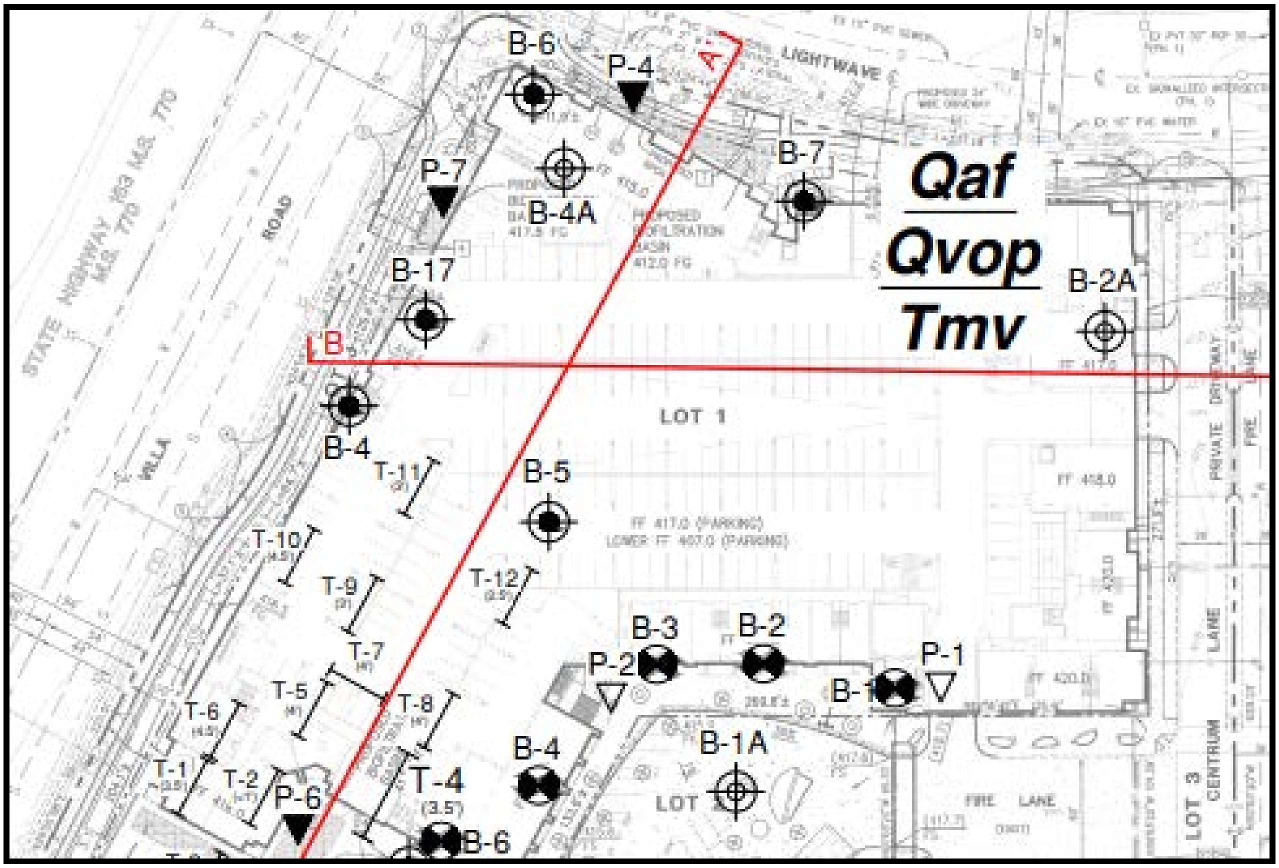
2. Event 2, November 9, 2017. Four percolation tests (referenced as P-4 through P-7) and a single engineering boring were completed.

The engineering borings and percolation/ infiltration borings in each event were completed by specialty subcontractors retained by NOVA, working under the continuous supervision of a NOVA geologist. The work by NOVA was completed in recognition of the work already completed and reported in Geocon 2005. Thus, the subsurface exploration was focused toward development of data in areas then planned for stormwater BMP's including bioretention basins and several biofiltration areas. The locations of engineering borings and related percolation testing were located as shown in Figure 3-2 (following page).

The following subsections describe the conduct of the engineering borings and percolation testing.

3.3.2 Engineering Borings

Engineering borings were advanced by a truck-mounted drilling rig utilizing hollow stem drilling equipment. Boring locations were determined in the field based on the proposed retention/biofiltration locations presented in Storm Drain Plan (SCE, 2016). The total depths of the engineering borings ranged from approximately 5.5 feet to 16 feet bgs.



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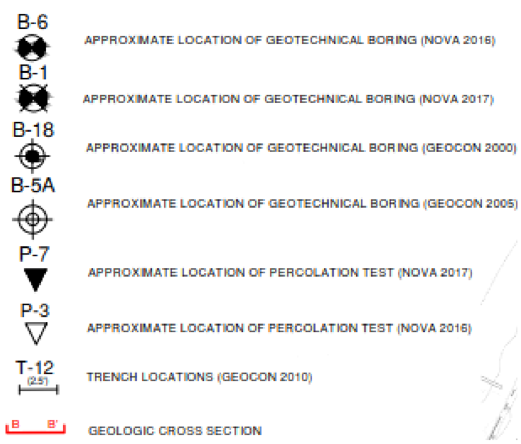

Figure 3-2. Locations of the Borings and Percolation Testing

Plates 1-3, provided immediately following the text of this report, depict the above information in larger scale.

Table 3-2 provides an abstract of the indications of the engineering borings by NOVA.

Table 3-2. Abstract of the Engineering Borings Reported in NOVA 2016

Boring Reference	Approximate Ground Surface Elevation (feet, msl)	Total Depth Below Ground Surface (feet)	Thickness of Artificial Fill (feet)
B-1	416	5.5	1
B-2	416	16	2
B-3	416	6.5	1
B-4	415.5	16	1
B-5	415.5	5.5	1
B-6	415.5	6.5	1

Notes:
1. No groundwater was encountered in any of the borings.
2. Very Old Paralic (Qvop8) deposits underlie the artificial fill.

The borings were completed under the direction of a geologist from NOVA who directed sampling and maintained a log of the subsurface materials that were encountered.

Soil samples recovered from the engineering borings were transferred to NOVA's geotechnical laboratory where a geotechnical engineer reviewed the soil samples and the field logs. Representative soil samples were selected and tested in NOVA's materials laboratory to check visual classifications and to determine pertinent engineering properties.

Both disturbed and relatively undisturbed samples were recovered from the borings, sampling of soils is described below.

1. The Modified California sampler ('ring sampler', after ASTM D 3550) was driven using a 140-pound hammer falling for 30 inches with a total penetration of 18 inches, recording blow counts for every 6 inches of penetration.

2. The Standard Penetration Test sampler ('SPT', after ASTM D 1586) was driven in the same manner as the ring sampler, recording blow counts in the same fashion. SPT blow counts for the final 12 inches of penetration comprise the SPT 'N' value, an index of soil consistency.

3. Bulk samples were recovered from the upper 5 feet of the subsurface, providing composite samples for testing of soil moisture and density relationships and corrosivity.

Logs of the borings are provided in Appendix B.

3.3.3 Percolation Testing

<u>General</u>

Due to design changes that relocated stormwater infiltration BMPs, NOVA completed an aggregate of seven percolation tests in two events, as described below.

1. <u>Event 1, April 2016</u>. Three (3) percolation tests, P-1 through P-3, were completed.
2. <u>Event 2, November 2011</u>. Four (4) percolation tests, P-4 through P-7, were completed.

Description of the Testing

All of the percolation testing was completed following recommendations presented in the County of San Diego BMP Design Manual. The locations of the tests are shown in Figure 3-2. Plate 2, provided at the end of the text of the report, shows these locations in larger scale.

Once the test borings were drilled to the design depth, the borings were converted to percolation wells by placing an approximately 2-inch layer of ¾-inch gravel on the bottom, then extending 3-inch diameter Schedule 40 perforated PVC pipe to the ground surface. The ¾-inch gravel was used to fill the annular space around the perforated pipe to at least 12-inches below existing finish grade to minimize the potential of soil caving.

The percolation test holes were pre-soaked before testing and immediately prior to testing. The pre-soak process consisted of filling the hole twice with water before testing. Water levels were recorded every 30 minutes for six hours (minimum of 12 readings), or until the water percolation stabilized after each reading, the water level was raised to close to the previous water level to maintain a near constant head before subsequent readings.

Summary of Results

Table 3-3 abstracts the indications of the percolation testing. Note that percolation rate is not infiltration rate. Discussion regarding infiltration rate and recommendations for design of stormwater infiltration BMPs is provided in Section 9.

Table 3-3. Abstract of the Percolation Testing by NOVA in April 2016 and November 2017

Date	Boring	Approx. Elevation (feet, msl)	Total Depth (feet)	Approximate Percolation Test Elev. (feet, msl)	Percolation Rate (in/hour) [2]	Subsurface Units Tested[1]
04/2016	P-1	+416	6	+410	.24	Qvop8
04/2016	P-2	+416	6.3	+409.7	.21	Qvop8
04/2016	P-3	+415.5	5.5	+410	1.20	Qvop8
11/2017	P-4	+413	5	+408	0.96	Qvop8
11/2017	P-5	+415	5	+410	0.96	Qafu
11/2017	P-6	+415	5	+410	0.48	Qvop8
11/2017	P-7	+413	5	+408	0.96	Qvop8

Notes:
1. The referenced geologic units are Old Paralic Deposits (Qvop8) and artificial fill (Qafu).
2. Readings for P-3 at 10-minute intervals due to high percolation rate.

Closure

At the conclusion of the percolation testing, the upper sections of the PVC pipe were removed and the resulting holes backfilled with soil cuttings to match the existing surfacing.

3.4 Laboratory Testing by Geocon 2005

3.4.1 Strength and Compressibility

In situ testing conducted in the borings reported in Geocon 2005 show that the naturally occurring sandstones that underlie the site are of high strength and low compressibility. These geologic units commonly refused the standard penetration test ('SPT', after ASTM D 1586) sampler, with SPT blow counts ('N') commonly greater than 100 blows per foot.

Geocon 2005 supplements the *in situ* testing with limited scope laboratory testing. Direct shear testing of sandstones and artificial fill from within the limits of the planned Centrum 6 building are tabulated in Table 3-4.

Table 3-4. Summary of the Direct Shear Testing Reported by Geocon 20005

Boring	Sample Depth (feet)	Dry Density (lb/ft^3)	Moisture Content (%)	Cohesion (lb/ft^2)	Friction Angle (°)	Subsurface Unit Tested[1,2]
B-1A	3	107	7	400	30	Qvop8
B-1A	9	111	14	144	36	Qvop8
B-2A	3	109	13	124	41	Qafu
B-4A	2	87	10	605	29	Qvop8
B-4A	8	104	14	572	30	Qvop8

Notes:
1. Qvop8 indicates Very Old Paralic Deposits.
2. Qafu indicates undocumented artificial fill, a soil sourced from the Qvop8 deposits

It should be noted that the data provided in Table 3-4 are conservative estimates of the shear strength of the geologic unit (i.e., Very Old Paralic, Qvop8) tested. The energy required to penetrate the drive sampling device (i.e., the Modified California sampler, ASTM D 3550) substantially diminishes the strength and stiffness of the samples recovered.

3.4.2 Chemical

Limited scope chemical testing was undertaken to assess the potential for sulfate attack to concrete. Table 3-5 summarizes this data.

Table 3-5. Summary of the Water Soluble Sulfate Testing Reported by Geocon 20005

Boring	Sample Depth (feet)	Water Soluble Sulfates (%)
B-1A	1	0.013
B-3A	5	0.050

3.5 Laboratory Testing by NOVA 2016

Soil samples recovered from the engineering borings were transferred to NOVA's geotechnical laboratory where a geotechnical engineer reviewed the soil samples and the field logs.

Representative soil samples were selected and tested in NOVA's materials laboratory to check visual classifications and to determine pertinent engineering properties. The laboratory program included visual classifications of all soil samples as well as gradation testing (ASTM D422) undertaken for the purposes of soil characterization.

Geologic logging of the borings indicates that the subsurface is dominated by sandstones of the Very Old Paralic Deposits Unit 8. Testing of uncemented/disturbed portions of the formation shows the formation to consist of silty fine to medium sands, 'SM' after ASTM D2487.

Table 3-6 summarizes the laboratory testing completed for NOVA 2016.

Table 3-6. Abstract of the Gradation Testing Reported in NOVA 2016

Boring	Sample Depth (feet)	Percent Passing U.S. No 200 Sieve (0.074 mm)	Soil Classification after ASTM D2487
1	5	20	SM
2	5	39	SM
2	6.5	27	SM
2	8	23	SM
2	9.5	18	SM
3	5	27	SM
4	5	22	SM
4	6.5	22	SM
4	8	26	SM
4	9.5	36	SM
4	11	37	SM
4	12.5	26	SM
4	14	26	SM

4.0 SITE CONDITIONS

4.1 Geologic Setting

4.1.1 Regional

The project area is located in the coastal portion of the Peninsular Range geomorphic province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California. The province varies in width from approximately 30 to 100 miles.

This area of the Province has undergone several episodes of marine inundation and subsequent marine regression (coastline changes) throughout the last 54 million years. These events have resulted in the deposition of a thick sequence of marine and nonmarine sedimentary rocks on the basement igneous rocks of the Southern California Batholith and metamorphic rocks.

Gradual emergence of the region from the sea occurred in Pleistocene time, and numerous wave-cut platforms, most of which were covered by relatively thin marine and nonmarine terrace deposits, formed as the sea receded from the land. Accelerated fluvial erosion during periods of heavy rainfall, along with the lowering of base sea level during Quaternary times, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms in western San Diego County.

4.1.2 Site Specific

The site is situated within the coastal plain zone of the Peninsular Ranges geomorphic province. The geology of the area is controlled by both alluvial and marine influences. This plain is underlain by near-shore marine sedimentary rocks deposited at various intervals from the late-Mesozoic era through the Quaternary period. The Coastal Plain increases in elevation from west to east across marine terrace surfaces uplifted during Pleistocene time. Sedimentary rocks consist of sandstones, siltstones, and claystones that were deposited during the Cretaceous, Tertiary, and Quaternary periods.

Geologic units encountered by the subsurface investigation include sandstones of the Very Old Paralic deposits (Qvop8) and Mission Valley Formation (Tmv). Figure 4-1 (following page) depicts the surface geology of the site area from which it can be seen that Very Old Paralic deposits (Qvop8) are mapped to occur widely as the surficial geologic formation in the site area.

The Very Old Paralic deposits are shallow marine and nonmarine (talus and slopewash) terrace deposits of early Pleistocene age. The Paralics were deposited on a currently-raised 6 mile-wide wavecut platform. Soils of this unit are typically consolidated, light brown to reddish brown, clean to silty, medium- to coarse-grained sand and gravels with localized interbeds of clayey sand and sandy clay (i.e., localized back-beach lagoonal deposits).

The paralics occur widely, found from the International Border to northern Carlsbad and comprising the dominant near-surface geologic formation in much of San Diego. The unit ranges to 65 feet in thickness but is generally less than 50 feet in thickness.

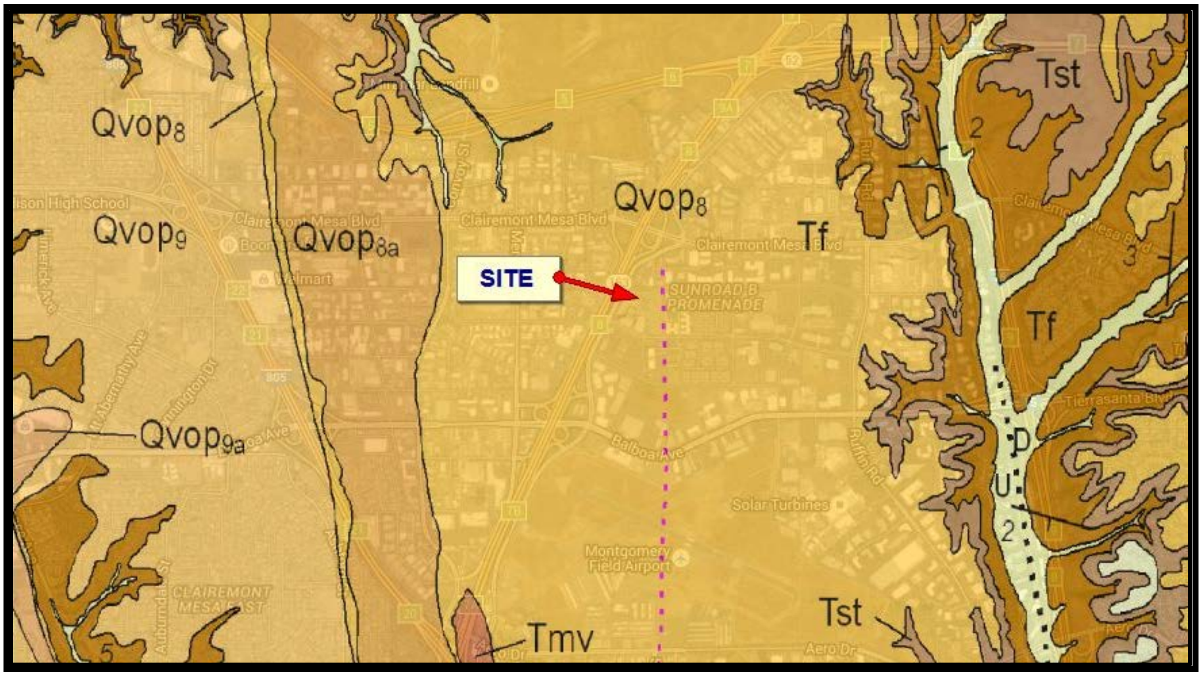

Figure 4-1. Geologic Map of the Site Vicinity

4.2 Site Conditions

4.2.1 Surface

The site area is cleared, covered with a thin veneer of fill and light grasses. Current surface elevations range from about +413 to +417 feet mean sea level (msl).

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Figure 4-2. Surface Conditions

4.2.2 Subsurface

Reporting by Geocon, confirmed by additional work by NOVA, indicates that the site is underlain by a sequence of fill and naturally occurring soils that may be characterized for the purposes of this report as below.

1. Unit 1a, Undocumented Fill (Qfu). The site is covered by a veneer of artificial fill typically less than three feet in thickness, though varying locally to as much as 10 feet. Tables 3-1 and 3-2 summarize the thickness of fill encountered at each of the borings.

   The fill occurs as a medium dense silty and clayey sand with varying amounts of gravel and cobbles, likely sourced from the Unit 2 Paralics. Records regarding placement of the fill are unavailable, such that the fill is considered ‘undocumented’- subject to wide variations in quality.

2. Unit 2, Very Old Paralics ($Qvop_8$). Formerly referenced as the Lindavista Formation, the Very Old Paralics include very dense silty sandstone with varying amounts of gravel and cobbles. As is discussed in Section 3, testing of uncemented/disturbed portions of the formation characterizes these materials as silty fine to medium sands, ‘SM’ after ASTM D2487. This unit is the likely source of the Unit 1 fill.

3. Unit 3, Mission Valley (Tmv). The Mission Valley Formation is expected to underlie Unit 2 at depths ranging from 17 to 21 feet below the existing ground surface. Soils of this unit are similar in nature to the soils of Unit 2- very dense silty and clayey sands with gravel and cobbles- but also includes interbeds of cemented materials (siltstone and sandstone).

The excavation for the subterranean parking level is expected to expose soils of both Unit 2 and Unit 3. These soils are suitable to support the structure. While these soils will be suitable to support the parking structure, excavation could locally be difficult.

4.2.3 Groundwater

Static

No groundwater was encountered in the borings by NOVA to a depth of 16.5 feet below ground surface (about El +400 feet msl). Geocon did not encounter groundwater in borings that extended to 60 feet below ground surface (to about El +355 feet msl).

Perched

Infiltrating storm water from prolonged wet periods can ‘perch’ atop localized zones of lower permeability soil that exist above the static groundwater level. Localized perched groundwater conditions may also develop once development completes and landscape irrigation commences.

No perched groundwater was observed during the work of NOVA 2016 or reported by others.

4.2.4 Surface Water

No surface water was evident on the site at the time of NOVA’s fieldwork. NOVA did not observe any visual evidence of seeps, springs, erosion, staining, discoloration, etc. that would indicate recent problems with surface water.

5.0 REVIEW OF GEOLOGIC AND SOIL HAZARDS

5.1 Overview

This section provides review of soil and geologic-related hazards common to this region of California, considering each for its potential to affect the planned development.

The primary hazards identified by this review are abstracted below.

1. Seismic. The site is at risk for moderate-to-severe ground shaking in response to a large-magnitude earthquake during the lifetime of the planned development. While there is no risk of liquefaction or related seismic phenomena, strong ground motion could affect the site. This circumstance is common to all civil works in this area of California.

2. Undocumented Fill. No records exist regarding the quality of the Unit 1 fill that covers the site. Moreover, site records discussed in Section 2 herein indicate the thickness of the fill varies widely. This fill is potentially compressible beneath shallow foundations.

The following subsections describe NOVA's review of soil and geologic hazards.

5.2 Geologic Hazards

5.2.1 Strong Ground Motion

The site is not located within a currently designated Alquist-Priolo Earthquake Zone. No known active faults are mapped on the site area. The nearest known active fault is the Rose Canyon fault system, located approximately 2 miles west of the site. This system has the potential to be a source of strong ground motion.

The seismicity of the site was evaluated utilizing a web-based analytical tool provided by the USGS. This evaluation shows the site may be subjected to a Magnitude 7 seismic event, with a corresponding risk-based Peak Ground Acceleration (PGA_M) of $PGA_M \sim 0.41$ g.

5.2.2 Seismic Safety Study

According to our review of the City of San Diego Seismic Safety Study (City of San Diego, 2008), the site is located within Hazard Category 51 corresponding to "level mesas - underlain by terrace deposits and bedrock; nominal risk".

5.2.3 Fault Rupture

No evidence of faulting was observed during NOVA's geologic reconnaissance of the site. No active faulting is otherwise mapped within the vicinity of the site. Because of the lack of known active faults on the site, the potential for surface rupture at the site is considered low. Shallow ground rupture due to shaking from distant seismic events is not considered a significant hazard, although it is a possibility at any site.

Figure 5-1 (following page) maps faults in the site vicinity.

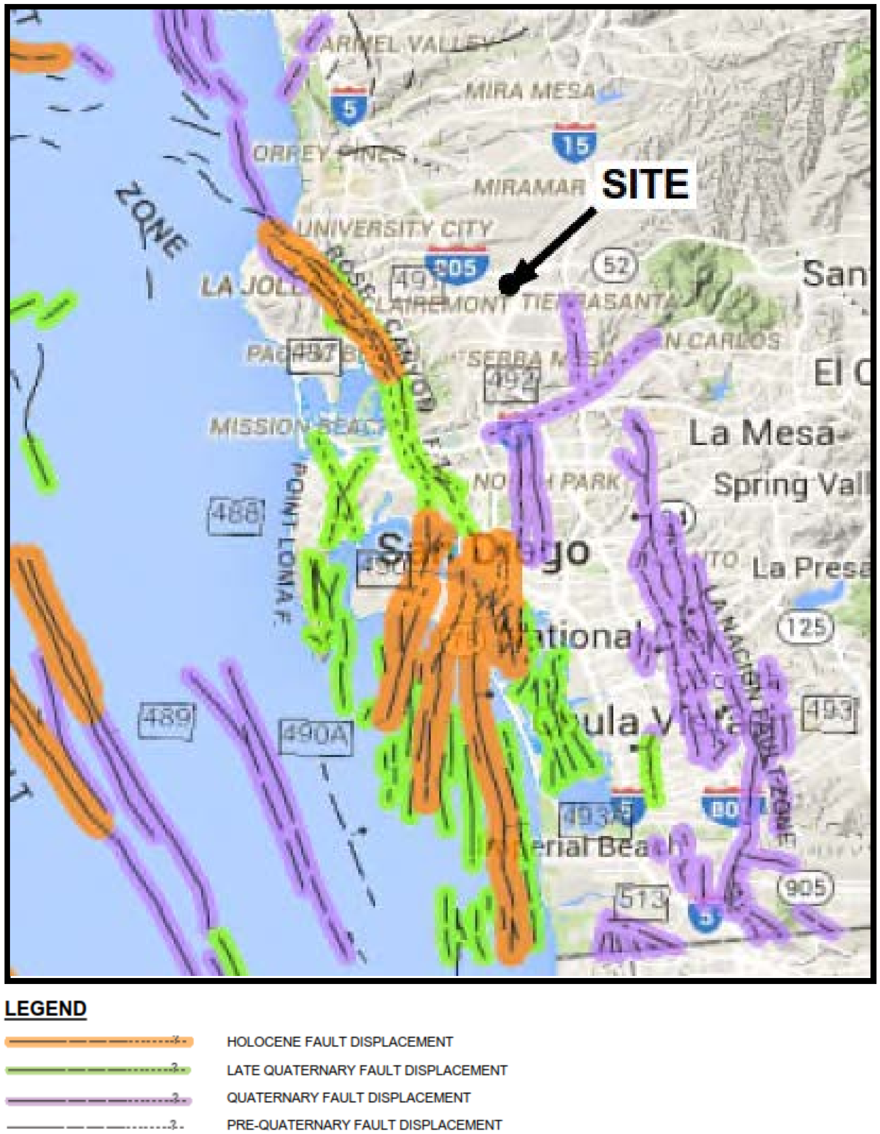


Figure 5-1. Faulting in the Site Vicinity

5.2.4 Landslide

As used herein, 'landslide' describes downslope displacement of a mass of rock, soil, and/or debris by sliding, flowing, or falling. Such mass earth movements are greater than about 10 feet thick and larger than 300 feet across. Landslides typically include cohesive block glides and disrupted slumps that are formed by translation or rotation of the slope materials along one or more slip surfaces.

The causes of classic landslides start with a preexisting condition- characteristically, a plane of weak soil or rock- inherent within the rock or soil mass. Thereafter, movement may be precipitated by earthquakes, wet weather, and changes to the structure or loading conditions on a slope (e.g., by erosion, cutting, filling, release of water from broken pipes, etc.).

In consideration of the level ground at and around the site, NOVA considers the landslide hazard at the site to be 'negligible' for the site and the surrounding area.

5.3 Soil Hazards

5.3.1 Embankment Stability

As used herein, 'embankment stability' is intended to mean the safety of localized natural or man-made embankments against failure. Unlike landslides described above, embankment stability can include smaller scale slope failures such as erosion-related washouts and more subtle, less evident processes such as soil creep.

No new slopes are planned as part of the future site development. There are no existing slopes on the site. There is no concern regarding embankment stability at this site.

5.3.2 Seismic

Liquefaction

'Liquefaction' refers to the loss of soil strength during a seismic event. The phenomenon is observed in areas that include geologically 'younger' soils (i.e., soils of Holocene age), shallow water table (less than about 60 feet depth), and cohesionless (i.e., sandy and silty) soils of looser consistency. The seismic ground motions increase soil water pressures, decreasing grain-to-grain contact among the soil particles, which causes the soils to lose strength.

Resistance of a soil mass to liquefaction increases with increasing density, plasticity (associated with clay-sized particles), geologic age, cementation, and stress history. The relatively finer grained, stiff/dense and geologically 'older' subsurface units at this site have no potential for liquefaction.

Seismically Induced Settlement

Apart from liquefaction, a strong seismic event can induce settlement within loose to moderately dense, unsaturated granular soils. The soils of Unit 2 and Unit 3 are sufficiently cemented, dense and finer grained that these soils will not be prone to seismic settlement.

Lateral Spreading

Lateral spreading is a phenomenon in which large blocks of intact, non-liquefied soil move downslope on a liquefied soil layer. Lateral spreading is often a regional event. For lateral spreading to occur, a liquefiable soil zone must be laterally continuous and unconstrained, free to move along sloping ground. Due to the absence of a potential for liquefaction and relatively flat surrounding topography, there is no potential for lateral spreading.

5.3.3 Expansive Soil

Expansive soils are characterized by their ability to undergo significant volume changes (shrinking or swelling) due to variations in moisture content¸ the magnitude of which is related to both clay content and plasticity index. These volume changes can be damaging to structures. Nationally, the annual value of real estate damage caused by expansive soils is exceeded only by that caused by termites.

As is discussed in Section 3, the soils have been characterized by testing to determine Expansion Index ('EI' after ASTM D 4829). Originally developed in Orange County in the 1960s, EI is a basic soil index property, comparable to indices such as the Atterberg limits of soils. The expansion index has been judged by ASTM "… *to have a greater range and better sensitivity of expansion potential than other indices...*" EI has been adopted by the 2013 California Building Code ('CBC', Section 1803.5.3) for characterization of expansive soils. The listing below tabulates the qualitative descriptors of expansion potential based upon EI.

Table 5-1. Qualitative Descriptors Of Expansion Potential Based Upon EI

Expansion Index ('EI'), ASTM D 4829	Expansion Potential, ASTM D 4829	Expansion Classification, 2013 CBC
0 to 20	Very Low	Non-Expansive
21 to 50	Low	Expansive
51 to 90	Medium	
91 to 130	High	
>130	Very high	

Geocon 2000 reports the findings of EI testing of three samples of the Unit 1 fill, determining EI= 8, EI = 0 and EI = 28 for three samples. Based upon the indications of this testing, as well as visual inspection of samples recovered by NOVA, the Unit 1 fill indicates 'very low' expansion potential.

5.3.4 Hydro-Collapsible Soils

Hydro-collapsible soils are common in the arid climates of the western United States in specific depositional environments- principally, in areas of young alluvial fans, debris flow sediments, and loess (wind-blown sediment) deposits. These soils are characterized by low *in situ* density, low moisture contents, and relatively high unwetted strength.

The soil grains of hydro-collapsible soils were initially deposited in a loose state (i.e., high initial 'void ratio') and thereafter lightly bonded by water sensitive binding agents (e.g., clay particles, low-grade cementation, etc.). While relatively strong in a dry state, the introduction of water into these soils causes the binding agents to fail. Destruction of the bonds/binding causes relatively rapid densification and volume loss (collapse) of the soil. This change is manifested at the ground surface as subsidence or settlement. Ground settlements from the wetting can be damaging to structures and civil works. Human activities that can facilitate soil collapse include irrigation, water impoundment, changes to the natural drainage, disposal of wastewater, etc.

The consistency and geologic age of the Unit 2 soils are such that these soils are not potentially hydro-collapsible.

5.3.5 Undocumented Fill

Records are not available regarding the placement of the Unit 1 fill, such that this fill is considered 'undocumented,' subject to wide variations in quality and potentially compressible.

Section 6 discusses design to adapt to the undocumented fill.

5.3.6 Corrosive Soils

Chemical testing of the near-surface soils indicates the soils contain low concentrations of soluble sulfates and chlorides. Section 6 addresses this consideration in more detail.

5.4 Other Hazards

5.4.1 Flood

The site is located within a FEMA-designated flood zone, Flood Map No. 06073C1610G dated May 16, 2012. The site area is designated “Zone X,” an area of minimal flood hazard. Figure 5-2 (following page) reproduces flood mapping by FEMA of the site area.

Figure 5-2. Flood Mapping of the Site Area
(source: adapted from FEMA Flood Map 06073C1610G, Revised May 16, 2012)

5.4.2 Tsunami

Tsunami describes a series of fast-moving, long period ocean waves caused by earthquakes or volcanic eruptions. The altitude and distance of the site from the ocean preclude this threat.

5.4.3 Seiche

Seiches are standing waves that develop in an enclosed or partially enclosed body of water such as lakes or reservoirs. Harbors or inlets can also develop seiches. Most commonly caused by strong winds and rapid atmospheric pressure changes, seiches can be affected by seismic events and tsunamis.

The site is not located near a body of water that could generate a seiche.

6.0 EARTHWORK AND FOUNDATIONS

6.1 Overview

6.1.1 General

Based upon the indications of the field and laboratory data developed for this site in Geocon 2005 and NOVA 2016, it is the opinion of NOVA that the site is suitable for development of the planned structure on shallow foundations provided the geotechnical recommendations described herein are followed.

As is discussed in Section 5, the planned structures may experience strong ground motions associated with a large magnitude earthquake. This hazard is common to all civil development in this area of California. Section 6.2 addresses seismic design parameters.

The undocumented fill- referenced herein as 'Unit 1'- is considered potentially compressible. Section 6.4 provides recommendations for management of undocumented fill by remedial grading.

6.1.2 Review and Surveillance

The subsections following provide geotechnical recommendations for the planned development as it is now understood. It is intended that these recommendations provide sufficient geotechnical information to develop the project in general accordance with 2016 California Building Code (CBC) requirements.

NOVA should be given the opportunity to review the grading plan, foundation plan, and geotechnical-related specifications as they become available to confirm that the recommendations presented in this report have been incorporated into the plans prepared for the project.

All earthwork related to site and foundation preparation should be completed under the observation of NOVA.

6.2 Seismic Design Parameters

6.2.1 Site Class

The Site Class was determined using site-specific boring data and geologic knowledge, with reference to ASCE 7-10, Table 20.3-1. Based on this information, the site is classified as Site Class C per ASCE 7-10, Table 20.3-1.

6.2.2 Seismic Design Parameters

Table 6-1 (following page) provides seismic design parameters for the site in accordance with 2016 CBC and mapped spectral acceleration parameters.

Table 6-1. Seismic Design Parameters, ASCE 7-10

Parameter	Value
Site Soil Class	C
Site Latitude (decimal degrees)	32.8283
Site Longitude (decimal degrees)	-117.141608
Site Coefficient, F_a	1.000
Site Coefficient, F_v	1.415
Mapped Short Period Spectral Acceleration, S_S	1.005
Mapped One-Second Period Spectral Acceleration, S_1	0.385
Short Period Spectral Acceleration Adjusted For Site Class, S_{MS}	1.005
One-Second Period Spectral Acceleration Adjusted For Site Class, S_{M1}	0.545
Design Short Period Spectral Acceleration, S_{DS}	0.670
Design One-Second Period Spectral Acceleration, S_{D1}	0.363

Source: U.S. Seismic Design Maps, found at http://earthquake.usgs.gov/designmaps/us/application.php

6.3 Corrosivity and Sulfates

6.3.1 General

Electrical resistivity, chloride content, and pH level are all indicators of the soil's tendency to corrode ferrous metals. Chemical testing was performed for Geocon 2000 on a representative sample of the near surface soils. The results of the testing reported by Geocon 2000 are tabulated in Table 6-2.

Table 6-2. Summary of Corrosivity Testing of the Near Surface Soil

Parameter	Units	Value
pH	standard unit	10.2
Resistivity	Ohm-cm	1,000
Water Soluble Chloride	Ppm	96
Water Soluble Sulfate	Ppm	170

6.3.2 Metals

Caltrans considers a soil to be corrosive if one or more of the following conditions exist for representative soil and/or water samples taken at the site:

- chloride concentration is 500 parts per million (ppm) or greater;
- sulfate concentration is 2,000 ppm (0.2%) or greater; or,
- the pH is 5.5 or less.

Based on the Caltrans criteria, the on-site soils would not be considered 'corrosive' to buried metals.

In addition to the above parameters, the risk of soil corrosivity buried metals is considered by determination of electrical resistivity (ρ). Soil resistivity may be used to express the corrosivity of soil only in unsaturated soils. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of DC electrical current from the metal into the soil. As the resistivity of the soil decreases, the corrosivity generally increases. A common qualitative correlation (cited in Romanoff 1989, NACE 2007) between soil resistivity and corrosivity to ferrous metals is tabulated below.

Table 6-3. Soil Resistivity and Corrosion Potential

Minimum Soil Resistivity (Ω-cm)	**Qualitative Corrosion Potential**
0 to 2,000	Severe
2,000 to 10,000	Moderate
10,000 to 30,000	Mild
Over 30,000	Not Likely

Despite the relatively benign environment for corrosivity indicated by pH and water-soluble chlorides, the resistivity testing suggests that design should consider that the soils may be moderately corrosive to embedded ferrous metals.

Typical recommendations for mitigation of such corrosion potential in embedded ferrous metals include:

- a high-quality protective coating such as an 18-mil plastic tape, extruded polyethylene, coal tar enamel, or Portland cement mortar;
- electrical isolation from above grade ferrous metals and other dissimilar metals by means of dielectric fittings in utilities and exposed metal structures breaking grade; and,
- steel and wire reinforcement within concrete having contact with the site soils should have at least 2 inches of concrete cover.

If extremely sensitive ferrous metals are expected to be placed in contact with the site soils, it may be desirable to consult a corrosion specialist regarding choosing the construction materials and/or protection design for the objects of concern.

6.3.3 Sulfate Attack

As shown in Table 6-2, the soil sample tested by Geocon indicated water-soluble sulfate (SO_4) content of 170 parts per million (‘ppm,’ 0.017% by weight). With $SO_4 < 0.10$ percent by weight, the American Concrete Institute (ACI) 318-08 considers a soil to have no potential (S0) for sulfate attack.

Table 6-4 (following page) reproduces the Exposure Categories considered by ACI.

Table 6-4. Exposure Categories and Requirements for Water-Soluble Sulfates

Exposure Category	Class	Water-Soluble Sulfate (SO_4) In Soil (percent by weight)	Cement Type (ASTM C150)	Max Water-Cement Ratio	Min. f'_c (psi)
Not	S0	$SO_4 < 0.10$	-	-	-
Moderate	S1	$0.10 \leq SO_4 < 0.20$	II	0.50	4,000
Severe	S2	$0.20 \leq SO_4 \leq 2.00$	V	0.45	4,500
Very severe	S3	$SO_4 > 2.0$	V + pozzolan	0.45	4,500

Adapted from: ACI 318-08, Building Code Requirements for Structural Concrete

6.3.4 Limitations

Testing to determine several chemical parameters that indicate a potential for soils to be corrosive to construction materials are traditionally completed by the Geotechnical Engineer, comparing test results with a variety of indices regarding corrosion potential.

Like most geotechnical consultants, NOVA does not practice in the field of corrosion protection, since this is not specifically a geotechnical issue. Should you require more information, a specialty corrosion consultant should be retained to address these issues.

6.4 Earthwork

6.4.1 General

As is noted in Section 2, no detailed structural or civil- related design information is available at this time. However, based upon the known condition of the site and the design concept that is currently considered, NOVA expects that earthwork will include (i) mass excavation for the parking garage; and, (ii) excavations for foundations and utilities.

Earthwork should be performed in accordance with Section 300 of the most recent approved edition of the "*Standard Specifications for Public Works Construction*" and "*Regional Supplement Amendments*."

6.4.2 Site Preparation

Prior to the start of earthwork, the site should be cleared of vegetation and related root systems, and existing pavement. The deleterious materials should be disposed of in approved off-site locations.

At the outset of site work, the Contractor should establish Construction Best Management Practices to prevent erosion of graded/excavated areas until such time as permanent drainage and erosion control measures have been installed. Any existing utilities which are to be abandoned should either be (i) excavated and the trenches backfilled; or, (ii) the lines completely filled with sand-cement slurry.

6.4.3 Compaction Requirements

All fill and backfill should be compacted to a minimum of 90 percent relative compaction after ASTM D1557 (the 'modified Proctor') following moisture conditioning to at least 2% above the optimum moisture content. Fill should be placed in loose lifts no thicker than the ability of the compaction equipment to thoroughly densify the lift. For most self-propelled construction equipment, this will limit loose lifts to on the order of 10-inches or less. Lift thickness for hand-operated equipment (tampers, walked behind compactors, etc.) will be limited to on the order of 4 inches or less.

6.4.4 Select Fill

Select Fill should be a mineral soil free of organics with the characteristics listed below:

- free of organics, with at least 40 percent by weight finer than ¼-inches in size and,
- maximum particle size of 3 inches; and,
- expansion index (EI) less than 50 (i.e., EI < 50, after ASTM D 4829).

Most of the Unit 1 fill that is now in place should conform to the above criteria.

6.4.5 Excavation Characteristics

The Unit 1 fill and Unit 2 Paralics will be readily excavated by earthwork equipment usual for developments of this nature. Locally, the sandstones of the Unit 3 Mission Valley Formation may require heavy ripping or special excavation techniques.

6.4.6 Remedial Grading

General

It is anticipated that most of Unit 1 undocumented fill at the site will be completely removed during excavation for the underground parking garage.

Where not removed from the foundation level in parking structure, the Unit 1 fill should be removed to contact with the level of the Unit 2 Paralics. This removal should extend at least five feet outside the building limits or to the property line, whichever is less. Thereafter, the excavated Unit 1 fill should be backfilled with either:

- Select Fill that conforms to the requirements described in Section 6.4.4; or,
- a controlled low strength material (CLSM, sometimes referenced as ‘flowable fill’).

Select Fill

This fill should be placed in loose lifts not to exceed 10 inches in loose thickness and compacted to at least at least 2% above optimum moisture content and 90 percent relative compaction after ASTM D 1557.

CLSM

Over excavated areas or other excavations can be backfilled up to the bottom of the design footing elevation with a CLSM that develops a minimum unconfined compressive strength of 40 psi. A two sack slurry mix should meet this criterion.

If employed, the CLSM should conform to material requirements identified in Section 19-3 of the Caltrans Standard Specifications (latest edition). The Caltrans specification for the gradation of CLSM aggregate is reproduced on below as Table 6-5 (following page).

Table 6-5. Gradation for CLSM Fill Aggregate

U.S. Standard Sieve Size (ASTM E 11)	Percent Passing by Weight, ¾ -inch Max
1½ inch	100
1 inch	80 to 100
¾ inch	60 to 100
3/8 inch	50 to 100
No. 4	40 to 80
No. 8	10 to 40

Source: Caltrans 2015, Section 19-3.02G

6.4.7 Maintenance of Moisture in Soils During Construction

The subgrade moisture condition of the building pad and foundation soils must be maintained at least 2% above optimum moisture content up to the time of concrete.

6.4.8 Trenching and Backfilling for Utilities

Excavation for utility trenches must be performed in conformance with OSHA regulations contained in 29 CFR Part 1926.

Utility trench excavations have the potential to degrade the properties of the adjacent soils. Utility trench walls that are allowed to move laterally will reduce the bearing capacity and increase settlement of adjacent footings and overlying slabs.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Backfill for utility trenches must be placed to meet the project specifications for the engineered fill of this project. Unless otherwise specified, the backfill for the utility trenches should be placed in 4 to 6 inch loose lifts and compacted to a minimum of 90 percent relative compaction after ASTM D 1557 (the 'modified Proctor') at soil moisture at least +2 percent of the optimum moisture content. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to 90 percent relative compaction with respect to the Modified Proctor.

Compaction testing should be performed for every 20 cubic yards of backfill placed or each lift within 30 linear feet of trench, whichever is less.

Backfill of utility trenches should not be placed with water standing in the trench. If granular material is used for the backfill, the material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material.

6.4.9 Flatwork

Prior to casting exterior flatwork, the upper two feet of subgrade soils should be removed and replaced with "Select" fill, moisture conditioned and recompacted, as recommended in Section 6.4.5. Concrete slabs for pedestrian traffic or landscaping should be at least four (4) inches thick.

6.5 Shallow Foundations

6.5.1 General

Shallow foundations (isolated spread or continuous) footings for support of the structure may be established following penetration of at least 12 inches into either Unit 2 or Unit 3. Foundation excavations for any at-grade portion of the structure will need to be deepened and extended at least 12 inches into either Unit 2 or Unit 3.

The following subsections detail recommendations for shallow foundations.

6.5.2 Conventionally Reinforced Concrete Slab

The ground level of the structure may employ conventional on-grade (ground-supported) slab. Conventionally reinforced on-grade concrete slabs may be designed using a modulus of subgrade reaction (k) of 140 pounds per cubic inch (i.e., k = 140 pci).

The actual slab thickness and reinforcement should be designed by the Structural Engineer. NOVA recommends the slab be a minimum 5 inches thick, reinforced by at least #3 bars placed at 16 inches on center each way within the middle third of the slabs by supporting the steel on chairs or concrete blocks ("dobies").

Minor cracking of concrete after curing due to drying and shrinkage is normal. Cracking is aggravated by a variety of factors, including high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due during curing. The use of low-slump concrete or low water/cement ratios can reduce the potential for shrinkage cracking.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or ‘weakened plane’ joints at frequent intervals. Joints should be laid out to form approximately square panels.

6.5.3 Conventional Foundations

Conventional foundations, consisting of isolated and continuous footings, may be employed as described below.

Isolated Foundations

Isolated foundations for interior columns may be designed for an allowable contact stress of 6,000 psf. This value may be increased by one-third for transient loads such as wind and seismic. These foundation units should have a minimum width of 30 inches, embedded a minimum of 24 inches below lowest adjacent grade, including a minimum embedment of 12 inches into either Unit 2 or Unit 3.

Continuous Foundations

Continuous foundations may be designed for an allowable contact stress of 6,000 psf, for footings with a minimum of 18 inches in width and embedded 24 inches below lowest adjacent grade with an overall minimum embedment of 12 inches into either the Unit 2 or Unit 3 soils. This bearing value may be increased by one-third for transient loads such as wind and seismic.

Resistance to Lateral Loads

Lateral loads to shallow foundations cast neatly against Unit 2 or Unit 3 sandstones may be resisted by passive earth pressure against the face of the footing, calculated as a fluid density of 400 psf per foot of depth, neglecting the upper 1 foot of soil below surrounding grade in this calculation. Additionally, a coefficient of friction of 0.35 between soil and the concrete base of the footing may be used with dead loads.

Settlement

If the building is supported as recommended above, it will settle on the order of 0.5 inch to 1 inch. This movement will occur elastically, as dead load (DL) and permanent live loads (LL) are applied. In usual circumstance, about 80% of this settlement will occur during the construction period. Angular distortion due to differential settlement of adjacent, unevenly loaded footings should be less than 1 inch in 40 feet (i.e., Δ./L less than 1:480).

6.5.4 Moisture Barrier

Capillary Break

NOVA recommends that the requirements for a capillary break ('sand layer') be determined in accordance with ACI Publication 302 "*Guide for Concrete Floor and Slab Construction*." A "capillary break" may consist of a 4-inch thick layer of compacted, well-graded sand should be placed below the floor slab. This porous fill should be clean coarse sand or sound, durable gravel with not more than 5 percent coarser than the 1-inch sieve or more than 10 percent finer than the No. 4 sieve, such as AASHTO Coarse Aggregate No. 57.

Vapor Barrier

Membranes set below floor slabs should be rugged enough to withstand construction. If a vapor barrier is desired, a minimum 15-mil polyethylene membrane should be placed over the porous fill to preclude floor dampness.

NOVA recommends that a minimum 15-mil low permeance vapor membrane be used. For example, Carlisle-CCW produces the Blackline 400® underslab, vapor and air barrier, a 15-mil low-density polyethylene (LDPE) rated at 0.012 perms after ASTM E 96.

Limitations of This Recommendation

Recommendation for moisture barriers are traditionally included with geotechnical foundation recommendations, though these requirements are primarily the responsibility of the Structural Engineer or Architect.

If there is particular concern regarding moisture sensitive materials or equipment to be placed above the slab-on-grade, a qualified person (for example, such as the flooring subcontractor and/or Structural Engineer) should be consulted to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. NOVA does not practice in the field of moisture vapor transmission evaluation since this is not specifically a geotechnical issue.

6.6 Deep Foundations

6.6.1 General

In the event foundations for Centrum 6 are located adjacent to and above the base of the existing subterranean garage, the potential for these loads to affect the garage walls must be considered. The existing garage extends 3-levels below surrounding grade. Additionally, NOVA anticipates that there could be as much as 40 feet of backfill behind the subterranean retaining walls.

In the event it is considered that new foundations will overload the garage walls or in concern for compressible backfill, alternatives for design will include either (i) deepening foundations in order to not surcharge the walls of the existing parking structure; or, (ii) transferring column loads to depth by use of deep foundations.

6.6.2 Drilled Piles

Drilled piles (also referenced as 'cast-in-drilled-hole' piles, or 'CIDH piles') should be extended through the fill/backfill and be embedded at least five pile diameters into Unit 2 or Unit 3 below the base of the garage.

NOVA estimates that 24-inch diameter; 40-foot long drilled piles founded in formational soils will develop allowable axial capacities on the order of 200 kips at that level. Tensile capacities will be on the order of 60 kips per pile. The allowable lateral resistance will be on the order of 15 kips/pile, assuming fixed head design conditions and that piles within groups are spaced a minimum of three pile diameters (3D) center to center.

The foregoing is provided as general guidance for consideration of drilled piles. NOVA should provide specific design analyses in the event drilled piles are employed.

6.7 Control of Moisture Around Foundations

6.7.1 General

Design for the structure should include care to control accumulations of moisture around and below foundations. Such design will require coordination from among the Design Team; at a minimum to include the Architect, the Civil Engineer, and the Landscape Architect.

6.7.2 Erosion and Moisture Control During Construction

Surface water should be controlled during construction, via berms, gravel/sandbags, silt fences, straw wattles, siltation basins, positive surface grades, or other methods to avoid damage to the finish work or adjoining properties. The Contractor should take measures to prevent erosion of graded areas until such time as permanent drainage and erosion control measures have been installed. After grading, all excavated surfaces should exhibit positive drainage and eliminate areas where water might pond.

6.7.3 Design

<u>General</u>

Civil, structural, architectural and landscaping design for the areas around foundations should be undertaken with a view to the maintenance of an environment that encourages constant moisture conditions in the foundation soils following construction. Roof and surface drainage, landscaping, and utility connections should be designed to limit the potential for infiltration and/or releases of moisture beneath structures. This care should, at a minimum, include the actions described below.

Drainage

Rainfall to roofs should be collected in gutters and discharged in a controlled manner through downspouts designed to drain away from foundations. Downspouts, roof drains or scuppers should discharge into splash blocks to slabs or paving sloped away from buildings.

Surface Grades

Proper surface drainage will be required to minimize the potential of water seeking the level of the bearing soils under foundations and pavements. In areas where sidewalks or paving do not immediately adjoin the structure, protective slopes should be provided with a minimum grade (away from the structure) of approximately 3 percent for at least 5 feet from perimeter walls. A minimum gradient of 1 percent is recommended in hardscape areas. Drainage should be directed to approved drainage facilities.

6.7.4 Utilities

Design for Differential Movement

Underground piping within or near structures should be designed with flexible couplings to accommodate both ground and slab movement so that minor deviations in alignment do not result in breakage or distress. Utility knockouts should be oversized to accommodate the potential for differential movement between foundations and the surrounding soil.

Backfill Above Utilities.

Excavations for utility lines, which extend under or near structural areas should be properly backfilled and compacted. Utilities should be bedded and backfilled with approved granular soil to a depth of at least one foot over the pipe. This backfill should be uniformly watered and compacted to a firm condition for pipe support. Backfill above the pipe zone should meet the requirements for Select Fill, placed to at least 90% relative compaction at 2% above optimum.

6.8 Retaining Walls

6.8.1 General

As is discussed in Section 2, only conceptual design information is currently available. The following subsections provide guidance for design of cantilevered retaining walls should planning change and such retaining structures be employed.

6.8.2 Shallow Foundations

Retaining walls should be developed on ground prepared in accordance with the criteria provided in Section 6.4. Continuous shallow foundations may be designed in accordance with the criteria provided in Section 6.5.

6.8.3 Lateral Earth Pressures

Static

Design may include smaller conventionally reinforced concrete retaining walls. Lateral earth pressures for wall design are provided on Table 6-6 as equivalent fluid weights, in psf/foot of wall height or pounds per cubic foot (pcf).

Table 6-6. Lateral Earth Pressures

Loading Condition	**Equivalent Fluid Density (pcf) for Approved Backfill[A, B]**
Active (wall movement allowed)	35
"At Rest" (no wall movement)	60
'Passive" (wall movement toward the soils)	250

Note A: 'approved' means Select Fill with EI < 50 after ASTM D4829 and approved by the Geotechnical Engineer.
Note B: assumes wall includes appropriate drainage.

Vehicle Surcharge Loads

Where the retaining walls are subject to vehicle surcharge load an additional 30 pcf should be added to the lateral earth pressures.

Seismic

The lateral seismic pressure acting on a cantilevered retaining wall should be applied as an inverted triangle with a magnitude of 19H, where H is the free height of the wall. The resultant dynamic thrust acts at a distance of 0.6H above the base of the wall. This equation applies to level backfill and walls that retain no more than 15 feet of soil.

6.8.4 Foundation Uplift

A soil unit weight of 125 pcf may be assumed for calculating the weight of soil over the wall footing.

6.8.5 Resistance to Lateral Loads

Lateral loads to wall foundations will be resisted by a combination of frictional and passive resistance as described below.

- Frictional Resistance. A coefficient of friction of 0.35 between the soil and base of the footing.

- Passive Resistance. Passive soil pressure against the face of footings or shear keys cast neat against Unit 2 or Unit 3 will accumulate at an equivalent fluid weight of 350 pounds per cubic foot (pcf). The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in calculations of passive resistance.

6.8.6 Wall Drainage

The recommended equivalent fluid pressures provided in the preceding subsection assume that constantly functioning drainage systems are installed between walls and soil backfill to prevent the uncontrolled buildup of hydrostatic pressures and lateral stresses in excess of those stated.

Design for wall drainage may include the use of pre-engineered wall drainage panels or a properly compacted granular free-draining backfill material (EI <50). 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.

Figure 6-1 provides a conceptual design for wall drainage. Numerous alternatives are available for collection of water behind retaining walls. The intent of this Figure 6-1 is to depict the concepts described in the preceding paragraph.

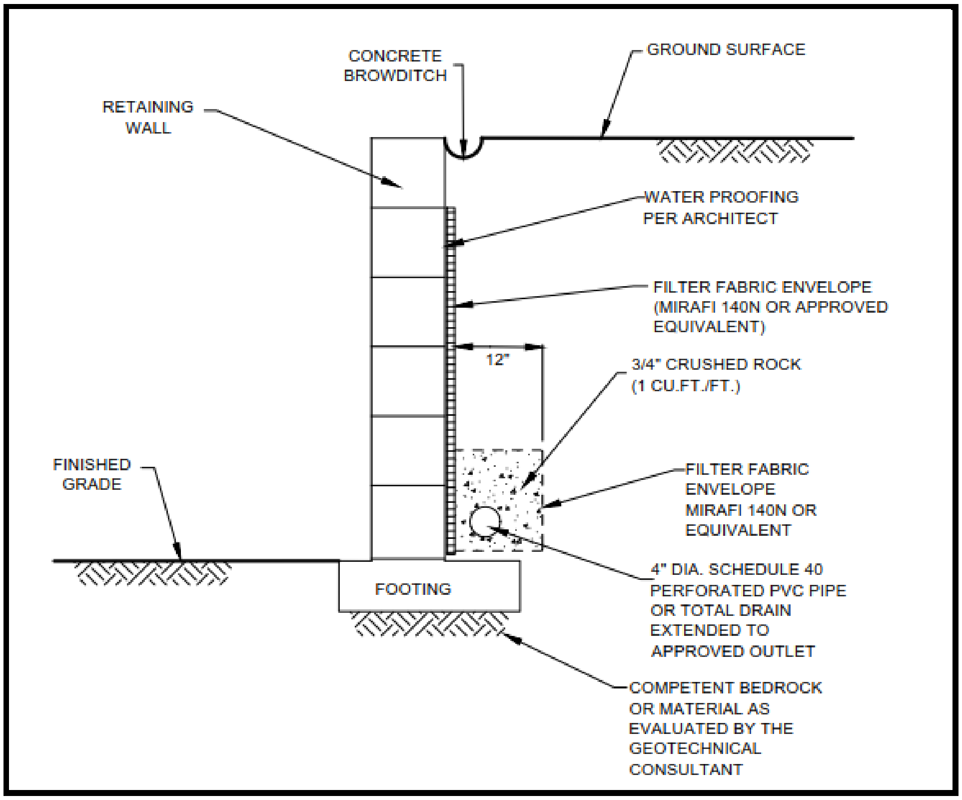


Figure 6-1. Conceptual Design for Wall Drainage

6.9 Wall Surcharge by Biofiltration Basins

Design for stormwater infiltration BMPs may employ the use of the biofiltration basins- ground supported and embedded structures that exfiltrate through a base. The design is not yet finalized. However, in the north and west of the structure, these basins may be sited adjacent to walls for the subterranean level, founded at about elevation +408 feet msl and rising to the ground surface at about El +416 feet msl. Figure 6-1 (following page) depicts preliminary planning for alignment of the structures.

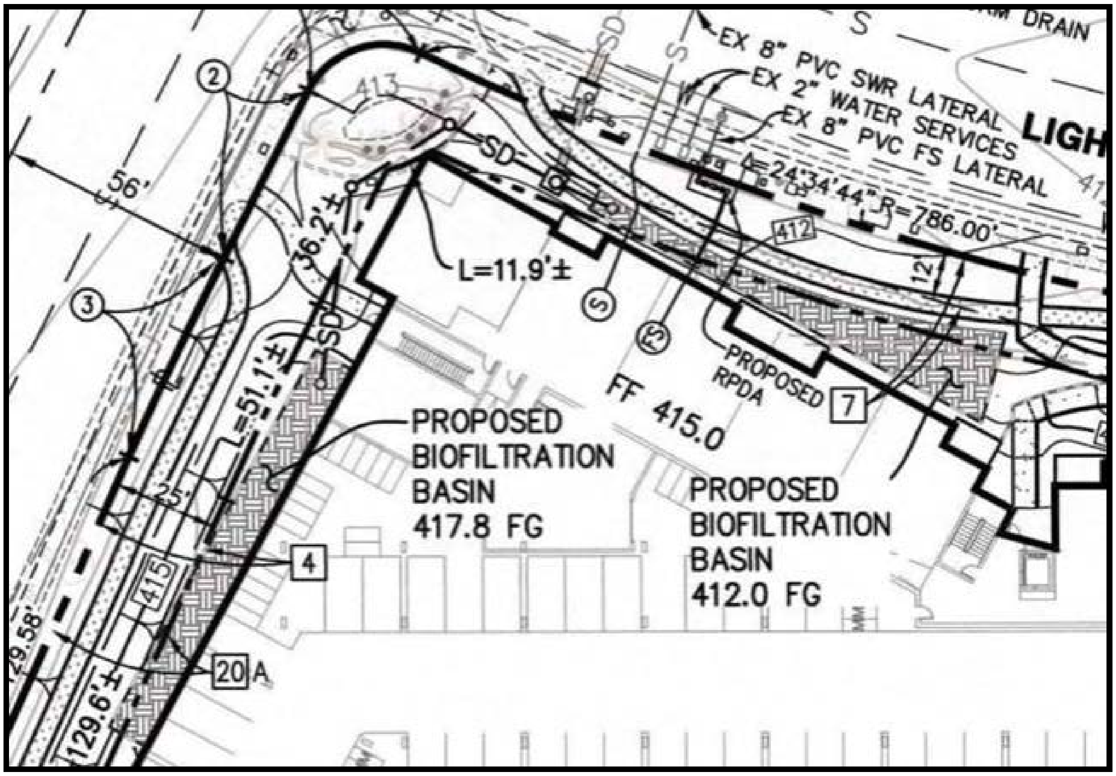


Figure 6-2. Preliminary Planning for Alignment of Biofiltration Basins

The biofiltration structures will retain both soil and water. Retained water may rise to at or near the top of the biofiltration basin. Additionally, exfiltration may saturate the ground beneath the basins. In consideration of this potential, design for subterranean walls in the vicinity of the biofiltration basins should include allowance for full hydrostatic pressure from the top of the biofiltration basin to the base of the wall. No new soil loads will be applied. Soil pressures should be considered as described in Section 6.8

6.10 Elevator Pits

Though retaining walls are not planned, it is possible that an elevator pit may be necessary.

Walls for an elevator pit should be designed in accordance with the recommendations provided in Section 6.7 for retaining walls. The elevator slab and related retaining wall footings will derive support from the Unit 2 soils that will be exposed in an excavation for the elevator pit.

Design for the elevator pit walls should add care that considers the circumstances and conditions described below.

1. Wall Yield. NOVA expects that proper function of the elevator pit should not allow yielding of the elevator pit walls. As such, walls should be designed to resist 'at rest' lateral soil pressures plus the surcharge of any structures or foundations surrounding the elevator pit.

2. Construction. By virtue of a usual location near the center of the structure, the need for special equipment, and the likelihood that elevator pit construction will precede much of the construction around it, design of elevator pit walls should include consideration for surcharge conditions that will occur during construction. Such conditions may include, but not be limited to, surcharges

from vehicle traffic and sloping ground above and around the walls.

3. Moisture. NOVA recommends that consideration be given to passive side waterproofing to prevent moisture accumulation inside the elevator pit.

4. Piston. If the elevator pit includes a plunger-type elevator piston, a deeper drilled excavation may be required. NOVA should be consulted regarding recommendations for development of a plunger-type elevator piston.

6.11 Temporary Slopes

Temporary slopes may be required for excavations during grading. All temporary excavations should comply with local safety ordinances. The safety of all excavations is solely the responsibility of the Contractor and should be evaluated during construction as the excavation progresses.

Based on the data interpreted from the borings, the design of temporary slopes may assume California Occupational Safety and Health Administration (Cal/OSHA) Soil Type A for planning purposes.

Temporary slopes in the Unit 2 and Unit 3 formational soils may be excavated no steeper than ¾: 1 (horizontal: vertical). Temporary slopes in the Unit 1 undocumented fill may be excavated no steeper than 1.2: 1 (horizontal: vertical).

7.0 TEMPORARY SHORING

7.1 General

7.1.1 Need for Temporary Shoring

Development of the below grade level of parking will require temporary shoring to maintain vertical sides of the excavation. The recommendations provided in this section are intended to provide guidance for design of temporarily retained excavations.

7.1.2 Responsibilities

It is the responsibility of the Contractor to provide an excavation that is safe, with deflections that do not damage nearby structures or utilities. Design of temporary shoring should be performed by a qualified Shoring Engineer. The Shoring Engineer should be solely responsible for the design, utilizing the indications of subsurface conditions provided in this report.

7.2 Planned Excavation

7.2.1 Limits of the Excavation

Though design to this point is only conceptual, it is expected that the excavation will be largely be bounded by streets and adjacent properties. The excavation will likely extend to within about 10 feet of both streets and properties that adjoin the site.

7.2.2 Subsurface Conditions

Design should consider that the alignment of temporary walls is underlain by the sequence of soil units described in Section 4.3.

7.2.3 Groundwater

<u>Measured Groundwater Level</u>

Based upon the indications of the engineering borings, groundwater is expected to occur at least 20 feet below the base of excavations for the parking structure.

<u>Potential for Perched Groundwater</u>

As is discussed in Section 3, periods of wet weather can develop conditions of perched water. NOVA was involved with sites complicated by perched water during the months following the heavy rains of Winter/Spring 2-16-2017.

The potential for perched water is such that design and construction-related planning should consider potential for near-surface groundwater levels to affect below grade construction. The Contractor should be prepared to address perched groundwater if encountered during the grading operations. In addition, wet soils may be encountered at the bottom of the removals.

7.3 Potential Approaches to Temporary Shoring

The excavation for the below-grade garage may extend to about 15 feet below existing ground surface, requiring temporary shoring for stability. Design of temporary shoring is principally governed by soil and groundwater conditions, as well as by the depth and width of the excavated area. As such, support of the excavation face can be provided by a variety of means.

In consideration of the excavation required in this instance, NOVA expects that a cantilevered system of 'soldier piles and wood lagging' will likely provide the most cost-effective system, drilling soldier beams into the Unit 1 and Unit 2 soils.

The soldier beam and lagging retaining wall may be supported by either

- cantilever, retaining the excavation by the stiffness of the soldier beams; or,
- external bracing, adding resistance to lateral loads by the use of tiebacks.

7.4 Design Conditions for Wall Loading

7.4.1 General

Design for braced/retained excavation should consider conditions of wall loading as described below.

1. <u>Condition 1, 'At Rest</u>.' Design for the retaining wall should consider the use of 'at-rest' soil pressures at locations where wall deflections may effect potentially damaging settlement.

2. <u>Condition 2, 'Active</u>.' Design for temporary walls that are not located near sensitive structures or utilities should consider 'active' earth pressures.

7.4.2 Design for Condition 1 ('At Rest') Wall Soil Loads

Walls developed near existing, settlement sensitive structures may be designed to resist 'at rest' (i.e., 'K_o') earth pressures, using a conventional 'equivalent fluid' wall pressure distribution for cantilevered walls. The magnitude of the maximum equivalent fluid pressure (P) may be calculated as:

$P\ (\text{psf}) = (K_o)\ (\gamma)\ (H)$ where,

$K_o = 1 - \sin\phi \quad \phi = 34°$, and $K_o = (1 - 0.56) = 0.44$

$\gamma = 125\ \text{lb/ft}^3$

H = wall height

$P = 0.44 \times 125 \times H = 55H$

7.4.3 Design for Condition 2 ('Active') Wall Soil Loads

Wall pressures in areas where wall deflections will not immediately threaten structures or utilities may be completed using a conventional 'equivalent fluid wall pressure' distribution.

The magnitude of the maximum equivalent fluid pressure (P) may be calculated as:

$P\ (psf) = (K_a)\ (\gamma)\ (H)$ where,

$K_a = (1 - \sin\phi) / (1 + \sin\phi)$ $\phi = 34°$, $K_a = 0.31$

$\gamma = 125\ lb/ft^3$

H = wall height

$P = 0.31 \times 125 \times H = 39H$

7.4.4 Passive Resistance

It is assumed that soldier beams will be set in pre-drilled holes and backfilled with lean concrete or a sand cement slurry with a compressive strength of at least 700 psf.

Passive soil resistance for embedded portions of soldier piles can be calculated using an equivalent passive soil fluid weight of 400 lb/ft^3, ignoring the first foot of penetration. The passive resistance can be assumed to act over a width of 2.5 pile diameters. The means and methods of placement of this slurry mix will be the responsibility of the Shoring Contractor.

7.5 Tie-Back Anchor Design

7.5.1 General

It is not is expected that external bracing by use of tiebacks will be required to support even the taller areas of temporary excavation. The following subsections address implementation of tiebacks in the event such support is desirable.

7.5.2 Rankine Failure Wedge

Design should assume that the failure wedge adjacent to the shoring is defined by a plane drawn at 29° from the vertical from the toe of the wall. Figure 7-1 (following page) depicts this wedge graphically.

Tieback anchors should extend at least 20 feet beyond the failure wedge (i.e., the "bonded "zone) depicted in Figure 7-1. The intent of this provision is to provide global stability for the shored wall. The bonded length should commence at least 5 feet beyond the failure wedge.

7.5.3 Bond Stresses and Anchor Spacing

The Shoring Engineer should be solely responsible for determination of allowable bond stresses on pressure-concreted ('post-grouted') anchors. NOVA expects that an allowable bond stress of 3,500 psf or more should be readily achievable. Only the resistance developed beyond the failure wedge should be used in resisting lateral loads. If the anchors are spaced at least 6 feet on center, no reduction in the capacity of the anchors need be considered due to group action. In no event should the anchors extend less than the minimum length beyond the potential failure wedge as given above.

As a tie-back anchor system is intended for temporary use, provisions should be made in the design to de-tension and abandon the tie-backs when the basement walls are able to support the lateral loads.

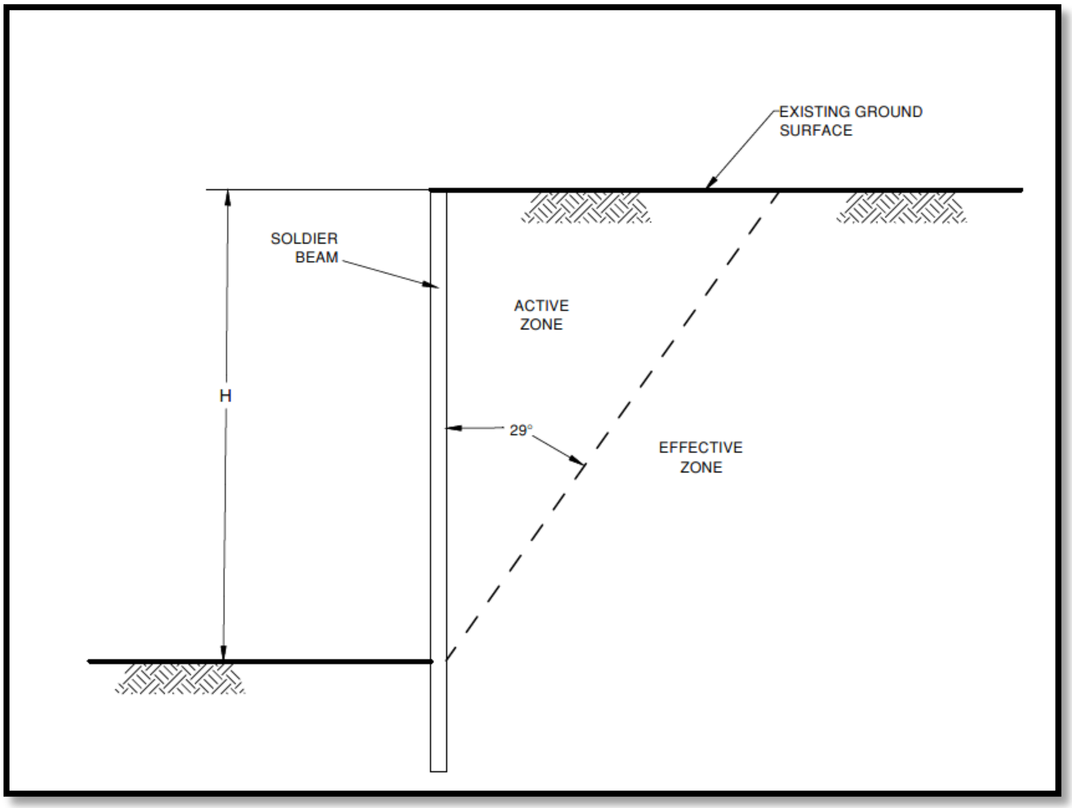


Figure 7-1. Recommended Effective Zone for Tieback Anchors

7.5.4 Anchor Testing

Wall design should provide for (i) performance testing; (ii) proof testing; and, (iii) creep testing of wall anchors. In this regard, it is recommended that guidance provided in FHWA 1999 be utilized. Guidance for proof testing for all anchors provides for loading to a single cycle and load hold at the test load. The guidance provides that loading be applied pre-provided in load increments of 0.25DL, 0.50DL, 1.00DL, 1.20DL and 1.30DL (the 'test load').

All of the production anchors should be tested to at least 130% of the design load; the total deflection during the tests should not exceed 1.5 inches. The rate of creep under the 130% test should not exceed 0.1 inch over a 15-minute period for the anchor to be approved for the design loading.

7.5.5 Anchor Installation

The anchors may be installed at angles of 15 to 35 degrees below the horizontal. The Unit 2 and Unit 3 soils are cemented such that limited caving should be anticipated in drilling the anchors.

The anchors should be filled with concrete placed by pumping from the tip of the anchor to the failure wedge (i.e., over the bonded zone). The portion of the anchor tendons outside of the bonded length should be sleeved in plastic (i.e., over the unbonded zone). If the anchor tendons are sleeved, it is acceptable to concrete the entire length of the anchor.

7.6 Miscellaneous Wall Design Considerations

Soldier piles set in drilled holes will require bearing. Bearing should not be considered. The soil-pile bond will be on the order of 600 psf or greater.

The coefficient of friction (μ) between the wall and retained soils will be about μ = 0.35.

7.7 Wall Construction

Walls will be constructed by first setting the soldier beams. Thereafter, the pace of the excavation will be limited by the establishment of lagging, as described below.

Excavation should not be advanced the deeper than about 4 feet below the bottom of the lagging at any time. These gaps of up to 4 feet should only be allowed to stand for short periods of time in order to decrease the potential for sloughing/caving. Backfilling should be conducted when necessary between the back of the lagging and excavation sidewalls to reduce any sloughing in this zone.

7.8 Expected Wall Movements

7.8.1 General

Design should endeavor to limit deflection at the top of temporary walls to on the order of 1” along the deeper portion of the wall. Actual wall movement and related ground settlement are related to a variety of factors, most significantly (i) the stiffness and spacing of the soldier piles; and, (ii) workmanship in wall construction.

The high-quality sands and sandstones of Unit 2 and Unit 3 are favorable for sound wall construction. NOVA expects that the combination of workmanship and a relatively stiff cantilevered wall will result in good wall performance. Additionally, ground and wall movement monitoring described in the following subsections should be sufficient to detect any unusual behavior (e.g., larger than anticipated wall movement or ground settlement) before the condition becomes problematic.

NOVA does not provide shoring design services. However, in a check the feasibility of constructing a cantilevered wall, NOVA has completed preliminary numerical evaluations. Utilizing relatively stiff soldier piles ($I > 6{,}000\ in^4$) embedded a minimum of 15 feet below the base of the excavation, top deflection can be limited to on the order of 0.7 inch.

7.8.2 Excavation Planning and Monitoring

<u>Excavation Planning</u>

Sequencing of shoring installation, excavation and required groundwater or perched water control dewatering will be critical to control of deflections and settlement. The minimum amount of allowable deflection of the soldier pile wall should be determined by a Structural Engineer in consultation with the Geotechnical Engineer.

NOVA recommends that prior to initiating construction a detailed excavation phasing plan be submitted by the Shoring Contractor and reviewed by the Shoring Engineer and Geotechnical Engineer.

Excavation Monitoring

Systematic settlement monitoring of adjacent ground and structures/pavements should be performed to evaluate the performance of the shoring. Shoring and the conformance of related monitoring with the 2016 CBC (specifically, Section J106.2) is the responsibility of the Shoring Contractor. Caution should be used to minimize damage to existing pavement, utilities, and/or structures caused by settlement or reduction of lateral support.

At a minimum, monitoring prior to, during after construction should address the actions listed below.

1. Pre-Construction Building Condition Survey. The condition of the parking garage to the immediate south should be documented prior to wall construction. In usual case, this includes a careful walk-through by experienced structural and geotechnical engineers.

2. Soldier Beam Monitoring. Prior to construction, select soldier beams should be marked and surveyed, establishing a basis for a long-term plot of soldier pile movement with time.

3. Ground Monitoring. The ground surrounding the excavation, to a distance (where accessible) of at least 20 feet from the walls, should be periodically surveyed for evidence of settlement. Such monitoring will require a preconstruction ground survey.

4. Post-Construction Building Condition Survey. The pre-construction survey should be reproduced at the end of construction, establishing the condition of the structure at that time.

8.0 PAVEMENT DESIGN

8.1 General

The structural design of pavement sections depends primarily on anticipated traffic conditions, subgrade soils, and construction materials. For the purposes of the preliminary evaluation provided in this section, NOVA has assumed a Traffic Index (TI) of 5.0 for passenger car parking, and 6.0 for the driveways. These traffic indices should be confirmed by the project civil engineer prior to final design.

8.2 Drainage

Control of surface drainage is important to the design and construction of pavements. Standing water that develops either on the pavement surface or within the base course can soften the subgrade and create other problems related to the deterioration of the pavement. Good drainage should minimize the risk of the subgrade materials becoming saturated and weakened over a long period of time.

The following recommendations should be considered to limit the amount of excess moisture, which can reach the subgrade soils:

- maintain surface gradients at a minimum 2% grade away from the pavements;
- compact utility trenches for landscaped areas to the same criteria as the pavement subgrade;
- seal all landscaped areas in or adjacent to pavements to minimize or prevent moisture migration to subgrade soils;
- planters should not be located next to pavements (otherwise, subdrains should be used to drain the planter to appropriate outlets);
- place compacted backfill against the exterior side of curb and gutter; and,
- concrete curbs bordering landscaped areas should have a deepened edge to provide a cutoff for moisture flow beneath pavements (generally, the edge of the curb can be extended an additional twelve inches below the base of the curb).

Preventative maintenance should be planned and provided for in the ownership of all pavements. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

8.3 Subgrade Preparation

Remedial grading for paved areas should include removing the upper 2 feet of the Unit 1 undocumented fill, compacting the bottom of the removals to at least 90% relative compaction after ASTM D 1557 (the ‘modified Proctor’). The removed soils should be replaced with “Select” fill and densified to at least 95% relative compaction after ASTM D 1557 (the ‘modified Proctor’).

After the completion of compaction/densification, areas to receive pavements should be proof-rolled. A loaded dump truck or similar should be used to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during this proof-rolling should be removed, replaced with an approved backfill, and compacted. The Geotechnical Engineer can provide alternative options such as using geogrid and/or geotextile to stabilize the subgrade at the time of construction, if necessary.

Construction should be managed such that preparation of the subgrade immediately precedes placement of the base course. Proper drainage of the paved areas should be provided to reduce moisture infiltration to the subgrade.

The preparation of roadway and parking area subgrades should be observed on a full-time basis by a representative of NOVA to confirm that any unsuitable materials have been removed and that the subgrade is suitable for support of the proposed driveways and parking areas after ASTM D1557.

8.4 Flexible Pavements

Provided the subgrade in paved areas is prepared per the recommendations in Section 8.3, an R-value of 30 can be assumed. Table 8-1 provides recommended sections for flexible pavements. The recommended pavement sections are for planning purposes only. Additional R-value testing should be performed on actual soils at the design subgrade levels to confirm the pavement design.

Table 8-1. Preliminary Recommendations for Flexible Pavements

Area	Estimated Subgrade R-Value	Traffic Index	Asphalt Thickness (in)	Base Course Thickness (in)
Parking Stalls	30	5.0	3.0	6.0
Auto Driveways/Roadways	30	6.0	4.0	7.0

The above sections assume properly prepared subgrade consisting of at least 24 inches of select soil compacted to a minimum of 95% relative compaction. The aggregate base materials should also be placed at a minimum relative compaction of 95%. Construction materials (asphalt and aggregate base) should conform to the current Standard Specifications for Public Works Construction (Green Book).

8.5 Rigid Pavements

The flexible pavement specifications used in driveways and parking stalls may not be adequate for truck loading and turnaround areas. In this event, NOVA recommends that a rigid concrete pavement section be provided. The pavement section should consist of 6 inches of concrete over a 6-inch base course. The aggregate base materials should also be placed at a minimum relative compaction of 95%. The concrete should be obtained from a mix design that conforms with the minimum properties shown in Table 8-2 (following page).

Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/ contraction and isolation. Sawed joints should be cut within 24-hours of concrete placement, and should be a minimum of 25% of slab thickness plus 1/4 inch. All joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. Where dowels cannot be used at joints accessible to wheel loads, pavement thickness should be increased by 25 percent at the joints and tapered to regular thickness in 5 feet.

Table 8-2. Recommendations for Concrete Pavements

Property	Recommended Requirement
Compressive Strength @ 28 days	3,250 psi minimum
Strength Requirements	ASTM C94
Minimum Cement Content	5.5 sacks/cu. yd.
Cement Type	Type V Portland
Concrete Aggregate	ASTM C33
Aggregate Size	1-inch maximum
Maximum Water Content	0.5 lb/lb of cement
Maximum Allowable Slump	4 inches

9.0 STORMWATER INFILTRATION

9.1 Overview

Based upon the indications of the field exploration and laboratory testing reported herein, NOVA has evaluated the site as abstracted below after guidance contained in the *City of San Diego BMP Design Manual* (hereafter, 'the BMP Manual'). Section 3.3 provides a description of the field work undertaken to complete percolation testing. Figure 3-2 depicts the location of the testing. Plate 2, provided following the text of this report locates the testing in larger scale. This section addresses design infiltration rates.

It should be noted that the locations of the proposed BMPs have changed over time with the changes in planning for construction. It remains NOVA's judgment that the infiltration rate will be similar across the site as it underlain by very dense Very Old Parlics in the near surface.

As is well-established by the BMP Manual, the feasibility of stormwater infiltration is principally dependent on geotechnical and hydrogeologic conditions at the project site. In consideration of the low measured infiltration rates at this site, NOVA concludes that the site is not feasible for development of permanent stormwater infiltration BMPs.

This section provides an assessment of the feasibility of stormwater infiltration utilizing the information developed by the field exploration, as well as other elements of the site assessment.

9.2 Infiltration Rates

9.2.1 General

The percolation rate of a soil profile is not the same as its infiltration rate ('I'). Therefore, the measured/calculated field percolation rate was converted to an estimated infiltration rate utilizing the Porchet Method in accordance with guidance contained in the BMP Manual. Table 9-1 provides infiltration rates determined by the percolation testing by testing in 2016 and 2017.

Table 9-1. Infiltration Rates Determined by Percolation Testing

Year	Boring	Approximate Ground Elevation (feet, msl)	Depth of Test (feet)	Approximate Test Elevation (feet, msl)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour, F=2*)
2016	P-1	+416	6	+410	0.01	0.00
2016	P-2	+416	6.3	+409.7	0.01	0.00
2016	P-3	+415.5	5.5	+410	0.05	0.03
2017	P-4	+413	5	+408	0.01	0.00
2017	P-5	+415	5	+410	0.03	0.01
2017	P-6	+415	5	+410	0.01	0.00
2017	P-7	+413	5	+408	0.01	0.00

Notes: (1) 'F' indicates 'Factor of Safety' (2) elevations are approximate and should be reviewed

9.2.2 Design Infiltration Rate

In consideration of the nature and variability of subsurface materials, as well as the natural tendency of infiltration structures to become less efficient with time, the calculated infiltration rates should be modified to use at least a factor of safety (F) of F=2 for preliminary design purposes. The factor of safety can potentially increase after the design considerations are evaluated and selected at the discretion of the design engineer. The design factor of safety Worksheet D.5-1 is presented in the attached Appendix C.

The 2017 percolation testing at locations P-4 through P-7 was conducted at locations of currently planned stormwater infiltration BMPs. As may be seen by review of Table 9-1, the design basis infiltration rate ranges from I = 0.00 to I = 0.03, heavily weighted by this testing and the indications of the 2016 testing to I = 0.00 inches per hour (using a preliminary F = 2).

9.3 Review of Geotechnical Feasibility Criteria

9.3.1 Overview

Section C.2 of Appendix C of the BMP Manual provides seven factors that should be considered by the project geotechnical professional while assessing the feasibility of infiltration related to geotechnical conditions. These factors are listed below

- C.2.1 Soil and Geologic Conditions
- C.2.2 Settlement and Volume Change
- C.2.3 Slope Stability
- C.2.4 Utility Considerations
- C.2.5 Groundwater Mounding
- C.2.6 Retaining Walls and Foundations
- C.2.7 Other Factors

The above geotechnical feasibility criteria are reviewed in the following subsections.

9.3.2 Soil and Geologic Conditions

The soil borings and percolation tests borings completed for this assessment disclose the sequence of soil units described below.

1. <u>Unit 1, Undocumented Fill (Qafu)</u>. A thin veneer of undocumented fill covers the site. The fill is a silty and clayey sand (derived from the Unit 2 Paralics) of typically less than 3 feet thickness.

2. <u>Unit 2, Paralics ($Qvop_8$)</u>. This unit was encountered immediately beneath the Unit 1 fill at all borings on the site. Formerly referenced as the Lindavista Formation, the Very Old Paralics include very dense silty sand with varying amounts of gravel and cobbles. Testing of uncemented/disturbed portions of the formation characterizes these materials as silty fine to medium sands, 'SM' after ASTM D2487. This unit is the likely source of the Unit 1 fill.

3. Unit 3, Mission Valley Formation (Tmv). The Mission Valley Formation is expected to underlie the Very Old Paralics at depths ranging from 17 to 21 feet below existing ground surface. Soils of this unit are similar in nature to the soils of Unit 2- very dense silty and clayey sands with gravel and cobbles- but also includes interbeds of cemented materials (siltstone and sandstone).

9.3.3 Settlement and Volume Change

Unit 2 and Unit 3 materials do not have expansion potential, such that these soils will not be prone to swelling upon wetting or shrinkage on drying. The soils will not be prone to hydro-collapse on wetting.

9.3.4 Slope Stability

There are no slopes on-site, nor are any material soil embankments planned for the new development. As a consequence, embankment stability is not a constraint to BMPs.

9.3.5 Utilities

Stormwater infiltration BMPs should not be sited within 10 feet of underground utilities.

9.3.6 Groundwater Mounding

In consideration of the low measured percolation/infiltration rates, it is likely that groundwater mounding will occur if stormwater infiltration is attempted in any scale. Groundwater mounding can result in damaging groundwater mounding during wet periods, affecting utilities, pavements, flat work, and foundations.

9.3.7 Retaining Walls and Foundations

Permanent stormwater infiltration BMPs should not be sited within 25 feet of foundations for structures, including any retaining walls.

9.3.8 Other Factors

Biofiltration-2 (BF-2), is located in an area with over 15 feet of fill. This was found in the exploratory boring B-1 (NOVA 2017) and the percolation rate was tested at P-5 (NOVA 2017). Due to the considerable fill depth in this area, the extension of the BMP down to natural soil is infeasible and the results from this percolation test boring should be voided.

9.4 Suitability of the Site for Stormwater Infiltration

The locations of the proposed BMPs have changed over time with the change in the proposed construction. However, in consideration of the homogeneity of the subsurface that is well demonstrated by borings completed across the limits of the planned Centrum 6 development, it is NOVA’s judgment that the infiltration rate will be similar across the site as it underlain by the same very dense Very Old Parlics. This was confirmed by the percolation testing results performed November 9, 2017, at the currently planned locations of stormwater infiltration BMPs.

As a consequence of the widespread occurrence across the San Diego area of the various facies of the Paralics, the infiltration characteristics of the geologic materials are well understood. Where the Paralics occur in dense, often cemented form as is the case at this site, infiltration rates are commonly those measured and reported in NOVA 2016. The results from the testing performed November 9, 2017, at the currently planned BMP locations were consistent with these low rates- rates that suggest I = 0.00.

NOVA does not recommend infiltration of stormwater at the site by permanent stormwater BMPs. This opinion is based upon consideration of the variety of factors detailed above- most significantly, (i) the low measured infiltration rates, (ii) the related potential for groundwater mounding, and (iii) limited space for siting such structures away from walls, utilities, and foundations.

10.0 REFERENCES

10.1 Site Specific

10.1.1 Architectural

Sunroad Centrum 6 & 7, Schematic Design, KTGY Architects + Planners, 2017-0142, July 26, 2017.

10.1.2 Geotechnical

Geotechnical Investigation, Sunroad Spectrum Phase 1, Building Pads A, B, 1 Through 6, And Parking Structure, San Diego, CA, Geocon Inc., November 13, 2000 (“Geocon 2000”).

Update Geotechnical Investigation, Sunroad Centrum, Spectrum Center Boulevard and Kearney Villa Road, San Diego, CA, Geocon Inc., Project No. 06505-22-02, Mar 22, 2005 (“Geocon 2005”).

Geotechnical Investigation, Centrum 2, Spectrum Center Boulevard and Kearney Villa Road, San Diego, CA, Geocon Inc., Project No. 06505-52-04, Nov 22, 2010 (“Geocon 2010”).

Additional Geotechnical Recommendations, Sunroad Centrum 2, Spectrum Center Boulevard and Kearny Villa Rd., San Diego, CA, Geocon Inc., November 23, 2011 (Geocon 2011”).

Addendum Geotechnical Investigation, Sunroad Parking Structure, Spectrum Ctr. Boulevard & Kearney Villa Road, San Diego, California, NOVA Services, Inc., Project 2014116, February 25, 2014 (“NOVA 2014”).

10.1.3 Civil

Improvement and Grading Plan for Sunroad Centrum Place, Drawing No. 34009-D, Stevens-Cresto Engineering, Inc., January 19, 2016 (‘SCE 2016’)

DRAFT, Vesting Tentative Map, Planned Development Permit, Sunroad Centrum 6, Sheets C1.0 through C3.0, Stevens-Cresto Engineering, Inc., August 1, 2017 (‘SCE 2017’)

10.2 Design

American Concrete Institute, 2002, Building Code Requirements for Structural Concrete, ACI 318-02.

American Concrete Institute, 2015, Guide to Concrete Floor and Slab Construction, ACI 302.1R-15.

ASCE, Minimum Design Load for Buildings and Other Structures, ASCE 7-10.

APWA, 2015 Standard Specifications for Public Works Construction (‘Greenbook’)

California Code of Regulations, Title 24, 2013 California Building Standards Code.

California Department of Transportation (Caltrans), 2003, *Corrosion Guidelines*, Version 1.0, available at http://www.dot.ca.gov/hq/esc/ttsb/corrosion/pdf/2012-11-19-Corrosion-Guidelines.pdf.

USGS, Earthquake Hazards Program, *Seismic Design Maps & Tools*, accessed 13 August 2017 at: http://earthquake.usgs.gov/hazards/designmaps/

10.3 Geologic and Site Setting

Jennings, C. W. and Bryant, W. A., 2010, *Fault Activity Map of California*, California Geological Survey, Geologic Data Map No. 6.

Kennedy, M.P. and Tan, S.S., 1977, *Geology of National City, Imperial Beach and Otay Mesa Quadrangles, Southern San Diego Metropolitan Area, California*, California Division of Mines and Geology, Map Sheet 29.

Norris, R. M. and Webb, R. W., 1990, Geology of California, Second Edition: John Wiley & Sons, Inc.

United States Federal Emergency Management Agency (FEMA), 2012, Flood Insurance Rate Map (FIRM), Map Number No. 06073C1914G, effective date May 16, 2012.

United States Geological Survey and California Geological Survey, 2011, Quaternary Fault and Fold database for the United States, http://earthquake.usgs.gov/regional/qfaults/.

California Department of Water Resources, Water Data Library: found at http://www.water.ca.gov/waterdatalibrary/

California Division of Mines and Geology (CDMG), 2008, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, Special Publication 117A.

United States Department of Agriculture, Natural Resources Conservation Service, *Custom Soil Resource Report for San Diego County Area, California*, August 15, 2017.

PLATES

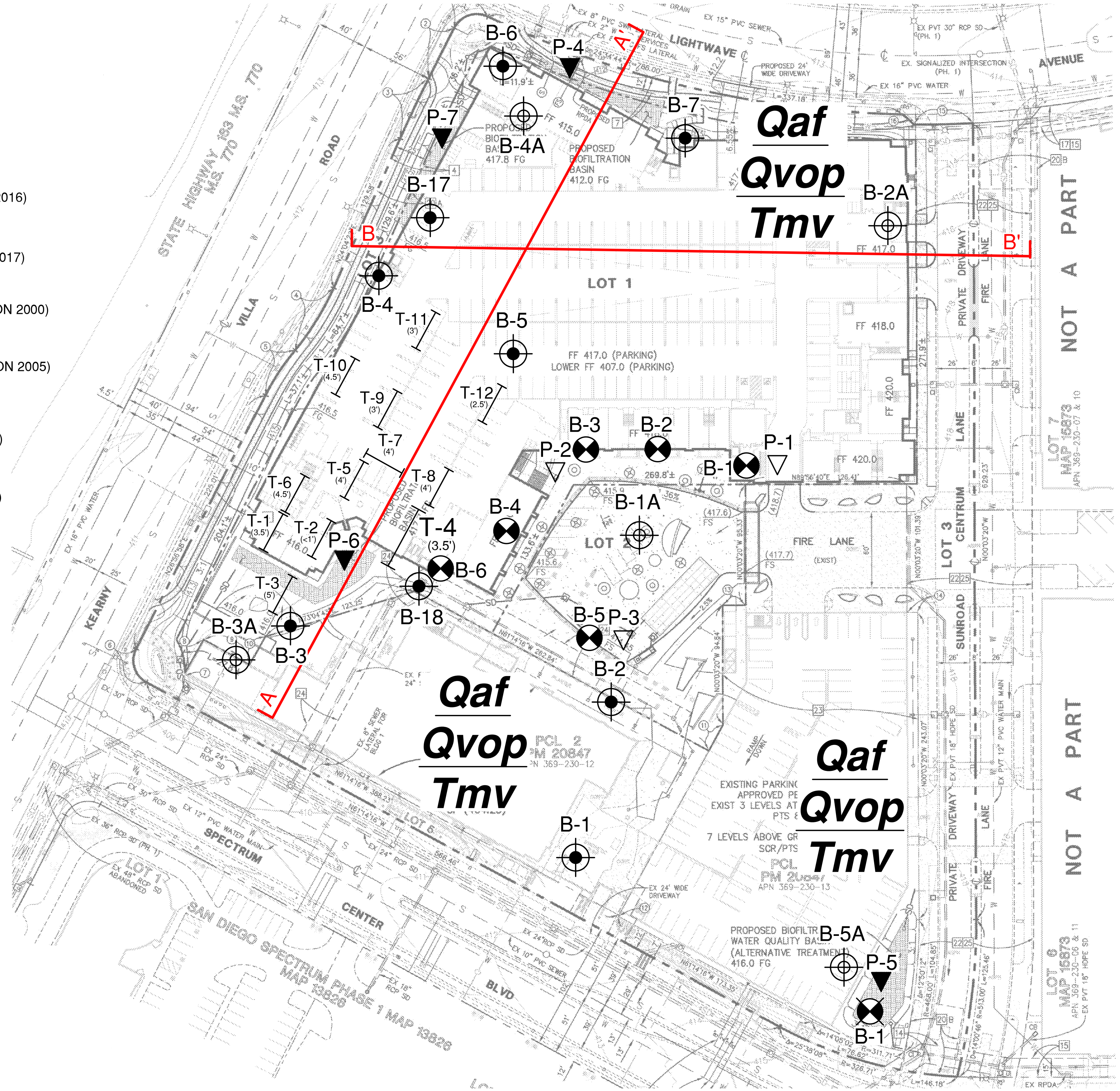
Plate 1: Subsurface Exploration Map

Plate 2: Map of Percolation Testing

Plate 3: Cross Sections

KEY TO SYMBOLS

Qaf	FILL
Qvop	VERY OLD PARALIC DEPOSITS
Tmv	MISSION VALLEY FORMATION
B-6	APPROXIMATE LOCATION OF GEOTECHNICAL BORING (NOVA 2016)
B-1	APPROXIMATE LOCATION OF GEOTECHNICAL BORING (NOVA 2017)
B-18	APPROXIMATE LOCATION OF GEOTECHNICAL BORING (GEOCON 2000)
B-5A	APPROXIMATE LOCATION OF GEOTECHNICAL BORING (GEOCON 2005)
P-7	APPROXIMATE LOCATION OF PERCOLATION TEST (NOVA 2017)
P-3	APPROXIMATE LOCATION OF PERCOLATION TEST (NOVA 2016)
T-12 (2.5')	TRENCH LOCATIONS (GEOCON 2010)
B B'	GEOLOGIC CROSS SECTION



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4445 EASTGATE MALL
SAN DIEGO, CALIFORNIA

PROJECT NO:	1015310
DATE:	NOV 2017
DRAWN BY:	DTW
REVIEWED BY:	JDB

SUBSURFACE INVESTIGATION MAP

0 100' 200'

PLATE: 1

Sunroad Enterprises
4445 Eastgate Mall Suite 400
San Diego, CA 92121

Wermers Properties
5120 Shoreham Place, #150
San Diego, CA 92122

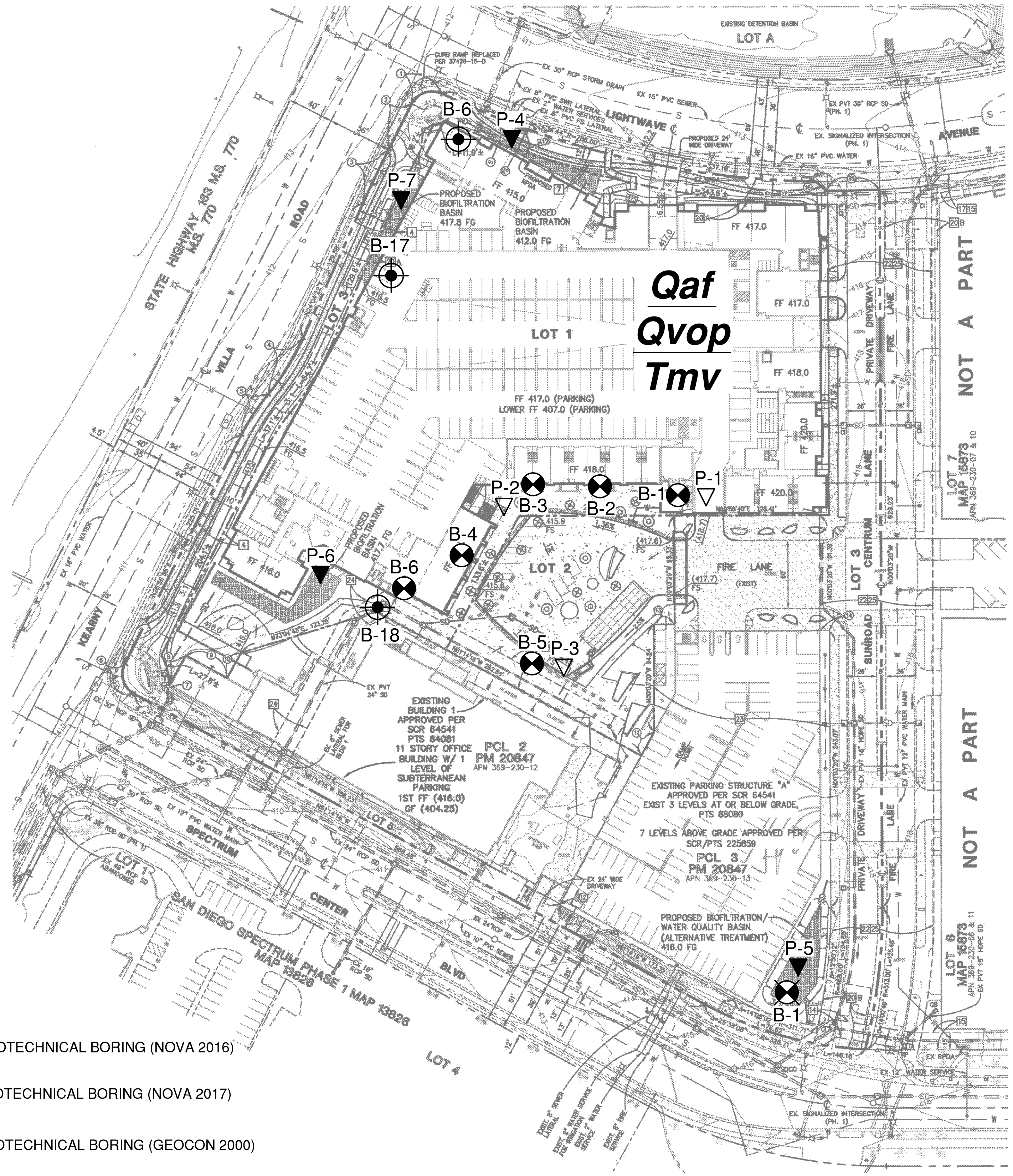
SUNROAD CENTRUM 6
SAN DIEGO, CA

VESTING TENTATIVE MAP NO. ________
PLANNED DEVELOPMENT PERMIT
AUGUST 1, 2017

CONCEPT GRADING & UTILITY PLAN

C3.0

STEVENS-CRESTO ENGINEERING, INC.
CIVIL ENGINEERS • LAND SURVEYORS • LAND PLANNERS



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P-3	APPROXIMATE LOCATION OF PERCOLATION TEST (NOVA 2016)
P-7	APPROXIMATE LOCATION OF PERCOLATION TEST (NOVA 2017)

SUNROAD CENTRUM

SUNROAD ENTERPRISES
WERMERS PROPERTIES

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Wermers Properties
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SUNROAD CENTRUM 6
SAN DIEGO, CA

VESTING TENTATIVE MAP NO. ________
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CONCEPT GRADING & UTILITY PLAN

C3.0

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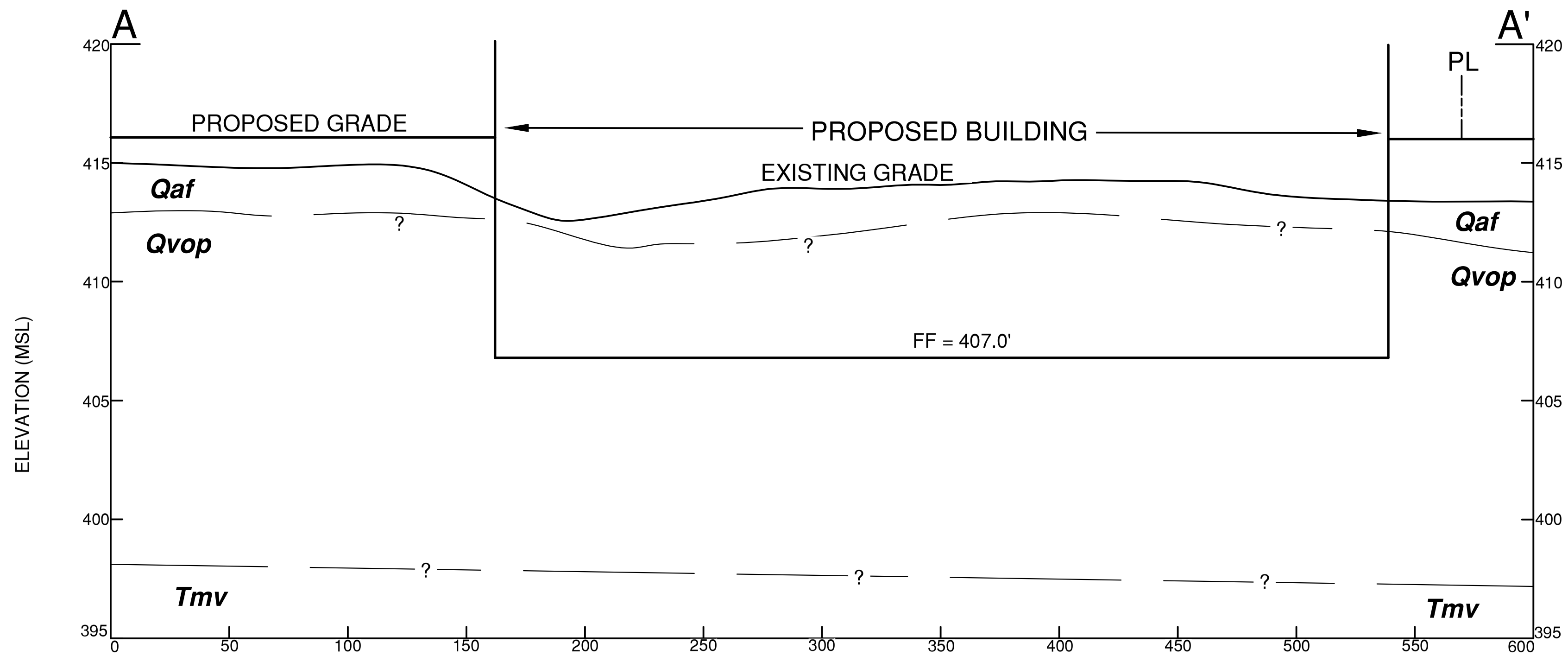
REVIEWED BY:	JDB

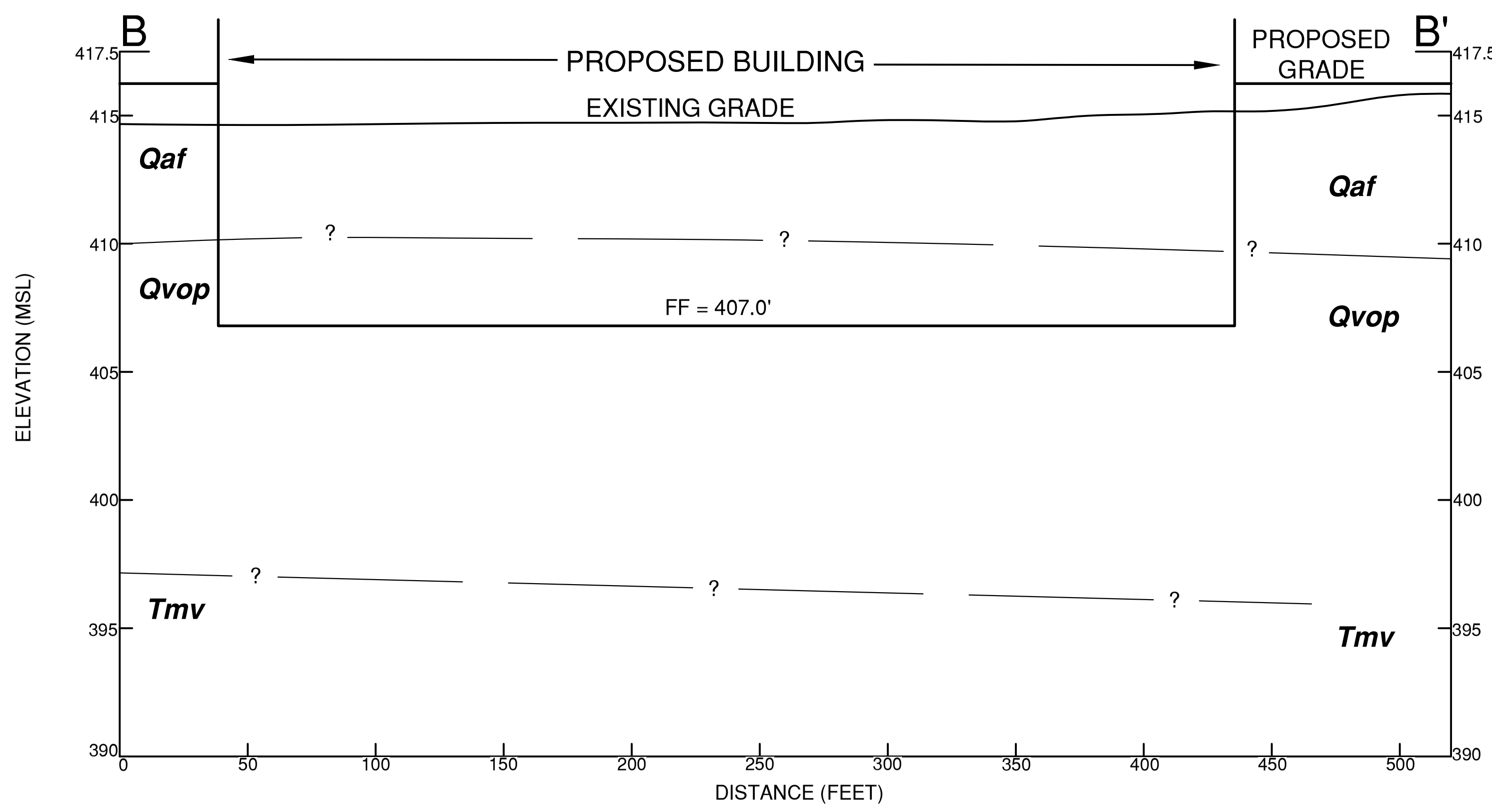
PERCOLATION TESTING MAP

0 120' 240'

PLATE: 2



GEOLOGIC CROSS-SECTION AA'
HORIZONTAL SCALE:1" = 75'
VERTICAL SCALE: 1" = 15'



GEOLOGIC CROSS-SECTION BB'
HORIZONTAL SCALE:1" = 75'
VERTICAL SCALE: 1" = 15'

KEY TO SYMBOLS

Qaf FILL

Qvop VERY OLD PARALIC DEPOSITS

Tmv MISSION VALLEY FORMATION

? GEOLOGIC CONTACT, QUERIED WHERE INFERRED

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GEOLOGIC CROSS SECTION AA' & BB'

0 1" 2"

PLATE: 3

APPENDIX A

USE OF THE GEOTECHNICAL REPORT

NOVA

Important Information About Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

APPENDIX B

Logs of Borings by NOVA

NOVA

BORING LOG

BORING NO.: B-1/P-1

PROJECT: Sunroad Centrumplace
BORING LOCATION: Spectrum Center Boulevard
DRILLING CONTRACTOR: Cal Pac Drilling
DRILLING METHOD: 6" Diameter Hollow Stem Auger
DRILLING EQUIPMENT: Mobile B-61
SAMPLING METHOD: Drive Sampler- SPT
HAMMER WT.: 140 **DROP:** 30"

PROJECT NO.: 1015310
ELEVATION AND DATUM: 416 feet ± (MSL)
DATE STARTED: 4/27/2016 **DATE FINISHED:** 4/27/2016
TOTAL BORING DEPTH: 6.5 feet
DEPTH TO WATER START: N/A **FINISH:** N/A
LOGGED BY: HE
REVIEWED BY: HE

ELEVATION (MSL)	DEPTH (FT.)	SOIL STRATIGRAPHY	USCS CLASSIFICATION	SAMPLER TYPE	BLOWS/FT.	GEOTECHNICAL DESCRIPTION	DRY DENSITY (pcf)	WATER CONTENT (%)	LAB TESTS
	0					3" AC OVER 4" BASE MATERIAL			
			SM			ARTIFICIAL FILL(Qaf): RED-BROWN; LOOSE; MOIST; GRAVELLY SILTY SAND; FINE TO MEDIUM GRAINED (SM)			
	2		SM			OLD PARALIC DEPOSITS UNIT 8 (Qop8): REDDISH BROWN; MEDIUM DENSE; MOIST; GRAVELLY SILTY SANDSTONE; FINE TO MEDIUM GRAINED (SM)			
410	6			SPT	27				
						Boring Terminated at 6.5FT. No Groundwater Encountered. No Caving			

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26; Elevation scale: 410, 400, 390

SAMPLER KEY: BULK SPT MOD. CAL. NO RECOVERY

BORING LOG B-1

DATE EXCAVATED:	NOVEMBER 8, 2017	**EQUIPMENT:**	TRIPOD RID
EXCAVATION DESCRIPTION:	8 INCH DIAMETER AUGER BORING	**GPS COORD.:**	N/A
GROUNDWATER DEPTH:	GROUNDWATER NOT ENCOUNTERED	**ELEVATION:**	415 FT

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0				SC		**ARTIFICIAL FILL(Qafu):** *CLAYEY SAND; DARK BROWN, WET, LOOSE, FINE TO MEDIUM GRAINED, SOME COBBLE ≤ 6", SOME GRAVEL ≤ 3", ORGANIC ODOR*		
						MOTTLED DARK BROWN AND RED BROWN		
			CAL. MOD.		43 #			*ERRONEOUS BLOWCOUNT DUE TO COBBLE*
5			CAL. MOD.		28	*MEDIUM DENSE*		
			SPT		10	*LOOSE*		
10			SPT		16	*MEDIUM DENSE*		
15			SPT		7	*LOOSE*		
						BORING TERMINATED AT 16.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING		
20								
25								
30								

KEY TO SYMBOLS

▼	GROUNDWATER	#	ERRONEOUS BLOWCOUNT
⊠	BULK SAMPLE	*	NO SAMPLE RECOVERY
⧄	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

SUNROAD CENTRUM 6
SPECTRUM CENTER BLVD AND LIGHTWAVE AVE
SAN DIEGO, CALIFORNIA

LOGGED BY:	DM	DATE:	NOV 2017
REVIEWED BY:	HP	PROJECT NO.: 1015310	

NOVA

APPENDIX B-1

BORING LOG

BORING NO.: B-2

PROJECT: Sunroad Centrumplace
PROJECT NO.: 1015310
BORING LOCATION: Spectrum Center Boulevard
ELEVATION AND DATUM: 416 feet ± (MSL)
DRILLING CONTRACTOR: Cal Pac Drilling
DATE STARTED: 4/27/2016 **DATE FINISHED:** 4/27/2016
DRILLING METHOD: 6" Diameter Hollow Stem Auger
TOTAL BORING DEPTH: 16 feet
DRILLING EQUIPMENT: Mobile B-61
DEPTH TO WATER START: N/A **FINISH:** N/A
SAMPLING METHOD: Drive Sampler- SPT
LOGGED BY: HE
HAMMER WT.: 140 **DROP:** 30"
REVIEWED BY: HE

ELEVATION (MSL)	DEPTH (FT.)	SOIL STRATIGRAPHY	USCS CLASSIFICATION	SAMPLER TYPE	BLOWS/FT.	GEOTECHNICAL DESCRIPTION	DRY DENSITY (pcf)	WATER CONTENT (%)	LAB TESTS
	0					3" AC OVER 2" BASE MATERIAL			
			SM			ARTIFICIAL FILL(Qaf): DARK RED-BROWN; MEDIUM DENSE; VERY MOIST; SILTY SAND; FINE TO MEDIUM GRAINED (SM)			
	2		SC/ SM			OLD PARALIC DEPOSITS UNIT 8 (Qop8): DARK RED-BROWN; MEDIUM DENSE; VERY MOIST; CLAYEY SANDSTONE; FINE TO MEDIUM GRAINED (SC-SM)			
	4								
410	6			SPT	14				
			SM	SPT	10	DARK RED-BROWN; MEDIUM DENSE; MOIST; SILTY SANDSTONE; FINE TO MEDIUM GRAINED (SM)			
	8			SPT	50/6	BECOMES REDDISH BROWN; VERY DENSE			
	10			SPT	50/6	BECOMES WELL TO MODERATE-WELL CEMENTED; OCCASIONAL GRAVEL SIZE ROCK			
	12								
	14								
				SPT	50/6				
400	16					BORING TERMINATED AT 16.0FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.			
	18								
	20								
	22								
	24								
390	26								

SAMPLER KEY: BULK SPT MOD. CAL. NO RECOVERY

BORING LOG

BORING NO.: B-3/P2

PROJECT: Sunroad Centrumplace
PROJECT NO.: 1015310
BORING LOCATION: Spectrum Center Boulevard
ELEVATION AND DATUM: 416 feet ± (MSL)
DRILLING CONTRACTOR: CALPAC
DATE STARTED: 4/27/2016 **DATE FINISHED:** 4/27/2016
DRILLING METHOD: 6" Hollow Stem Auger
TOTAL BORING DEPTH: 6.5 feet
DRILLING EQUIPMENT: Mobile B-61
DEPTH TO WATER START: N/A **FINISH:** N/A
SAMPLING METHOD: Drive Sampler- SPT
LOGGED BY: HE
HAMMER WT.: 140 **DROP:** 30"
REVIEWED BY: HE

ELEVATION (MSL)	DEPTH (FT.)	SOIL STRATIGRAPHY	USCS CLASSIFICATION	SAMPLER TYPE	BLOWS/FT.	GEOTECHNICAL DESCRIPTION	DRY DENSITY (pcf)	WATER CONTENT (%)	LAB TESTS
	0					3" AC OVER 3" BASE			
			SM			ARTIFICIAL FILL(Qaf): DARK RED-BROWN; MEDIUM DENSE; VERY MOIST; SILTY SAND; FINE TO MEDIUM GRAINED (SM)			
	2		SM			OLD PARALIC DEPOSITS UNIT 8(Qop8): DARK RED-BROWN; MEDIUM DENSE; VERY MOIST; SILTY SANDSTONE; FINE TO MEDIUM GRAINED (SM)			
	4					BECOMES LIGHT REDDISH BROWN			
410	6			SPT	72				
						BORING TERMINATED AT 6.5FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.			
	8								
	10								
	12								
	14								
400	16								
	18								
	20								
	22								
	24								
390	26								

SAMPLER KEY: BULK SPT MOD. CAL. NO RECOVERY

BORING LOG

BORING NO.: B-4

PROJECT: Sunroad Centrumplace
BORING LOCATION: Spectrum Center Boulevard
DRILLING CONTRACTOR: CALPAC
DRILLING METHOD: 6" Hollow Stem Auger
DRILLING EQUIPMENT: Mobile B-61
SAMPLING METHOD: Drive Sampler- SPT
HAMMER WT.: 140 **DROP:** 30"

PROJECT NO.: 1015310
ELEVATION AND DATUM: 415.5 feet ± (MSL)
DATE STARTED: 4/27/2016 **DATE FINISHED:** 4/27/2016
TOTAL BORING DEPTH: 16 feet
DEPTH TO WATER START: N/A **FINISH:** N/A
LOGGED BY: HE
REVIEWED BY: HE

ELEVATION (MSL)	DEPTH (FT.)	SOIL STRATIGRAPHY	USCS CLASSIFICATION	SAMPLER TYPE	BLOWS/FT.	GEOTECHNICAL DESCRIPTION	DRY DENSITY (pcf)	WATER CONTENT (%)	LAB TESTS
	0		SM			ARTIFICIAL FILL (Qaf): DARK RED-BROWN; MEDIUM DENSE; VERY MOIST; SILTY SAND; FINE TO MEDIUM GRAINED (SM)			
			SM			OLD PARALIC DEPOSITS UNIT 8 (Qop8): DARK RED-BROWN; MEDIUM DENSE; VERY MOIST; SILTY SANDSTONE; FINE TO MEDIUM GRAINED (SM)			
	2								
	4					BECOMES LIGHT REDDISH BROWN (RUST COLOR); MEDIUM DENSE; DAMPT TO MOIST			
410						BECOMES VERY DENSE			
	6			SPT	51				
				SPT	77				
	8			SPT	46				
	10			SPT	30	OCCASIONAL GRAVEL ROCK			
				SPT	80	BECOMES SLIGHTLY GRAVELLY			
	12			SPT	68	BECOMES DARK BROWN; VERY DENSE; VERY MOIST;SOME CLAY; FINE TO COARSE GRAINED			
	14			SPT	50/5	BECOMES LIGHT BROWN-REDDISH BROWN (RUST COLOR); VERY DENSE; DAMP; FINE TO MEDIUM GRAINED SOME COARSE			
400	16					BORING TERMINATED AT 16.0FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.			
	18								
	20								
	22								
	24								
390	26								

SAMPLER KEY: BULK SPT MOD. CAL. NO RECOVERY

BORING LOG

BORING NO.: B-5/P-3

PROJECT:	Sunroad Centrumplace	**PROJECT NO.:**	1015310
BORING LOCATION:	Spectrum Center Boulevard	**ELEVATION AND DATUM:**	415.5 feet ± (MSL)
DRILLING CONTRACTOR:	CALPAC	**DATE STARTED:**	4/27/2016 **DATE FINISHED:** 4/27/2016
DRILLING METHOD:	6" Hollow Stem Auger	**TOTAL BORING DEPTH:**	5.5 feet
DRILLING EQUIPMENT:	Mobile B-61	**DEPTH TO WATER START:**	N/A **FINISH:** N/A
SAMPLING METHOD:	Drive Sampler- SPT	**LOGGED BY:**	HE
HAMMER WT.:	140 **DROP:** 30"	**REVIEWED BY:**	HE

ELEVATION (MSL)	DEPTH (FT.)	SOIL STRATIGRAPHY	USCS CLASSIFICATION	SAMPLER TYPE	BLOWS/FT.	GEOTECHNICAL DESCRIPTION	DRY DENSITY (pcf)	WATER CONTENT (%)	LAB TESTS
	0		SM			ARTIFICIAL FILL (Qaf): REDDISH BROWN-RED BROWN; MEDIUM DENSE; DAMP; SILTY SAND; FINE TO MEDIUM GRAINED (SM)			
			SM			OLD PARALIC DEPOSITS UNIT 8 (Qop8): REDDISH BROWN-RED BROWN; MEDIUM DENSE; DAMP; SILTY SANDSTONE; FINE TO MEDIUM GRAINED (SM)			
	2								
	4								
410				SPT	50/5	BECOMES GRAVELLY			
	6					BORING TERMINATED AT 5.5FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.			
	8								
	10								
	12								
	14								
400	16								
	18								
	20								
	22								
	24								
390	26								

SAMPLER KEY: BULK SPT MOD. CAL. NO RECOVERY

BORING LOG

BORING NO.: B-6

PROJECT: Sunroad Centrumplace	**PROJECT NO.:** 1015310
BORING LOCATION: Spectrum Center Boulevard	**ELEVATION AND DATUM:** 415.5 feet ± (MSL)
DRILLING CONTRACTOR: CALPAC	**DATE STARTED:** 4/27/2016 **DATE FINISHED:** 4/27/2016
DRILLING METHOD: 6" Hollow Stem Auger	**TOTAL BORING DEPTH:** 6.5 feet
DRILLING EQUIPMENT: Mobile B-61	**DEPTH TO WATER START:** N/A **FINISH:** N/A
SAMPLING METHOD: Drive Sampler- SPT & CAL	**LOGGED BY:** HE
HAMMER WT.: 140 **DROP:** 30"	**REVIEWED BY:** HE

ELEVATION (MSL)	DEPTH (FT.)	SOIL STRATIGRAPHY	USCS CLASSIFICATION	SAMPLER TYPE	BLOWS/FT.	GEOTECHNICAL DESCRIPTION	DRY DENSITY (pcf)	WATER CONTENT (%)	LAB TESTS
	0		SM			ARTIFICIAL FILL(Qaf): RED-BROWN; MEDIUM DENSE; MOIST; SILTY SAND W/GRAVEL; FINE TO MEDIUM GRAINED (SM)			
	1		SM			OLD PARALIC DEPOSITS UNIT 8(Qop8): RED-BROWN; MEDIUM DENSE; MOIST; SILTY SANDSTONE; SOME GRAVEL; FINE TO MEDIUM GRAINED (SM)			
410	5.5			SPT	50/3	BECOMES VERY DENSE AND GRAVELLY			
	6.5				50/6	BORING TERMINATED AT 6.5FT. REFUSAL DUE TO GRAVEL-COBBLE. NO GROUNDWATER ENCOUNTERED. NO CAVING.			

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26
Elevation scale: 410, 400, 390

SAMPLER KEY: BULK SPT MOD. CAL. NO RECOVERY

APPENDIX C

Infiltration Worksheets

NOVA

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

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?** Note that it is not necessary to investigate each and every criterion in the worksheet if infiltration is precluded. Instead a letter of justification from a geotechnical professional familiar with the local conditions substantiating any geotechnical issues will be required.			
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 must be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: *The infiltration rates of the existing soils for location P-1 through P-7, based on the on-site infiltration study was calculated to be less than 0.5 inches per hour (P-1=0.00, P-2=0.00, P-3=0.03, P-4=0.00, P-5=0.01, P-6=0.00, and P-7=0.00 inches per hour) after applying a minimum factor of safety (F) of F=2.*			
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 must be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: *No. See Criterion 1.*			

Worksheet C.4-1 Page 2 of 4			
Criteria	Screening Question	**Yes**	**No**
3	**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 must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: *Water contamination was not evaluated by NOVA services.*			
4	**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 must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: *The potential for water balance was not evaluated by NOVA services.*			
Part 1 Result*	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	*Proceed to Part 2*	

*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 County staff to substantiate findings.

Worksheet C.4-1 Page 3 of 4			
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 must be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: *The infiltration rates of the existing soils for location P-1 through P-7, based on the on-site infiltration study was calculated to be less than 0.5 inches per hour (P-1=0.00, P-2=0.00, P-3=0.03, P-4=0.00, P-5=0.01, P-6=0.00, and P-7=0.00 inches per hour) after applying a minimum factor of safety (F) of F=2.* *These widespread very low to zero permeability soil and geologic conditions do not allow for infiltration in any appreciable rate or volume.*			
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 must be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: *C2.1 A geologic investigation was performed at the subject site.* *C2.2 Settlement and Volume Change: The subject site is underlain by very dense formational soils, added to the very low to negligible infiltration rate of the on-site soils suggest that settlement or volume change due to water infiltration is negligible.* *C2.3 BMPs are not anticipated to be located near slopes on this site. Infiltration has the potential to cause slope failures. BMPs are to be sited a minimum of 50 feet away from any slope.* *C2.4 Infiltration can potentially damage subsurface and underground utilities. BMPs are to be sited a minimum of 10 feet away from all underground utilities.* *C2.5 Stormwater infiltration can result in damaging ground water mounding during wet periods.* *C2.6 BMPs are not anticipated to be located near foundations or retaining walls. Infiltration has the potential to increase lateral pressure and reduce soil strength which can impact foundations and retaining walls. BMPs are to be sited a minimum of 10 feet away from any foundations or retaining walls.* *C2.7 Other Factors: The site is entirely underlain by the low permeable, very dense, Old Paralic Deposits which has shown to have a low infiltration rate. In consideration of these widespread, low permeability formational soils, it is NOVA's opinion that the site is not suitable for stormwater infiltration BMPs. Finally, Biofiltration-2 (BF-2), is located in an area with over 15 feet of fill. Due to the considerable fill depth in this area, the extension of the BMP down to natural soil is infeasible and the results from this percolation test boring should be voided.*			

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**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 must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: *Water contamination was not evaluated by NOVA services.*			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: *The potential for water balance was not evaluated by NOVA services.*			
Part 2 Result*	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.**	*No Infiltration*	

*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 Agency/Jurisdictions to substantiate findings

C.5 Feasibility Screening Exhibits

Table C.5-1 lists the feasibility screening exhibits that were generated using readily available GIS data sets to assist the project applicant to screen the project site for feasibility.

Table C.5-1: Feasibility Screening Exhibits

Figures	Layer	Intent/Rationale	Data Sources
C.1 Soils	Hydrologic Soil Group – A, B, C, D	Hydrologic Soil Group will aid in determining areas of potential infiltration	SanGIS http://www.sangis.org/
	Hydric Soils	Hydric soils will indicate layers of intermittent saturation that may function like a D soil and should be avoided for infiltration	USDA Web Soil Survey. Hydric soils, (ratings of 100) were classified as hydric. http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
C.2: Slopes and Geologic Hazards	Slopes >25%	BMPs are hard to construct on slopes >25% and can potentially cause slope instability	SanGIS http://www.sangis.org/
	Liquefaction Potential	BMPs (particularly infiltration BMPs) must not be sited in areas with high potential for liquefaction or landslides to minimize earthquake/landslide risks	SanGIS http://www.sangis.org/
	Landslide Potential		SanGIS Geologic Hazards layer. Subset of polygons with hazard codes related to landslides was selected. This data is limited to the City of San Diego Boundary. http://www.sangis.org/
C.3: Groundwater Table Elevations	Groundwater Depths	Infiltration BMPs will need to be sited in areas with adequate distance (>10 ft) from the groundwater table	GeoTracker. Data downloaded for San Diego county from 2014 and 2013. In cases where there were multiple measurements made at the same well, the average was taken over that year. http://geotracker.waterboards.ca.gov/data_download_by_county.asp
C.4: Contaminated Sites	Contaminated soils and/or groundwater sites	Infiltration must limited in areas of contaminated soil/groundwater	GeoTracker. Data downloaded for San Diego county and limited to active cleanup sites http://geotracker.waterboards.ca.gov/

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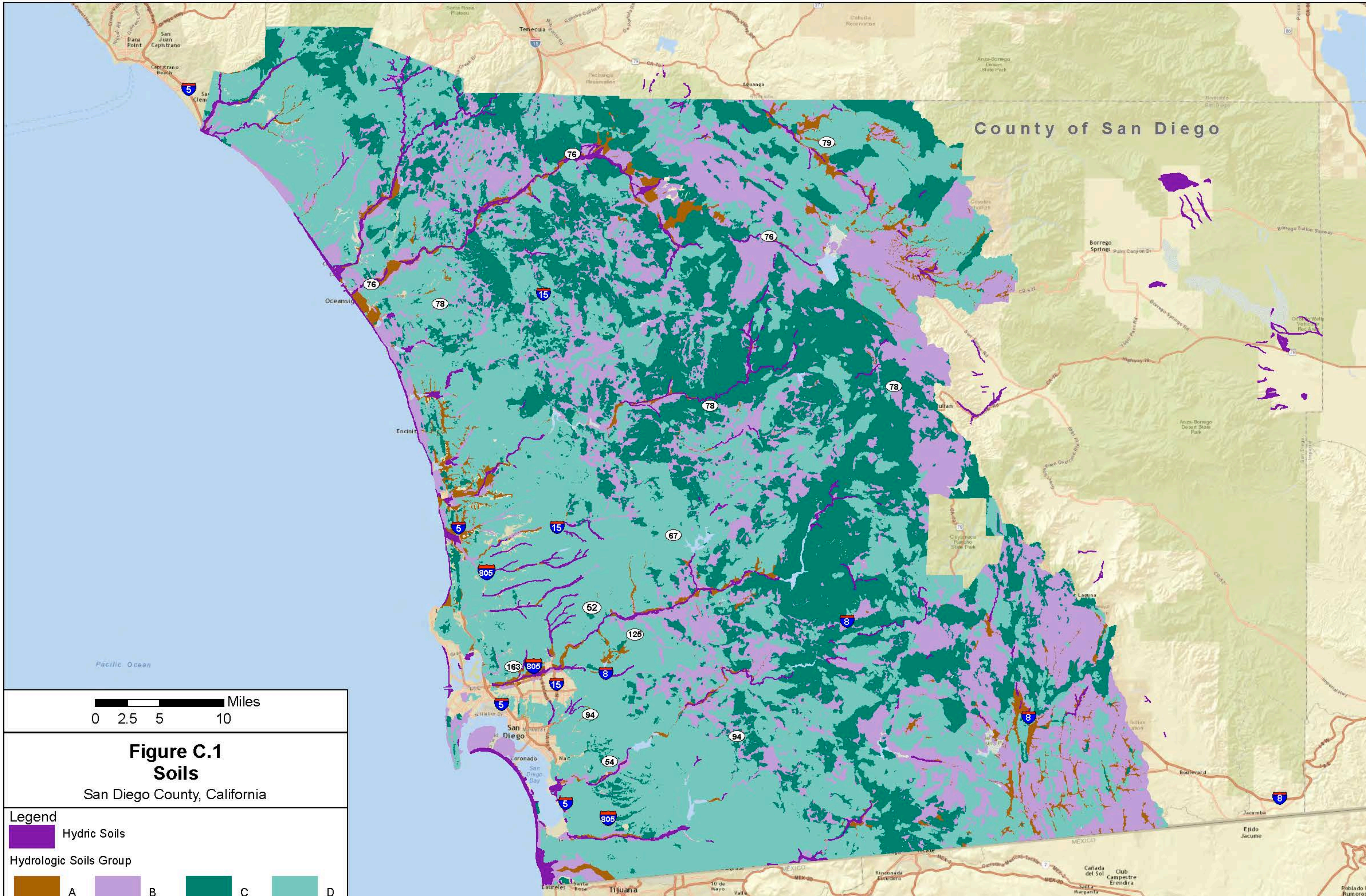


Figure C.1
Soils
San Diego County, California

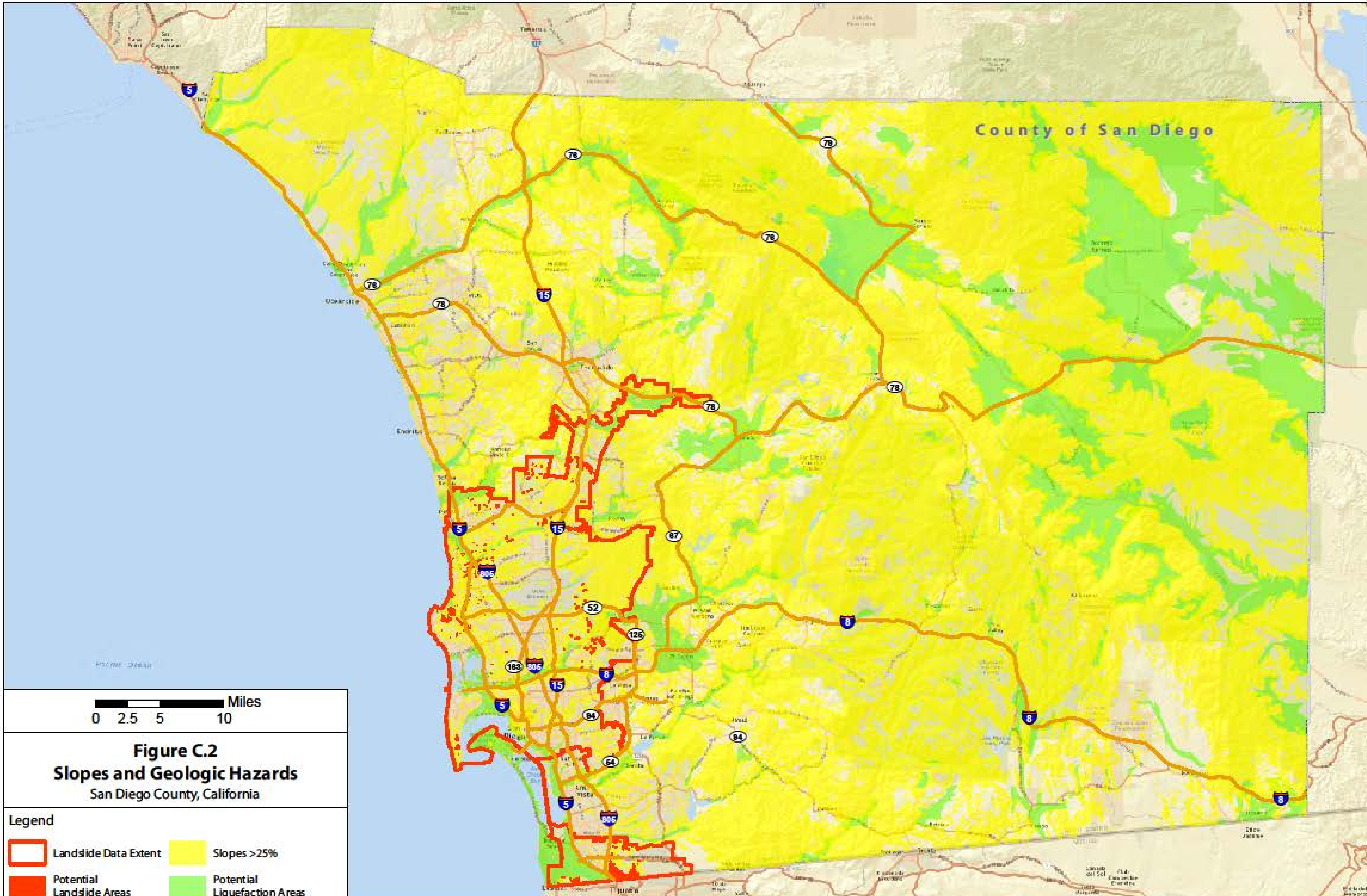
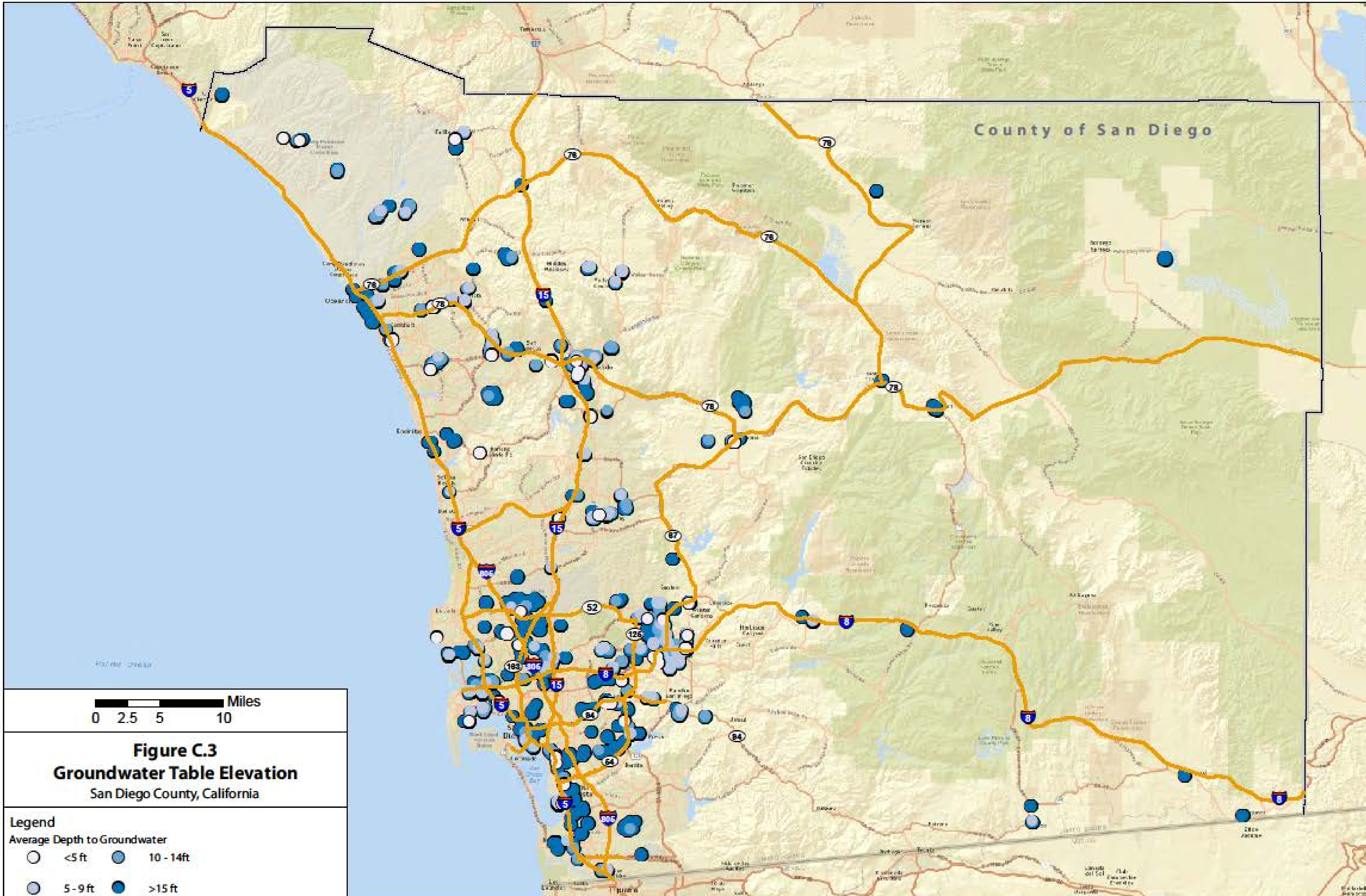


Figure C.2
Slopes and Geologic Hazards
San Diego County, California



County of San Diego
Miles
0 2.5 5 10
Figure C.3
Groundwater Table Elevation
San Diego County, California
Legend
Average Depth to Groundwater
<5 ft
10 - 14ft
5 - 9 ft
>15 ft

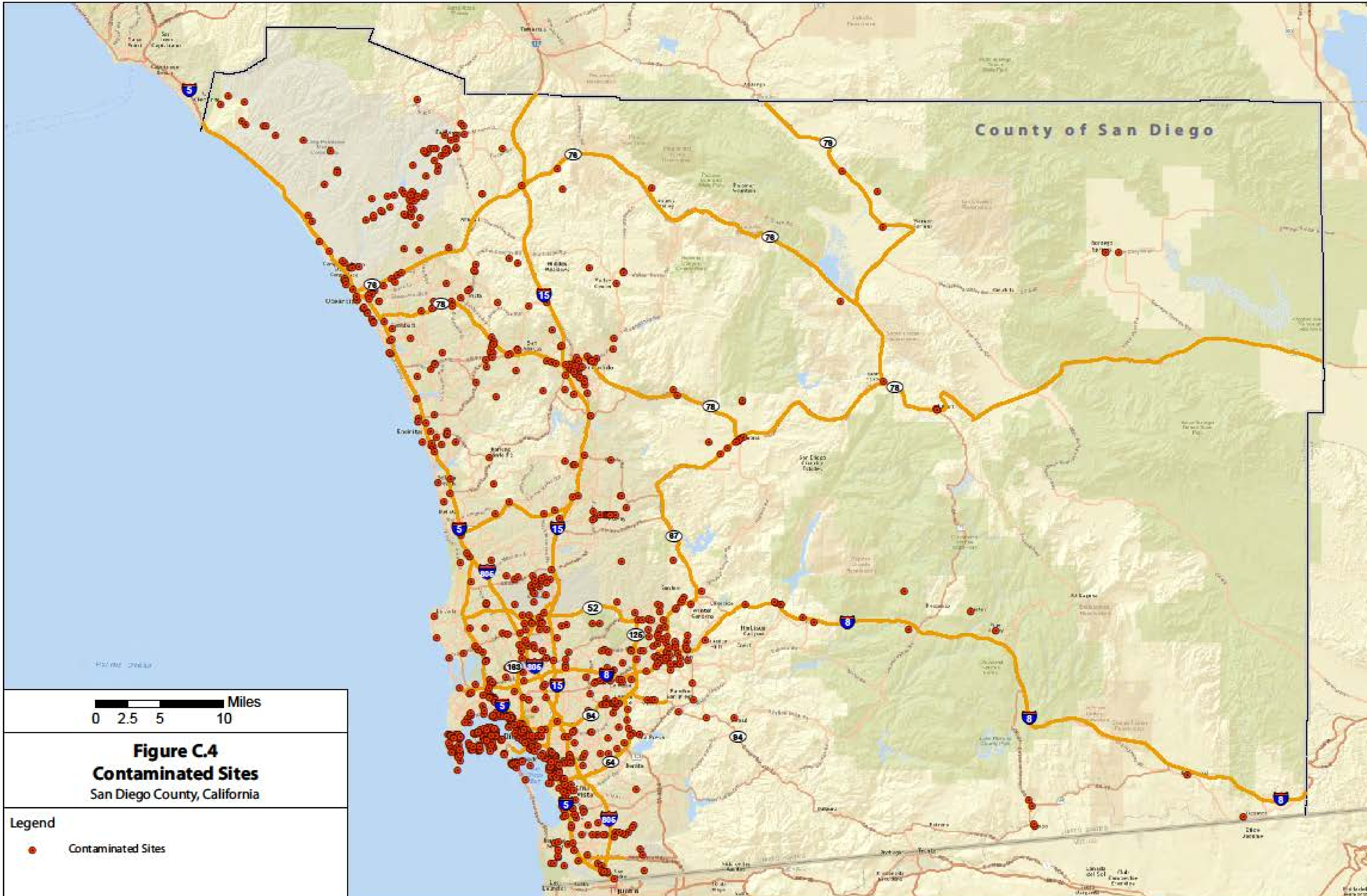


Figure C.4
Contaminated Sites
San Diego County, California

Worksheet D.5-1: Factor of Safety and Design Infiltration Rate Worksheet

Factor of Safety and Design Infiltration Rate Worksheet			Worksheet D.5-1		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	*2*	*0.5*
		Predominant soil texture	0.25	*2*	*0.5*
		Site soil variability	0.25	*2*	*0.5*
		Depth to groundwater / impervious layer	0.25	*1*	*0.25*
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			*1.75 →* ***2***
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$					
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					*0.01*
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$					
Supporting Data					

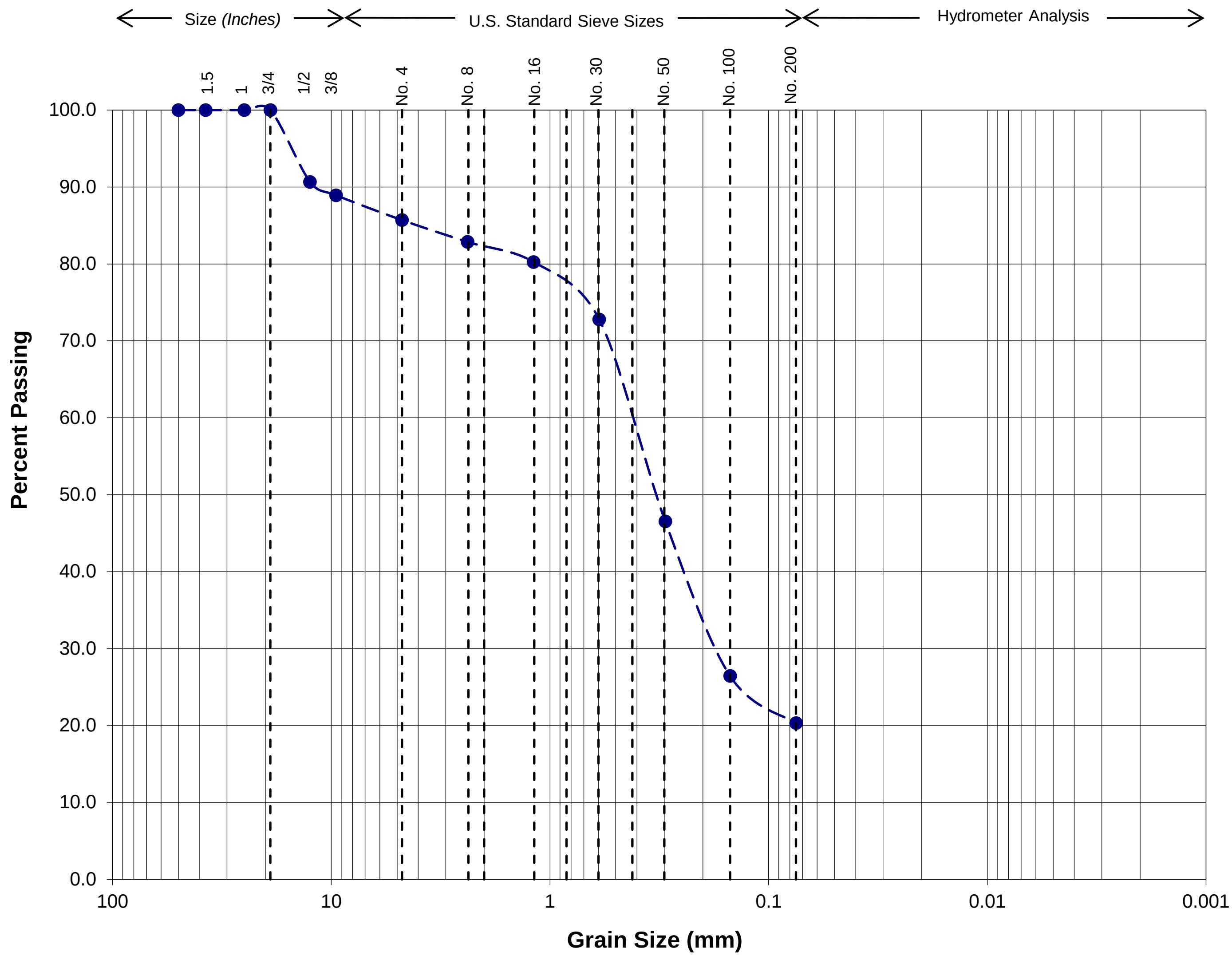
Briefly describe infiltration test and provide reference to test forms:

Borehole percolation tests were utililized for all percolation borings (P-1 through P-7) at the bottom of the prospective infiltration basins accompanied by exploratory engineering borings. The data is abstracted and detailed in the Preliminary Geotechnical Investigation (NOVA 2017). The minimum factor of safety required is F=2 per the San Diego County BMP Manual (February 2016). If the site passes the feasibility analysis at F=2, then the design considerations (B) must be evaluated and selected at the ***discretion of the design engineer****. The design factor will then be multiplied by the suitability factor (2 in this case) thus* ***potentially*** *increasing the factor of safety.*

APPENDIX D

Records of Laboratory Testing by NOVA

NOVA



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

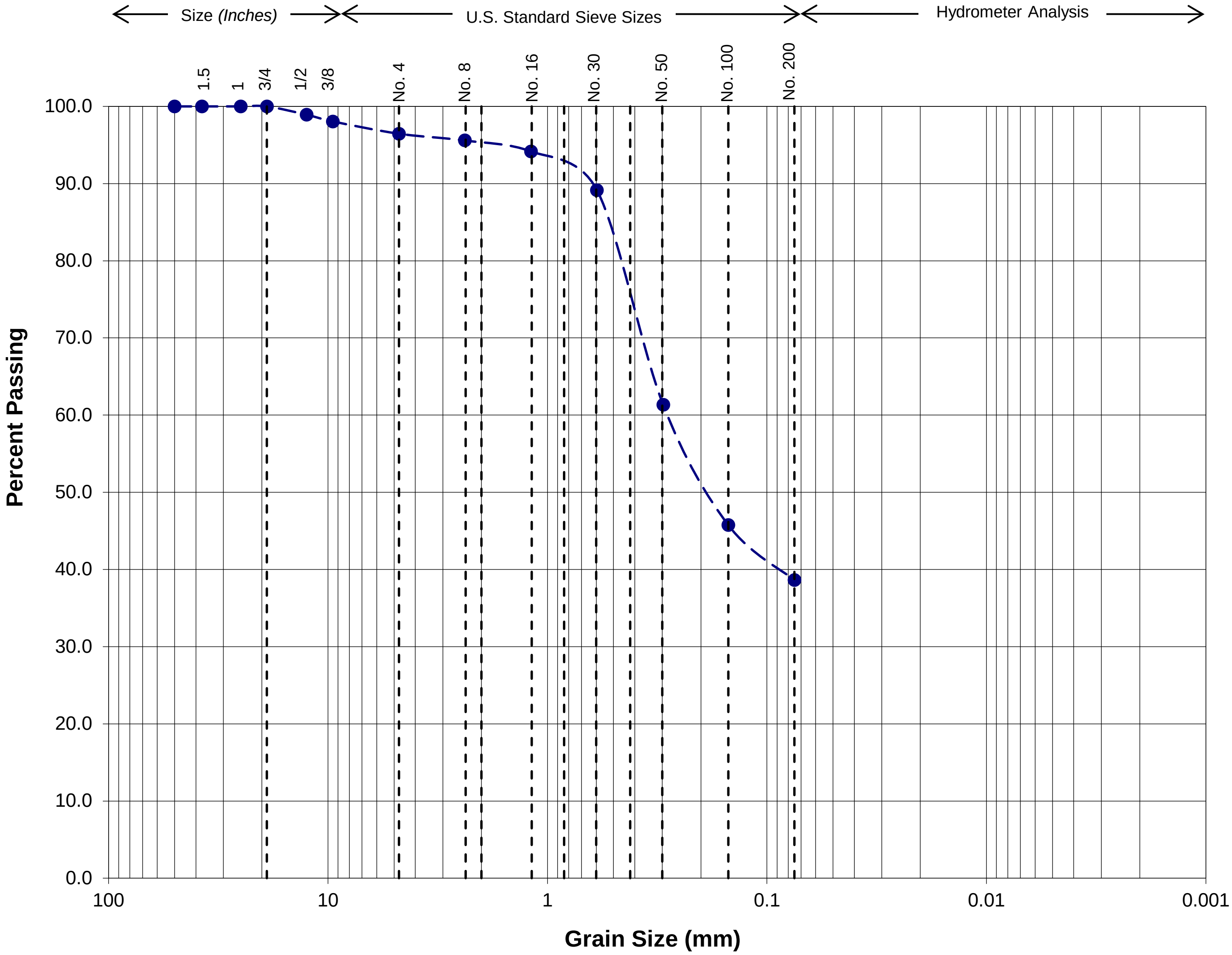
Sample Location:	B-1
Depth (ft):	5.0'
USCS Soil Type:	SM
Passing No. 200 (%):	20

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-1



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

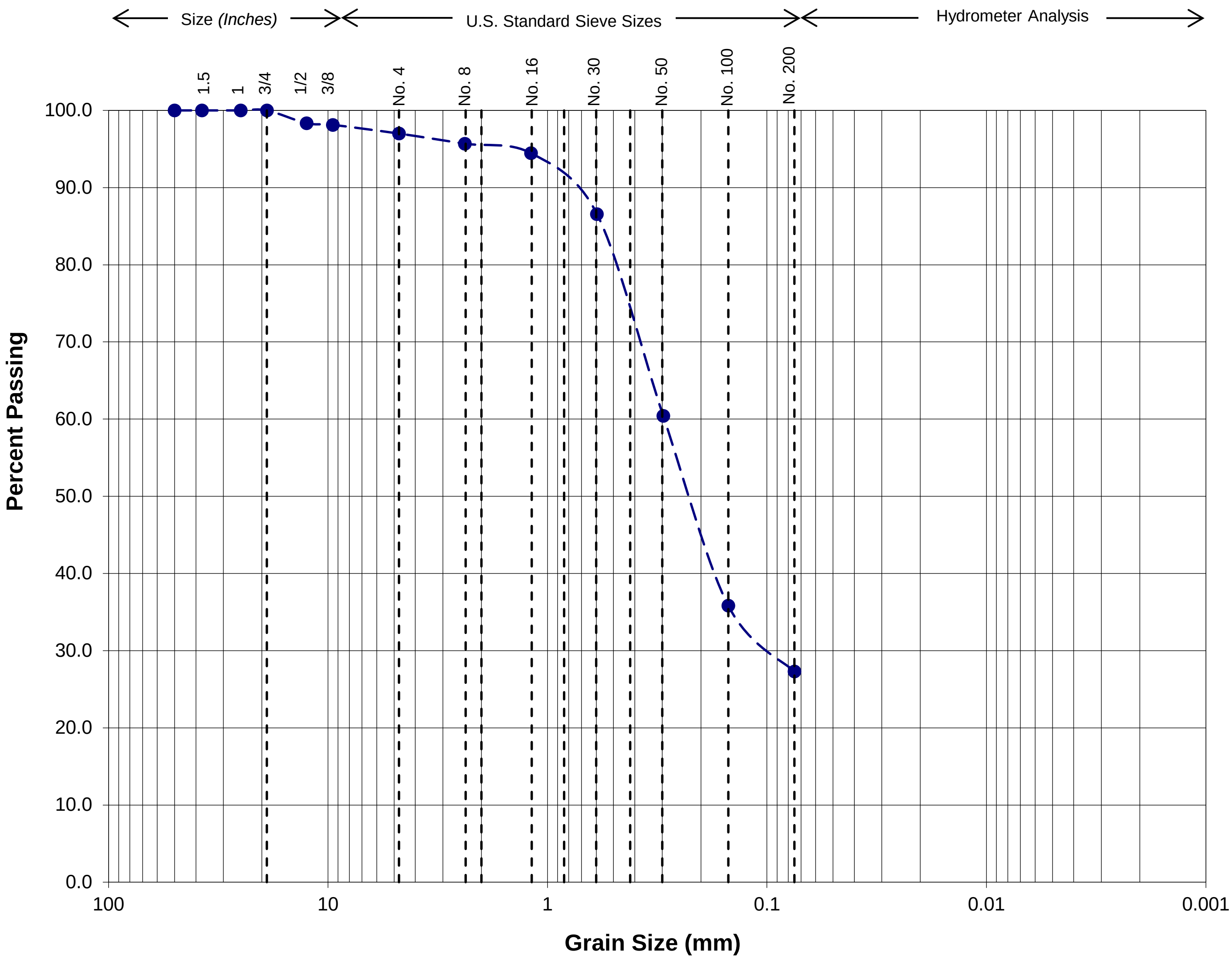
Sample Location:	B-2
Depth (ft):	5.0'
USCS Soil Type:	SM
Passing No. 200 (%):	39

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-2



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

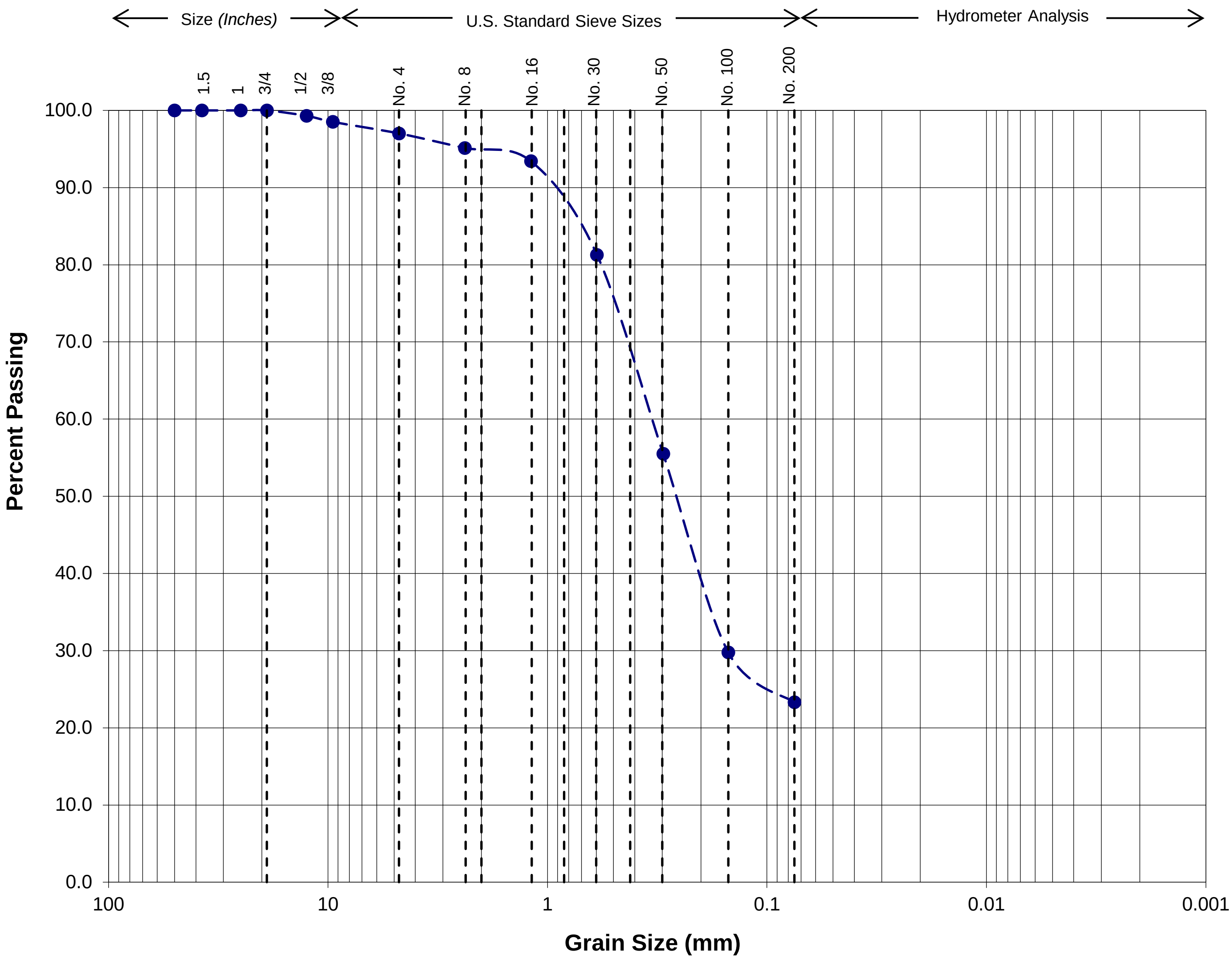
Sample Location:	B-2
Depth (ft):	6.5'
USCS Soil Type:	SM
Passing No. 200 (%):	27

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-3



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

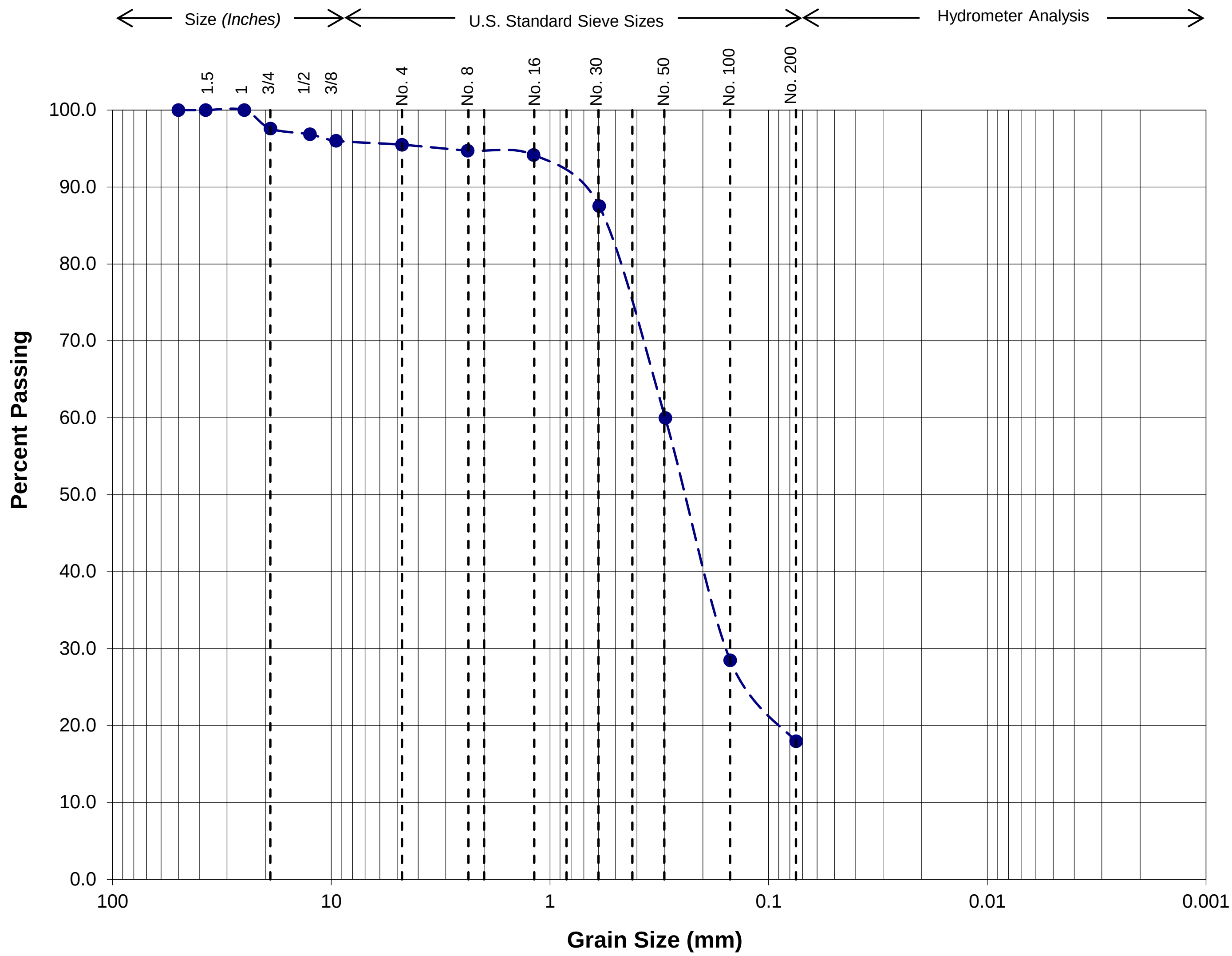
Sample Location:	B-2
Depth (ft):	8'
USCS Soil Type:	SM
Passing No. 200 (%):	23

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-4



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

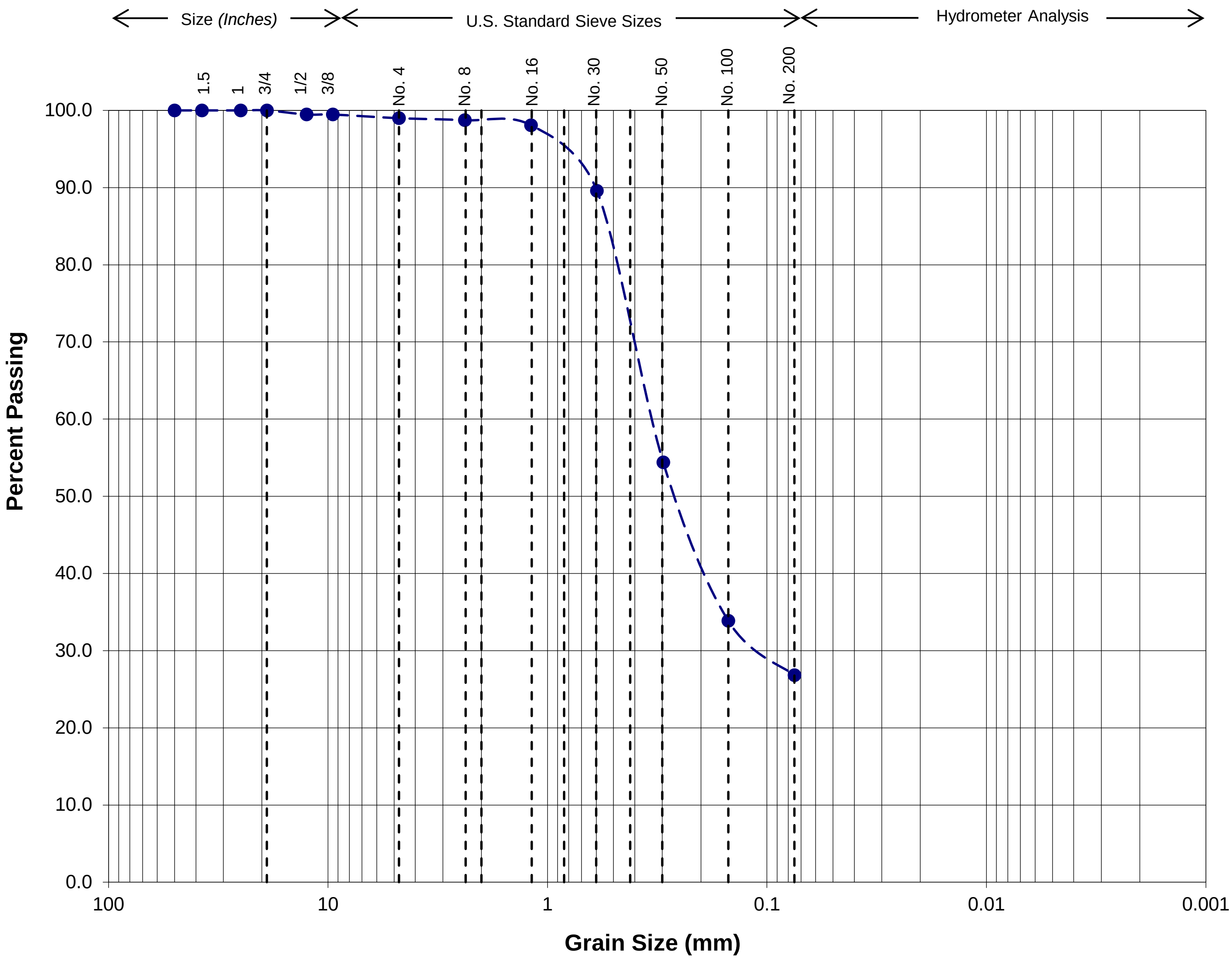
Sample Location:	B-2
Depth (ft):	9.5'
USCS Soil Type:	SM
Passing No. 200 (%):	18

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-5



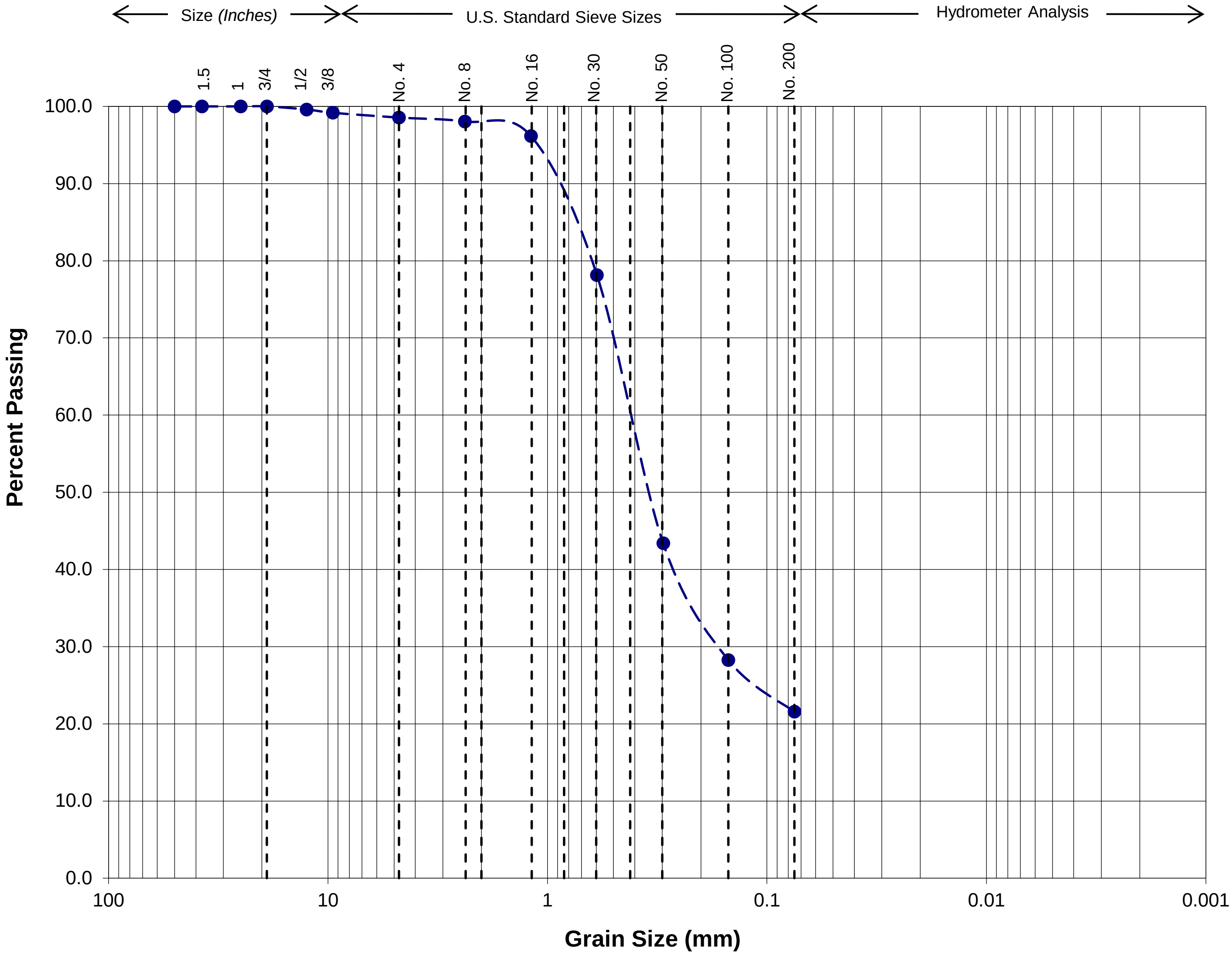
<table>
<tr><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Sample Location:	B-3
Depth (ft):	5'
USCS Soil Type:	SM
Passing No. 200 (%):	27

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	**B-6**



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<tr><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

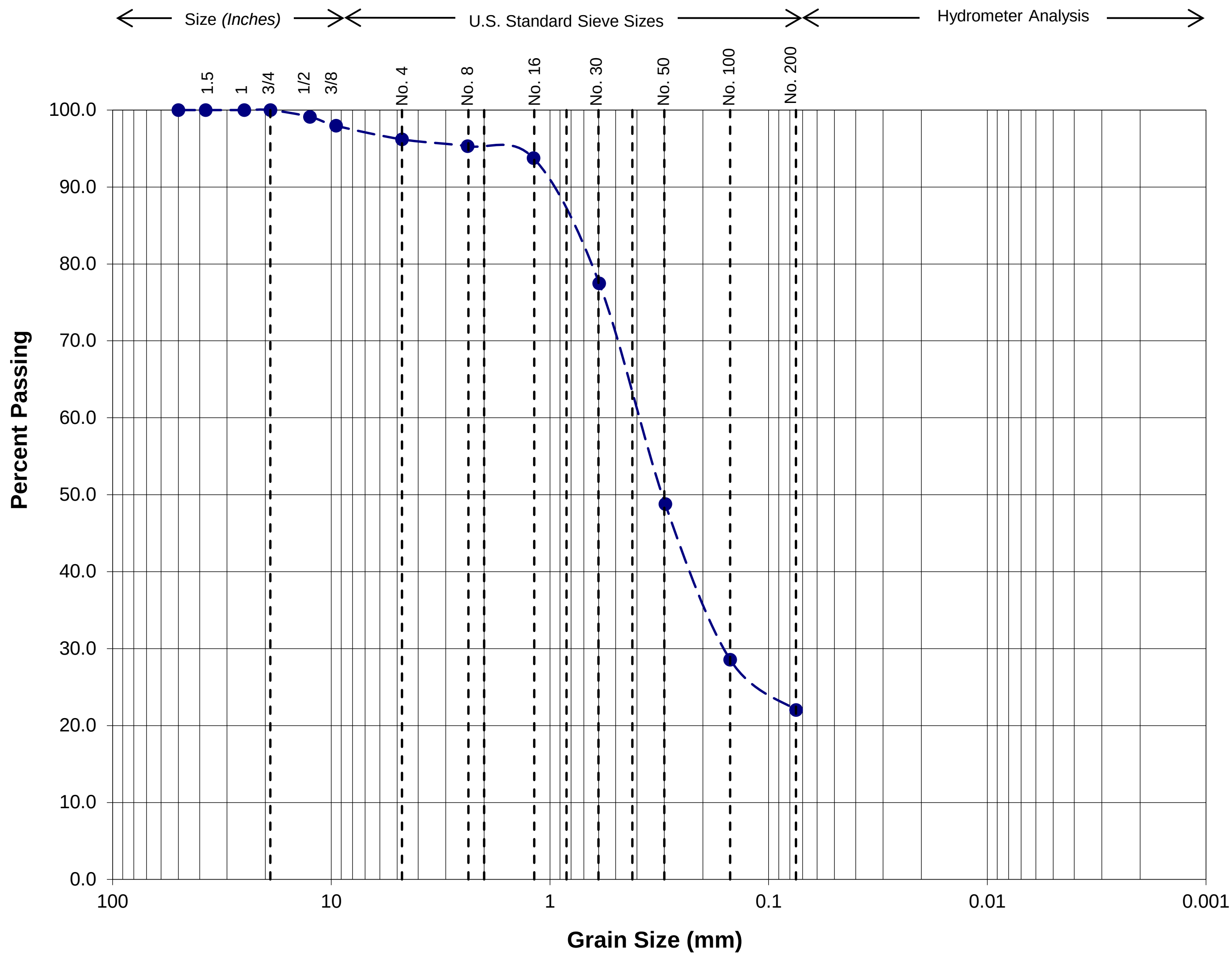
Sample Location:	B-4
Depth (ft):	5'
USCS Soil Type:	SM
Passing No. 200 (%):	22

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-7



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

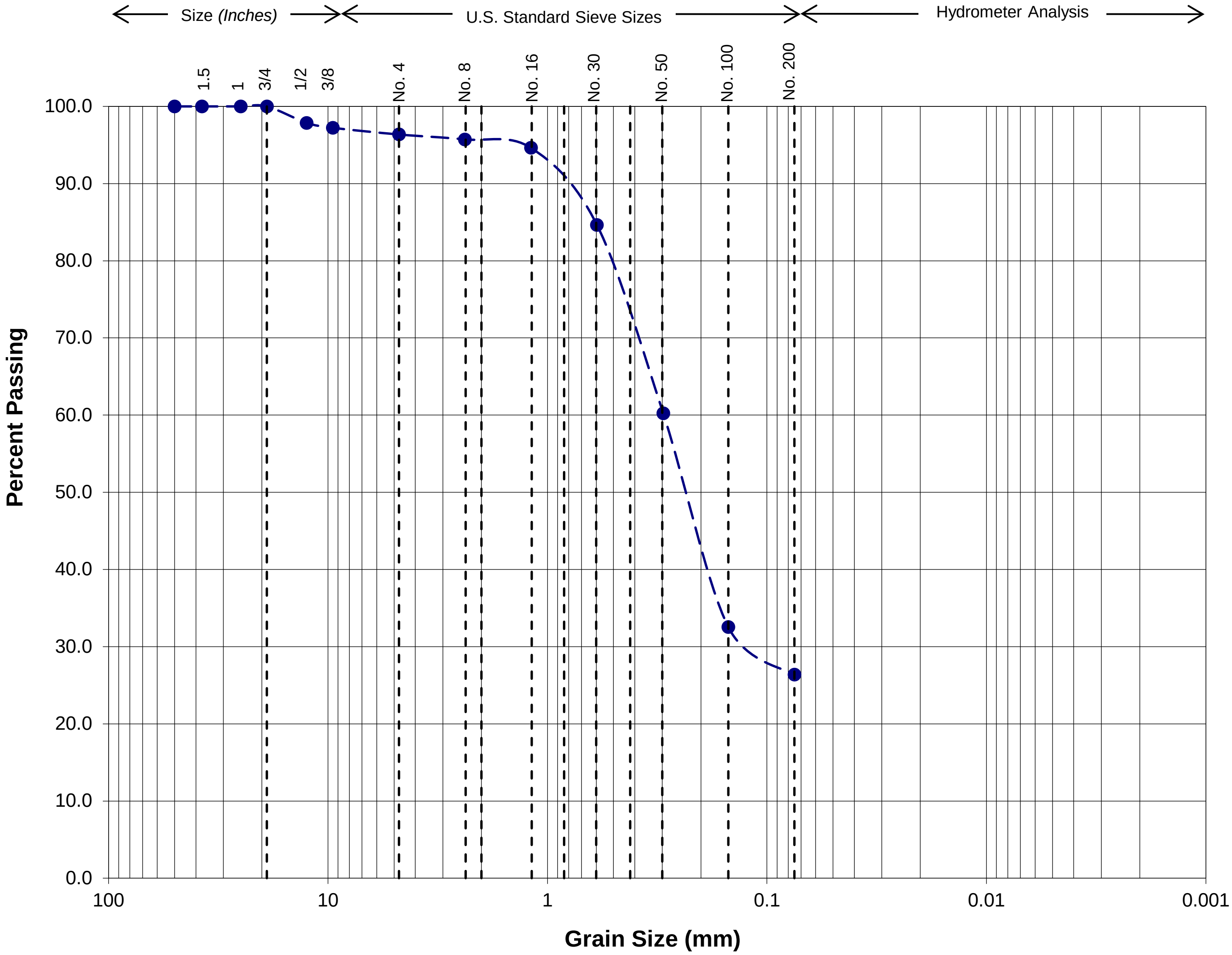
Sample Location:	B-4
Depth (ft):	6.5'
USCS Soil Type:	SM
Passing No. 200 (%):	22

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	**B-8**



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

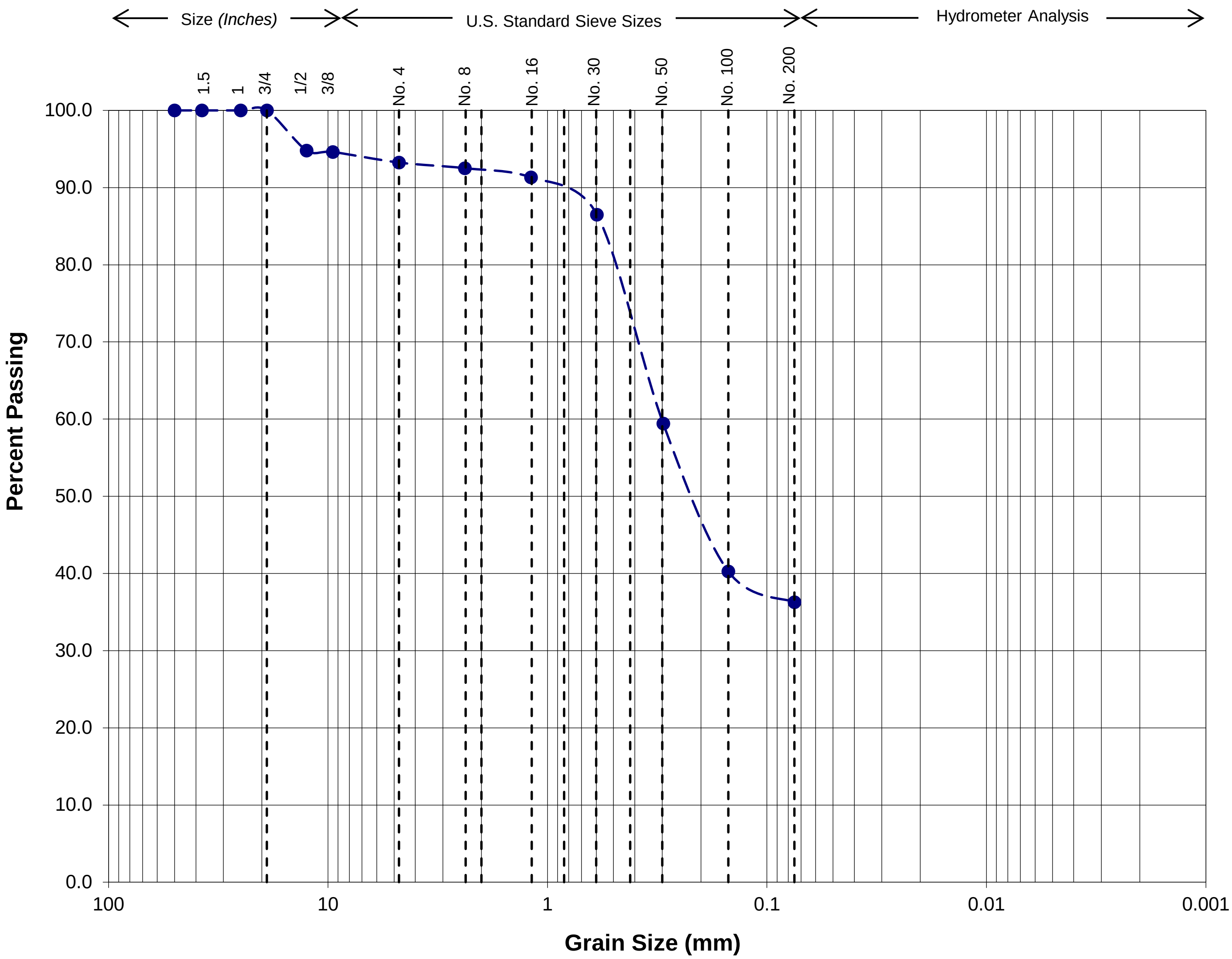
Sample Location:	B-4
Depth (ft):	8'
USCS Soil Type:	SM
Passing No. 200 (%):	26

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-9



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

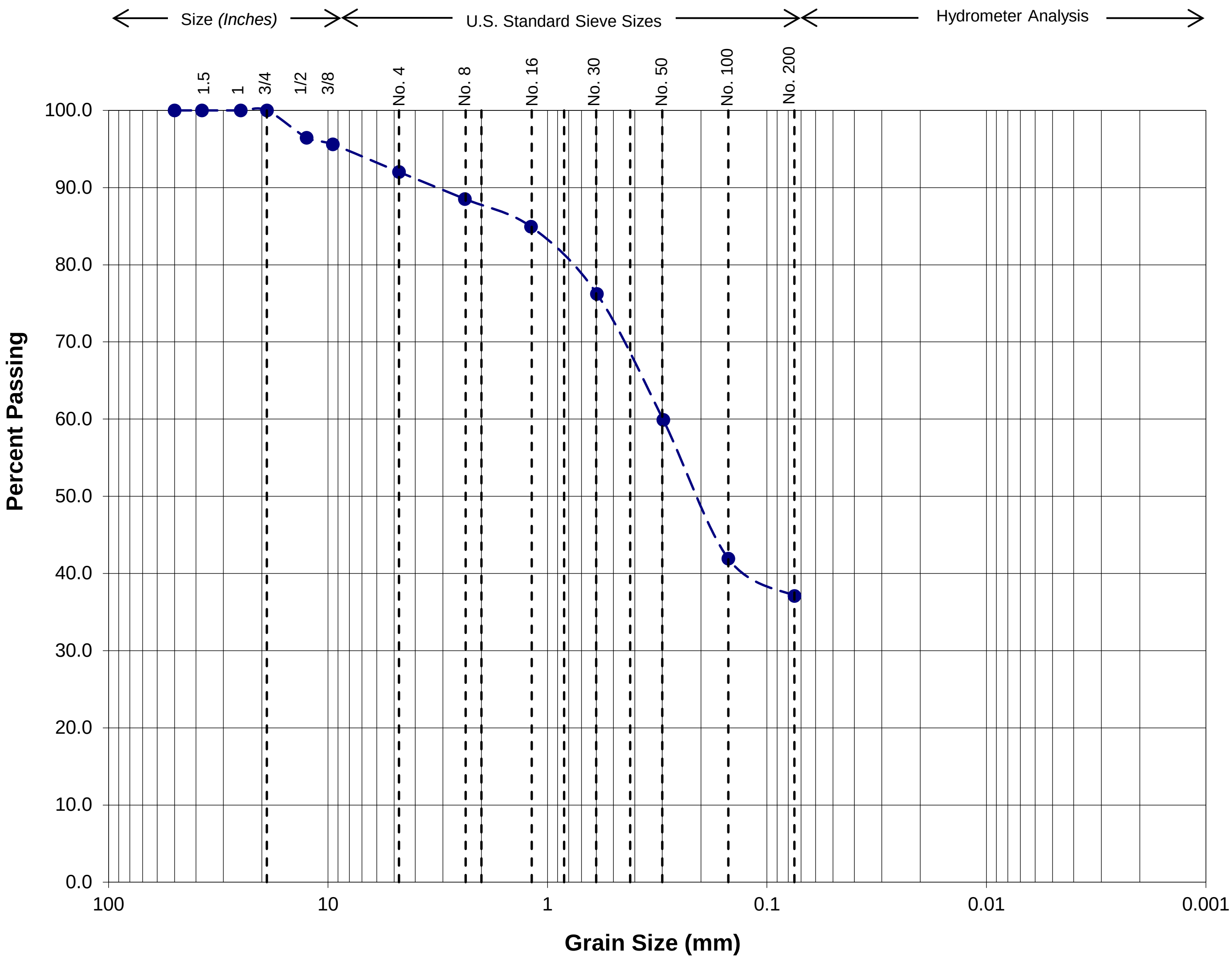
Sample Location:	B-4
Depth (ft):	9.5'
USCS Soil Type:	SM
Passing No. 200 (%):	36

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	B-10



<table>
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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

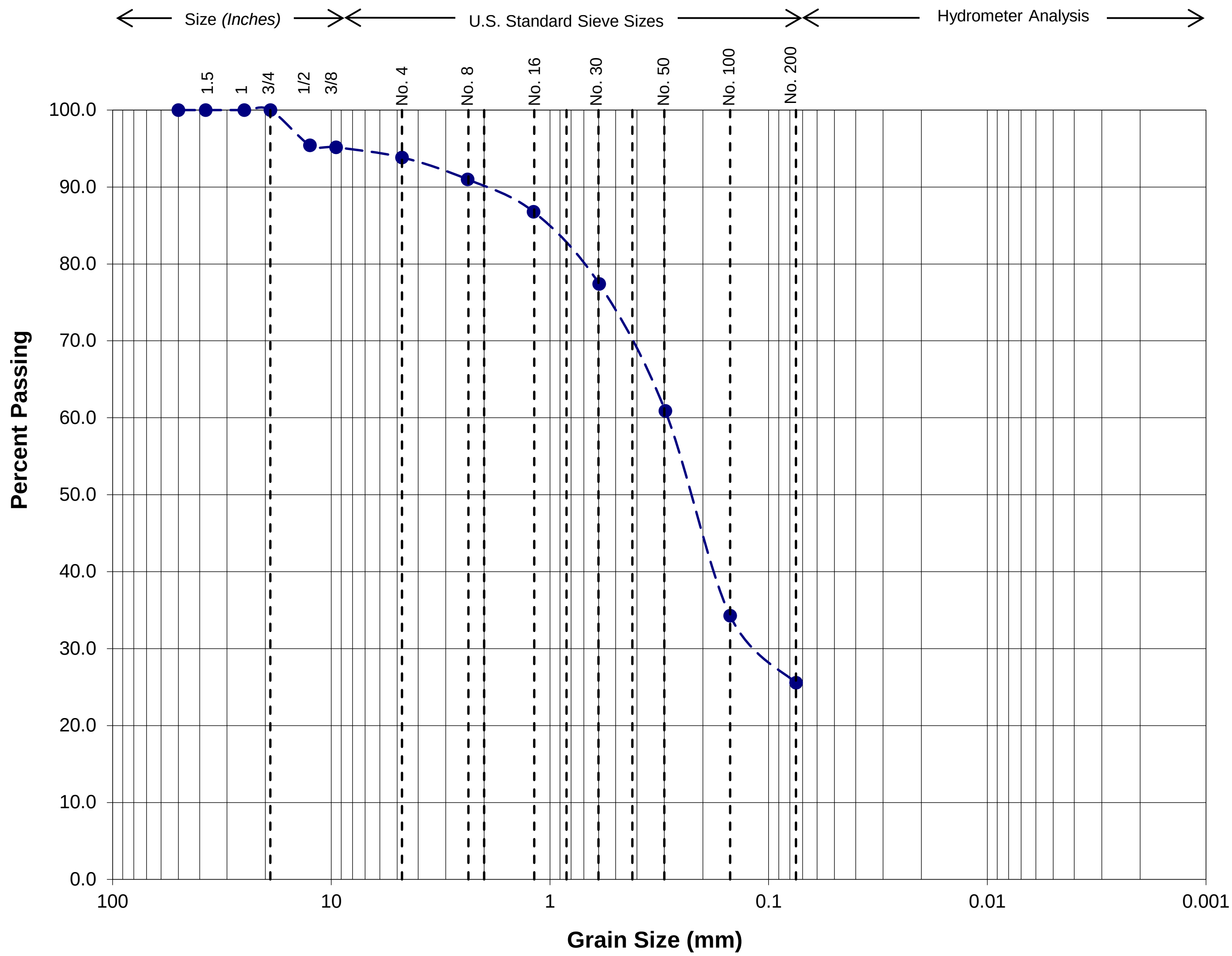
Sample Location:	B-4
Depth (ft):	11'
USCS Soil Type:	SM
Passing No. 200 (%):	37

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	**B-11**



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

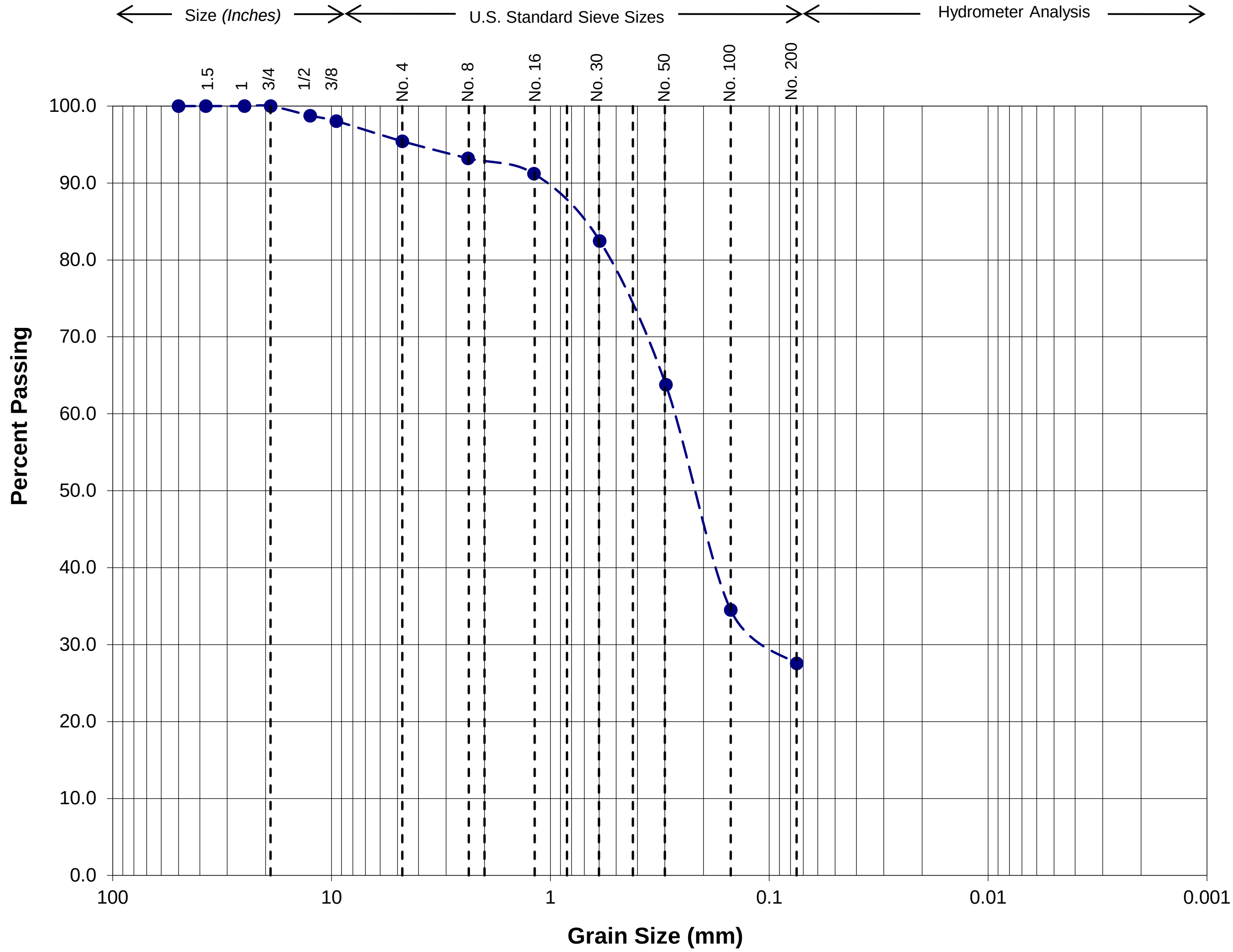
Sample Location:	B-4
Depth (ft):	12.5'
USCS Soil Type:	SM
Passing No. 200 (%):	26

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	**B-12**



GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

Sample Location:	B-4
Depth (ft):	14'
USCS Soil Type:	SM
Passing No. 200 (%):	28

NOVA

GRADATION ANALYSIS TEST RESULTS

CENTRUMPLACE INFILTRATION STUDY
5247-5289 KEARNY VILLA ROAD
SAN DIEGO,CA

DATE	PROJECT NO.	FIGURE
5/6/2016	1015310.1	**B-13**

APPENDIX E

Records of Borings and Trenches by Geocon

NOVA

PROJECT NO. 06505-52-04

TRENCH T 1

ELEV. (MSL.) **413** DATE COMPLETED **11-03-2010**

EQUIPMENT **JD 510 BACKHOE** BY: **N. BORJA**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, reddish brown, Silty, fine to coarse SAND; few gravel and cobble			
2	T1-1			SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes		111.6	8.6
				CL	Stiff, moist, reddish brown to yellowish brown, Sandy CLAY; trace gravel			
4	T1-2			SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Very dense, damp, reddish brown, Silty, fine to coarse SANDSTONE; little gravel and cobble; weakly cemented; micaceous		127.9	6.6
					TRENCH TERMINATED AT 4 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-1,
Log of Trench T 1, Page 1 of 1

06505-52-04.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. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 2 ELEV. (MSL.) 413 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose, moist, reddish brown and dark reddish brown, Silty, fine to medium SAND; few gravel and cobble			
2				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, damp, reddish brown, Silty, fine- to coarse-grained SANDSTONE; little gravel and cobble; weakly cemented; some mica flakes			
					TRENCH TERMINATED AT 2.5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-2,
Log of Trench T 2, Page 1 of 1

06505-52-04.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. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 3 ELEV. (MSL.) 413 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose, moist, reddish brown and light gray, Silty, fine to medium SAND; little gravel and cobble			
2				SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes -Excavates with trace gravel and cobble		111.5	14.0
4				SM-SC	Medium dense, moist, reddish brown to yellowish brown and gray, Silty to Clayey, fine to medium SAND; few gravel and cobble			
6				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Very dense, damp to moist, reddish brown, Silty, fine- to coarse-grained SANDSTONE; some gravel and cobble; weakly cemented			
					TRENCH TERMINATED AT 6.5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-3,
Log of Trench T 3, Page 1 of 1

06505-52-04.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. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 4 ELEV. (MSL.) 414 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, reddish brown, Silty, fine to medium SAND; little gravel and cobble; trace asphalt concrete			
2				SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes		110.2	10.6
4				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, damp, reddish brown, Silty, fine- to coarse-grained SANDSTONE; little gravel and cobble; weakly cemented			
					TRENCH TERMINATED AT 4.5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-4,
Log of Trench T 4, Page 1 of 1

06505-52-04.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. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5 ELEV. (MSL.) 414 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, reddish brown, Silty, fine to medium SAND; few gravel and cobble; trace asphalt concrete			
2	T5-1			SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes -Becomes reddish brown to dark reddish brown; few gravel and cobble			
4				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, damp, reddish brown to yellowish brown, Silty, fine- to coarse-grained SANDSTONE; some gravel and cobble; uncemented			
					TRENCH TERMINATED AT 5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-5,
Log of Trench T 5, Page 1 of 1

06505-52-04.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. 06505-52-04

TRENCH T 6

ELEV. (MSL.) 413 DATE COMPLETED 11-03-2010

EQUIPMENT JD 510 BACKHOE BY: N. BORJA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, reddish brown, Silty, fine to medium SAND; little gravel and cobble; trace asphalt concrete			
2				SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes		108.9	8.9
4				SC	Medium dense, moist, yellowish brown and reddish brown, Clayey, fine to medium SAND; few gravel and cobble			
				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, moist, reddish brown to yellowish brown, Silty, fine- to coarse-grained SANDSTONE; some gravel and cobble; uncemented			
					TRENCH TERMINATED AT 5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-6,
Log of Trench T 6, Page 1 of 1

06505-52-04.GPJ

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

PROJECT NO. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 7 — ELEV. (MSL.) 414 DATE COMPLETED 11-03-2010 — EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T7-1			SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, reddish brown to brown, Silty, fine to medium SAND; few gravel and cobble; trace asphalt concrete			
2				SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes		112.0	10.4
							101.5	12.9
				SC	Stiff, moist, reddish brown and gray, Sandy CLAY			
4	T7-2			SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, damp, reddish brown to yellowish brown, Silty, fine- to coarse-grained SANDSTONE; few gravel and cobble; weakly cemented		125.5	6.6

TRENCH TERMINATED AT 4.5 FEET
NO GROUNDWATER ENCOUNTERED

Figure A-7,
Log of Trench T 7, Page 1 of 1

06505-52-04.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. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 8 ELEV. (MSL.) 414 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose, moist to wet, brown to reddish brown, Silty, fine to medium SAND; little gravel and cobble			
2				SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes			
	T8-1			SC	Stiff, moist, mottled reddish brown to yellowish brown and gray, Sandy CLAY; trace gravel and cobble		116.6	15.0
4				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, damp, reddish brown to yellowish brown, Silty, fine- to coarse-grained SANDSTONE; some gravel and cobble; weakly cemented			
					TRENCH TERMINATED AT 4.5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-8,
Log of Trench T 8, Page 1 of 1

06505-52-04.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. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 9 ELEV. (MSL.) 414 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, brown to reddish brown, Silty, fine to medium SAND; little gravel and cobble			
2				SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes		113.9	8.7
				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Very dense, damp, reddish brown, Silty, fine- to medium-grained SANDSTONE; little gravel and cobble; weakly cemented; some mica flakes			
					TRENCH TERMINATED AT 3.5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-9,
Log of Trench T 9, Page 1 of 1

06505-52-04.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

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 10 ELEV. (MSL.) 414 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0 2				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, reddish brown to brown, Silty, fine to medium SAND; few gravel and cobble			
4				SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes			
				SC	Medium dense, moist, reddish brown, Clayey, fine to medium SAND; trace gravel			
				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, damp, reddish brown to yellowish brown, Silty, fine- to coarse-grained SANDSTONE; little gravel and cobble; weakly cemented			
					TRENCH TERMINATED AT 5 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-10,
Log of Trench T 10, Page 1 of 1

06505-52-04.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. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 11 ELEV. (MSL.) 414 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, reddish brown to brown, Silty, fine to medium SAND; few gravel and cobble			
2	T11-1			SM	**WEATHERED TERRACE DEPOSITS (Qt)** Medium dense, moist, dark reddish brown, Silty, fine to medium SAND; trace charcoal flakes		118.8 128.2	6.9 3.9
				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Very dense, damp, reddish brown, Silty, fine- to medium-grained SANDSTONE; little gravel; weakly cemented			

TRENCH TERMINATED AT 3.5 FEET
NO GROUNDWATER ENCOUNTERED

Figure A-11,
Log of Trench T 11, Page 1 of 1

06505-52-04.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

GEOCON

PROJECT NO. 06505-52-04

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 12 ELEV. (MSL.) 415 DATE COMPLETED 11-03-2010 EQUIPMENT JD 510 BACKHOE BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist to wet, brown to reddish brown, Silty, fine to medium SAND; few gravel and cobble			
2	T12-1			CH	**WEATHERED TERRACE DEPOSITS (Qt)** Stiff, moist, dark reddish brown, Sandy FAT CLAY; high plasticity		96.3 106.5	26.0 20.5
				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Very dense, damp, reddish brown, Silty, fine- to medium-grained SANDSTONE; little gravel and cobble; weakly cemented			
					TRENCH TERMINATED AT 3 FEET NO GROUNDWATER ENCOUNTERED			

Figure A-12,
Log of Trench T 12, Page 1 of 1

06505-52-04.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 06505-22-02

BORING B 1A

ELEV. (MSL.) ____________ DATE COMPLETED 03-02-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		CL	**PREVIOUSLY PLACED FILL** Soft, moist, dark brown, Sandy CLAY			
2	B1A-1	SM	**LINDAVISTA FORMATION** Dense to very dense, moist, red, mottled light brown, Silty, fine to medium SAND			
6	B1A-2			50/5"	98.4	11.7
10	B1A-3			50/5"	106.9	7.4
16	B1A-4		-Pyrite flecks, no apparent mottling	50/5"	97.5	19.8
18			-Difficult drilling, gravel/cobble lense at 18 feet			
20			-No recovery, gravel in sampler	50/3"		
22		SM	**MISSION VALLEY FORMATION** Very dense, damp, light gray with reddish brown mottling, Silty, fine to medium SANDSTONE, weakly cemented -Thin gravel lense at 23 feet			

Log of Boring B 1A, Page 1 of 3

06505-22-02.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 1A

ELEV. (MSL.) ________ DATE COMPLETED 03-02-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	B1A-5				**MISSION VALLEY FORMATION** Very dense, damp, light gray with reddish brown mottling, Silty, fine to medium SANDSTONE; weakly cemented	50/6"	108.1	11.8
28								
30	B1A-6				-Less mottling	50/6"	110.6	14.3
32								
34								
36	B1A-7			SM		50/6"	109.0	10.8
38								
40	B1A-8					50/5"	100.0	10.9
42								
44								
46	B1A-9					50/6"	111.3	13.8
48								

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. 06505-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 1A ELEV. (MSL.) ____ DATE COMPLETED 03-02-2005 EQUIPMENT CME 85 W/8" HSA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
50	B1A-10				**MISSION VALLEY FORMATION** Very dense, damp, light gray with reddish brown mottling, Silty, fine to medium SANDSTONE with fine to coarse angular gravel	50/6"	98.8	15.1
52								
54				SM				
56								
58								
60	B1A-11				-No gravel	50/5"	116.6	13.9
					BORING TERMINATED AT 60 FEET 6 INCHES No groundwater encountered Backfilled with 16 ft³ of hydrated bentonite grout and chips			

06505-22-02.GPJ

Log of Boring B 1A, Page 3 of 3

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. 06505-22-02

BORING B 2A

ELEV. (MSL.) ________ DATE COMPLETED 03-02-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**PREVIOUSLY PLACED FILL** Hard/dense, moist, dark reddish brown, Sandy CLAY to Clayey SAND with coarse rounded gravel			
2								
4				CL/SC				
6	B2A-1					50/6"		6.6
8								
10	B2A-2				-Poor recovery, gravel/cobble	50/3"		6.6
					LINDAVISTA FORMATION Dense to very dense, moist, red, Silty, fine to medium SAND			
12								
14				SM				
16					-No recovery, cobble in sampler	50/1"		
18					-Difficult drilling, gravel/cobble			
					MISSION VALLEY FORMATION Very dense, damp, light gray, Silty, fine to medium SANDSTONE, weakly cemented			
20					-No recovery, gravel/cobble	50/3"		
22				SM				
24								

06505-22-02.GPJ

Log of Boring B 2A, Page 1 of 3

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. 06505-22-02

BORING B 2A

ELEV. (MSL.) ________ DATE COMPLETED 03-02-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	B2A-3				**MISSION VALLEY FORMATION** Very dense, damp, light gray with reddish brown mottling, Silty, fine to medium SANDSTONE, weakly cemented	50/6"	108.6	13.2
28								
30	B2A-4				-With fine sub-rounded gravel	50/3"	93.2	12.3
32								
34								
36	B2A-5			SM	-Increased fine sand	50/3"	108.7	12.9
38								
40	B2A-6				-Siltstone interbeds	50/4"	98.1	17.8
42								
44								
46	B2A-7				-Laminated with light brown silt	50/4"	106.3	15.0
48								

Log of Boring B 2A, Page 2 of 3

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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. 06505-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 2A ELEV. (MSL.) ______ DATE COMPLETED 03-02-2005 EQUIPMENT CME 85 W/8" HSA MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B2A-8				**MISSION VALLEY FORMATION** Very dense, damp, light gray with reddish brown mottling, Silty, fine to medium SANDSTONE, weakly cemented	50/6"	111.8	15.0
52								
54				SM				
56	B2A-9					50/4"	111.2	14.1
58								
60	B2A-10					50/4"	113.0	13.0
					BORING TERMINATED AT 60 FEET 6 INCHES No groundwater encountered Backfilled with 16 ft³ of hydrated bentonite grout and chips			

Log of Boring B 2A, Page 3 of 3

06505-22-02.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. 06505-22-02

BORING B 3A

ELEV. (MSL.) ________ DATE COMPLETED 03-03-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**PREVIOUSLY PLACED FILL** Soft, moist, dark brown, Sandy CLAY			
2								
4				SM	**LINDAVISTA FORMATION** Dense to very dense, moist, red, Silty, fine to medium SAND			
	B3A-1				-With fine to coarse subangular gravel and cobbles	50/5"	91.6	7.6
6	B3A-2							
8								
10	B3A-3				-Cobble in sampler	50/5"		6.4
12	B3A-4			SM/SC	Dense to very dense, moist, dark reddish brown to grayish tan, Silty to Clayey, fine to medium SAND with gravel and cobbles			
14								
16					-Refusal at 15 feet, moved location 20 feet east and continued drilling -Difficult drilling, cobble lense 14 to 16 feet	50/2"		
18				SC	**MISSION VALLEY FORMATION** Very dense, moist, light brownish gray with grayish tan mottling, Clayey, fine to medium SAND			
20	B3A-5				-Ring sample disturbed	50/4"		
22								
24				SM/SC	Very dense, damp, brownish gray with grayish tan mottling, Clayey to Silty, fine to medium SAND			

Log of Boring B 3A, Page 1 of 2

06505-22-02.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. 06505-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 3A ELEV. (MSL.) ______ DATE COMPLETED 03-03-2005 EQUIPMENT CME 85 W/8" HSA MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B3A-6				**MISSION VALLEY FORMATION** Very dense, damp, brownish gray with grayish tan mottling, Clayey to Silty, fine to medium SAND	50/4"	94.4	12.9
26								
28				SM/SC				
30					-Sample disturbed	50/4"		
32					Very dense, damp, light gray, Silty, fine- to medium-grained SANDSTONE, weakly cemented			
34								
36						50/1"		
38				SM				
40	B3A-7				-Interbedded with moist, grayish tan, clayey, fine sand	50/5"	106.3	14.2
42								
44								
	B3A-8					50/4"	107.8	13.8
					BORING TERMINATED AT 45 FEET 4 INCHES No groundwater encountered Backfilled with 12 ft³ of hydrated bentonite grout and chips			

Log of Boring B 3A, Page 2 of 2

06505-22-02.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. 06505-22-02

BORING B 4A

ELEV. (MSL.) ________ DATE COMPLETED 03-03-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**PREVIOUSLY PLACED FILL** Loose, moist, dark brown, Silty SAND			
				SP-SM	**LINDAVISTA FORMATION** Medium dense to dense, damp, red, fine to medium SAND with Silt			
6	B4A-1				-Becomes very dense below 5 feet	50/5"	109.3	8.3
10	B4A-2				-Pale reddish brown, silty, fine SANDSTONE; moderately cemented	50/6"	87.0	10.1
					-Cobble lenses between 11 and 15 feet			
16					-Cobble in sampler	50/5"		
18				SC	**MISSION VALLEY FORMATION** Very dense, moist, brownish gray with grayish tan and pinkish tan mottling, Clayey, fine to medium SAND			
20	B4A-3					50/5"	92.7	10.0
24				SM	Very dense, damp, gray, Silty, fine to medium SANDSTONE, weakly cemented			

Log of Boring B 4A, Page 1 of 2

06505-22-02.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. 06505-22-02

BORING B 4A

ELEV (MSL.) ________ DATE COMPLETED 03-03-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B4A-4				**MISSION VALLEY FORMATION**			
26	B4A-5				Very dense, damp, gray, Silty, fine to medium SANDSTONE, weakly cemented	50/4"	98.2	11.5
28								
30	B4A-6				-Laminated with moist, dark brown silt interbeds	50/5"	91.1	12.9
32								
34				SM				
36	B4A-7					50/5"	98.2	11.4
38								
40	B4A-8				-Laminated with dull pink, clayey, fine sand interbeds	50/5"	104.5	14.1
42								
44								
	B4A-9					50/4"	113.8	13.5

BORING TERMINATED AT 45 FEET 4 INCHES
No groundwater encountered
Backfilled with 12 ft³ of hydrated bentonite grout and chips

Log of Boring B 4A, Page 2 of 2

06505-22-02.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 5A

ELEV. (MSL.) ________ DATE COMPLETED 03-03-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2				CL/SC	**PREVIOUSLY PLACED FILL** Hard and dense, moist, grayish brown and orange-brown, fine to medium SAND and CLAY with gravel and cobbles			
4 – 6	B5A-1			SW-SM/ SW-SC	Dense to very dense, damp, grayish orange-brown to reddish brown, fine to medium SAND with Silt and Clay; scattered gravel and cobbles	67/11"	90.9	10.1
8 – 20				SM	**LINDAVISTA FORMATION** Dense, damp, dark reddish brown, Silty, fine SAND with gravel and cobble lenses	50/1"		
16	B5A-2					50/1"		
20						50/2"		
22 – 24				SM/SC	**MISSION VALLEY FORMATION** Very dense, damp, brownish gray, Silty to Clayey, fine to medium SANDSTONE; weakly cemented			

06505-22-02.GPJ

Log of Boring B 5A, Page 1 of 2

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 5A

ELEV. (MSL.) ______ DATE COMPLETED 03-03-2005

EQUIPMENT CME 85 W/8" HSA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					**MISSION VALLEY FORMATION** Very dense, damp, light gray, Silty, fine to medium SANDSTONE; becomes moderately cemented with depth	50/1"		
28								
30	B5A-3				-No recovery using California Modified sampler; drove SPT sample	50/2"		
32								
34				SM				
36	B5A-4					50/5"		
38								
40	B5A-5				-Laminated with gray, poorly to moderately indurated siltstone interbeds and cobbles	50/5"		
42								
44								
	B5A-6					50/3"		

BORING TERMINATED AT 45 FEET 3 INCHES
No groundwater encountered
Backfilled with 12 ft³ of hydrated bentonite grout and chips

Log of Boring B 5A, Page 2 of 2

06505-22-02.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. 06505-02-01

BORING B 1

ELEV. (MSL.) ____________ DATE COMPLETED 10/19/00

EQUIPMENT IR A300

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B1-1			SC	**PREVIOUSLY PLACED FILL** Dense, moist, brown, Clayey SAND with gravel/cobbles			
2	B1-2					50/5"	113.9	11.2
4				SM	**LINDAVISTA FORMATION** Moist, light reddish-brown, Silty SANDSTONE			
6	B1-3					50/4.5"	111.3	8.3
					BORING TERMINATED AT 6 FEET			

Figure A-1, Log of Boring B 1

SUNSP

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. 06505-02-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 2 ELEV. (MSL.) ______ DATE COMPLETED 10/19/00 EQUIPMENT IR A300	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	B2-1			SM	**PREVIOUSLY PLACED FILL** Dense, moist, reddish-brown, Silty SAND with gravel			
2	B2-2			SM	**LINDAVISTA FORMATION** Very dense, moist, light reddish-brown, Silty SANDSTONE with gravel	50/5"		
4								
6	B2-3					50/6"	97.9	7.4
					BORING TERMINATED AT 6 FEET			

Figure A-2, Log of Boring B 2

SUNSP

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. 06505-02-01

BORING B 3

ELEV. (MSL.) ____________ DATE COMPLETED 10/19/00

EQUIPMENT IR A300

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B3-1				**PREVIOUSLY PLACED FILL** Very dense, damp, light brown, Silty SAND with gravel/cobbles			
2	B3-2					50/4"		8.6
4				SM				
6								
8	B3-3			SM	**LINDAVISTA FORMATION** Very dense, moist, tan/reddish-brown, Silty SANDSTONE with trace gravel	50/5"	110.8	9.2
10				SM	Very dense, moist, reddish-brown, Silty SANDSTONE with cobbles			

BORING TERMINATED AT 10.5 FEET

Figure A-3, Log of Boring B 3

SUNSP

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. 06505-02-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 4 ELEV. (MSL.) ______ DATE COMPLETED 10/19/00 EQUIPMENT IR A300	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	B4-1			SM	**PREVIOUSLY PLACED FILL** Moderately dense, moist, light brown, Silty SAND with gravel			
2	B4-2			SM	Moderately dense, moist, dark red, Silty SAND with gravel	19	117.3	9.6
4								
6	B4-3			SM	**LINDAVISTA FORMATION** Very dense, moist, reddish-brown, Silty SAND with gravel and cobbles	50/3"	109.5	10.3
8								
10	B4-4			SM	Very dense, moist, light reddish-brown, Silty SANDSTONE with gravel	18/3"		
12								
14					BORING TERMINATED AT 14 FEET			

Figure A-4, Log of Boring B 4

SUNSP

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. 06505-02-01

BORING B 5

ELEV. (MSL.) ______ DATE COMPLETED 10/19/00

EQUIPMENT IR A300

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B5-1				**PREVIOUSLY PLACED FILL** Very dense, moist, brown, Silty SAND			
2	B5-2					50/6"		5.4
4					**LINDAVISTA FORMATION** Very dense, moist, reddish-brown, Silty SANDSTONE			
6	B5-3					50/6"	112.4	9.3
8								
10					BORING TERMINATED AT 10 FEET			

Figure A-5, Log of Boring B 5

SUNSP

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. 06505-02-01

BORING B 6

ELEV. (MSL.) ________ DATE COMPLETED 10/19/00

EQUIPMENT IR A300

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B6-1				**PREVIOUSLY PLACED FILL** Moderately dense, moist, light brown, Silty SAND with gravel			
2	B6-2							
	B6-1				**LINDAVISTA FORMATION** Very dense, moist, light reddish-brown, Silty SANDSTONE	50/5"	107.6	6.9
4								
6	B6-3					50/6"		
8								
10	B6-4					50/5"	101.6	7.1
					BORING TERMINATED AT 10.5 FEET			

Figure A-6, Log of Boring B 6

SUNSP

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. 06505-02-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 7 ELEV. (MSL.) ______ DATE COMPLETED 10/19/00 EQUIPMENT IR A300	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	B7-1				**PREVIOUSLY PLACED FILL** Moderately dense, moist, dark brown, Silty SAND with gravel			
2	B7-2					27		
4				SM				
6	B7-3					22	119.8	11.1
8				SM	**LINDAVISTA FORMATION** Very dense, moist, light reddish-brown, Silty SANDSTONE			
10					BORING TERMINATED AT 10 FEET			

Figure A-7, Log of Boring B 7

SUNSP

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. 06505-02-01

BORING B 17

ELEV. (MSL.) ____________ DATE COMPLETED 10/23/00

EQUIPMENT IR A300

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B17-1			GP	**PREVIOUSLY PLACED FILL** Very dense, brown, Silty SAND/poorly graded gravel			
2								
4	B17-2				**LINDAVISTA FORMATION** Very dense, moist, reddish-brown, Silty SANDSTONE	50/4"		7.3
6	B17-3					50/5"	109.5	6.9
8								
10					BORING TERMINATED AT 10 FEET			

Figure A-17, Log of Boring B 17

SUNSP

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. 06505-02-01

BORING B 18

ELEV. (MSL.) ____________ DATE COMPLETED 10/23/00

EQUIPMENT IR A300

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B18-1				**PREVIOUSLY PLACED FILL** Very dense, moist, brown, Clayey SAND/Silty SAND with gravel			
2	B18-2			SM		50/5"	100.8	9.2
4								
6					**LINDAVISTA FORMATION** Very dense, moist, reddish-brown, Silty SANDSTONE with gravel/cobbles			
8								
10					BORING TERMINATED AT 10 FEET			

Figure A-18, Log of Boring B 18

SUNSP

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.

NOVA

GEOTECHNICAL ■ MATERIALS ■ SPECIAL INSPECTIONS
SBE ■ SLBE ■ SCOOP

4373 Viewridge Avenue, Ste. B
San Diego, CA 92123
858.292.7575

Mr. Craig Bachmann, Director of Construction
Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, California 92121

April 18, 2018
Project No. 1015310

Subject: Response to Review Comments
Report of Preliminary Geotechnical Investigation
Sunroad Centrum 6
Spectrum Center Boulevard and Lightwave Avenue, San Diego, California

References:

1. San Diego 2017. *Memorandum L64A-003A-2, LDR-Geology*, City of San Diego, Project No. 565879-10, December 20, 2017.

2. SC 2017. *Vesting Tentative Map/Planned Development Permit Plan, Sunroad Centrum 6, San Diego, California*, Stevens Cresto Engineering Inc., August 18, 2017, Project No. unknown, August 18, 2017.

3. NOVA 2017. *Report, Preliminary Geotechnical Investigation, Sunroad Centrum 6, Spectrum Boulevard and Lightwave Avenue, San Diego, California*, NOVA Services Inc., Project No. 1015310, November 14, 2017.

Dear Mr. Bachman:

The intent of this letter is to respond to comments by LDR-Geology on behalf the City of San Diego regarding its review of the above-referenced geotechnical reports for the subject project. The comments by the City of San Diego were provided under cover of a letter dated December 20, 2017 and are referenced herein as 'San Diego 2017.'

This response has been prepared by NOVA Services, Inc. (NOVA) for Sunroad Enterprises. NOVA is retained by Sunroad Enterprises as Geotechnical Engineer-of-Record (GEOR) for the project.

Review Comments and Responses

The following text reproduces comments from San Diego 2017 regarding geotechnical-related design for the above-referenced project. Comments from San Diego 2017 are reproduced below in italics, following which a response is provided by NOVA.

Issue 12. *Submit an addendum geotechnical letter/report that provides the following information* [regarding comment whether or not the proposed project as recommended will measurably destabilize neighboring properties or induce the settlement of adjacent structures].

Response 12. Noted.

Issue 13. *The geotechnical consultant must comment whether or not the proposed project as recommended will measurably destabilize neighboring properties or induce the settlement of adjacent structures.*

Response 13. The proposed development will not destabilize or result in settlement of adjacent property or the right of way provided the geotechnical recommendations of NOVA 2017 are followed.

Closure

It is hoped this letter adequately responds to concerns by the City of San Diego regarding the geotechnical report. In the meantime, should you have any questions regarding this report or other matters, please do not hesitate to call.

Sincerely,
NOVA Services, Inc.

Wail Mokhtar
Project Manager

John F. O'Brien, P.E., G.E.
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
JOHN F. O'BRIEN
651
expires 3-31-2019
GEOTECHNICAL
STATE OF CALIFORNIA

WM/hp:jfo

STEVENS · CRESTO ENGINEERING, INC.

PRELIMINARY DRAINAGE STUDY

FOR:

SUNROAD CENTRUM 6,
VTM NO. 2003387/ PDP NO. 2003388

(ADDENDUM TO APPROVED STUDY FOR CENTRUM 12)

San Diego, CA 92123
APN: 369-230-01, 02, 03, 04 & 14

Prepared For:
SUNROAD ENTERPRISES
4445 Eastgate Mall, Suite 400
San Diego, CA 92121

Prepared By:
STEVENS CRESTO ENGINEERING INC.
9665 Chesapeake Drive, Suite 200
San Diego, CA 92123

Contact: Bryan T. Hill, Senior Engineer
Telephone: 858-694-5660
Email: bth@scengr.com

SCE Project No.: 17006.01
Date: 11/09/17
Project No.: 565879

PRELIMINARY DRAINAGE STUDY

FOR:

SUNROAD CENTRUM 6,
VTM NO. 2003387/ PDP NO. 2003388

(ADDENDUM TO APPROVED STUDY FOR CENTRUM 12)

San Diego, CA 92123

Certification

This Drainage Study has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer (Engineer) attests to the technical information contained herein and the engineering data upon which the following design, recommendations, conclusions, and decisions are based.

STEVENS CRESTO ENGINEERING, INC.
9665 Chesapeake Drive
Suite 200
San Diego, CA 92123
Tel: (858) 694-5660

REGISTERED PROFESSIONAL ENGINEER
BRYAN T. HILL
No. 69339
Exp. 6-30-18
CIVIL
STATE OF CALIFORNIA

11/9/17

Bryan T. Hill　　　　Date
R.C.E. 69339

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"DRAINAGE STUDY FOR: CENTRUM 12"	3
CITY OF SAN DIEGO DRAWING NO. 34009-14-D AND 34009-15-D	4

1

SECTION 1

SUMMARY

Purpose of Study
This addendum has been prepared to address the addition of the Sunroad Centrum 6 development to the previously approved "Drainage Study for Centrum 12", dated 06/27/06. Sunroad Centrum 6 will construct a new building at the southeast corner of Kearny Villa Road and Lightwave Avenue. The "Drainage Study for Centrum 12" anticipated the development of Sunroad Centrum 6, and utilized a runoff coefficient of 0.85 for all areas proposed to be developed by Sunroad Centrum 6. See Section 3 for the "Drainage Study for Centrum 12", provided for reference, and Section 4 for sheets from City of San Diego DWG: 34009-D, the Fine Grading Plan for Centrum 12, which show the anticipated future building footprint in the location of Sunroad Centrum 6; the proposed project generally conforms to the anticipated footprint. This addendum has been prepared to accompany the Vesting Tentative Map (VTM) Review for Sunroad Centrum 6. A detailed analysis of the proposed development, including hydraulic calculations for all tributary storm drain, will be completed at final engineering.

Proposed Hydrology
The proposed Sunroad Centrum 6 development generally maintains drainage patterns and discharge points shown on Exhibit "B" – Proposed Condition, from the "Drainage Study for Centrum 12". This exhibit is included in Section 3 with the approximate location of Sunroad Centrum 6 added in red.

Basins

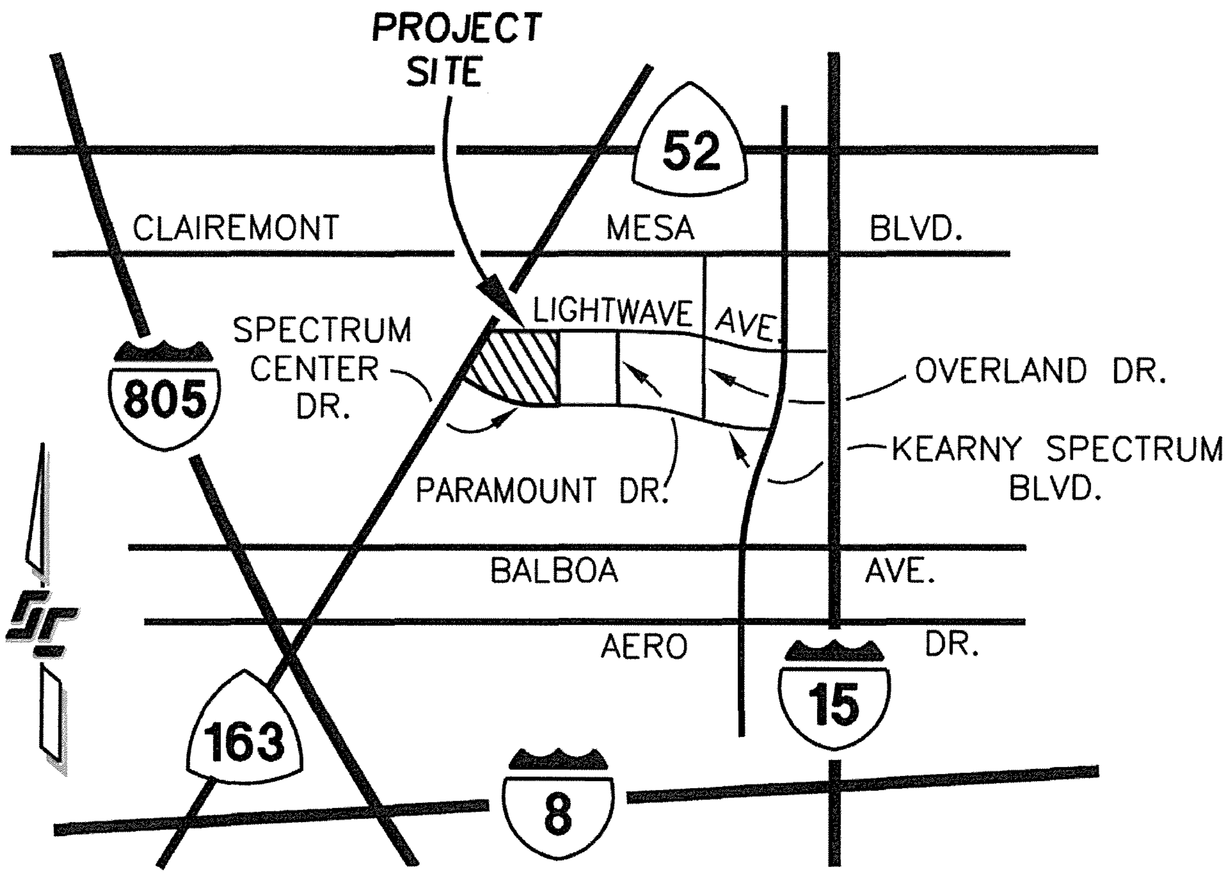
Sunroad Centrum 6 is contained primarily within Basins A, B, E, and G on Exhibit "B"- Proposed Condition. The proposed building will either split roof drainage areas to maintain the basin delineation or will implement detention to ensure that the peak flow rates at Nodes 003, 011, 019, and 033 are not exceeded. Detailed calculations will be provided at final engineering.

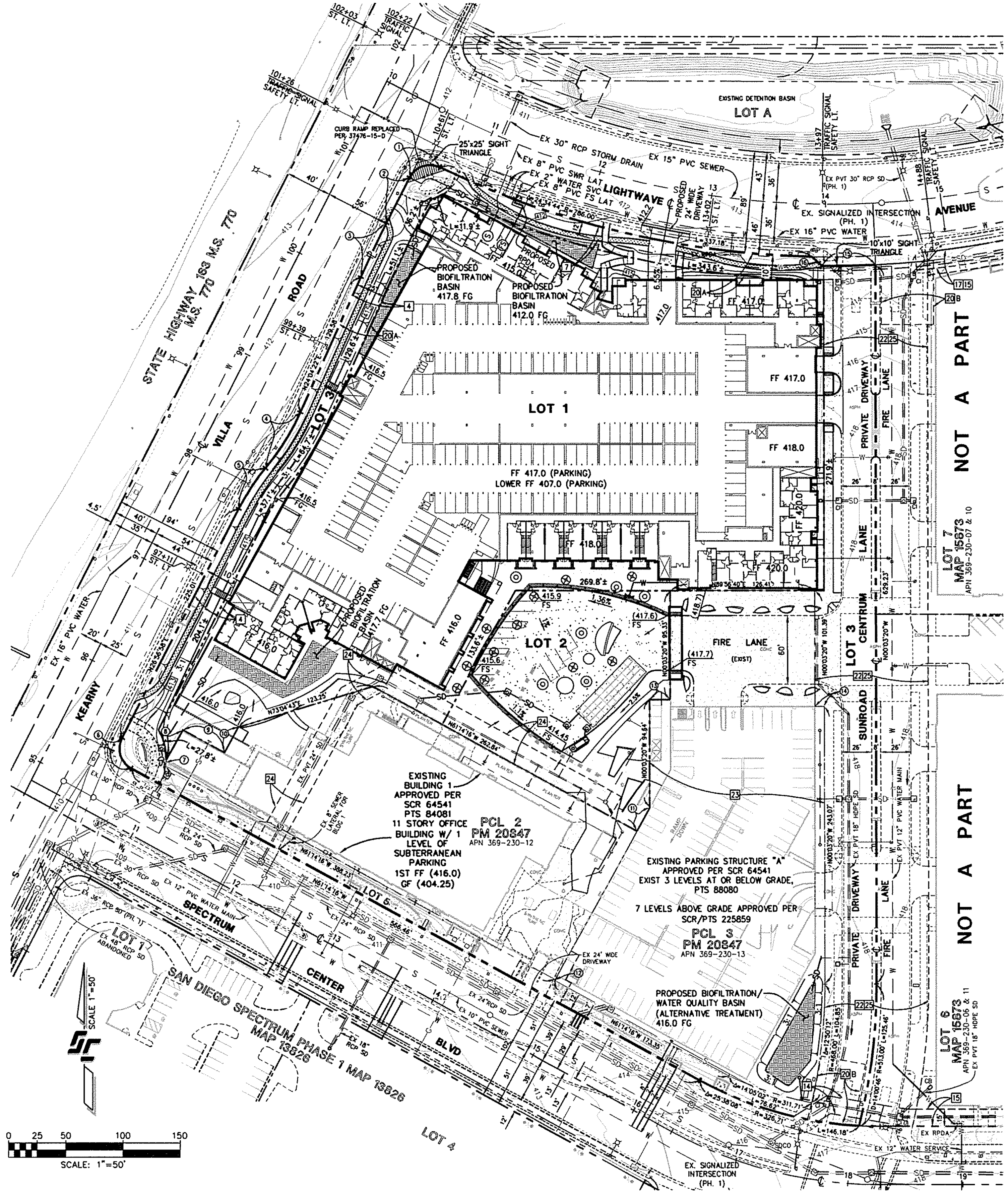
CONCLUSION
The Sunroad Centrum 6 project is a development that was anticipated in the "Drainage Study for Centrum 12". That drainage study utilized a highly impervious runoff coefficient of 0.85 for all areas proposed to be developed by Sunroad Centrum 6, and the proposed project generally honors the drainage patterns shown on Exhibit "B" – Proposed Condition. As a result, the "Drainage Study for Centrum 12" provides adequate analysis of the proposed Sunroad Centrum 6 project for the VTM. A detailed analysis of the proposed development, including hydraulic calculations for all tributary storm drain, will be completed at final engineering.

2

SECTION 2

VICINITY MAP
(NO SCALE)





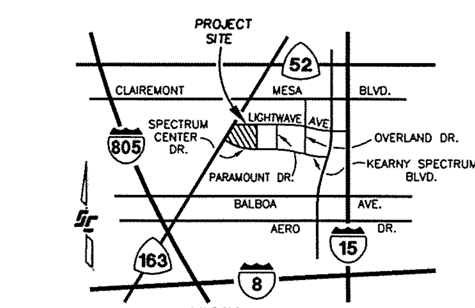
GRADING TABULATION

TOTAL SITE AREA: 5.83 ACRES GROSS.
TOTAL AMOUNT OF SITE TO BE GRADED: 4.85 ACRES.
PERCENT OF TOTAL SITE GRADED = 83%
AMOUNT OF EXISTING SITE WITH NATURAL 25% SLOPES OR GREATER: 0 ACRES.
PERCENT OF TOTAL EXISTING SITE WITH NATURAL 25% SLOPES OR GREATER = 0%
(SITE HAS BEEN PREVIOUSLY GRADED)
AMOUNT OF SITE WITHIN HILLSIDE REVIEW: 0 ACRES.
PERCENT OF TOTAL SITE WITHIN HILLSIDE REVIEW = 0%
AMOUNT OF CUT: 48,500 CUBIC YARDS±; MAXIMUM DEPTH OF CUT: 12 FEET± (SUBTERRANEAN GARAGE)
AMOUNT OF FILL: 5,400 CUBIC YARDS±;
MAXIMUM HEIGHT OF FILL SLOPES: 5'±
MAXIMUM HEIGHT OF CUT SLOPES: N/A (NO CUT SLOPES)
AMOUNT OF IMPORT/EXPORT SOIL: 43,100 CUBIC YARDS± (EXPORT)
RETAINING WALLS: 105 LF, 4' MAX HT.

NOTES:
STREET LIGHTS AROUND PROJECT PERIMETER TO BE UPGRADED TO CURRENT CITY STANDARDS AND WILL INCLUDE FIXTURE TYPE UPGRADED TO LED AND SPACING TO CONFORM TO CURRENT REQUIREMENTS.

BOUNDARY DATA

	BEARING/DELTA	RADIUS	LENGTH
1	88°47'27"	20.00'	30.96'
2	N26°57'28"E	--	44.85'
3	02°52'38"	1042.00'	52.33'
4	15°46'01"	210.00'	57.79'
5	12°53'28"	190.00'	42.75'
6	88°11'14"	20.00'	30.79'
7	5°57'03"	47.50'	4.93'
8	N28°45'44"E	--	30.19'
9	N61°14'16"W	--	41.22'
10	N28°45'44"E	--	25.20'
11	N28°45'14"E	--	23.45'
12	N28°45'14"E	--	1.02'
13	N89°56'40"E	--	18.36'
14	N89°56'40"E	--	8.31'
15	03°20'26"	794.00'	46.29'
16	N47°01'02"W	--	11.92'



VICINITY MAP
NO SCALE

SUNROAD CENTRUM

SUNROAD ENTERPRISES

Sunroad Enterprises
4445 Eastgate Mall Suite 400
San Diego, CA 92121

WERMERS PROPERTIES | DEVELOPMENT ACQUISITION MANAGEMENT

Wermers Properties
5120 Shoreham Place, #150
San Diego, CA 92122

SUNROAD CENTRUM 6
SAN DIEGO, CA

AUGUST 1, 2017
VESTING TENTATIVE MAP NO. 2003387
PLANNED DEVELOPMENT PERMIT NO. 2003388
AUGUST 1, 2017
REV. NOV. 8, 2017

REGISTERED PROFESSIONAL ENGINEER
JOSEPH G. CRESTO
No. 45601
Exp. 12-31-18
CIVIL
STATE OF CALIFORNIA

CONCEPT GRADING & UTILITY PLAN

C3.0

STEVENS-CRESTO ENGINEERING, INC.
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9665 CHESAPEAKE DRIVE
SUITE 200
SAN DIEGO, CA 92123-1352

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www.scengr.com

X:\2017\17006\CAD\PRELIM\VTM-PDP\17006-01 VTM PDP 03.DWG DATE: 11/9/2017 4:52 PM USER: BTH

3

SECTION 3

"DRAINAGE STUDY FOR: CENTRUM 12"

STEVENS · CRESTO ENGINEERING, INC.

DRAINAGE STUDY FOR:

CENTRUM 12

SAN DIEGO, CA

Prepared for:
SUNROAD ENTERPRISES
4445 Eastgate Mall, Suite 400
San Diego, CA 92121

Prepared by:
STEVENS CRESTO ENGINEERING INC.
9665 Chesapeake Drive, Suite 320
San Diego, CA 92123

DATE: 02/01/06
REVISED: 06/27/06
SCE Project: 00018.14

W.O. No.: 426200
P.T.S. No.: 98300
DWG. No.: 34009-D

CIVIL ENGINEERS • PLANNERS • LAND SURVEYORS
9665 CHESAPEAKE DRIVE, SUITE 320 • SAN DIEGO, CA • 92123-1352
PHONE 858.694.5660 • FAX 858.694.5661

DRAINAGE STUDY FOR:

CENTRUM 12

SAN DIEGO, CA

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Exhibit "C" "Desiltation Basin Calculations"

EXHIBITS **4**

Exhibit 'A', "Existing Condition"

Exhibit 'B', "Proposed Condition"

Improvement Plans for Centrum 12

Improvement Plans Kearny Villa Road and Spectrum Center Court

APPENDIX A **5**

Memorandum dated October 5, 2000, approved by the City of San Diego, Subdivision Engineer on October 10, 2000.

1

SECTION 1

SUMMARY

Purpose of Study

Centrum 12, the first phase of a multiphase commercial subdivision, is located in the community of Kearny Mesa, in the City of San Diego and is bound by Kearny Villa Road to the west, Paramount Drive to the east, Lightwave Avenue to the north, and Spectrum Center Boulevard to the south. The project is part of the redevelopment of the former General Dynamics Convair plant in Kearny Mesa.

Legal description for the proposed commercial development is: Parcels 1 thru 7, and 13 of P.M. No. 18972, according to Map thereof, filed in the Office of the County Recorder of San Diego County, May 24, 2002 as File No. 2002-0444396 of Official Records, Parcel 1 of P.M. No. 19193, according to Map thereof, filed in the Office of the County Recorder of San Diego County, March 28, 2003 as File No. 2003-0354510 of Official Records, and Parcel 1 of P.M. No. 19312, according to Map thereof, filed in the Office of the County Recorder of San Diego County, September 3, 2003 as File No. 2003-1073075 of Official Records, all in the City of San Diego, County of San Diego, State of California.

This report analyzes fifty-year storm runoff rates generated from the proposed redevelopment and accompanies the Grading and Improvement Plan for Centrum 12.

In preparing this report, we have reviewed and incorporated by reference the approved study, "Drainage Study (for) San Diego Spectrum (dated March 26, 1999)" prepared by Kimley-Horn and Associates (KHA). Runoff for basins within the Drainage Study for San Diego Spectrum utilized HEC-1 modeling. As a result of the HEC-1 modeling for this region, the runoff rates reported within the KHA drainage study, used to size the existing storm drain infrastructure in the area, is less than runoff rates calculated using the City mandated Rational Method for basin area of this size. Therefore, based on hydraulic analysis of the fifty–year storm event, the existing storm drain system in Spectrum Center Boulevard is unable to convey the higher runoff rate, generated from the Rational Method, without storm water runoff ponding up out of adjacent curb inlets and cleanouts in Spectrum Center Boulevard.

The issue of increased runoff rates generated utilizing the Rational Method as opposed to the HEC-1 modeling has been raised, addressed, and approved by the City of San Diego, Subdivision Engineer and documented in Memorandum dated October 5, 2000 (included in Appendix A, Section 5). Conclusions of the Memorandum, states the City, "...will accept some surcharge in the laterals and in the private, on-site systems, as long as the calculated HGL using the higher Rational Method Q's, is below the ground elevations on the site."

To circumvent the impact of utilizing the City's mandated Rational Method, the existing storm drain system in Kearny Villa Road and Spectrum Center Boulevard will be up-sized and a new system will be constructed, paralleling the existing system in Spectrum Center Boulevard, to convey runoff from the project (See proposed hydraulic calculations in Section 3 and Improvement Plan for Centrum 12 for hydraulic grade lines in the proposed storm drain system included in Section 4).

Existing Hydrology

The 26-acre project, in its existing condition, is a vacant rough graded site that drains to three separate desilting basins. See Exhibit "A" in Section 4 for a graphic depicting the existing drainage condition. This study breaks the existing on-site drainage basins into two major basins, "A", and "B" and are described as follows:

Basin "A" is approximately 16.82-acres and is subdivided into two sub-basins, "A1" and "A2". Two separate desiltation basins located at the northwest and northeast corners of the site collect runoff generated by each sub-basin. Sub-Basin "A1" is approximately 1.28-acres and runoff generated within this basin is conveyed, via overland flow, to the desilting basin at the northeast corner of the site. Sub-basin "A2" is approximately 15.54-acres and runoff generated within this basin is conveyed, via overland and open channel ditch flow, to the desilting basin at the northwest corner of the site. Ultimately, runoff from Basin "A" is conveyed to a private detention basin, per TM-96-0165, W.O. 980969, DWG No. 29636-4-D, located at the northwest corner of Kearny Villa Road and Lightwave Avenue.

Basin "B" is approximately 9.51-acres and runoff generated within the basin is conveyed, via overland flow, to the desilting pond located at the southwest corner of the site. Ultimately, runoff from Basin "B" enters the public storm drain system in Spectrum Center Boulevard via a 24" RCP storm drain lateral per DWG. No. 29636-25-D.

Proposed Hydrology

The initial phase of project will consist of a 12-story office building with one level of subterranean parking, a 3-level below-grade parking structure, and associated on-grade parking lots. Proposed drainage basins will generally match existing basins and storm drain outfall points. A private on-site drainage system will collect and convey runoff within the project site. See Exhibit "B", in Section 4, for a graphic depicting the proposed site plan and drainage conditions. Exhibit "C" (and calculations which follow it), within Section 3, depict the drainage basin tributary to the on-site desiltation basin being constructed east of the drive lane and adjacent to Lightwave Avenue.

Desiltation Basin:
The desiltation basin accepts runoff from rough graded areas of the tributary basins shown on Exhibit "C." However, as noted on Exhibit "C" only 7.2 acres of this tributary basin is un-planted; the rough graded areas east of the temporary parking up to the lot line are planted and irrigated, as a Best Management Practice, per Building Department Permit Number PTS 84081. Resultantly, the desiltation pond is sized for the tributary area which is un-planted.

Proposed basins "A" through "H" are described as follows:
Basin "A" is approximately 1.28-acres and a runoff coefficient of 0.85 was utilized in the runoff calculations for the full development of the commercial site. The fifty-year storm peak runoff rate for Basin "A" is approximately 4.6-cfs at the outfall point, located at the existing desilting basin in the northwest corner of the project site. Runoff is conveyed into Lightwave Avenue, via an existing 24" RCP storm drain lateral and ultimately to an existing detention basin located at the northwest corner of Lightwave and Kearny Villa Road.

Basin "B" is approximately 14.01-acres and generates a fifty-year storm peak runoff rate of approximately 35.7-cfs. A runoff coefficient of 0.85 was utilized in the runoff calculations for the full development of the commercial site. The outfall is a proposed 30" RCP storm drain lateral, located at the proposed signalized driveway on Lightwave Avenue. Ultimately, runoff is conveyed to the existing detention basin located at the northwest corner of Lightwave and Kearny Villa Road.

Basin "C" is approximately 1.30-acres and generates a fifty-year storm peak runoff rate of approximately 4.0-cfs. A runoff coefficient of 0.85 was utilized in the runoff calculations for the full development of the commercial site. The outfall is located at the existing desilting basin at the northeast side of the project. The existing desilting basin initially served the multi-family development, east of the project site, before the development was constructed. Currently, the multi-family development area collects runoff within the development, via a private drainage system, and conveys it to the public storm drain in Lightwave Avenue per DWG No. 32556-D. Ultimately, runoff from both the multi-family development and Basin "C" is conveyed to the existing detention basin located at the northwest corner of Lightwave Avenue and Kearny Villa Road.

Basin "D" is approximately 5.56-acres and generates a fifty-year storm peak runoff rate of approximately 16.3-cfs. A runoff coefficient of 0.85 was utilized in the runoff calculations for the full development of the commercial site. The outfall is a proposed 24" RCP storm drain lateral, located at the proposed signalized driveway on Spectrum Center Boulevard.

Basin "E" is approximately 2.42-acres and generates a fifty-year storm peak runoff rate of approximately 8.6-cfs. A runoff coefficient of 0.85 was utilized in the runoff calculations for the full development of the commercial site. Runoff is conveyed into a proposed public 24" RCP storm drain in Spectrum Center Boulevard via a private 24" RCP storm drain lateral. See Exhibit "B" in Section 4 for a graphic depicting the proposed drainage condition.

Basin "F" is approximately 0.31-acres and generates a fifty-year storm peak runoff rate of approximately 1.1-cfs. A runoff coefficient of 0.85 was utilized in the runoff calculations for the full development of the commercial site. Basin "F" consists of landscaped slopes along Spectrum Center Boulevard. Runoff from Basin "F" is conveyed onto Spectrum Center Boulevard via overland sheet flow to an existing curb inlet at the intersection of Spectrum Center Boulevard and Kearny Villa Road.

Basin "G" is approximately 1.41-acres and generates a fifty-year storm peak runoff rate of approximately 5.0-cfs. A runoff coefficient of 0.85 was utilized in the runoff calculations for the full development of the commercial site. Runoff generated from Basin "G" is conveyed to an existing desilting basin located at the southwest corner of the site and ultimately outfalls into the back of the existing curb inlet in Spectrum Center Boulevard. In the fully developed condition, runoff generated in Basin "G" will be routed to the private on-site drainage system serving Basin "E". Therefore, said private system serving Basin "E" is designed to convey runoff from both Basin "E" and "G", and is incorporated into the hydraulic grade line (HGL) shown on the proposed 24" RCP storm drain in Spectrum Center Boulevard.

Basin "H" is approximately 0.02-acres and generates a fifty-year storm peak runoff rate of approximately 0.1-cfs. A runoff coefficient of 0.85 was utilized in the runoff calculations. Basin "H" consists of a private driveway for access in and out of the subterranean parking structure beneath the proposed building. Runoff will be collect by a private drainage system and treated with and sand-oil separator before pumped into the proposed storm drain system in Spectrum Center Boulevard via a 6" PVC lateral.

Procedure

1. Runoff rates were determined by the rational method: Q= CIA

    a. Runoff coefficients (C) of 0.85, for the proposed development, were utilized in the runoff calculations.

    b. 50-year storm intensities (I_{50}), were determined by the Intensity-Duration-Frequency Curves per City of San Diego's Drainage Design Manual (April 1984).

    c. Drainage basin area(s) (A), in acres, are delineated and quantified as shown on Exhibits "A" and "B" in Sections 4.

2. Storm drain hydraulic analysis and pipe sizing is based on the fifty-year storm event, Manning's equation; where, a roughness coefficient (n) of 0.010 for PVC and HDPE, and 0.013 for were utilized for hydraulic calculations using "Flowmaster" software. Head loss through storm drain structures is based on velocity head determined by Manning's equation and/or the Continuity equation. Structure loss coefficients were determine from equation 3-20 and table 3-8 in the San Diego County Drainage Design Manual, May 2005.

Conclusion

This report quantifies the Rational Method fifty-year peak runoff rate generated from the full development of the project site. As stated previously, the existing storm drain infrastructure to serve developments in this area were designed utilizing HEC-1 modeling, a less conservative approach to the City of San Diego's mandated Rational Method for basin areas currently draining to existing downstream infrastructures in the Spectrum area.

Utilizing Rational Method for the full development of Centrum 12, the existing downstream storm drain infrastructure in Kearny Villa Road and Spectrum Center Boulevard would not have the hydraulic capacity to convey the storm water runoff generated from the developed site without exceeding the system capacity and causing storm water to pond up out of curb inlets and cleanouts.

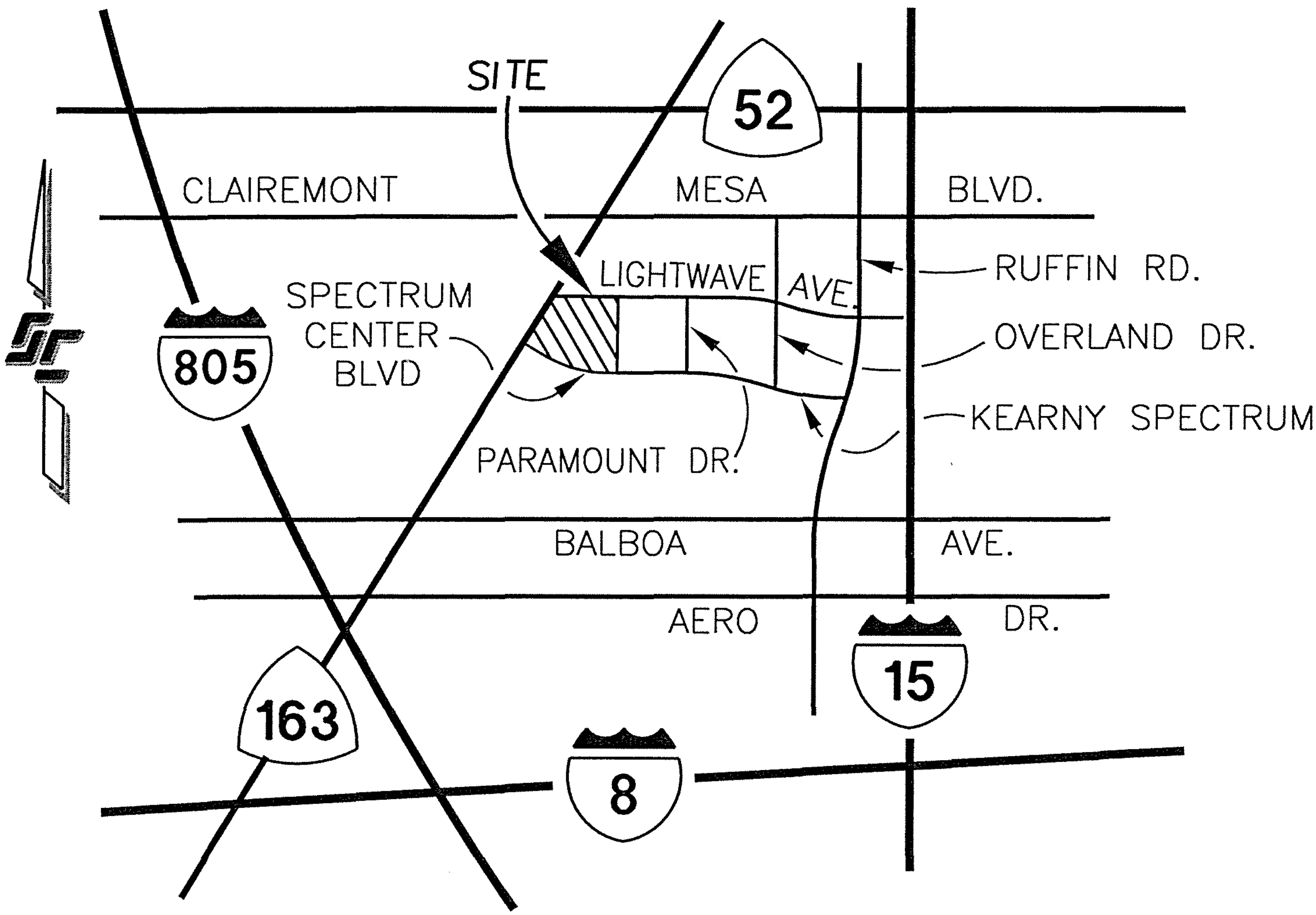
To circumvent the impact of utilizing the City's mandated Rational Method, the existing storm drain system in Kearny Villa Road and Spectrum Center Boulevard will be up-sized and a new system will be constructed, paralleling the existing system in Spectrum Center Boulevard, to convey runoff from the project. Based on the hydraulic analysis of the proposed storm drain system in Section 3, there will be pressure flow condition in the pipes however, water tight joints are specified on the construction documents and HGL will remain below ground in both the proposed public and private storm drain systems.

This project has honored the City's memorandum by satisfying the understandings stated in memorandum in Appendix A, Section 5.

2

SECTION 2

VICINITY MAP



VICINITY MAP

NO SCALE

3

SECTION 3

PROPOSED HYDROLOGY AND HYDRAULIC CALCULATIONS

CENTRUM 12

PROPOSED CONDITION *(Rational Method Procedure)*

San Diego, CA

RUN:

BASIN INFORMATION							FOR REFERENCE ONLY
DRAINAGE BASIN	AREA ac.	RUNOFF COEFF	T_C min	C x A	I_{50} in/hr	Q_{50} cfs	
A	1.28	0.85	5.0	1.09	4.20	4.6	
B	14.01	0.85	12.4	11.91	3.00	35.7	
C	1.30	0.85	7.4	1.11	3.60	4.0	
D	5.56	0.85	8.5	4.73	3.40	16.1	
E	2.42	0.85	6.7	2.06	4.20	8.6	
F	0.31	0.85	5.0	0.26	4.20	1.1	
G	1.41	0.85	5.0	1.20	4.20	5.0	
H	0.02	0.85	5.0	0.02	4.20	0.1	

HYDROLOGY

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BASIN 'A' (Tc & RUNOFF CALS)

TRAVEL TIME FROM NODE 001 TO 002

L = 210 ft (OVERLAND SHEET FLOW)

S ≅ 1.0%

C = 0.85

$$T_1 = \frac{1.8(1.1 - C)\sqrt{L}}{S^{1/3}} = 3.9 \text{ MINUTES}$$

TRAVEL TIME FROM NODE 002 TO 003

L = 80 ft (EX. BROW DITCH)

S = 0.5%

$A_{(NODE\ 002)} = A/2 = 1.28/2 = 0.64$ AC

C = 0.85

$Tc_{(NODE\ 002)} = 3.9$ MINUTES ⇒ USE 5.0 MINUTES

$I_{50} = 4.2$ IN/HR

$Q_{50\,(NODE\ 002)} = C \times I_{50} \times A = 0.85 \times 3.6 \times 0.64 = 2.3$ cfs

$V_{(DITCH)} = 2.6$ fps

$T_2 = L/V = (100\text{ ft}/2.6\text{ fps})(1\text{ MIN.}/60\text{ s}) = 0.6$ MINUTES

$Tc_{(BASIN\ 'A')} = T_1 + T_2 = 3.9 + 0.6 = 4.5$ MINUTES ⇒ USE 5.0 MINUTES

$I_{50} = 4.2$ IN/HR

C = 0.85

$A_{(BASIN\ 'A')} = 1.28$ AC.

$Q_{50\,(BASIN\ 'A'/NODE\ 003)} = C \times I_{50} \times A = \boxed{4.6 \text{ cfs}}$

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NODE 002 TO 003 (EXIST. BROW DITCH)
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Slope	0.005000	ft/ft
Discharg(	2.30	cfs

Options	
Current Roughness Methc	‹ved Lotter's Method
Open Channel Weighting	‹ved Lotter's Method
Closed Channel Weightin(	Horton's Method

Results		
Mannings Coefficie!	0.019	
Water Surface Elev	0.93	ft
Elevation Range	.00 to 1.50	
Flow Area	0.9	ft²
Wetted Perimeter	2.64	ft
Top Width	1.87	ft
Actual Depth	0.93	ft
Critical Elevation	0.80	ft
Critical Slope	0.011331	ft/ft
Velocity	2.64	ft/s
Velocity Head	0.11	ft
Specific Energy	1.04	ft
Froude Number	0.68	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
-0+10	-0+01	0.035
-0+01	0+01	0.019
0+01	0+10	0.035

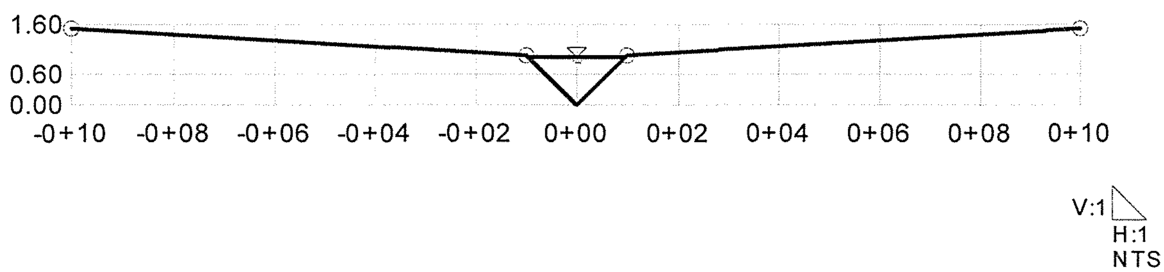
Natural Channel Points

Station (ft)	Elevation (ft)
-0+10	1.50
-0+01	1.00
0+00	0.00
0+01	1.00
0+10	1.50

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data		
Mannings Coefficiei	0.019	
Slope	0.005000	ft/ft
Water Surface Elev	0.93	ft
Elevation Range	.00 to 1.50	
Discharge	2.30	cfs



PROJECT NO. 00018.14
PROJECT CENTRUM 12
BY JPB CHK
DATE 2/01/06

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BASIN 'B' (Tc & RUNOFF CALCS.)

$A = A_{B1} + A_{B2} + A_{B3} + A_{B4} + A_{B5} + A_{B6} = 12.36 + 0.18 + 0.15 + 0.22 + 0.17 + 0.93 = 14.01$ AC,

$C = 0.85$ (FULLY DEVELOPED)

TRAVEL TIME FROM NODE 006 TO 007

L = 60 Ft (SHEET FLOW)

S = 1.0%

$$T_1 = \frac{1.8(1.1-C)\sqrt{L}}{S^{1/3}} = 3.5 \text{ MINUTES}$$

TRAVEL TIME FROM NODE 007 TO 008

L = 670 Ft (CONCENTRATED FLOW)

S = 1.0% ⇒ ΔE = 6.7 Ft

$$T_2 = (11.9L^3/\Delta E)^{0.385} = 6.7 \text{ MINUTES}$$

TRAVEL TIME FROM NODE 008 TO 009

L = 400 Ft (BROW DITCH)

S = 1%

$A_{(NODE\ 008)} = 7.15$ AC.

$Tc_{(NODE\ 008)} = 3.5 + 6.7 = 10.2$ MINUTES

$I_{50(NODE\ 008)} = 3.2$ IN/HR

$C = 0.85$

$Q_{50(NODE\ 008)} = C \times I_{50(NODE\ 007)} \times A_{(NODE\ 007)} = \underline{19.5 \text{ cFS}}$

V = 3.1 fps

$T_3 = L/V = (400 \text{ Ft} / 3.1 \text{ fps})(1 \text{ MIN} / 60 \text{ SEC}) = 2.2$ MINUTES

SEE NEXT PAGE FOR CONTINUATION

PROJECT NO. 00018.14
PROJECT CENTRUM 12
BY JPB CHK
DATE 2/01/06

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$T_C = T_1 + T_2 + T_3 = 3.5 + 6.7 + 2.2 = 12.4$ MINUTES

$I_{50\,(BASIN\ 'B')} = 3.0$ IN/HR

$A = 14.01$ AC

$Q_{50\,(BASIN\ 'B')} = C \times I_{50\,(BASIN\ 'B')} \times A = \boxed{35.7 \text{ cfs}}$

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NODE 008 TO 009 (BROW DITCH)
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Slope	0.010000	ft/ft
Discharg	19.50	cfs

Options	
Current Roughness Methc	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.022	
Water Surface Elev	1.49	ft
Elevation Range	.00 to 1.50	
Flow Area	6.3	ft²
Wetted Perimeter	20.57	ft
Top Width	19.71	ft
Actual Depth	1.49	ft
Critical Elevation	1.48	ft
Critical Slope	0.011008	ft/ft
Velocity	3.08	ft/s
Velocity Head	0.15	ft
Specific Energy	1.64	ft
Froude Number	0.96	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
-0+10	-0+01	0.035
-0+01	0+01	0.019
0+01	0+10	0.035

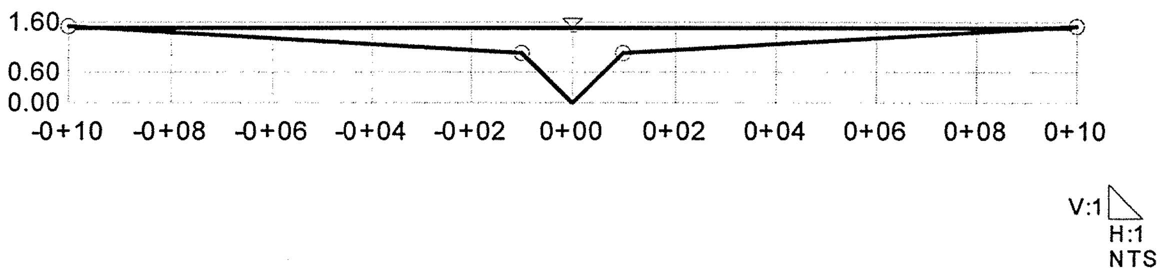
Natural Channel Points

Station (ft)	Elevation (ft)
-0+10	1.50
-0+01	1.00
0+00	0.00
0+01	1.00
0+10	1.50

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data		
Mannings Coefficiei	0.022	
Slope	0.010000	ft/ft
Water Surface Elev	1.49	ft
Elevation Range	.00 to 1.50	
Discharge	19.50	cfs



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BASIN 'C'

A = 1.30 AC.

* C = 0.85

TRAVEL TIME FROM NODE 010 TO 011 (OVERLAND SHEET FLOW)

L = 60 Ft

S = 1%

$$T_i = \frac{1.8(1.1 - C)\sqrt{L}}{S^{1/3}} = 3.5 \text{ MINUTES}$$

TRAVEL TIME FROM NODE 011 TO 012 (CONCENTRATED FLOW)

L = 320 Ft

S = 1% ⇒ ΔE = 3.2 Ft

$$T_F = \left(11.9\, L^3 / \Delta E\right)^{0.385} = 3.9 \text{ MINUTES}$$

$$T_C = T_i + T_F = 3.5 + 3.9 = \underline{7.4 \text{ MINUTES}}$$

$$I_{50} = 3.6 \text{ IN/HR}$$

$$Q_{50(A1)} = C \times I_{50} \times A = 0.85 \times 3.6 \times 1.28 = \boxed{4.0 \text{ cFS}}$$

* RUNOFF COEFFICIENT (C) OF 0.85 IS BASED UPON FULL DEVELOPMENT OF CENTRUM

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BASIN 'D'

SUB-BASIN 'D1': A = 2.65 AC.
C = 0.85

TRAVEL TIME FROM NODE 013 TO 014 (OVERLAND SHEET FLOW)
L = 60 Ft
S = 1%

$T_i = \frac{1.8(1.1-C)\sqrt{L}}{S^{1/3}} = 3.5$ MINUTES

TRAVEL TIME FROM NODE 014 TO 015 (CONCENTRATED FLOW)
L = 410 Ft
S = 1% ⇒ ΔE 4.1 Ft

$T_F = (11.9\,L^3/\Delta E)^{0.385} = 4.7$ MINUTES

$T_C = 3.5 + 4.7 = 8.2$ MINUTES

$I_{50} = 3.5$ IN/HR

Q_{50} @ NODE 015 $= C \times I_{50} \times A = \boxed{7.9 \text{ cFs}}$

TRAVEL TIME FROM NODE 015 TO 016:
L = 120 Ft (18" RCP)
S = 1.0%
Q = 7.9 cFs
V = 6.5 fps
T = L/V = (120 Ft / 6.5 fps)(1 MIN. / 60 sec) = 0.3 MINUTES

$T_{C\,(BASIN\,'D')} = T_{C\,(NODE\,015)} + T = 8.2 + 0.3 = 8.5$ MINUTES

$I_{50\,(BASIN\,'D')} = 3.4$ IN/HR

$\Sigma A_{(D2 \rightarrow D8)} = 2.91$ AC.

$Q_{50\,(NODE\,015)} = Q_{50\,(BASIN\,'D')} = 7.9 \text{ cFs} + C \times \Sigma A_{(D2 \rightarrow D8)} \times 3.4 \text{ IN/HR} = \boxed{16.3 \text{ cFs}}$

(SEE PAGE 14 OF THIS SECTION FOR CONTINUATION OF HYDROLOGY CALCS. FOR PROPOSED STORM DRAIN IN SPECTRUM CENTER BLVD. & KEARNY VILLA RD.)

NODE 015 TO 016 (18" RCP)
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

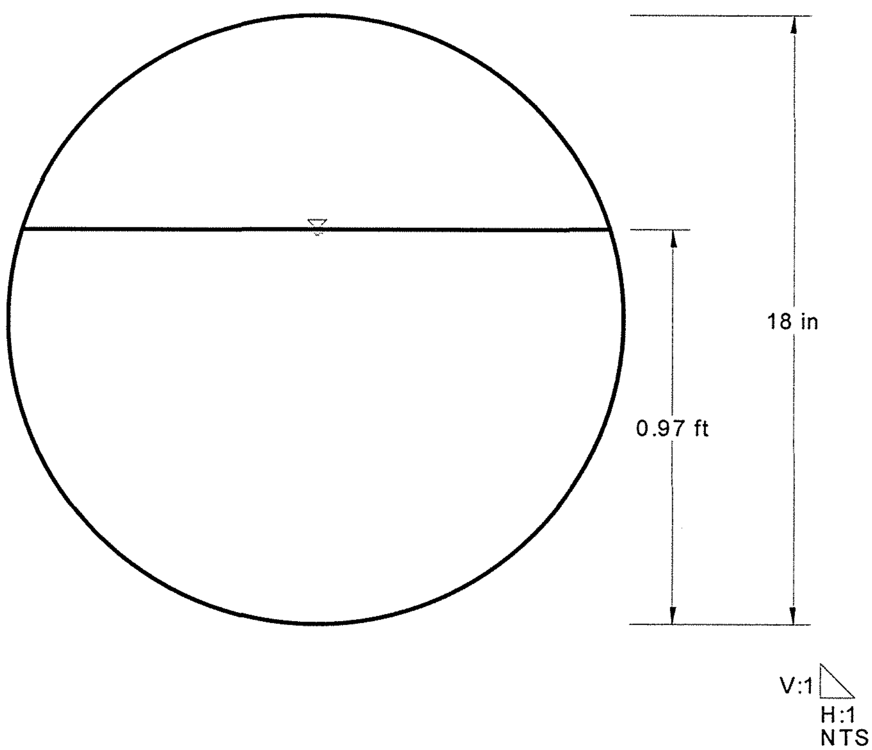
Input Data		
Mannings Coeffic	0.013	
Slope	0.010000	ft/ft
Diameter	18	in
Discharge	7.90	cfs

Results		
Depth	0.97	ft
Flow Area	1.2	ft²
Wetted Perime	2.81	ft
Top Width	1.43	ft
Critical Depth	1.09	ft
Percent Full	64.7	%
Critical Slope	0.007356	ft/ft
Velocity	6.53	ft/s
Velocity Head	0.66	ft
Specific Energ	1.63	ft
Froude Numbe	1.25	
Maximum Disc	11.30	cfs
Discharge Full	10.50	cfs
Slope Full	0.005657	ft/ft
Flow Type	Supercritical	

Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Slope	0.010000	ft/ft
Depth	0.97	ft
Diameter	18	in
Discharge	7.90	cfs



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BASIN 'E'

TRAVEL TIME FROM NODE 030 TO 031 (OVERLAND SHEET FLOW):

$$T_1 = 1.8(1-C)\sqrt{L} / S^{1/3} = 1.8(1-0.85)\sqrt{120'} / 2.9^{1/3}$$

$$T_1 = 2.1 \text{ MIN.}$$

NODE 031 TO 032 (GUTTER FLOW):

ASSUME $T_C = 5.0$ MIN. ; $I_{50} = 4.2$ IN/HR

$A_{E4} = 0.29$ AC. , $C = 0.85$

$Q_{50} = C \times I_{50} \times A_{E4} = \underline{1.0 \text{ cfs}}$

$S = 2\%$

$L = 130'$

$V = 2.8$ fps

$T_2 = L/V = (130 \text{ ft} / 2.8 \text{ fps})(1 \text{ min}/60 \text{ s}) = 0.8$ MIN.

NODE 032 TO 033 (PIPE FLOW)

$L = \pm 420'$

ASSUME $\Rightarrow$ $Q = C \times I_{50} \times A_{E4} = 0.85 \times 4.2 \times 0.29 = 1.0$ cfs

V_{PIPE} (12" PVC @ 0.5%) = 3.7 fps

$T_3 = (420 \text{ ft} / 3.7 \text{ fps})(1 \text{ MIN} / 60 \text{ s}) = 1.9$ MIN.

$\Sigma T_c = 2.1 + 0.8 + 1.9 = 4.8$ MINUTES $\Rightarrow$ USE 5.0 MINUTES ; $I_{50} = 4.2$ IN/HR

$Q_{50 \text{ (BASIN 'E')}} = C \times I_{50} \times \Sigma A_E = 0.85 \times 4.2 \text{ IN/HR} \times 2.42 \text{ AC.} = \boxed{8.6 \text{ cfs}}$

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BASIN 'F'

$A = A_{(F1)} + A_{(F2)} = 0.15 + 0.16 = 0.31$ AC.

$C = 0.85$

$T_c = 5.0$ MINUTES

$I_{50} = 4.2$ IN/HR

$Q_{50} = C \times I_{50} \times A = \boxed{1.1 \text{ cFS}}$

BASIN 'G'

$A = 1.41$ AC.

$C = 0.85$

$T_c = 5.0$ MINUTES

$I_{50} = 4.2$ IN/HR

$Q_{50} = C \times I_{50} \times A = \boxed{5.0 \text{ cFS}}$

BASIN 'H'

$A = 0.02$ AC.

$C = 0.85$

$T_c = 5.0$ MINUTES

$I_{50} = 4.2$ IN/HR

$Q_{50} = C \times I_{50} \times A = \boxed{0.1 \text{ cFS}}$

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CONTINUED FROM NODE 015, ON PAGE 9 OF THIS SECTION

TRAVEL TIME FROM NODE 016 TO 017 (24" RCP @ 0.5%)

Q_{50} = 16.3 cfs
L = 330 ft
V = 5.8 fps

T = L/V = (330 ft / 5.8 fps)(1 min./60s) = 1.0 MINUTE

$\Sigma T_{c\,(NODE\ 017)} = T_{c\,(BASIN\ D)} + T = 8.5 + 1.0 = 9.5$ MINUTES

$I_{50\,(NODE\ 017)} = 3.3$ IN/HR

$Q_{50\,(NODE\ 017)} = 16.3$ cfs $+ C \times I_{50\,(NODE\ 017)} \times A_{(BASIN\ H)}$

= 16.3 cfs + 0.85 × 3.3 IN/HR × 0.02 AC

= $\boxed{16.4 \text{ cfs}}$

TRAVEL TIME FROM NODE 017 TO 018 (24" RCP @ 0.5%)

L = 235 ft, Q = 16.4 cfs
V = 5.8 fps
T = L/V = (235 ft / 5.8 fps)(1 min./60s) = 0.7 MINUTES

$\Sigma T_{c\,(NODE\ 018)} = T_{c\,(NODE\ 017)} + T = 9.5 + 0.7 = 10.2$ MINUTES

$I_{50\,(NODE\ 018)} = 3.3$ IN/HR

(INTERIM, EXCLUDING BASIN 'G') → $Q_{50\,(NODE\ 018)} = 16.4$ cfs $+ C \times I_{50\,(NODE\ 018)} \times A_{(BASIN\ E)}$

= 16.4 cfs + 0.85 × 3.3 IN/HR × 2.42 AC.

= $\boxed{23.2 \text{ cfs}}$ – INTERIM CONDITION (W/O BASIN 'G')

(FINAL, INCLUDING BASIN 'G') $Q_{50\,(NODE\ 018)} = 16.4 + C \times I_{50\,(NODE\ 018)} \times (A_{(BASIN\ E)} + A_{(BASIN\ G)})$

= 16.4 + 0.85 × 3.3 × (2.42 + 1.41)

= $\boxed{27.1 \text{ cfs}}$ – FINAL CONDITION (W/ BASIN 'G')

NODE 016 TO 017 (24" RCP @ 0.5%)
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

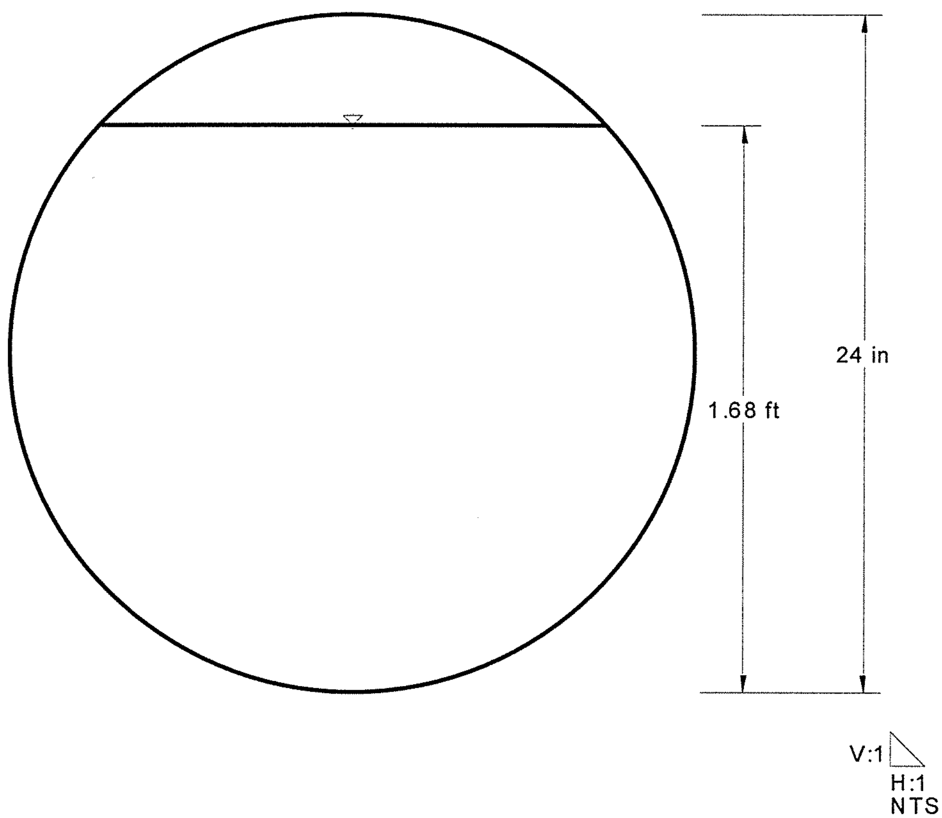
Input Data		
Mannings Coeffic	0.013	
Slope	0.005000	ft/ft
Diameter	24	in
Discharge	16.30	cfs

Results		
Depth	1.68	ft
Flow Area	2.8	ft²
Wetted Perime	4.63	ft
Top Width	1.47	ft
Critical Depth	1.46	ft
Percent Full	83.8	%
Critical Slope	0.006710	ft/ft
Velocity	5.80	ft/s
Velocity Head	0.52	ft
Specific Energ:	2.20	ft
Froude Numbe	0.74	
Maximum Disc	17.21	cfs
Discharge Full	16.00	cfs
Slope Full	0.005192	ft/ft
Flow Type	Subcritical	

Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Slope	0.005000	ft/ft
Depth	1.68	ft
Diameter	24	in
Discharge	16.30	cfs



NODE 017 TO 018 (24" RCP @ 0.5%)
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

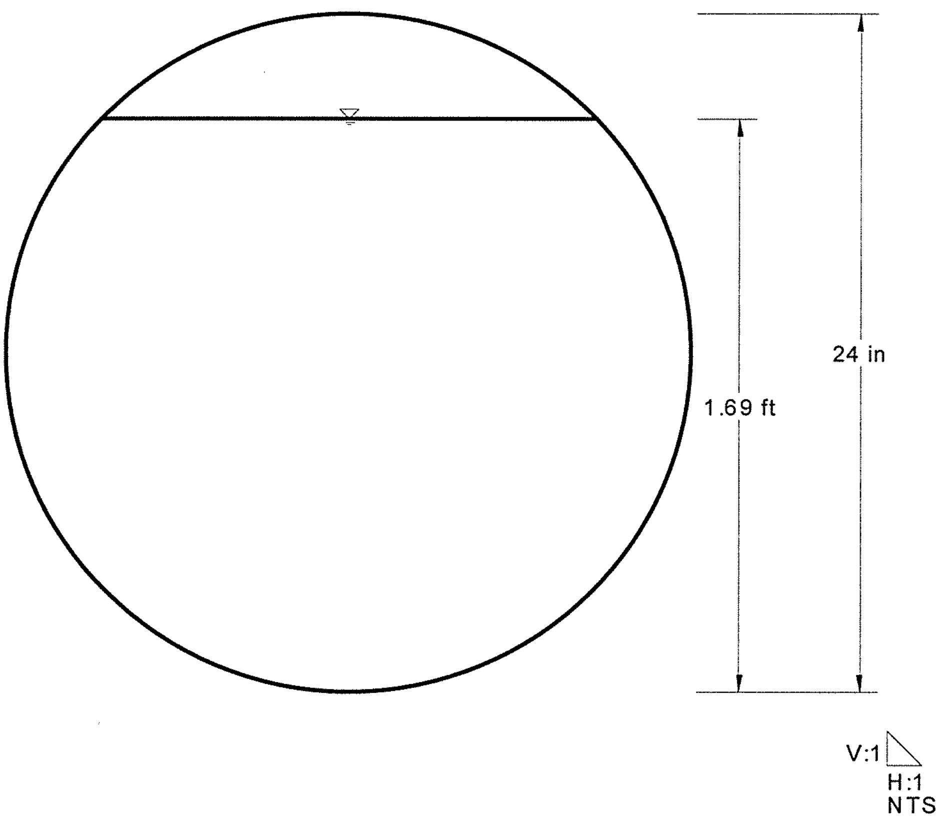
Input Data		
Mannings Coeffic	0.013	
Slope	0.005000	ft/ft
Diameter	24	in
Discharge	16.40	cfs

Results		
Depth	1.69	ft
Flow Area	2.8	ft²
Wetted Perime	4.66	ft
Top Width	1.45	ft
Critical Depth	1.46	ft
Percent Full	84.4	%
Critical Slope	0.006742	ft/ft
Velocity	5.80	ft/s
Velocity Head	0.52	ft
Specific Energ	2.21	ft
Froude Numbe	0.73	
Maximum Disc	17.21	cfs
Discharge Full	16.00	cfs
Slope Full	0.005256	ft/ft
Flow Type	Subcritical	

Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Slope	0.005000	ft/ft
Depth	1.69	ft
Diameter	24	in
Discharge	16.40	cfs



PROJECT NO. 00018.14
PROJECT CENTRUM 12
BY JPB CHK
DATE 2/01/06

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TRAVEL TIME FROM 018 TO 019 (24" RCP @ 0.5%) – PRESSURE FLOW

Q_{50} = 27.1 cfs (UTIMATE)
L = 112 ft

$V = Q/A = 27.1 \text{ cfs} / 3.14 \text{ ft}^2 = 8.6 \text{ fps}$

$T = L/V = (112 \text{ ft} / 8.6 \text{ fps})(1 \text{ min.} / 60 \text{ s}) = 0.2$ MINUTES

$\Sigma T_{c\,(\text{NODE } 019)} = T_{c\,(\text{NODE } 018)} + T = 10.2 + 0.2 = 10.4$ MINUTES

$I_{50\,(\text{NODE } 019)} = 3.2$ IN/HR

$Q_{50\,(\text{NODE } 019)} = 27.1 \text{ cfs} + \left(C_{(F)} \times A_{(F)} + C_{(057)} \times A_{(057)}\right) \times I_{50\,(\text{NODE } 019)}$

$= 27.1 \text{ cfs} + (0.85 \times 0.31 + 0.95 \times 2.57)\ 3.2$

$= \boxed{35.8 \text{ cfs}}$

TRAVEL TIME FROM 019 TO 020 (36" RCP @ 0.7%)

L = 99 ft, Q_{50} = 35.8 cfs
V = 7.9 fps

$T = L/V = (99 \text{ ft} / 7.9 \text{ fps})(1 \text{ min.} / 60 \text{ s}) = 0.2$ MINUTES

$\Sigma T_{c\,(\text{NODE } 020)} = T_{c\,(\text{NODE } 019)} + T = 10.4 + 0.2 = 10.6$ MINUTES

$I_{50\,(\text{NODE } 020)} = 3.2$ IN/HR

$Q_{50\,(\text{NODE } 020)} = 35.8 \text{ cfs} + [C_{(051)} \times A_{(051)} + C_{(052)} \times A_{(052)} + C_{(053)} \times A_{(053)} + C_{(054)} \times A_{(054)} + C_{(055)} \times A_{(055)} + C_{(056)} \times A_{(056)}] \times I_{50}$

$= 35.8 + (0.95 \times 1.05 + 0.95 \times 1.05 + 0.85 \times 2.19 + 0.85 \times 1.00 + 0.85 \times 2.33 + 0.95 \times 1.29)\ 3.2 \text{ in/hr}$

$= \boxed{61.1 \text{ cfs}}$

NODE 019 TO 020 (30" RCP @ 0.7%)
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

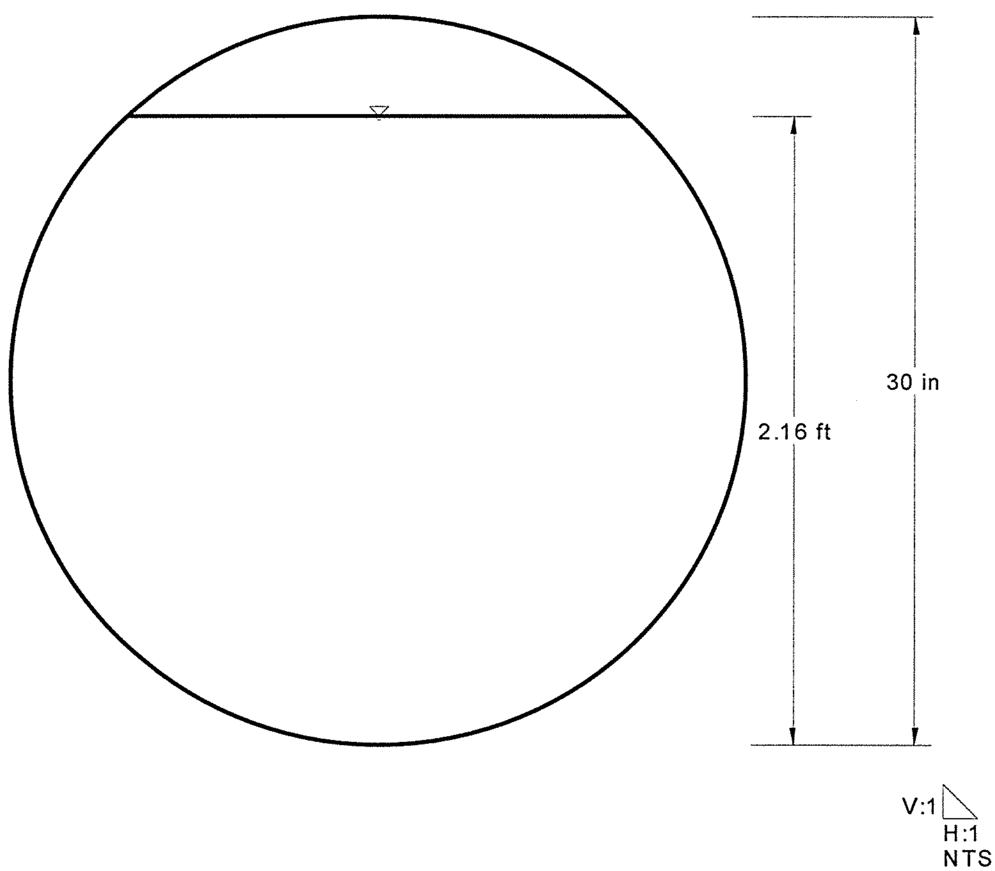
Input Data		
Mannings Coeffic	0.013	
Slope	007000	ft/ft
Diameter	30	in
Discharge	35.80	cfs

Results		
Depth	2.16	ft
Flow Area	4.5	ft²
Wetted Perime	5.97	ft
Top Width	1.71	ft
Critical Depth	2.03	ft
Percent Full	86.5	%
Critical Slope	0.007750	ft/ft
Velocity	7.93	ft/s
Velocity Head	0.98	ft
Specific Energ:	3.14	ft
Froude Numbe	0.86	
Maximum Disc	36.91	cfs
Discharge Full	34.32	cfs
Slope Full	0.007619	ft/ft
Flow Type	Subcritical	

Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Slope	007000	ft/ft
Depth	2.16	ft
Diameter	30	in
Discharge	35.80	cfs



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TRAVEL TIME FROM NODE 020 TO 021 (36" RCP @ 0.78%)

$Q = 61.1$ cfs
$V = 9.5$ fps

$L = 100$ ft
$T = L/V = (100\text{ ft} / 9.5\text{ fps})(1\text{ min.}/60\text{s}) = 0.2$ MINUTES

$\Sigma T_{c\,(\text{NODE } 021)} = T_{c\,(\text{NODE } 020)} + T = 10.7 + 0.2 = 10.8$ MINUTES

$I_{50\,(\text{NODE } 021)} = 3.1$ IN/HR

$Q_{50\,(\text{NODE } 021)} = 61.1\text{ cfs} + C_{(0510)} * A_{(0510)} \times I_{50}$

$= 61.1\text{ cfs} + 0.90 \times 2.20 \times 3.1$

$= \boxed{67.2\text{ cfs}}$

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NODE 020 TO 021 (36" RCP @ 0.78%)
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Slope	007800	ft/ft
Diameter	36	in
Discharge	61.10	cfs

Results		
Depth	2.57	ft
Flow Area	6.5	ft²
Wetted Perime	7.11	ft
Top Width	2.10	ft
Critical Depth	2.52	ft
Percent Full	85.8	%
Critical Slope	0.008043	ft/ft
Velocity	9.47	ft/s
Velocity Head	1.39	ft
Specific Energ	3.97	ft
Froude Numbe	0.95	
Maximum Disc	63.36	cfs
Discharge Full	58.90	cfs
Slope Full	0.008393	ft/ft
Flow Type	Subcritical	

Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Slope	007800	ft/ft
Depth	2.57	ft
Diameter	36	in
Discharge	61.10	cfs

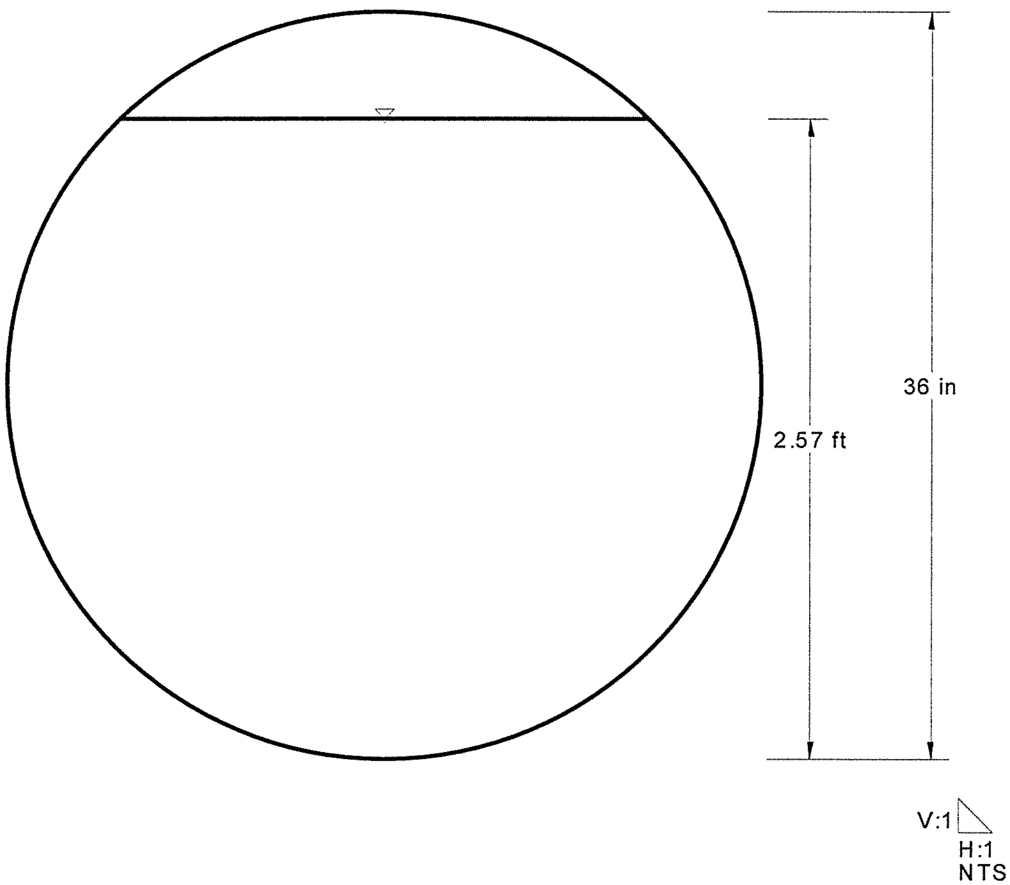


TABLE 2

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.

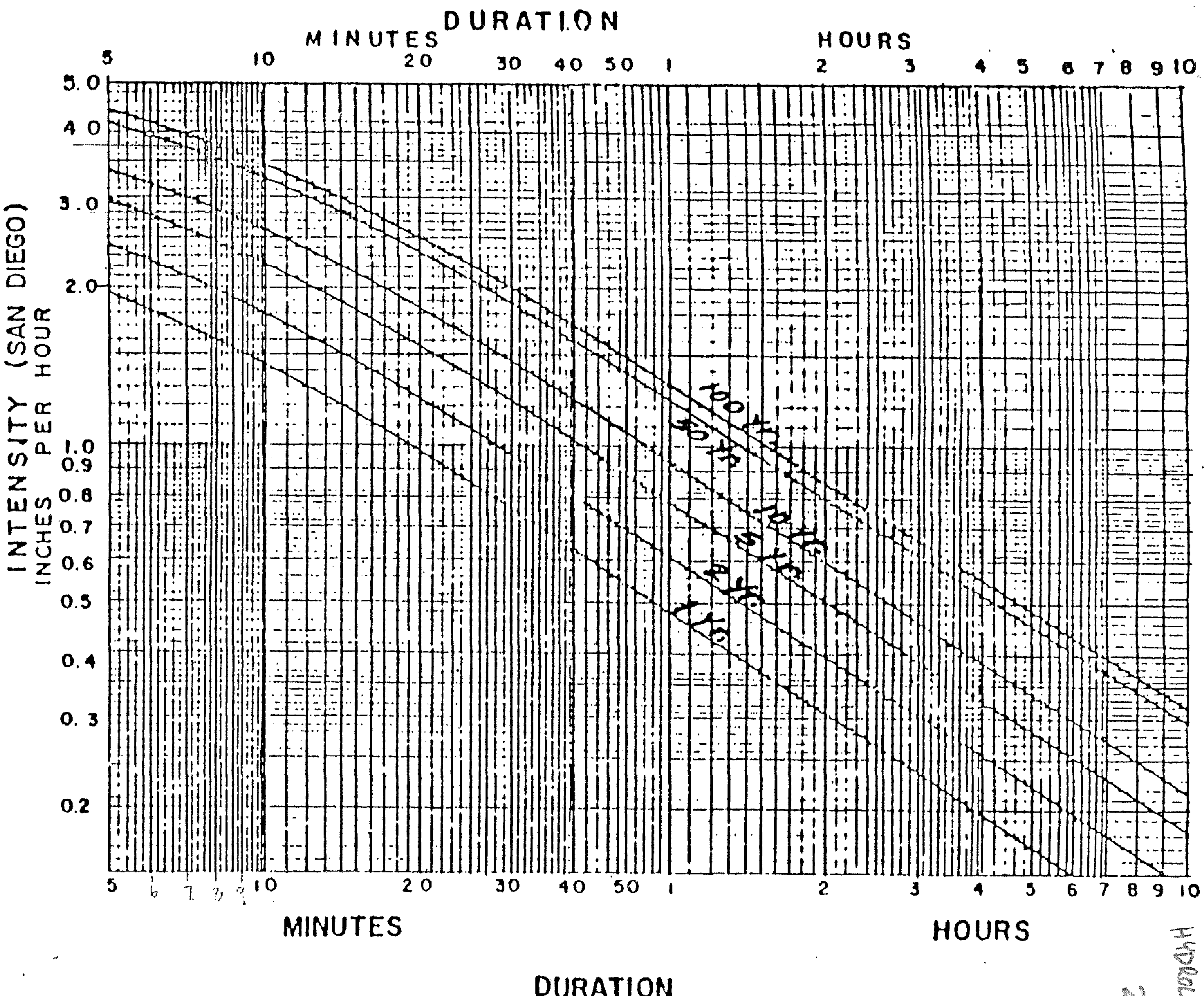
Actual imperviousness = 50%

Tabulated imperviousness = 80%

$$\text{Revised C} = \frac{50}{80} \times 0.85 = 0.53$$

ELEV.	FACTOR
0-1500	1.00
1500-3000	1.25
3000-4000	1.42
4000-5000	1.60
5000-6000	1.70
DESERT	1.25

To obtain correct intensity, multiply intensity on chart by factor for design elevation.

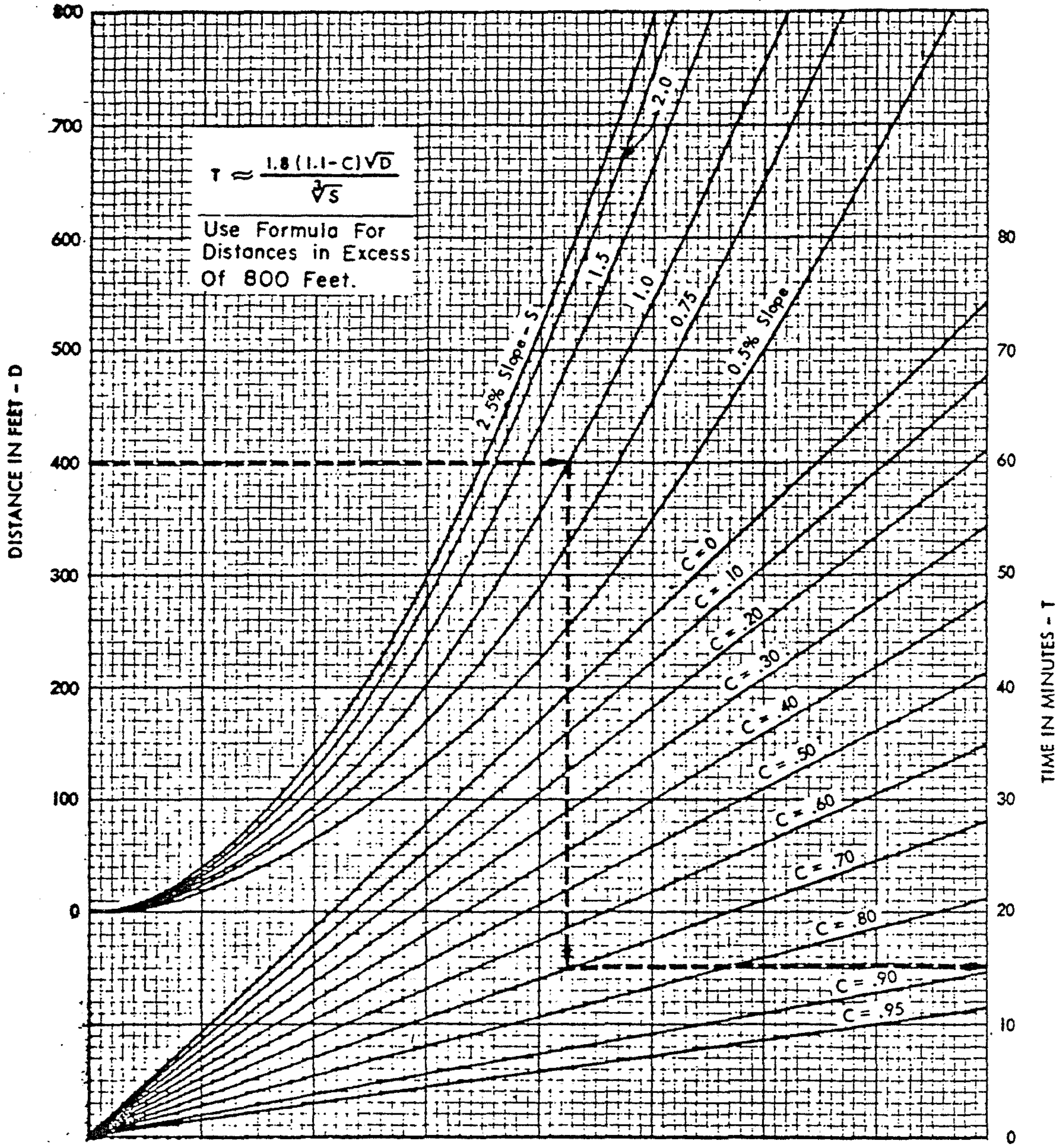


RAINFALL INTENSITY-DURATION-FREQUENC CURVES for COUNTY OF SAN DIEGO

APPENDIX I

HYDROLOGY REF. 2 OF 5

URBAN AREAS OVERLAND TIME OF FLOW CURVES

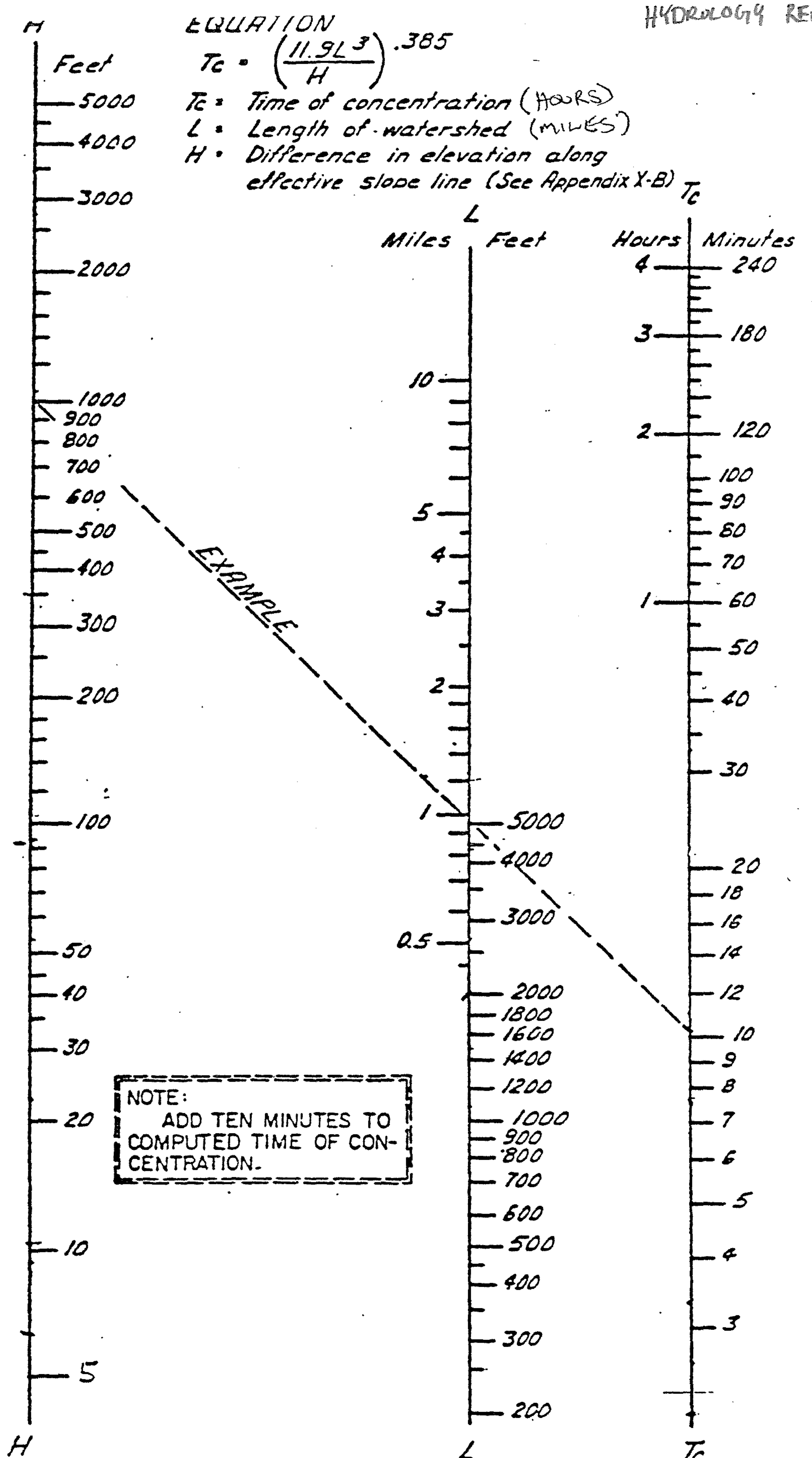


Surface Flow Time Curves

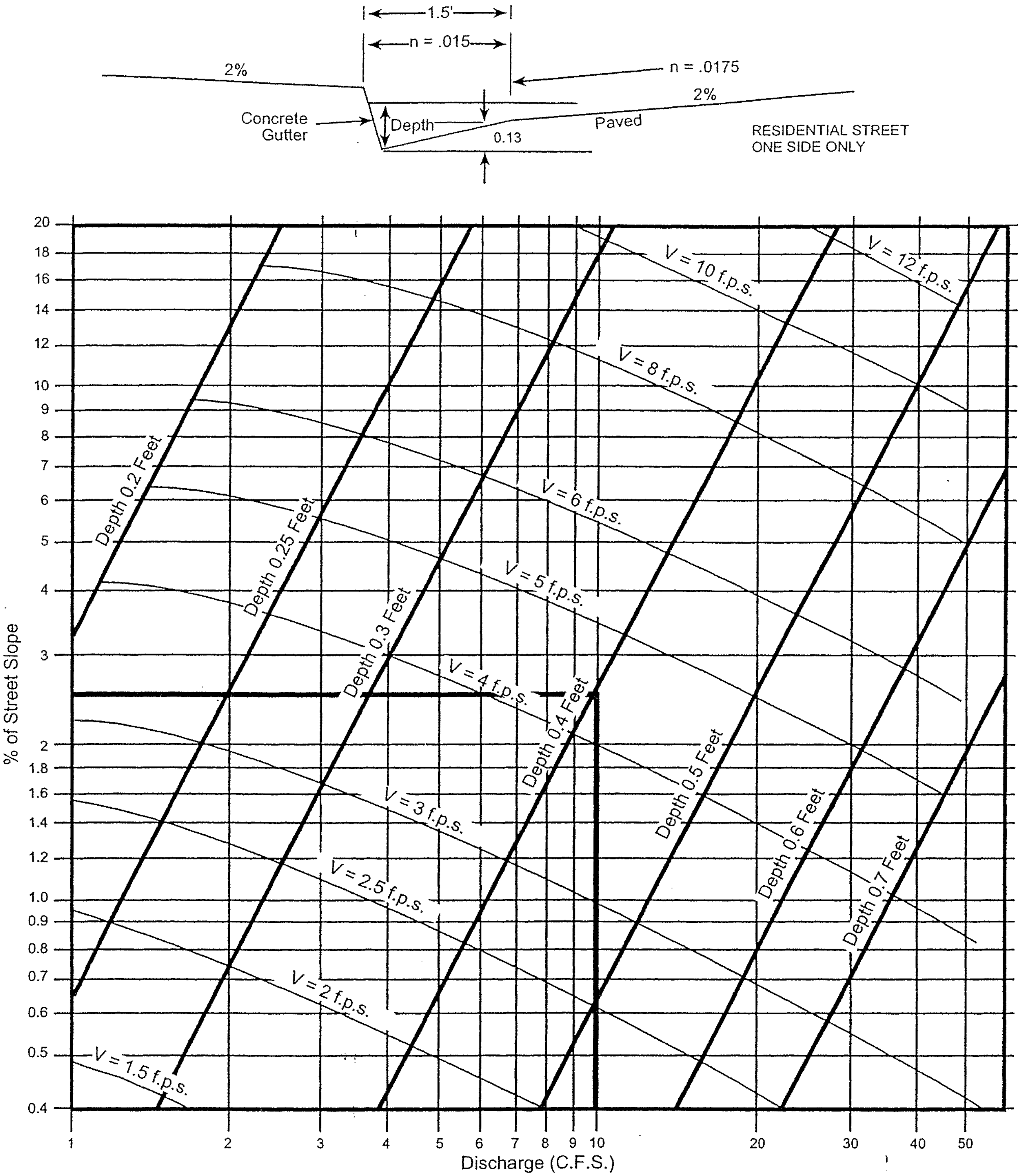
EXAMPLE:

GIVEN: LENGTH OF FLOW = 400 FT.
SLOPE = 1.0 %
COEFFICIENT OF RUNOFF C = .70

READ: OVERLAND FLOWTIME = 15 MINUTES



SAN DIEGO COUNTY DEPARTMENT OF SPECIAL DISTRICT SERVICES DESIGN MANUAL APPROVED [illegible signature]	NOMOGRAPH FOR DETERMINATION OF TIME OF CONCENTRATION (Tc) FOR NATURAL WATERSHEDS DATE ______ APPENDIX



EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

Gutter and Roadway Discharge - Velocity Chart

FIGURE **3-6**

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PROJECT NO. 00018.14
PROJECT CENTRUM 12
BY JPB CHK
DATE 2/01/06

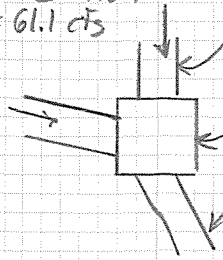
HYDRAULIC ANALYSIS

(PROPOSED STORM DRAIN IN KEARNY VILLA RD. & SPECTRUM CENTER BLVD.)

NODE 021

PROP.
36" RCP @ 0.78%
$Q_{50(IN)}$ = 61.1 cfs

EXISTING
30" RCP @ 1%
$Q_{50(IN)}$ = 6.1 cfs



EX. AS C.O. ~402.1 FL

EXIST. 48" RCP @ 0.9% (OPEN CHANNEL)
$Q_{50(OUT)}$ = 67.2 cfs

36" RCP (IN): Q_{50} = 61.1 cfs

$S = 0.84\%$

$V = 9.9$ fps

$k = 0.1(b/D_o)(1-\sin\theta) + 1.4(b/D_o)^{0.15}$ $\sin\theta = 0.97$

$H_L = kV^2/2g = 1.5$ ft

30" RCP (IN): Q_{50} = 6.1 cfs

$S = 1\%$

$V = 6.0$ fps

$K = 0.13$

$H_L = kV^2/2g = 0.1$ ft

$WSE_{(NODE\ 022)} = 402.1 + 1.5 + 0.1 + 2.0 = \boxed{405.7}$

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NODE 021 (36" RCP IN)
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

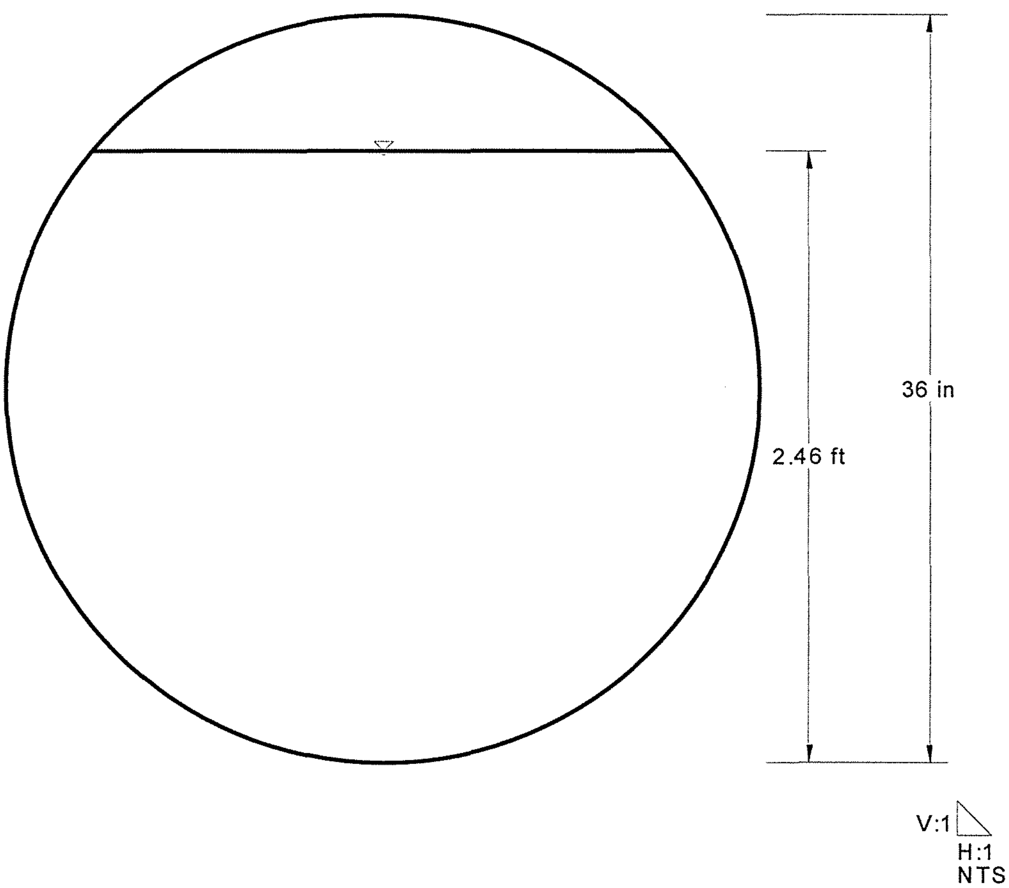
Input Data		
Mannings Coeffic	0.013	
Slope	0.008400	ft/ft
Diameter	36	in
Discharge	61.10	cfs

Results		
Depth	2.46	ft
Flow Area	6.2	ft^2
Wetted Perime	6.79	ft
Top Width	2.31	ft
Critical Depth	2.52	ft
Percent Full	81.9	%
Critical Slope	0.008043	ft/ft
Velocity	9.86	ft/s
Velocity Head	1.51	ft
Specific Energ:	3.97	ft
Froude Numbe	1.06	
Maximum Disc	65.75	cfs
Discharge Full	61.13	cfs
Slope Full	0.008393	ft/ft
Flow Type	Supercritical	

Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Slope	0.008400	ft/ft
Depth	2.46	ft
Diameter	36	in
Discharge	61.10	cfs



NODE 021 ~ 48" RCP (OUT)
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

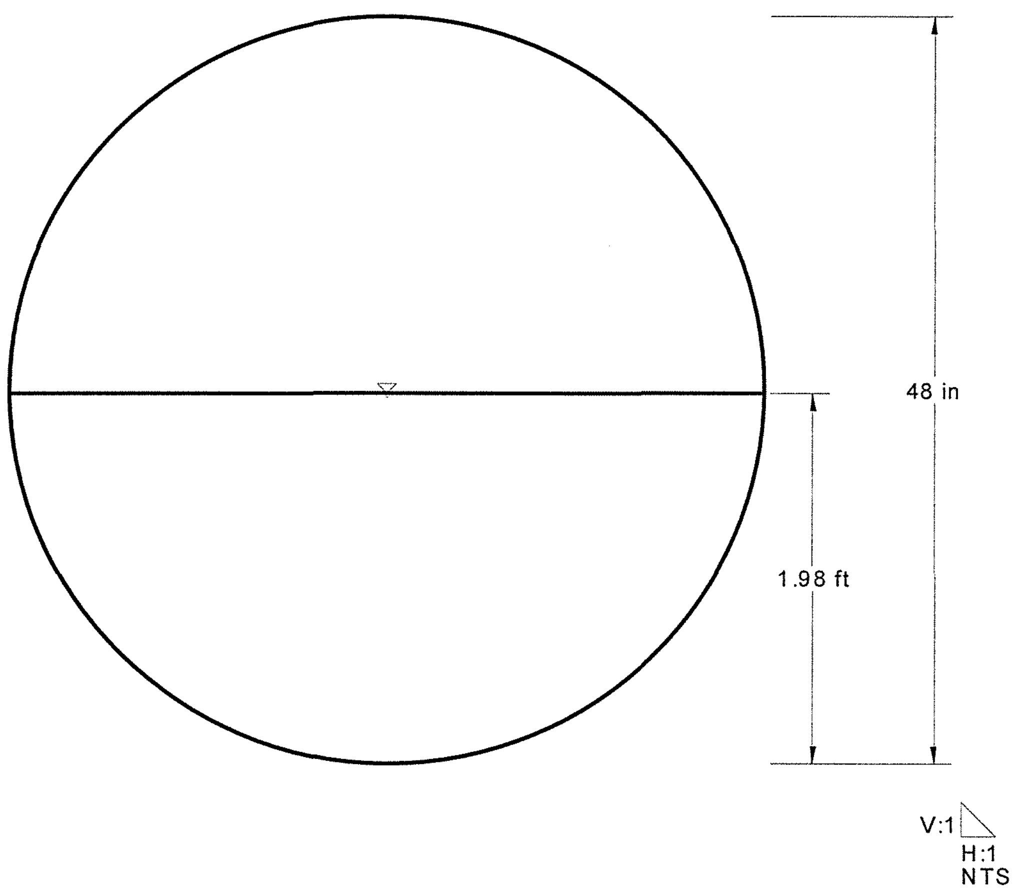
Input Data		
Mannings Coeffic	0.013	
Slope	0.009000	ft/ft
Diameter	48	in
Discharge	67.20	cfs

Results		
Depth	1.98	ft
Flow Area	6.2	ft²
Wetted Perime	6.25	ft
Top Width	4.00	ft
Critical Depth	2.48	ft
Percent Full	49.6	%
Critical Slope	0.004412	ft/ft
Velocity	10.81	ft/s
Velocity Head	1.81	ft
Specific Energ	3.80	ft
Froude Numbe	1.53	
Maximum Disc	146.58	cfs
Discharge Full	136.26	cfs
Slope Full	0.002189	ft/ft
Flow Type	Supercritical	

Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Slope	0.009000	ft/ft
Depth	1.98	ft
Diameter	48	in
Discharge	67.20	cfs



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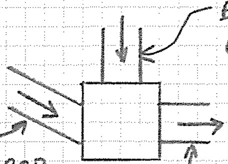
PROJECT CENTRUM 12
BY JAB CHK
DATE 2/01/06

NODE 020: (PROP. A5 CLEANOUT)

EXISTING 30" RCP @ 1.3%
$Q_{50(IN)}$ = 25.3 cfs



PROP. 30" RCP
$Q_{50(IN)}$ = 35.8 cfs
S = 0.7%
S_F = 0.8%

PROP. 36" RCP @ 0.84%
$Q_{50(OUT)}$ = 61.1 cfs

EXIST. 30" RCP (IN): Q_{50} = 25.3 cfs (SUBMERGED/PRESSURE)

S = 1.3%

$V = Q/A = 25.3/4.91 = 5.2$ fps

$K = 0.1(b/D_o)(1-\sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$

$= 0.1(5/3)(1-\sin 90) + 1.4(5/3)^{0.15}\sin 90$

$= 1.51$

$H_L = K\,V^2/2g = 0.6$ ft

PROP. 30" RCP (IN): Q_{50} = 35.8 cfs (SUBMERGED/PRESSURE)

S = 0.7%, S_F = 0.8%

$V = Q/A = 35.8/4.91 = 7.3$ fps

$K = 0.1(5/3)(1-\sin 55) + 1.4(5/3)^{0.15}\sin 55$

$= 1.3$

$H_L = K\,V^2/2g = 1.1$ ft

$WSE_{(NODE\ 020)} = 405.7 + 0.6 + 1.1 = \boxed{407.4}$

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DATE 2/01/06

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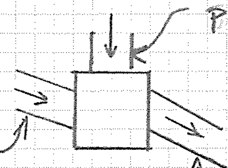
NODE 019: (PROP. A5 CLEANOUT)

PROP. 30" RCP @ 0.5%
$Q_{50\,(IN)} = 27.1$ cfs



EXIST. 24" RCP
@ 0.9%
$Q_{50\,(IN)} = 8.7$ cfs

PROP. 30" RCP @ 0.7%
$Q_{50\,(OUT)} = 35.8$ cfs

PROP. 30" RCP (IN):

$Q_{50} = 27.1$ cfs (SUBMERGED/PRESSURE)

$S = 0.5\%$,

$V = Q/A = 27.1/4.91 = 5.5$ fps

$K = 0.1(b/D_o)(1-\sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$

$= 0.1(5.0/3)(1-\sin 55) + 1.4(5.0/3)^{0.15}\sin 55$

$= 1.27$

$H_L = KV^2/2g = 0.6$ ft

EXIST. 24" RCP (IN):

$Q_{50} = 8.7$ cfs (SUBMERGED/PRESSURE)

$S = 0.9\%$

$V = Q/A = 8.7/3.14 = 2.8$ fps

$K = 0.1(b/D_o)(1-\sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$

$= 0.1(5/3)(1-\sin 0) + 1.4(5/3)^{0.15}\sin 0$

$= 0.17$

$H_L = KV^2/2g = 0.02 \rightarrow$ SAY 0

PROP. 30" RCP (OUT):

$Q_{50} = 35.8$ cfs

$S_f = ((Q \times n)/(0.46\,D^{8/3}))^2 = 0.08$

$WSE_{(NODE\ 019)} = 407.4 + 0.6 + \underbrace{0.1}_{S_f} = \boxed{408.1}$

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PROJECT NO. 00018.14
PROJECT CENTRUM 12
BY JPB CHK
DATE 2/01/06

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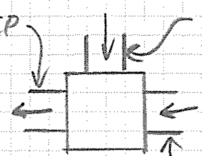
NODE 018: (PROP. A4 CLEANOUT)

PROP. 30" RCP
@ 0.5%
Q_{50} = 27.1 cfs
S_f = 0.4%



PROPOSED 24" RCP @ 2.3%
$Q_{50(IN)}$ = 10.7 cfs

PROPOSED 24" RCP @ 0.5%
$Q_{50(IN)}$ = 16.4 cfs

PROP. 24" RCP (IN): Q_{50} = 10.7 cfs (SUBMERGED/PRESSURE)

$S = 2.3\%$

$V = Q/A = 10.7/3.14 = 3.4$ fps

$K = 0.1(b/D_o)(1-\sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$

$= 0.1(4.5/2.5)(1-\sin 90) + 1.4(4.5/2.5)^{0.15}\sin 90$

$= 1.53$

$H_L = kV^2/2g = 0.33$ ft

PROP. 24" RCP (IN): Q_{50} = 16.4 cfs (SUBMERGED/PRESSURE)

$S = 0.5\%$,

$V = Q/A = 16.4/3.14 = 5.2$ fps

$K = 0.1(b/D_o)(1-\sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$

$= 0.1(4.5/2.5)(1-\sin 0) + 1.4(4.5/2.5)^{0.15}\sin 0$

$= 0.18$

$H_L = k V^2/2g = 0.1$ ft

$WSE = 408.1 + 0.3 + 0.1 = \boxed{408.5}$

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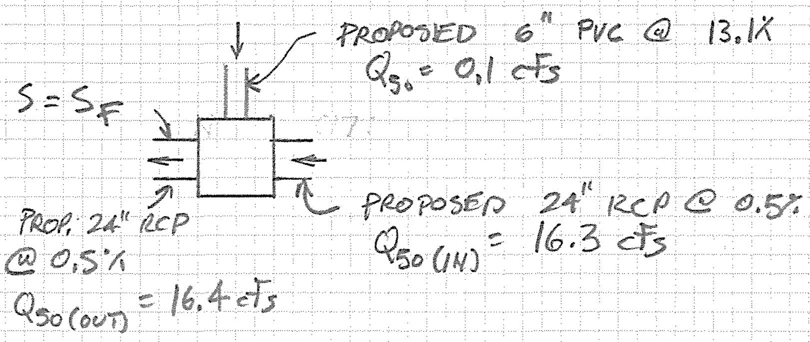
NODE 017: (PROP. A4 CLEANOUT)



PROP. 24" RCP (IN): $Q_{50} = 16.3$ cfs (SUBMERGED/PRESSURE)

$S = 0.5\%$

$V = Q/A = 16.3/3.14 = 5.2$ fps

$K = 0.1(b/D_o)(1-\sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$

$= 0.1(4.5/2)(1-\sin 0) + 1.4(4.5/2)^{0.15}\sin 0$

$= 0.23$

$H_L = KV^2/2g = 0.1$ Ft

$WSE_{(NODE\ 017)} = 408.5 + 0.1 = \boxed{408.6}$

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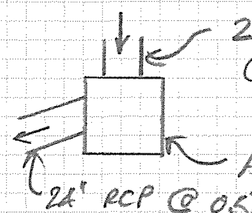
NODE 016:



24" RCP (IN): $Q_{50(IN)} = 16.3$ cfs (OPEN CHANNEL)

$S = 1.0\%$

$V = 7.8$ cfs

$$K = 0.1(b/D_o)(1 - \sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$$

$$= 0.1(4.5/2)(1 - \sin 61) + 1.4(4.5/2)^{0.15}\sin 61$$

$$= 1.41$$

$$H_L = KV^2/2g = 1.3 \text{ ft}$$

$$WSE_{(NODE\ 016)} = 409.1 + 1.3 = \boxed{410.4}$$

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SHEET 11 OF 11

PROJECT NO. 00018.14

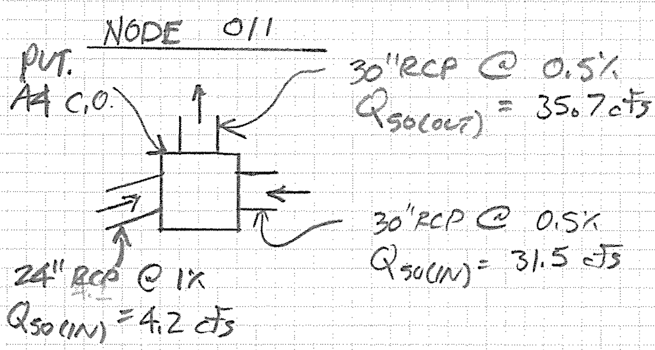
PROJECT CENTRUM 12

BY JPB CHK

DATE 2/01/06

HYDRAULIC ANALYSIS

(PROPOSED PVT. 30" RCP LATERAL IN LIGHTWAVE AVENUE)



30" RCP (OUT): $Q_{50} = 35.7$ cfs

$S = 0.5\%$

$S_f = \left[(Q \times n)/(0.46\, D^{8/3})\right]^2$

$= 0.7\%$

$H_{L(Sf)} = (S_f - S_o)L$

$= (0.007 - 0.005)\,114$

$= \boxed{0.2\text{ Ft}}$

30" RCP (IN): $Q_{50} = 31.5$ cfs (FULL/PRESSURE)

$S = 0.5\%$

$V = Q/A = 31.5/4.91 = 6.4$ fps

$K = 0.1(b/D_o)(1 - \sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta =$

$= 0.1(4.5/2.5)(1 - \sin 90) + 1.4(4.5/2.5)^{0.15}\sin 90$

$= 1.53$

$H_L = K\,V^2/2g = \boxed{1.0\text{ Ft}}$

24" RCP (IN): $Q_{50} = 4.2$ cfs (FULL/PRESSURE)

$S = 0.5\%$

$V = Q/A = 4.1/3.14 = 1.3$ fps

$K = 0.1(b/D_o)(1 - \sin\theta) + 1.4(b/D_o)^{0.15}\sin\theta$

$= 0.1(4.5/2.5)(1 - \sin 38) + 1.4(4.5/2.5)^{0.15}\sin 38$

$= 1.01$

$H_L = KV^2/2g = \boxed{0.02\text{ Ft}} \rightarrow$ SAY 0.1 Ft

$\Sigma H_L = 0.2 + 1.0 + 0.1 = \boxed{1.3\text{ Ft}}$

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v_2 = outflow velocity (ft/s); and
g = gravitational acceleration (32.2 ft/s^2).

Basic Structure Loss Coefficient (K_o)

The initial or basic loss at a clean-out structure is defined as:

$$K_O = 0.1\left(\frac{b}{D_O}\right)(1-\sin\theta)+1.4\left(\frac{b}{D_O}\right)^{0.15}\sin\theta \qquad (3\text{-}20)$$

where ...

K_O = initial or basic loss coefficient;
b = drainage structure diameter or equivalent diameter (ft);
D_o = outflow pipe diameter (ft); and
θ = deflection angle.

This basic equation is valid only when the water level in the receiving inlet, junction, or cleanout is above the invert of the incoming pipe. In cases where this is not true, the structure losses are assumed to be zero. For non-circular drainage structures, the equivalent structure diameter is defined as the diameter of a circular structure having the equivalent area of the actual non-circular one. Table 3-8 and Figure 3-7 (page 3-25) present basic head loss for standard clean-outs in the San Diego region.

Table 3-8 Equivalent Diameters for San Diego Regional Standard Cleanouts

SDRSD Standard Cleanout	Length (ft)	Width (ft)	Area (ft^2)	Equivalent Diameter b (ft)
A-4	4	4	16	4.5
A-5	5	4	20	5.0
A-6	6	4	24	5.5
A-7	7	4	28	6.0
A-8	8	4	32	6.4

Relative Pipe Diameter and Flow Depth Correction Factor (C_D)

Equation 3-21 describes the correction factor that accounts for the relative pipe diameter and flow depth within a drainage structure. The relative flow depth correction factor depends on the depth of flow within the structure, which in this case is measured relative to the crown of the outlet pipe. When the flow depth in the structure above the crown of the outlet pipe (d_{out}-D_o) is much higher relative to the outlet pipe diameter (D_o) (i.e., there is submerged flow or a high-pressure condition), the correction factor is based on the relative diameters of the inflow and outflow pipes. In cases where the relative flow depth is lower, or not significantly larger than the diameter of the outlet pipe, the correction factor is a function of the flow depth relative depth to the outlet pipe diameter. For practical purposes, the correction factor for relative pipe diameter and flow depth need not be greater than C_D=3.0.

6" PVC
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	C.010
Diameter	6 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	0.52	0.50	2.63	0.2	1.57	0.00
C.010000	0.73	0.50	3.71	0.2	1.57	0.00
C.015000	0.89	0.50	4.55	0.2	1.57	0.00
C.020000	1.03	0.50	5.25	0.2	1.57	0.00
C.025000	1.15	0.50	5.87	0.2	1.57	0.00
C.030000	1.26	0.50	6.43	0.2	1.57	0.00
C.035000	1.36	0.50	6.95	0.2	1.57	0.00
C.040000	1.46	0.50	7.43	0.2	1.57	0.00
C.045000	1.55	0.50	7.88	0.2	1.57	0.00
C.050000	1.63	0.50	8.31	0.2	1.57	0.00
C.055000	1.71	0.50	8.71	0.2	1.57	0.00
C.060000	1.79	0.50	9.10	0.2	1.57	0.00
C.065000	1.86	0.50	9.47	0.2	1.57	0.00
C.070000	1.93	0.50	9.83	0.2	1.57	0.00
C.075000	2.00	0.50	10.17	0.2	1.57	0.00
C.080000	2.06	0.50	10.51	0.2	1.57	0.00
C.085000	2.13	0.50	10.83	0.2	1.57	0.00
C.090000	2.19	0.50	11.14	0.2	1.57	0.00
C.095000	2.25	0.50	11.45	0.2	1.57	0.00
C.100000	2.31	0.50	11.75	0.2	1.57	0.00

8" PVC
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	C.010
Diameter	8 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	1.11	0.67	3.18	0.3	2.09	0.00
C.010000	1.57	0.67	4.50	0.3	2.09	0.00
C.015000	1.92	0.67	5.51	0.3	2.09	0.00
C.020000	2.22	0.67	6.36	0.3	2.09	0.00
C.025000	2.48	0.67	7.12	0.3	2.09	0.00
C.030000	2.72	0.67	7.79	0.3	2.09	0.00
C.035000	2.94	0.67	8.42	0.3	2.09	0.00
C.040000	3.14	0.67	9.00	0.3	2.09	0.00
C.045000	3.33	0.67	9.55	0.3	2.09	0.00
C.050000	3.51	0.67	10.06	0.3	2.09	0.00
C.055000	3.68	0.67	10.55	0.3	2.09	0.00
C.060000	3.85	0.67	11.02	0.3	2.09	0.00
C.065000	4.00	0.67	11.47	0.3	2.09	0.00
C.070000	4.16	0.67	11.91	0.3	2.09	0.00
C.075000	4.30	0.67	12.32	0.3	2.09	0.00
C.080000	4.44	0.67	12.73	0.3	2.09	0.00
C.085000	4.58	0.67	13.12	0.3	2.09	0.00
C.090000	4.71	0.67	13.50	0.3	2.09	0.00
C.095000	4.84	0.67	13.87	0.3	2.09	0.00
C.100000	4.97	0.67	14.23	0.3	2.09	0.00

10" PVC
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	C.010
Diameter	10 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	2.01	0.83	3.69	0.5	2.62	0.00
C.010000	2.85	0.83	5.22	0.5	2.62	0.00
C.015000	3.49	0.83	6.40	0.5	2.62	0.00
C.020000	4.03	0.83	7.38	0.5	2.62	0.00
C.025000	4.50	0.83	8.26	0.5	2.62	0.00
C.030000	4.93	0.83	9.04	0.5	2.62	0.00
C.035000	5.33	0.83	9.77	0.5	2.62	0.00
C.040000	5.70	0.83	10.44	0.5	2.62	0.00
C.045000	6.04	0.83	11.08	0.5	2.62	0.00
C.050000	6.37	0.83	11.68	0.5	2.62	0.00
C.055000	6.68	0.83	12.25	0.5	2.62	0.00
C.060000	6.98	0.83	12.79	0.5	2.62	0.00
C.065000	7.26	0.83	13.31	0.5	2.62	0.00
C.070000	7.54	0.83	13.82	0.5	2.62	0.00
C.075000	7.80	0.83	14.30	0.5	2.62	0.00
C.080000	8.06	0.83	14.77	0.5	2.62	0.00
C.085000	8.30	0.83	15.22	0.5	2.62	0.00
C.090000	8.54	0.83	15.67	0.5	2.62	0.00
C.095000	8.78	0.83	16.10	0.5	2.62	0.00
C.100000	9.01	0.83	16.51	0.5	2.62	0.00

12" PVC /HDPE
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	C.010
Diameter	12 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	3.27	1.00	4.17	0.8	3.14	0.00
C.010000	4.63	1.00	5.90	0.8	3.14	0.00
C.015000	5.67	1.00	7.22	0.8	3.14	0.00
C.020000	6.55	1.00	8.34	0.8	3.14	0.00
C.025000	7.32	1.00	9.32	0.8	3.14	0.00
C.030000	8.02	1.00	10.21	0.8	3.14	0.00
C.035000	8.66	1.00	11.03	0.8	3.14	0.00
C.040000	9.26	1.00	11.79	0.8	3.14	0.00
C.045000	9.82	1.00	12.51	0.8	3.14	0.00
C.050000	10.36	1.00	13.19	0.8	3.14	0.00
C.055000	10.86	1.00	13.83	0.8	3.14	0.00
C.060000	11.34	1.00	14.44	0.8	3.14	0.00
C.065000	11.81	1.00	15.03	0.8	3.14	0.00
C.070000	12.25	1.00	15.60	0.8	3.14	0.00
C.075000	12.68	1.00	16.15	0.8	3.14	0.00
C.080000	13.10	1.00	16.68	0.8	3.14	0.00
C.085000	13.50	1.00	17.19	0.8	3.14	0.00
C.090000	13.89	1.00	17.69	0.8	3.14	0.00
C.095000	14.27	1.00	18.18	0.8	3.14	0.00
C.100000	14.65	1.00	18.65	0.8	3.14	0.00

18" PVC/HDPE
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	C.010
Diameter	18 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	9.66	1.50	5.46	1.8	4.71	0.00
C.010000	13.65	1.50	7.73	1.8	4.71	0.00
C.015000	16.72	1.50	9.46	1.8	4.71	0.00
C.020000	19.31	1.50	10.93	1.8	4.71	0.00
C.025000	21.59	1.50	12.22	1.8	4.71	0.00
C.030000	23.65	1.50	13.38	1.8	4.71	0.00
C.035000	25.55	1.50	14.46	1.8	4.71	0.00
C.040000	27.31	1.50	15.45	1.8	4.71	0.00
C.045000	28.97	1.50	16.39	1.8	4.71	0.00
C.050000	30.53	1.50	17.28	1.8	4.71	0.00
C.055000	32.02	1.50	18.12	1.8	4.71	0.00
C.060000	33.45	1.50	18.93	1.8	4.71	0.00
C.065000	34.81	1.50	19.70	1.8	4.71	0.00
C.070000	36.13	1.50	20.44	1.8	4.71	0.00
C.075000	37.40	1.50	21.16	1.8	4.71	0.00
C.080000	38.62	1.50	21.86	1.8	4.71	0.00
C.085000	39.81	1.50	22.53	1.8	4.71	0.00
C.090000	40.96	1.50	23.18	1.8	4.71	0.00
C.095000	42.09	1.50	23.82	1.8	4.71	0.00
C.100000	43.18	1.50	24.44	1.8	4.71	0.00

24" PVC /HDPE
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	C.010
Diameter	24 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	20.79	2.00	6.62	3.1	6.28	0.00
C.010000	29.41	2.00	9.36	3.1	6.28	0.00
C.015000	36.02	2.00	11.46	3.1	6.28	0.00
C.020000	41.59	2.00	13.24	3.1	6.28	0.00
C.025000	46.50	2.00	14.80	3.1	6.28	0.00
C.030000	50.94	2.00	16.21	3.1	6.28	0.00
C.035000	55.02	2.00	17.51	3.1	6.28	0.00
C.040000	58.82	2.00	18.72	3.1	6.28	0.00
C.045000	62.38	2.00	19.86	3.1	6.28	0.00
C.050000	65.76	2.00	20.93	3.1	6.28	0.00
C.055000	68.97	2.00	21.95	3.1	6.28	0.00
C.060000	72.03	2.00	22.93	3.1	6.28	0.00
C.065000	74.97	2.00	23.87	3.1	6.28	0.00
C.070000	77.80	2.00	24.77	3.1	6.28	0.00
C.075000	80.54	2.00	25.64	3.1	6.28	0.00
C.080000	83.18	2.00	26.48	3.1	6.28	0.00
C.085000	85.74	2.00	27.29	3.1	6.28	0.00
C.090000	88.22	2.00	28.08	3.1	6.28	0.00
C.095000	90.64	2.00	28.85	3.1	6.28	0.00
C.100000	92.99	2.00	29.60	3.1	6.28	0.00

18 " RCP
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	C.013
Diameter	18 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.150000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	7.43	1.50	4.20	1.8	4.71	0.00
C.010000	10.50	1.50	5.94	1.8	4.71	0.00
C.015000	12.86	1.50	7.28	1.8	4.71	0.00
C.020000	14.85	1.50	8.41	1.8	4.71	0.00
C.025000	16.61	1.50	9.40	1.8	4.71	0.00
C.030000	18.19	1.50	10.30	1.8	4.71	0.00
C.035000	19.65	1.50	11.12	1.8	4.71	0.00
C.040000	21.01	1.50	11.89	1.8	4.71	0.00
C.045000	22.28	1.50	12.61	1.8	4.71	0.00
C.050000	23.49	1.50	13.29	1.8	4.71	0.00
C.055000	24.63	1.50	13.94	1.8	4.71	0.00
C.060000	25.73	1.50	14.56	1.8	4.71	0.00
C.065000	26.78	1.50	15.15	1.8	4.71	0.00
C.070000	27.79	1.50	15.73	1.8	4.71	0.00
C.075000	28.77	1.50	16.28	1.8	4.71	0.00
C.080000	29.71	1.50	16.81	1.8	4.71	0.00
C.085000	30.62	1.50	17.33	1.8	4.71	0.00
C.090000	31.51	1.50	17.83	1.8	4.71	0.00
C.095000	32.37	1.50	18.32	1.8	4.71	0.00
C.100000	33.22	1.50	18.80	1.8	4.71	0.00
C.105000	34.04	1.50	19.26	1.8	4.71	0.00
C.110000	34.84	1.50	19.71	1.8	4.71	0.00
C.115000	35.62	1.50	20.16	1.8	4.71	0.00
C.120000	36.39	1.50	20.59	1.8	4.71	0.00
C.125000	37.14	1.50	21.01	1.8	4.71	0.00
C.130000	37.87	1.50	21.43	1.8	4.71	0.00
C.135000	38.59	1.50	21.84	1.8	4.71	0.00
C.140000	39.30	1.50	22.24	1.8	4.71	0.00
C.145000	40.00	1.50	22.63	1.8	4.71	0.00
C.150000	40.68	1.50	23.02	1.8	4.71	0.00

24" RCP

Table
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data		
Mannings Coeffic	C.013	
Diameter	24	in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
C.005000	16.00	2.00	5.09	3.1	6.28	0.00
C.010000	22.62	2.00	7.20	3.1	6.28	0.00
C.015000	27.71	2.00	8.82	3.1	6.28	0.00
C.020000	31.99	2.00	10.18	3.1	6.28	0.00
C.025000	35.77	2.00	11.39	3.1	6.28	0.00
C.030000	39.18	2.00	12.47	3.1	6.28	0.00
C.035000	42.32	2.00	13.47	3.1	6.28	0.00
C.040000	45.24	2.00	14.40	3.1	6.28	0.00
C.045000	47.99	2.00	15.27	3.1	6.28	0.00
C.050000	50.58	2.00	16.10	3.1	6.28	0.00
C.055000	53.05	2.00	16.89	3.1	6.28	0.00
C.060000	55.41	2.00	17.64	3.1	6.28	0.00
C.065000	57.67	2.00	18.36	3.1	6.28	0.00
C.070000	59.85	2.00	19.05	3.1	6.28	0.00
C.075000	61.95	2.00	19.72	3.1	6.28	0.00
C.080000	63.98	2.00	20.37	3.1	6.28	0.00
C.085000	65.95	2.00	20.99	3.1	6.28	0.00
C.090000	67.86	2.00	21.60	3.1	6.28	0.00
C.095000	69.72	2.00	22.19	3.1	6.28	0.00
C.100000	71.53	2.00	22.77	3.1	6.28	0.00

30" RCP
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	0.013
Diameter	30 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.005000	29.00	2.50	5.91	4.9	7.85	0.00
0.010000	41.01	2.50	8.36	4.9	7.85	0.00
0.015000	50.23	2.50	10.23	4.9	7.85	0.00
0.020000	58.00	2.50	11.82	4.9	7.85	0.00
0.025000	64.85	2.50	13.21	4.9	7.85	0.00
0.030000	71.04	2.50	14.47	4.9	7.85	0.00
0.035000	76.73	2.50	15.63	4.9	7.85	0.00
0.040000	82.03	2.50	16.71	4.9	7.85	0.00
0.045000	87.01	2.50	17.72	4.9	7.85	0.00
0.050000	91.71	2.50	18.68	4.9	7.85	0.00
0.055000	96.19	2.50	19.60	4.9	7.85	0.00
0.060000	100.47	2.50	20.47	4.9	7.85	0.00
0.065000	104.57	2.50	21.30	4.9	7.85	0.00
0.070000	108.52	2.50	22.11	4.9	7.85	0.00
0.075000	112.32	2.50	22.88	4.9	7.85	0.00
0.080000	116.01	2.50	23.63	4.9	7.85	0.00
0.085000	119.58	2.50	24.36	4.9	7.85	0.00
0.090000	123.04	2.50	25.07	4.9	7.85	0.00
0.095000	126.42	2.50	25.75	4.9	7.85	0.00
0.100000	129.70	2.50	26.42	4.9	7.85	0.00

36" RCP
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	).013
Diameter	36 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.005000	47.16	3.00	6.67	7.1	9.42	0.00
0.010000	66.69	3.00	9.44	7.1	9.42	0.00
0.015000	81.68	3.00	11.56	7.1	9.42	0.00
0.020000	94.32	3.00	13.34	7.1	9.42	0.00
0.025000	105.45	3.00	14.92	7.1	9.42	0.00
0.030000	115.52	3.00	16.34	7.1	9.42	0.00
0.035000	124.77	3.00	17.65	7.1	9.42	0.00
0.040000	133.39	3.00	18.87	7.1	9.42	0.00
0.045000	141.48	3.00	20.02	7.1	9.42	0.00
0.050000	149.13	3.00	21.10	7.1	9.42	0.00
0.055000	156.41	3.00	22.13	7.1	9.42	0.00
0.060000	163.37	3.00	23.11	7.1	9.42	0.00
0.065000	170.04	3.00	24.06	7.1	9.42	0.00
0.070000	176.46	3.00	24.96	7.1	9.42	0.00
0.075000	182.65	3.00	25.84	7.1	9.42	0.00
0.080000	188.64	3.00	26.69	7.1	9.42	0.00
0.085000	194.45	3.00	27.51	7.1	9.42	0.00
0.090000	200.08	3.00	28.31	7.1	9.42	0.00
0.095000	205.57	3.00	29.08	7.1	9.42	0.00
0.100000	210.91	3.00	29.84	7.1	9.42	0.00

48" RCP
Rating Table for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data	
Mannings Coeffic	).013
Diameter	48 in

Attribute	Minimum	Maximum	Increment
Slope (ft/ft)	0.005000	0.100000	0.005000

Slope (ft/ft)	Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.005000	101.57	4.00	8.08	12.6	12.57	0.00
0.010000	143.64	4.00	11.43	12.6	12.57	0.00
0.015000	175.92	4.00	14.00	12.6	12.57	0.00
0.020000	203.13	4.00	16.16	12.6	12.57	0.00
0.025000	227.11	4.00	18.07	12.6	12.57	0.00
0.030000	248.78	4.00	19.80	12.6	12.57	0.00
0.035000	268.72	4.00	21.38	12.6	12.57	0.00
0.040000	287.27	4.00	22.86	12.6	12.57	0.00
0.045000	304.70	4.00	24.25	12.6	12.57	0.00
0.050000	321.18	4.00	25.56	12.6	12.57	0.00
0.055000	336.85	4.00	26.81	12.6	12.57	0.00
0.060000	351.83	4.00	28.00	12.6	12.57	0.00
0.065000	366.20	4.00	29.14	12.6	12.57	0.00
0.070000	380.02	4.00	30.24	12.6	12.57	0.00
0.075000	393.36	4.00	31.30	12.6	12.57	0.00
0.080000	406.26	4.00	32.33	12.6	12.57	0.00
0.085000	418.77	4.00	33.32	12.6	12.57	0.00
0.090000	430.91	4.00	34.29	12.6	12.57	0.00
0.095000	442.71	4.00	35.23	12.6	12.57	0.00
0.100000	454.22	4.00	36.15	12.6	12.57	0.00

Computation of grated inlet capacity in sump condition.

Model: QUIKSET "DB-1212". A precast concrete box with a cast iron grate.

Grate Size:	12 inches square
Rim bar size:	1 inch
Grate bar size:	1 inch
Opening width:	1 inch

Using Bureau of Public Roads chart 1073.02;

Q, flow into inlet (CFS)
P, perimeter of grate (feet) P= 3.33 feet
H, head (feet of water over grate top)
A, area of grate opening (square feet) A= 0.35 Sq ft

EQUATIONS: for heads less than 0.4 feet.
$Q = P * 3.0 * H ^{(3/2)}$

for heads over 1.4 feet.
$Q = A * 5.37 * H^{(1.2)}$

for heads between 0.4 and 1.4 feet,
(use value for 0.4 feet).

Table of flow values vs head levels.

Head (feet)	Flow Capacity
0.10	0.32 CFS
0.20	0.89 CFS
0.30	1.64 CFS
0.40	2.53 CFS
0.50	2.53 CFS
0.60	2.53 CFS
0.70	2.53 CFS
0.80	2.53 CFS
0.90	2.53 CFS
1.00	2.53 CFS
1.10	2.53 CFS
1.20	2.53 CFS
1.30	2.53 CFS
1.40	2.21 CFS
1.50	2.28 CFS
1.60	2.36 CFS
1.70	2.43 CFS
1.80	2.50 CFS
1.90	2.57 CFS
2.00	2.64 CFS

Computation of grated inlet capacity in sump condition.

Model: QUIKSET "DB-1818". A precast concrete box with a cast iron grate.

Grate Size:	18 inches square
Rim bar size:	1 inch
Grate bar size:	1 inch
Opening width:	1 inch

Using Bureau of Public Roads chart 1073.02;

Q, flow into inlet (CFS)
P, perimeter of grate (feet) P= 5.33 feet
H, head (feet of water over grate top)
A, area of grate opening (square feet) A= 0.89 Sq ft

EQUATIONS: for heads less than 0.4 feet.
Q = P * 3.0 * H ^(3/2)

for heads over 1.4 feet.
Q = A * 5.37 * H^(1.2)

for heads between 0.4 and 1.4 feet,
(use value for 0.4 feet).

Table of flow values vs head levels.

Head (feet)	Flow Capacity
0.10	0.51 CFS
0.20	1.43 CFS
0.30	2.63 CFS
0.40	4.05 CFS
0.50	4.05 CFS
0.60	4.05 CFS
0.70	4.05 CFS
0.80	4.05 CFS
0.90	4.05 CFS
1.00	4.05 CFS
1.10	4.05 CFS
1.20	4.05 CFS
1.30	4.05 CFS
1.40	5.65 CFS
1.50	5.85 CFS
1.60	6.04 CFS
1.70	6.22 CFS
1.80	6.40 CFS
1.90	6.58 CFS
2.00	6.75 CFS

Computation of grated inlet capacity in sump condition.

Model: QUIKSET "DB-2424". A precast concrete box with a cast iron grate.

Grate Size:	24 inches square
Rim bar size:	1 inch
Grate bar size:	1 inch
Opening width:	1 inch

Using Bureau of Public Roads chart 1073.02;

Q, flow into inlet (CFS)
P, perimeter of grate (feet) P= 7.33 feet
H, head (feet of water over grate top)
A, area of grate opening (square feet) A= 1.68 Sq ft

EQUATIONS: for heads less than 0.4 feet.
Q = P * 3.0 * H ^(3/2)

for heads over 1.4 feet.
Q = A * 5.37 * H^(1.2)

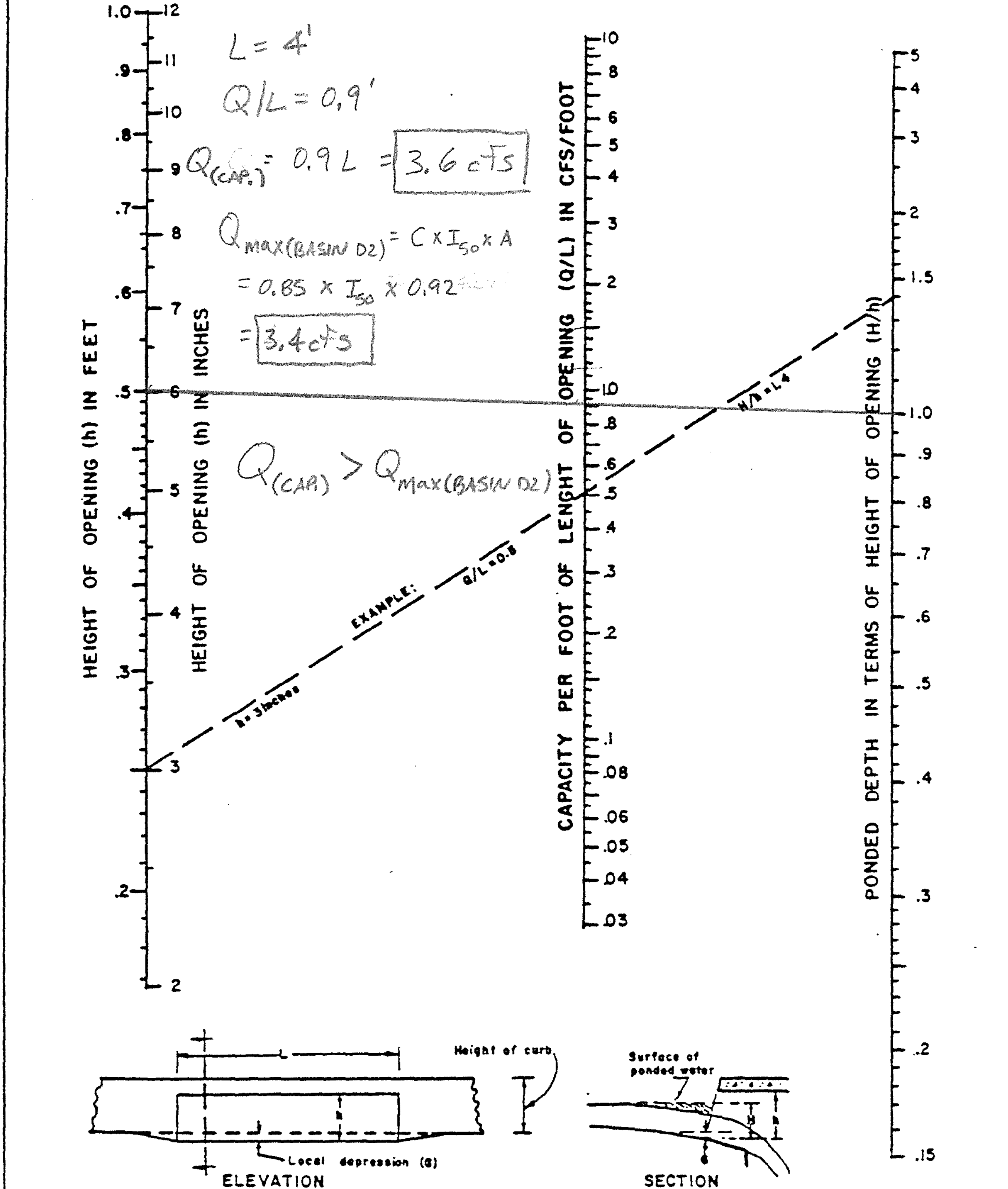
for heads between 0.4 and 1.4 feet,
(use value for 0.4 feet).

Table of flow values vs head levels.

Head (feet)	Flow Capacity
0.10	0.70 CFS
0.20	1.97 CFS
0.30	3.61 CFS
0.40	5.57 CFS
0.50	5.57 CFS
0.60	5.57 CFS
0.70	5.57 CFS
0.80	5.57 CFS
0.90	5.57 CFS
1.00	5.57 CFS
1.10	5.57 CFS
1.20	5.57 CFS
1.30	5.57 CFS
1.40	10.68 CFS
1.50	11.05 CFS
1.60	11.42 CFS
1.70	11.77 CFS
1.80	12.11 CFS
1.90	12.44 CFS
2.00	12.76 CFS

FOR TYPE 'B' C.I. IN BASINS B2 → B5, D2, AND D5 → D7

CHART I-103.6C



$L = 4'$

$Q/L = 0.9'$

$Q_{(CAP.)} = 0.9L = \boxed{3.6\text{ cfs}}$

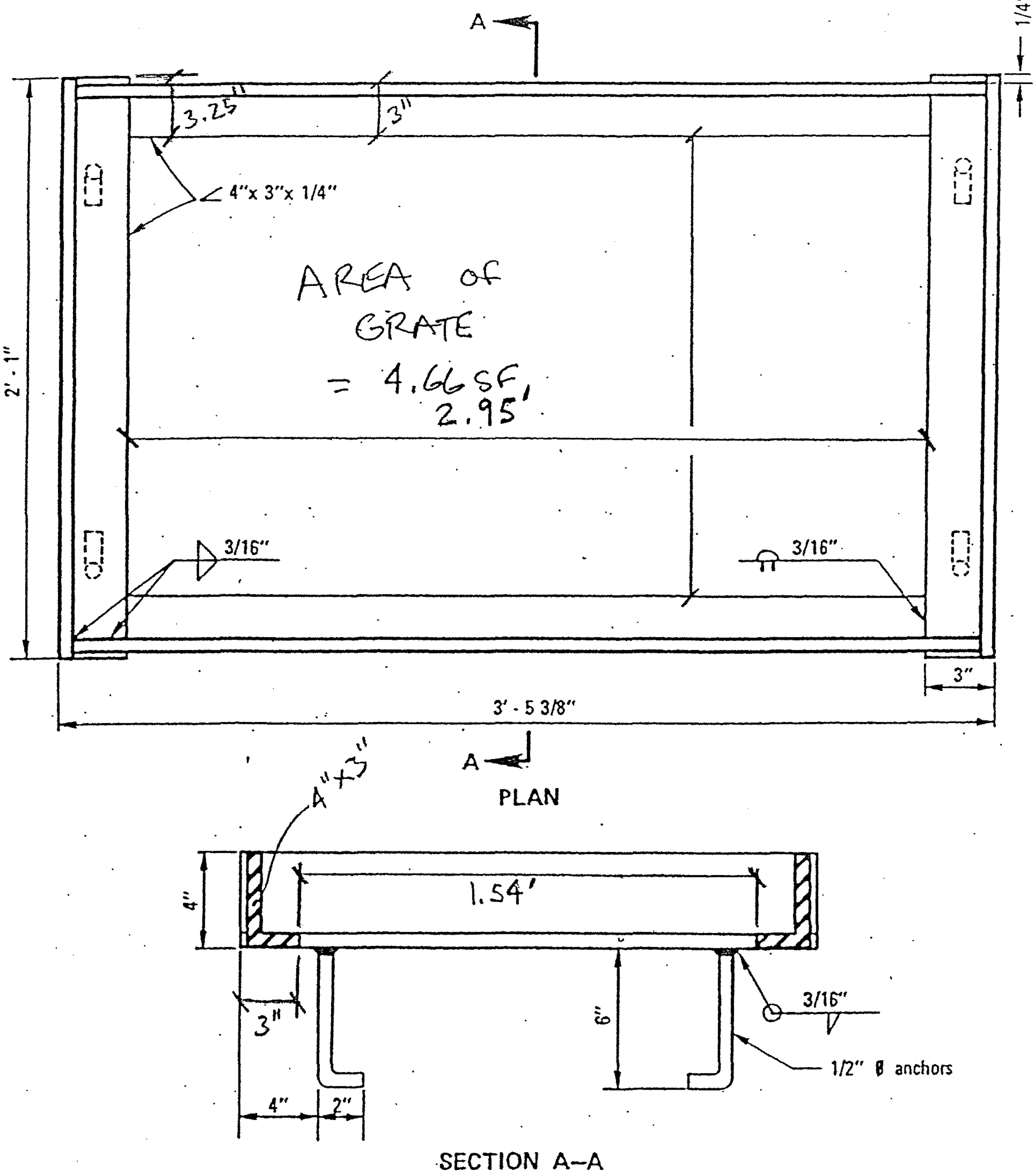
$Q_{max(BASIN\ D2)} = C \times I_{50} \times A$

$= 0.85 \times I_{50} \times 0.92$

$= \boxed{3.4\text{ cfs}}$

$Q_{(CAP)} > Q_{max(BASIN\ D2)}$

REV.		CITY OF SAN DIEGO - DESIGN GUIDE	SHT. NO.
		NOMOGRAM—CAPACITY, CURB INLET AT SAG	



$P = 2(2.95) + 2(1.54) = 8.98$

SUMP ⇒ H = Curb height minus 0.1' freeboard

⇒ $H = 0.4'$

⇒ $Q = 3(P)(H)^{3/2} = 6.8$ CFS

NOTES

1. Hot dip galvanize all parts after fabrication.

Revision	By	Approved	Date
Note 1	SC	M.B	5-86

SAN DIEGO REGIONAL STANDARD DRAWING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kendall — Coordinator R.C.E. 19807 — Dec. 1975 Date

WELDED STEEL GRATE FRAME (TYPE "I" CATCH BASIN)

DRAWING NUMBER D-13

RIPRAP SIZING FOR PROPOSED 30" RCP LATERAL IN LIGHTWAVE AVE.

200-1.6.3 Quality Requirements

Page 45 - First paragraph, second sentence change "60 days" to "30 days".

200-1.7 Selection of Riprap and Filter Blanket Material

Table 200-1.7

Velocity Meters/Sec (Ft/Sec) (1)	Rock Class (2)	Rip Rap Thick-Ness "T"	Filter Blanket Upper Layer(s) (3)			
			Option 1 Sect. 200 (4)	Option 2 Sect.400 (4)	Option 3 (5)	Lower Layer (6)
2 (6-7)	No. 3 Backing	0.6	5 mm (3/16")	C2	D.G.	----
2.2 (7-8)	No. 2 Backing	1.0	6 mm (1/4")	B3	D.G.	----
2.6 (8-9.5)	Facing	1.4	9.5 mm (3/8")	----	D.G.	----
3 (9.5-11)	Light	2.0	12.5 mm (½")	----	25mm (3/4"- 1-1/2")	----
3.5 (11-13)	220 kg (1/4 Ton)	2.7	19 mm (3/4")	----	25mm (3/4"- 1-1/2")	SAND
4 (13-15)	450 kg (½ Ton)	3.4	25 mm (1")	----	25mm (3/4"- 1-1/2")	SAND
4.5 (15-17)	900 kg (1 Ton)	4.3	37.5 mm (1-1/2")	----	TYPE B	SAND
5.5 (17-20)	1.8Tonne (2 Ton)	5.4	50 mm (2")	----	TYPE B	SAND

See Section 200-1.6. see also Table 200-1.6 (A)

Practical use of this table is limited to situations where "T" is less than inside diameter.

(1) Average velocity in pipe or bottom velocity in energy dissipater, whichever is greater.

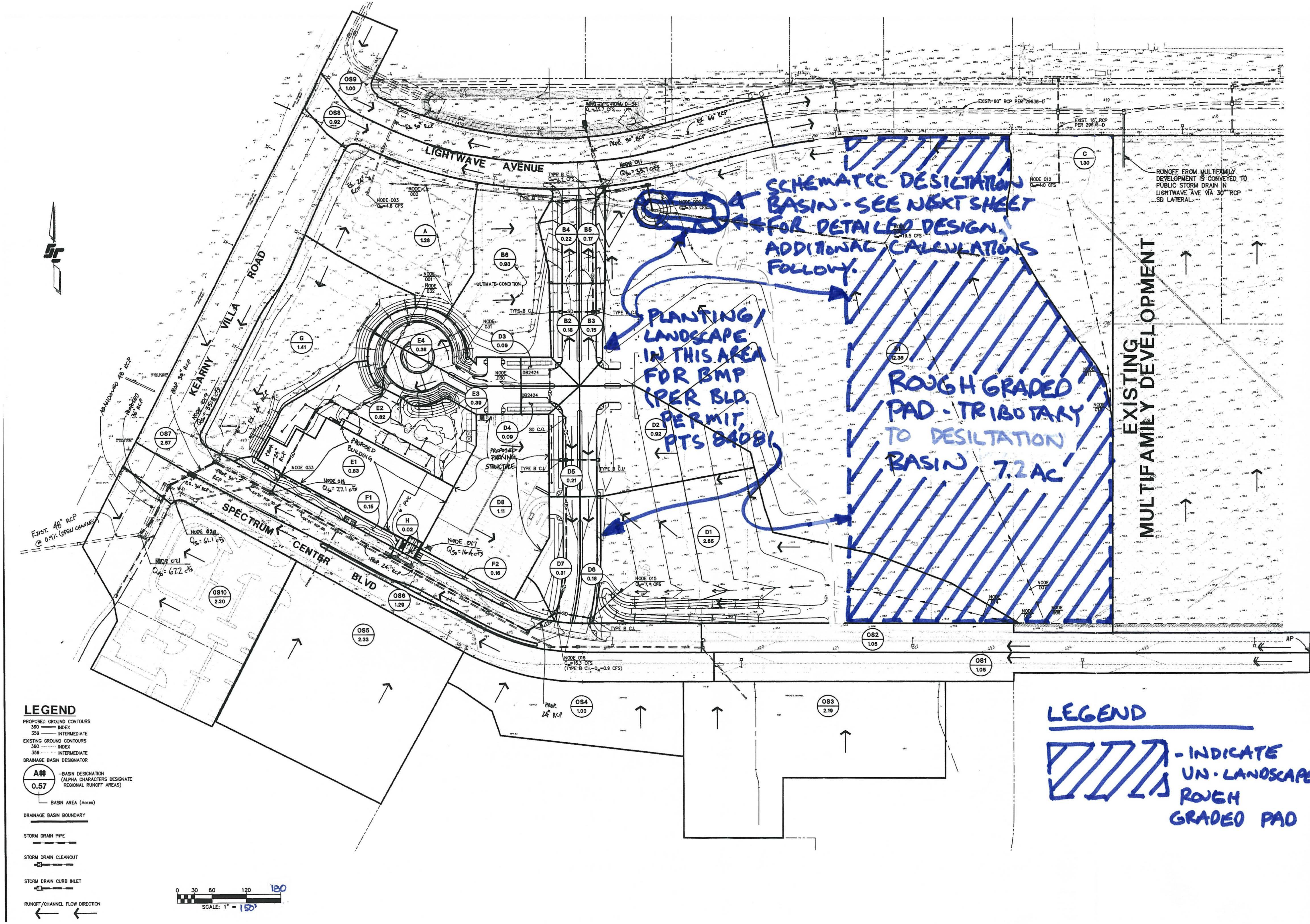
(2) If desired rip rap and filter blanket class is not available, use next larger class.

(3) Filter blanket thickness = 0.3 Meter (1 Foot) or "T", whichever is less.

(4) Standard Specifications for Public Works Construction.

(5) D.G. = Disintegrated Granite, 1mm to 10mm.

P.B. = Processed Miscellaneous Base.



STEVENS-CRESTO ENGINEERING
CIVIL ENGINEERS • LAND PLANNERS • SUR
9620 CHESAPEAKE DRIVE
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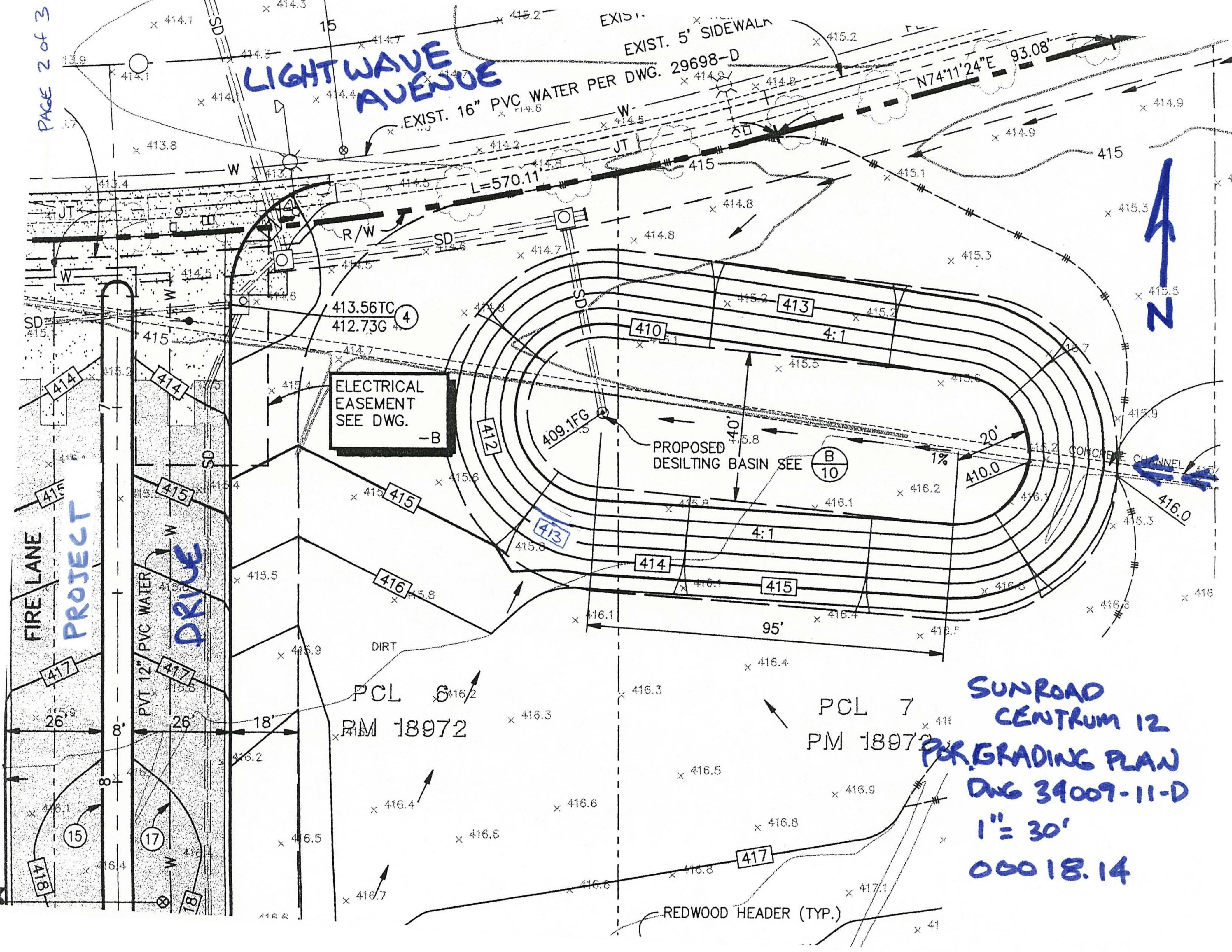
SAN DIEGO, CA 92123-1324
PHONE: 858.6
FAX: 858.6
www.scengr.com

REVISIONS

CENTRUM 12
KEARNY MESA, CALIFORNIA

EXHIBIT "C"
DESILTATION BASIN TRIBUTARY BASIN EXHIBIT

DATE: 06/27/06
SCE NO. 00018.14
SHEET C


LIGHTWAVE AVENUE
EXIST. 5' SIDEWALK
EXIST. 16" PVC WATER PER DWG. 29698-D
N74°11'24"E 93.08'
L=570.11'
R/W
SD
JT
W
413.56TC
412.73G
4
ELECTRICAL EASEMENT SEE DWG. -B
409.1FG
PROPOSED DESILTING BASIN SEE B/10
40'
20'
1%
410.0
4:1
95'
CONCRETE CHANNEL
416.0
FIRE LANE
PROJECT DRIVE
PVT 12" PVC WATER
26'
8'
18'
15
17
DIRT
PCL 6 PM 18972
PCL 7 PM 18972
REDWOOD HEADER (TYP.)
N
SUNROAD CENTRUM 12
PRE. GRADING PLAN
DWG 39009-11-D
1" = 30'
00018.14

STEVENS · CRESTO ENGINEERING, INC.
CIVIL ENGINEERS • PLANNERS • LAND SURVEYORS

PROJECT NO. 00018.14
PROJECT CENTRUM 12
BY RDH CHK
DATE 6/27/06

DESILTATION BASIN SIZEING CALCULATIONS

EXHIBIT C, UN-LANDSCAPED, ROUGH GRADED PAD, TRIBUTARY TO DESILTATION BASIN, ADJACENT TO LIGHTWAVE AVENUE, EAST OF PROJECT DRIVE.

TRIBUTARY DRAINAGE BASIN AREA = 7.2AC

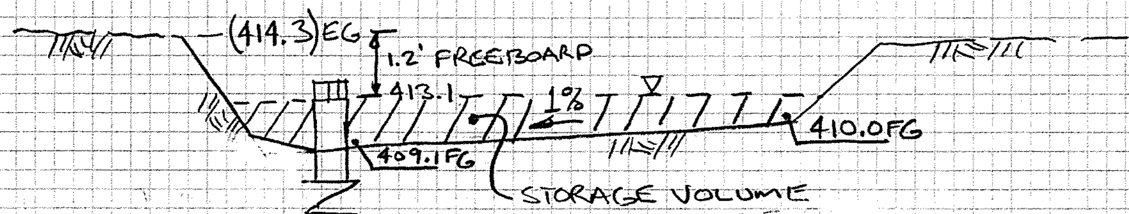
CRITERIA:

Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 3,600 cubic feet of storage per acre draining into the sediment basin. The length of the basin shall be more twice the width of the basin. The length is determined by measuring the distance between the inlet and the outlet; and the depth must not be less than three feet nor greater than five feet for safety reasons and for maximum efficiency.

DESILTATION BASIN STORAGE VOLUME:

$$7.2 * (3{,}600\ ft^3/AC) = 25{,}920\ cf$$

DESILTATION BASIN GEOMETRY



VOLUME PROVIDED

BOTTOM AREA = 5,002 SF
TOP AREA = 10,063 SF

DEPTH $\bar{D} = \dfrac{(413.1-409.1)+(413.1-410.1)}{2} = 3.5\ ft$

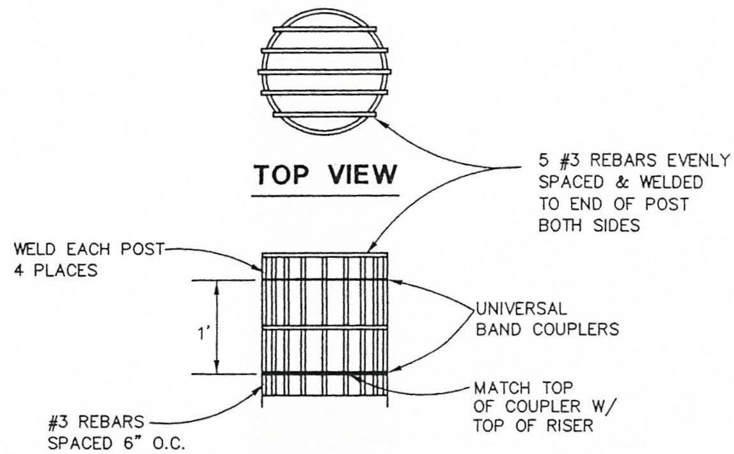
VOLUME $= \left(\dfrac{5{,}002+10{,}063}{2}\right)(3.5\ ft) = 26{,}364\ cf$ (AT TOP OF RISER 'ELEVATION 413.1')

CONCLUSION:

VOLUME REQUIRED = 25,920 cf
VOLUME PROVIDED = 26,364 cf

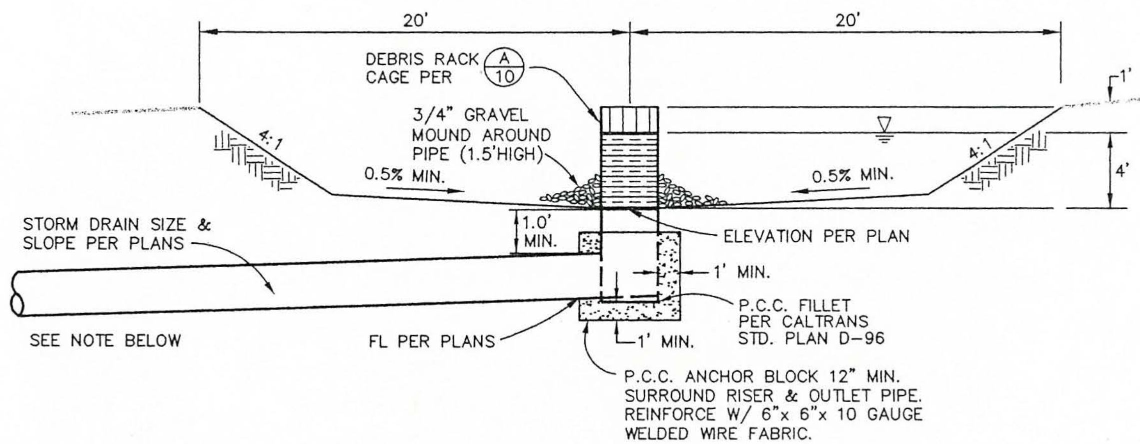
⟹ DESILTATION POND PROVIDES ADEQUATE STORAGE VOLUME

9665 CHESAPEAKE DRIVE, SUITE 320 • SAN DIEGO, CA • 92123
PHONE 858.694.5660 • FAX 858.694.5661



DEBRIS RACK CAGE A/10

NO SCALE



NOTE: TRENCH BACKFILL SHALL CONSIST OF NATIVE MATERIALS, APPROVED BY THE SOILS ENGINEER PRIOR TO PLACEMENT. OPEN-GRADED, HIGHLY PERMEABLE MATERIAL SHALL NOT BE USED AS BACKFILL.

CMP RISER, HOT-DIPPED GALVANIZED 12-GAUGE, 2-2/3 INCH X 1/2 INCH CORRUGATIONS. DIAMETER PER PLANS. CUT FIVE HORIZONTAL SLOTS OF 1/4 INCH X 10 INCHES (EQUALLY SPACED AROUND CIRCUMFERENCE). FIRST ROW TO BE 4 INCHES BELOW UNIVERSAL BAND COUPLER. SECOND ROW TO BE STAGGERED AT 5-1/3 INCHES BELOW FIRST ROW. CONTINUE STAGGERED ROWS UNTIL 24 INCHES ABOVE SOFFET OF PRIVATE STORM DRAIN PIPE.

MAINTENANCE

SEDIMENT SHALL BE REMOVED WHENEVER IT ACCUMULATES TO WITHIN 1' OF THE TOP OF RISER. SEDIMENT SHALL BE DISPOSED OF IN SUCH A MANNER THAT WILL PREVENT ITS RETURN TO THE DESILTING BASIN OR MOVEMENT INTO DOWNSTREAM AREAS DURING SUBSEQUENT RUNOFF. THE DESILTING BASINS ARE PRIVATE FACILITIES, AND THE CITY WILL NOT BE RESPONSIBLE FOR THEIR MAINTENANCE.

DESILTING BASIN B/10

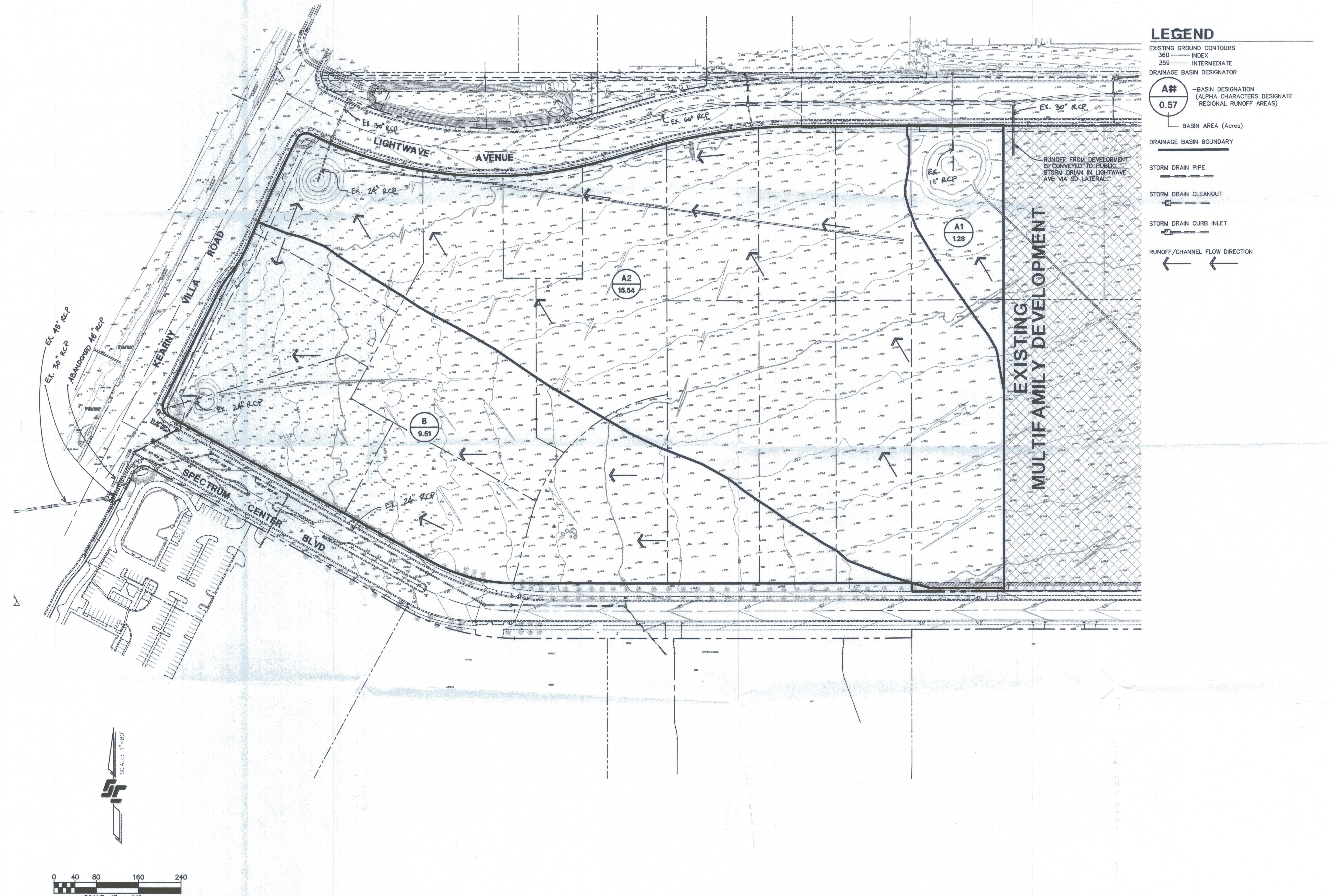
NO SCALE

POR.
GRADING PLAN
SHEET 34009-10-D

4

SECTION 4

EXHIBITS



STEVENS-CRESTO ENGINEERING, INC.
CIVIL ENGINEERS · LAND PLANNERS · SURVEYORS
9620 CHESAPEAKE DRIVE
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SAN DIEGO, CA 92123-1324
PHONE: 858.694.5660
FAX: 858.694.5661
www.scengr.com

REVISIONS

SUNROAD CENTRUM 12

KEARNY MESA, CALIFORNIA

EXHIBIT "A"
EXISTING CONDITION

DATE: 2/01/06

SCE NO. 00018.14

SHEET A

1 OF 1 SHEETS

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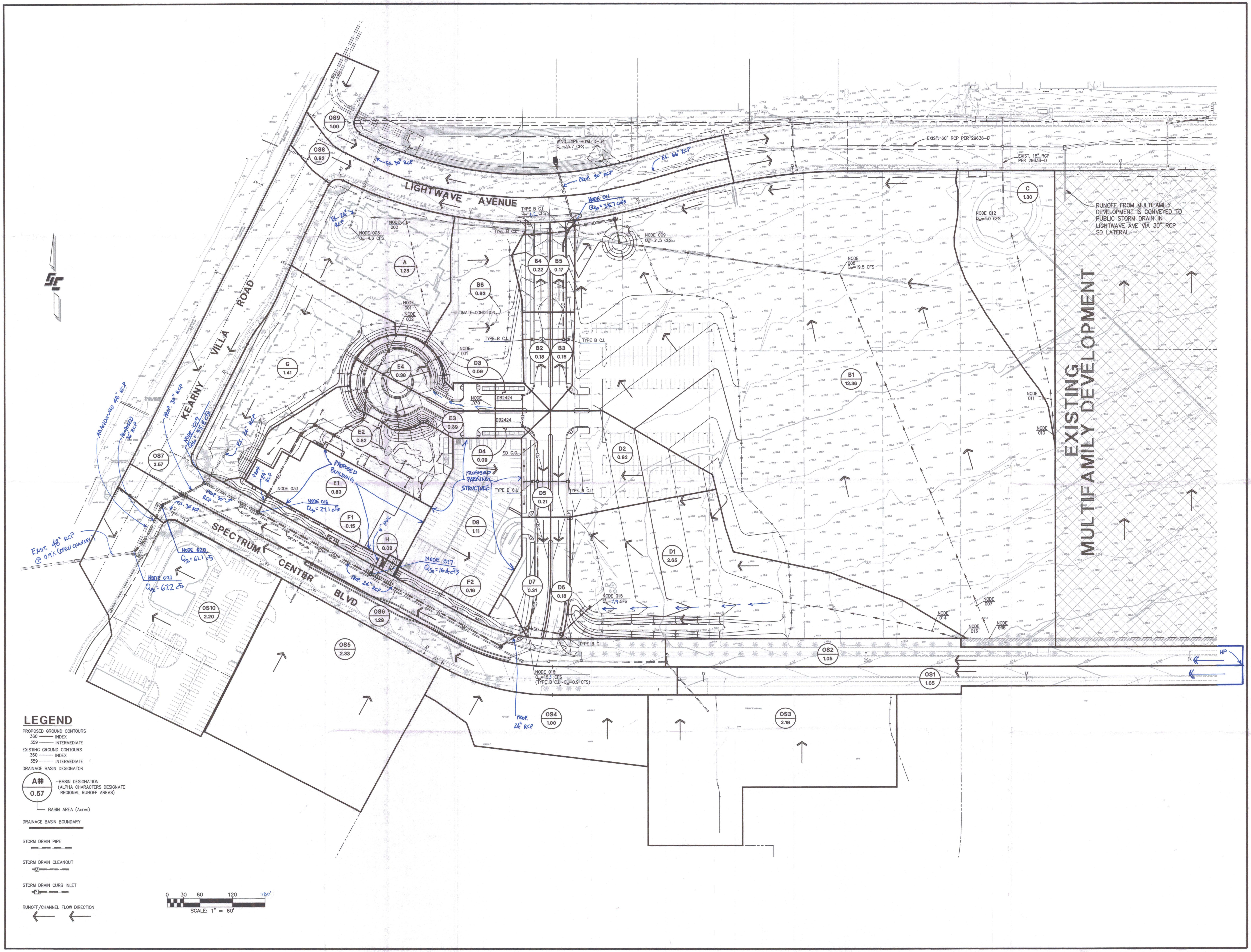

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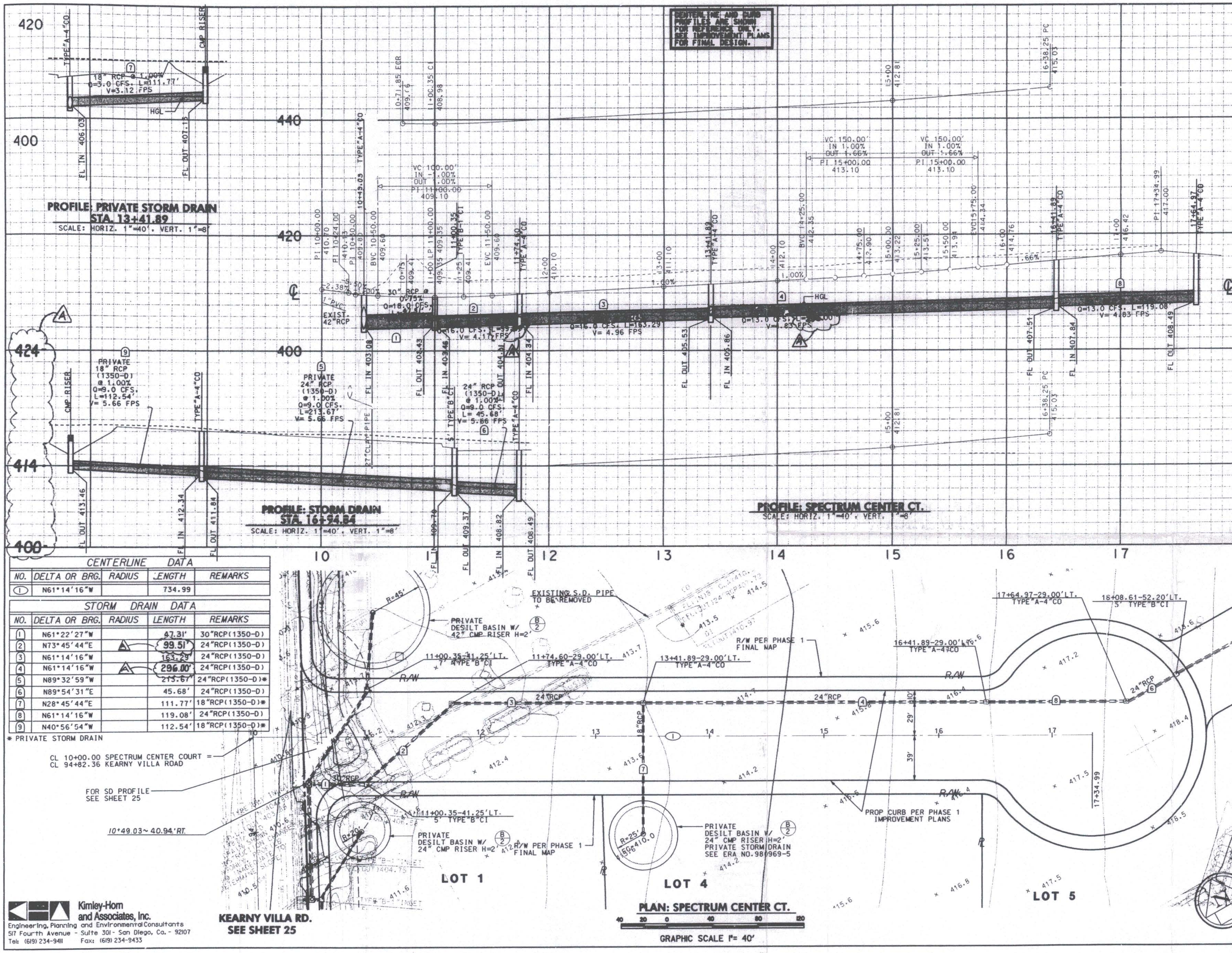
REVISIONS

CENTRUM 12
KEARNY MESA, CALIFORNIA

EXHIBIT "B"
PROPOSED CONDITION

DATE: 2/01/06
SCE NO. 00018.14
SHEET B
1 OF 1 SHEETS



CAUTION!!
LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

BENCH MARK

THE NORTHEAST BRASS PLUG IN TOP OF DRAINAGE INLET ON KEARNY VILLA ROAD AT BALBOA AVENUE ACCORDING TO CITY OF SAN DIEGO VERTICAL CONTROL DATA.
ELEVATION: 414.797 DATUM: M.S.L.

CENTERLINE DATA

NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N61°14'16"W		734.99	

STORM DRAIN DATA

NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N61°22'27"W		47.31'	30"RCP(1350-D)
2	N73°45'44"E		99.51'	24"RCP(1350-D)
3	N61°14'16"W		163.29'	24"RCP(1350-D)
4	N61°14'16"W		296.00'	24"RCP(1350-D)
5	N89°32'59"W		213.67'	24"RCP(1350-D)*
6	N89°54'31"E		45.68'	24"RCP(1350-D)
7	N28°45'44"E		111.77'	18"RCP(1350-D)*
8	N61°14'16"W		119.08'	24"RCP(1350-D)
9	N40°56'54"W		112.54'	18"RCP(1350-D)*

* PRIVATE STORM DRAIN

CL 10+00.00 SPECTRUM CENTER COURT = CL 94+82.36 KEARNY VILLA ROAD

FOR SD PROFILE SEE SHEET 25

Kimley-Horn and Associates, Inc.
Engineering, Planning and Environmental Consultants
517 Fourth Avenue - Suite 301 - San Diego, Ca. - 92107
Tel: (619) 234-9411 Fax: (619) 234-9433

ENGINEER OF WORK

4-16-99
TIMOTHY J. DEWITT R.C.E. 46579 DATE

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY JOHN DEWITT
No. 46579
Exp. 06\30\99
CIVIL
STATE OF CALIFORNIA

PID\PCD NO. 96-0165

PRIVATE CONTRACT J-095217.02

PLANS FOR THE IMPROVEMENT OF :

STORM DRAIN IN
SPECTRUM CENTER COURT

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING DEPARTMENT
SHEET 42 OF 51 SHEETS

W.O. NO. TM-96-0165 980969

FOR CITY ENGINEER 4/28/99 DATE

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	KHA			MAY 13 99
CHANGE	KHA		8/26/99	OCT 8 99
AS-BUILT	KHA	D.E.S.	5/6/02	SEP 9 02

CONTRACTOR CASS CONST. DATE STARTED 6/99
INSPECTOR HANI ASSI DATE COMPLETED 1/9/01

1882-6289
NAD 83
242-1729
LAMBERT COORDINATES

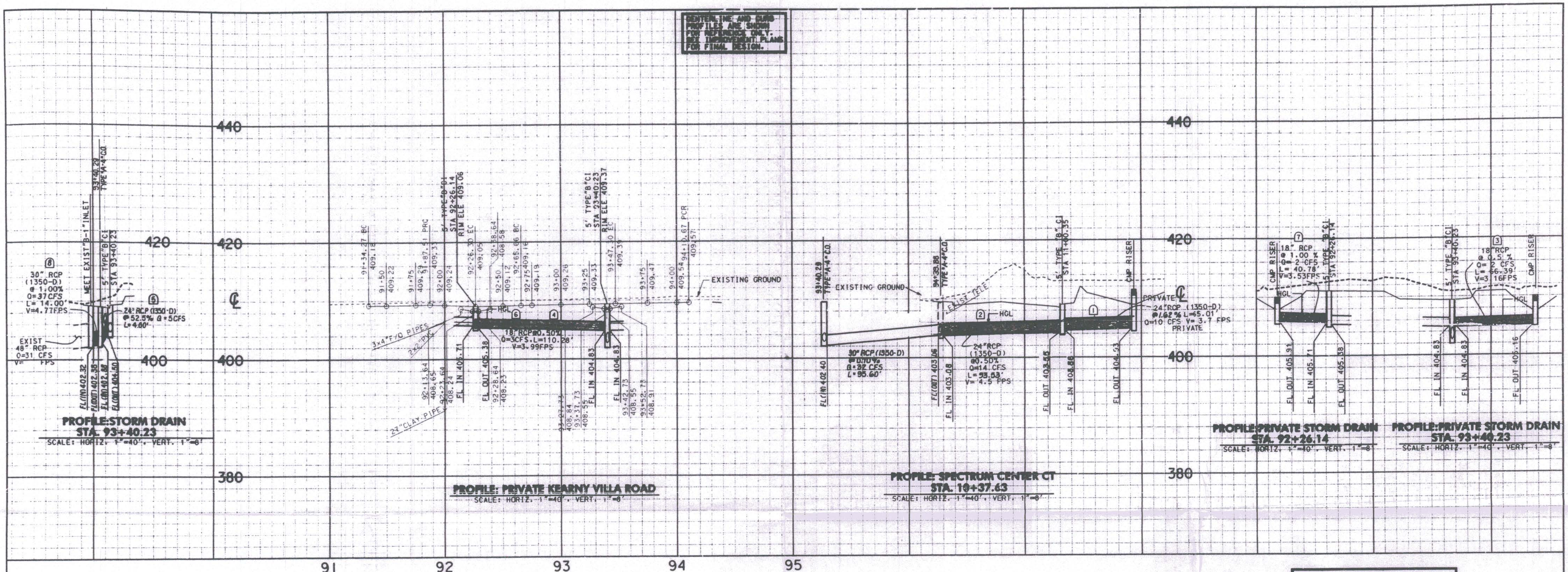
29636-42-D

REVISE STORM DRAIN PIPE LENGTHS & GRID ELEV.

AS-BUILT

PLOTTED : 22 APR 1999 m:\dgn\095217.01\170lap42.dgn

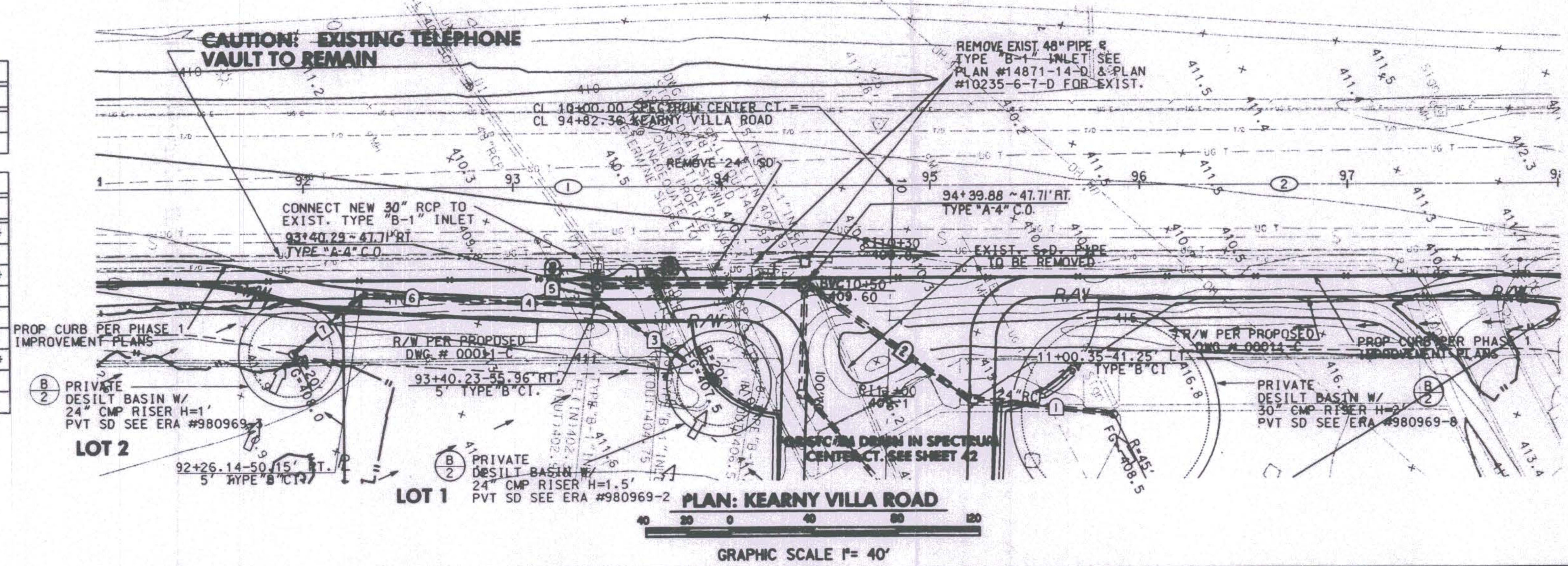
CONSTRUCTION CHANGE



CENTERLINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N26°56'58"E		383.11'	
2	N26°56'58"E		316.89'	

STORM DRAIN DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N33°18'26"E		65.01'	24"RCP(1350-D)*
2	N62°03'38"E		93.53'	24"RCP(1350-D)
3	N60°52'12"E		66.39'	18"RCP(1350-D)*
4	03°41'03"	1132.27'	72.81'	18"RCP(1350-D)
5	N62°41'34"W		4.00'	24"RCP(1350-D)
6	N31°05'33"E		37.47'	18"RCP(1350-D)
7	N13°14'37"W		40.78'	18"RCP(1350-D)*
8	N62°31'48"W		6.00'	30"RCP (1350-D)
9	N26°56'58"E		95.60'	30"RCP (1350-D)

* PRIVATE STORM DRAIN



Kimley-Horn and Associates, Inc.
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CAUTION!!
LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

BENCH MARK

THE NORTHEAST BRASS PLUG IN TOP OF DRAINAGE INLET ON KEARNY VILLA ROAD AT BALBOA AVENUE ACCORDING TO CITY OF SAN DIEGO VERTICAL CONTROL DATA.
ELEVATION: 414.797 DATUM: M.S.L.

ENGINEER OF WORK

4-16-99
TIMOTHY J. DEWITT R.C.E. 46579 DATE

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY JOHN DEWITT
No. 46579
Exp. 06\30\99
CIVIL
STATE OF CALIFORNIA

PID\PCD NO. 96-0165

PRIVATE CONTRACT J-095217.02

PLANS FOR THE IMPROVEMENT OF

STORM DRAIN IN
KEARNY VILLA ROAD

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING DEPARTMENT
SHEET 25 OF 51 SHEETS

W.O. NO. TM-96-0165 980969

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	KHA			MAY 13 99
AS-BUILT	KHA	D.E.S.	5/6/02	SEP 3 02

CONTRACTOR CASS CONST. DATE STARTED 6/99
INSPECTOR HANI ASSI DATE COMPLETED 7/9/01

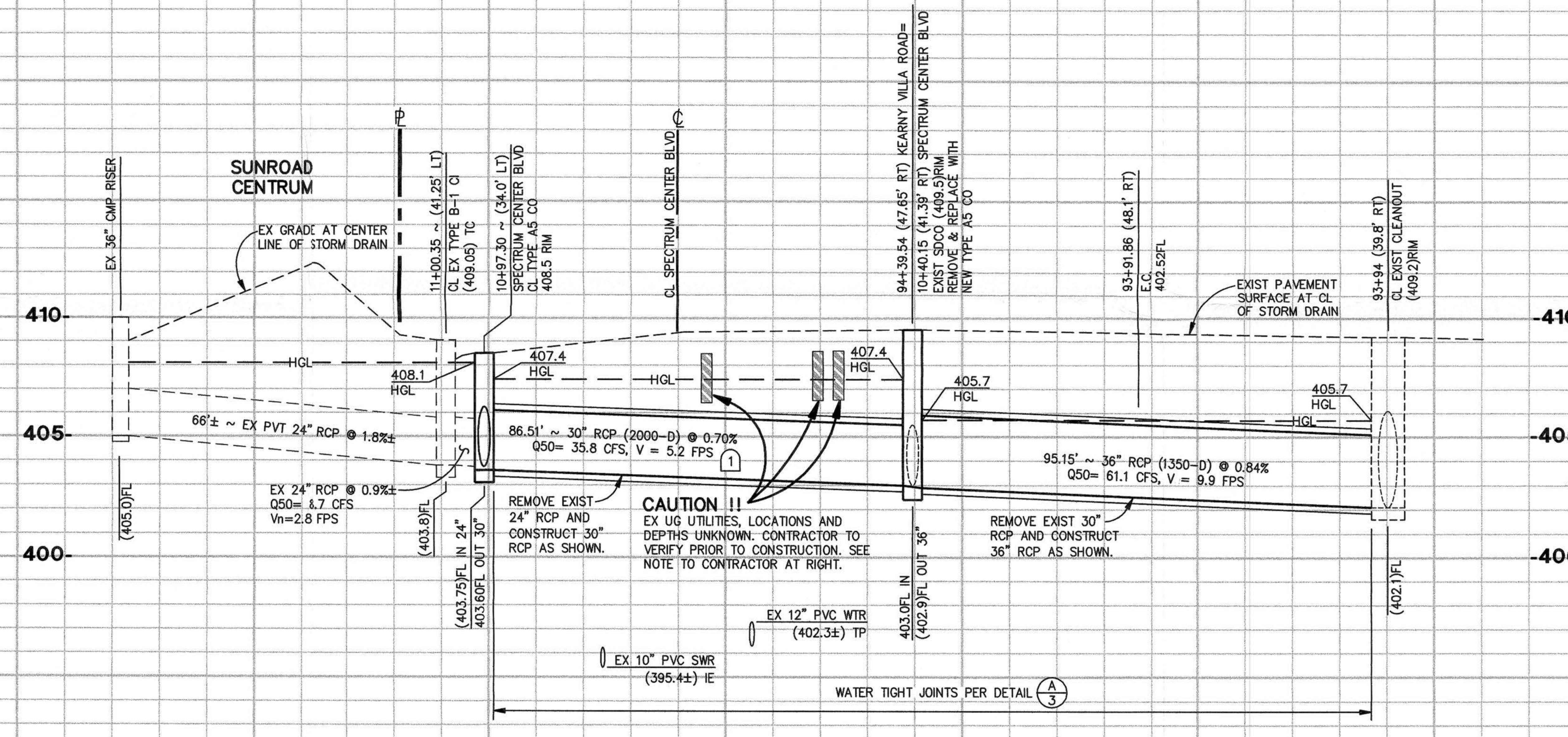
1882-6289
NAD 83
242-1729
LAMBERT COORDINATES

29636-25-D

PLOTTED : 15 APR 1999 s:\dgn\095217.01\1701gp25.dgn

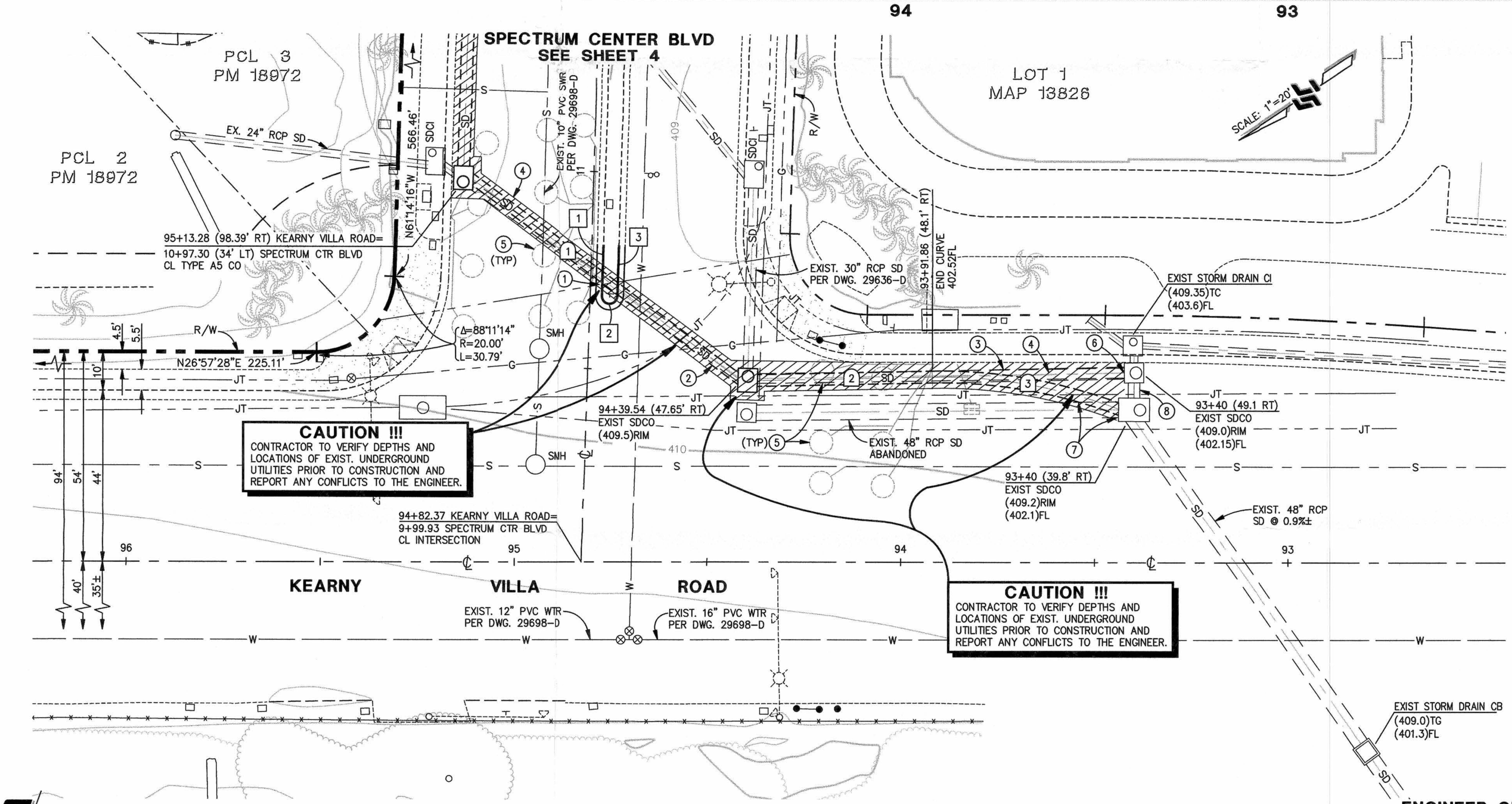
AS-BUILT

FILMED FROM THE ORIGINAL
BEST QUALITY OBTAINABLE



PROFILE: KEARNY VILLA ROAD STORM DRAIN

SCALE: 1"= 20' HORIZ.; 1"= 4' VERT.



PLAN: KEARNY VILLA ROAD STORM DRAIN

SCALE: 1"=20'

0 10 20 40 60

SCALE: 1" = 20'

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PHONE: 858.694.5660
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www.scengr.com

NOTE TO CONTRACTOR:
PRIOR TO ORDERING MATERIALS FOR STORM DRAIN WORK SHOWN ON THIS SHEET, POTHOLE ALL EXISTING UTILITIES AT CROSSINGS TO VERIFY FEASIBILITY OF PROPOSED CONSTRUCTION. REPORT ANY CONFLICTS TO ENGINEER OF WORK. CHANGES TO THIS DESIGN MAY REQUIRE A CONSTRUCTION CHANGE APPROVED BY THE CITY ENGINEER.

CURB DATA

NO.	BEARING-DELTA	RADIUS	LENGTH	REMARKS
1	N61°14'16"W	--	13.00'	6" TYPE B-2 MEDIAN
2	Δ =180°00'00"	2.00'	6.28'	6" TYPE B-2 MEDIAN
3	N61°14'16"W	--	13.00'	6" TYPE B-2 MEDIAN

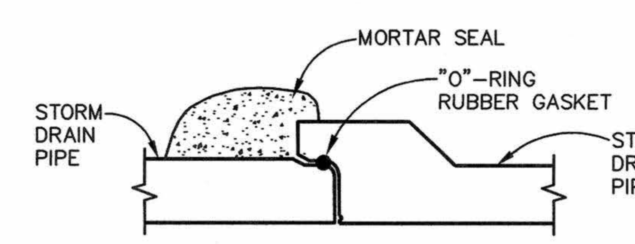
STORM DRAIN DATA (1350-D)

NO.	BEARING-DELTA	RADIUS	LENGTH	REMARKS
1	N63°10'34"E	--	86.51'	30" RCP (WTJ)
2	N25°44'04"E	--	45.64'	36" RCP (WTJ)
3	Δ =21°49'13"	130.00'	49.5'±	36" RCP (WTJ, BEVELED)
4				

(WTJ) INDICATES WATER TIGHT JOINTS PER DETAIL A/3

CONSTRUCTION NOTES

1. REMOVE AND REPLACE MEDIAN CURB (TYPE B-2) AND MEDIAN SURFACE TO ALLOW STORM DRAIN CONSTRUCTION (MATCH EXIST FINISHES).
2. EXIST 24" RCP SD PER DWG 29636-D TO BE REMOVED AND REPLACED WITH 30" RCP.
3. EXIST 30" RCP SD PER DWG 29636-D TO BE REMOVED AND REPLACED WITH 36" RCP.
4. TRENCH RESURFACING PER SDG-107
5. REPLACE TRAFFIC SIGNAL DETECTOR LOOPS AS REQ'D PER CITY SPECS.
6. PLUG EXISTING 30" OPENING AT NORTH SIDE OF EXISTING CLEANOUT; ABANDON IN PLACE (OR REMOVE IF DIRECTED BY THE CITY ENGINEER) PORTION OF EXISTING 30" RCP THAT IS NOT IN CONFLICT WITH PROPOSED 36" RCP. ABANDONMENT PER GREENBOOK SPECIFICATIONS.
7. PORTION OF EXISTING 48" RCP ABANDONED STORM DRAIN, REMOVE AS REQUIRED TO MAKE NEW CONNECTION SHOWN.
8. EXISTING 30" RCP STORM DRAIN PER DWG 29636-D TO REMAIN, PROTECT IN PLACE.



WATER TIGHT JOINT DETAIL A/3
(W.T.J) NO SCALE

ENGINEER OF WORK

JOSEPH G. CRESTO
R.C.E. 45601
DATE

REGISTERED PROFESSIONAL ENGINEER JOSEPH G. CRESTO No. 45601 Exp. 12-31-06 CIVIL STATE OF CALIFORNIA

BENCH MARK
BRASS PLUG IN TOP OF CURB INLET AT THE NE CORNER OF KEARNY VILLA ROAD AND BALBOA AVENUE
ELEV: 414.797 M.S.L.

PRIVATE CONTRACT

IMPROVEMENT PLAN FOR:

KEARNY VILLA ROAD
STORM DRAIN REPLACEMENT

SUNROAD CENTRUM 12

CITY OF SAN DIEGO, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
SHEET 3 OF SHEETS

W.O. NO. ______
P.T.S NO. ______

FOR CITY ENGINEER ______ DATE ______

V.T.M. ______

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	SCE			
AS-BUILTS				

1882-6289
NAD83 COORDINATES

242-1729
LAMBERT COORDINATES

CONTRACTOR ______ DATE STARTED ______
INSPECTOR ______ DATE COMPLETED ______

-3-D

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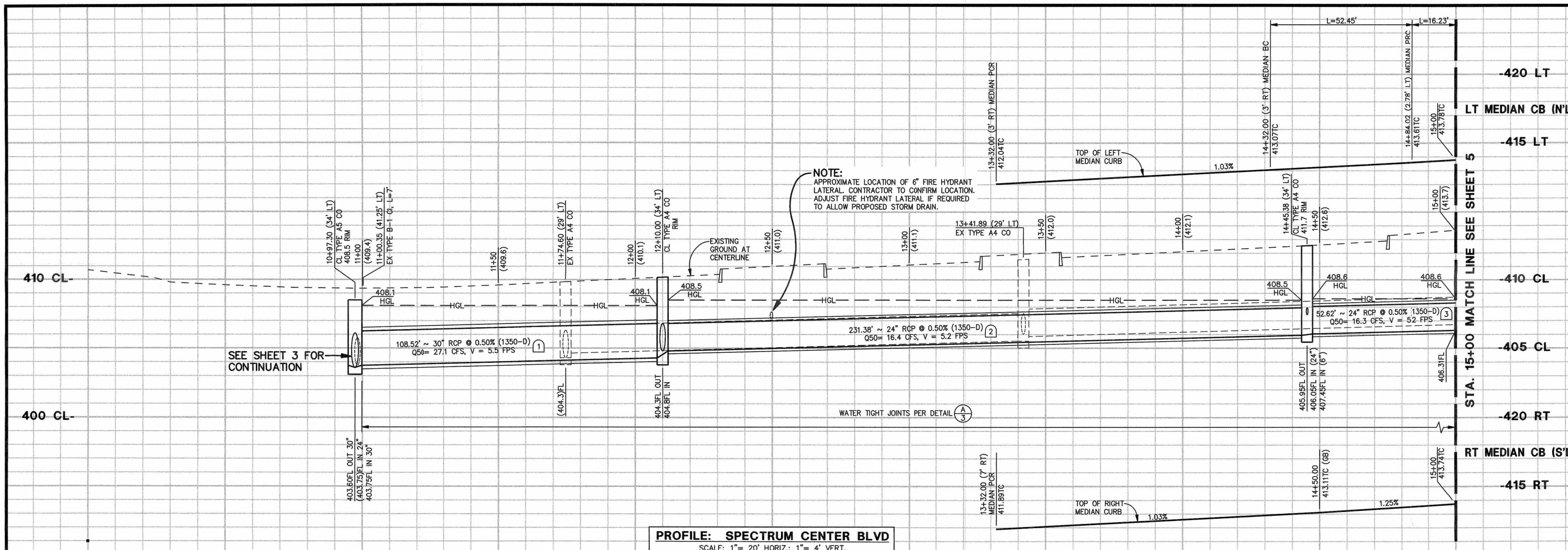
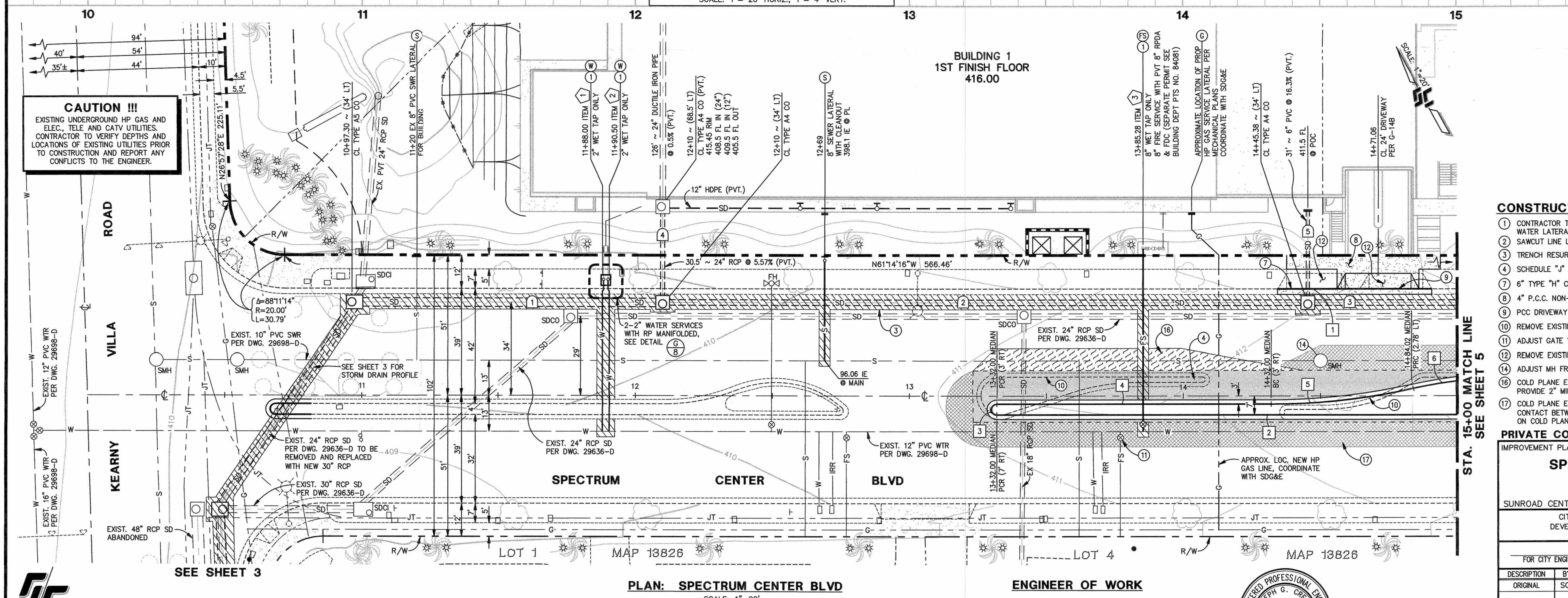
NOT FOR CONSTRUCTION



PROFILE: SPECTRUM CENTER BLVD
SCALE: 1"= 20' HORIZ.; 1"= 4' VERT.



PLAN: SPECTRUM CENTER BLVD
SCALE: 1"=20'

SCALE: 1" = 20'

CURB DATA				
NO.	BEARING-DELTA	RADIUS	LENGTH	REMARKS
1	N61°14'16"W	--	19.76'	6" TYPE "H" C & G
2	N61°14'16"W	--	168.00'	6" TYPE B-2 MEDIAN
3	Δ =180°00'00"	2.00'	6.28'	6" TYPE B-2 MEDIAN
4	N61°14'16"W	--	100.00'	6" TYPE B-2 MEDIAN
5	Δ =12°40'49"	237.00'	52.45'	6" TYPE B-2 MEDIAN
6	Δ =05°22'25"	173.00'	16.23'	6" TYPE B-2 MEDIAN

STORM DRAIN DATA (PVT.) (1350-D)				
NO.	BEARING-DELTA	RADIUS	LENGTH	REMARKS
1	N61°14'16"W	--	108.52'	30" RCP (WTJ)
2	N61°14'16"W	--	231.38'	24" RCP (WTJ)
3	N61°14'16"W	--	52.62'	24" RCP (WTJ)
4	N28°45'44"E	--	30.50'	24" RCP (WTJ)
5	N28°45'44"E	--	31.00'	6" PVC (SDR-35)

(WTJ) INDICATES WATER TIGHT JOINTS PER DETAIL A/3

CONSTRUCTION NOTES

1. CONTRACTOR TO PROVIDE ALL NECESSARY LABOR AND MATERIALS FOR INSTALLATION OF WATER LATERALS. CITY FORCES TO PROVIDE LABOR ONLY FOR THE WET TAP INSTALLATION.
2. SAWCUT LINE LIMIT
3. TRENCH RESURFACING PER SDG-107
4. SCHEDULE "J" PAVEMENT PER SDG-113
7. 6" TYPE "H" CURB AND GUTTER PER RSD G-2
8. 4" P.C.C. NON-CONTIGUOUS SIDEWALK PER RSD G-7, G-9 AND G-11.
9. PCC DRIVEWAY PER RSD G-14B
10. REMOVE EXISTING CONCRETE CURB & GUTTER OR MEDIAN CURB
11. ADJUST GATE VALVE BOX TO NEW GRADE
12. REMOVE EXISTING PCC DRIVEWAY
14. ADJUST MH FRAME AND COVER TO NEW GRADE.
16. COLD PLANE EXIST ASPHALT 2" DEEP AT CONTACT BETWEEN NEW AND EXIST PAVEMENT. PROVIDE 2" MIN OVERLAY ON COLD PLANED AREA FOR SMOOTH TRANSITION.
17. COLD PLANE EXIST ASPHALT 6' (MIN) WIDE AND 2" DEEP AT CONTACT BETWEEN NEW AND EXIST PAVEMENT. PROVIDE 2" OVERLAY ON COLD PLANED AREA FOR SMOOTH TRANSITION. SEE DETAIL A/5

PRIVATE CONTRACT

IMPROVEMENT PLAN FOR:

SPECTRUM CENTER BOULEVARD

SUNROAD CENTRUM 12

CITY OF SAN DIEGO, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
SHEET 4 OF SHEETS

W.O. NO. ____
P.T.S NO. ____
V.T.M. ____

FOR CITY ENGINEER ____ DATE ____

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	SCE			
AS-BUILTS				

1882-6289
NAD83 COORDINATES

242-1729
LAMBERT COORDINATES

CONTRACTOR ____ DATE STARTED ____
INSPECTOR ____ DATE COMPLETED ____

-4-D

STEVENS·CRESTO ENGINEERING, INC.
CIVIL ENGINEERS · PLANNERS · LAND SURVEYORS
9665 CHESAPEAKE DRIVE
SUITE 320
SAN DIEGO, CA 92123-1352
PHONE: 858.694.5660
FAX: 858.694.5661
www.scengr.com

ENGINEER OF WORK

JOSEPH G. CRESTO ____ DATE
R.C.E. 45601

REGISTERED PROFESSIONAL ENGINEER
JOSEPH G. CRESTO
No. 45601
Exp. 12-31-06
CIVIL
STATE OF CALIFORNIA

BENCH MARK
BRASS PLUG IN TOP OF CURB INLET AT THE NE CORNER OF KEARNY VILLA ROAD AND BALBOA AVENUE
ELEV: 414.797 M.S.L.

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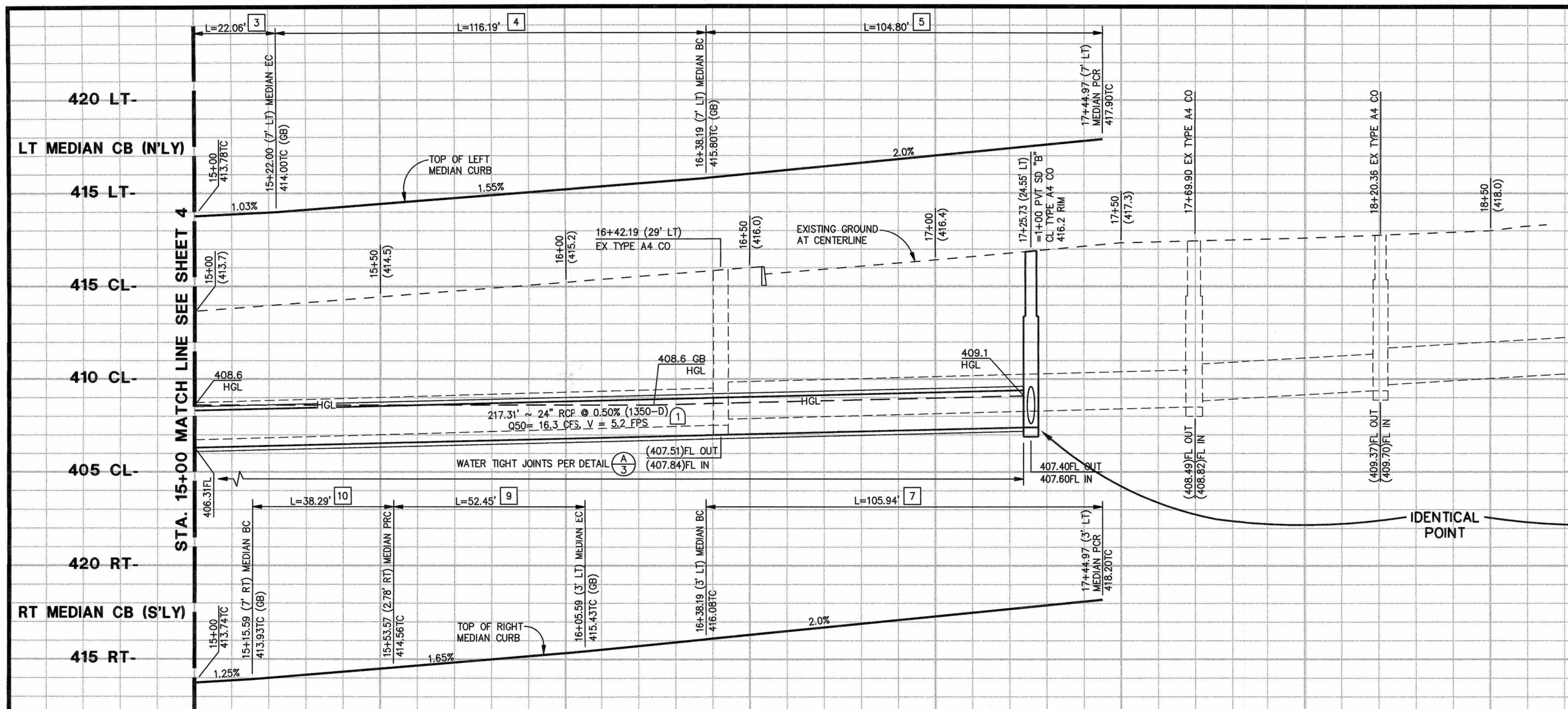
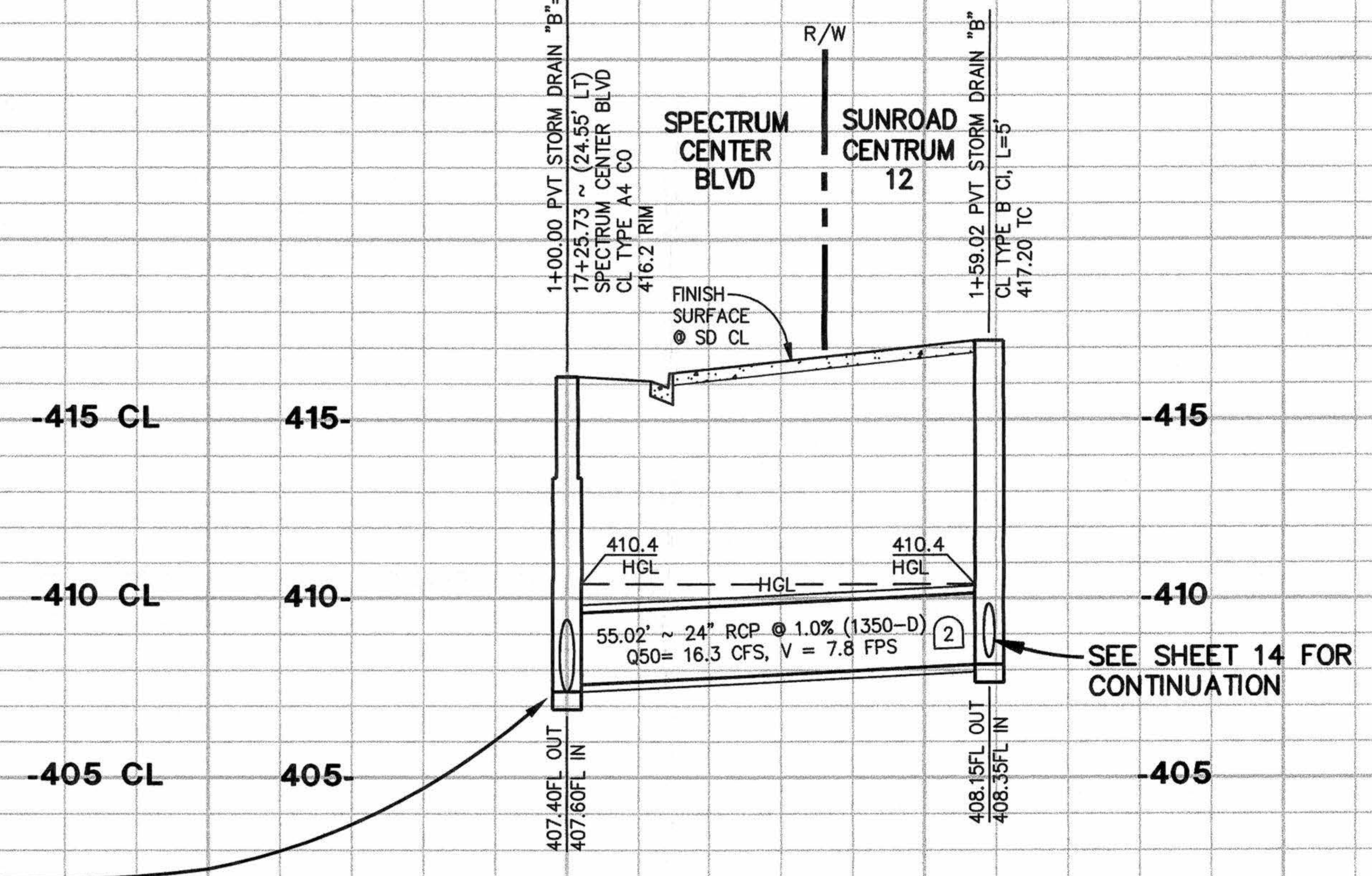
NOT FOR CONSTRUCTION

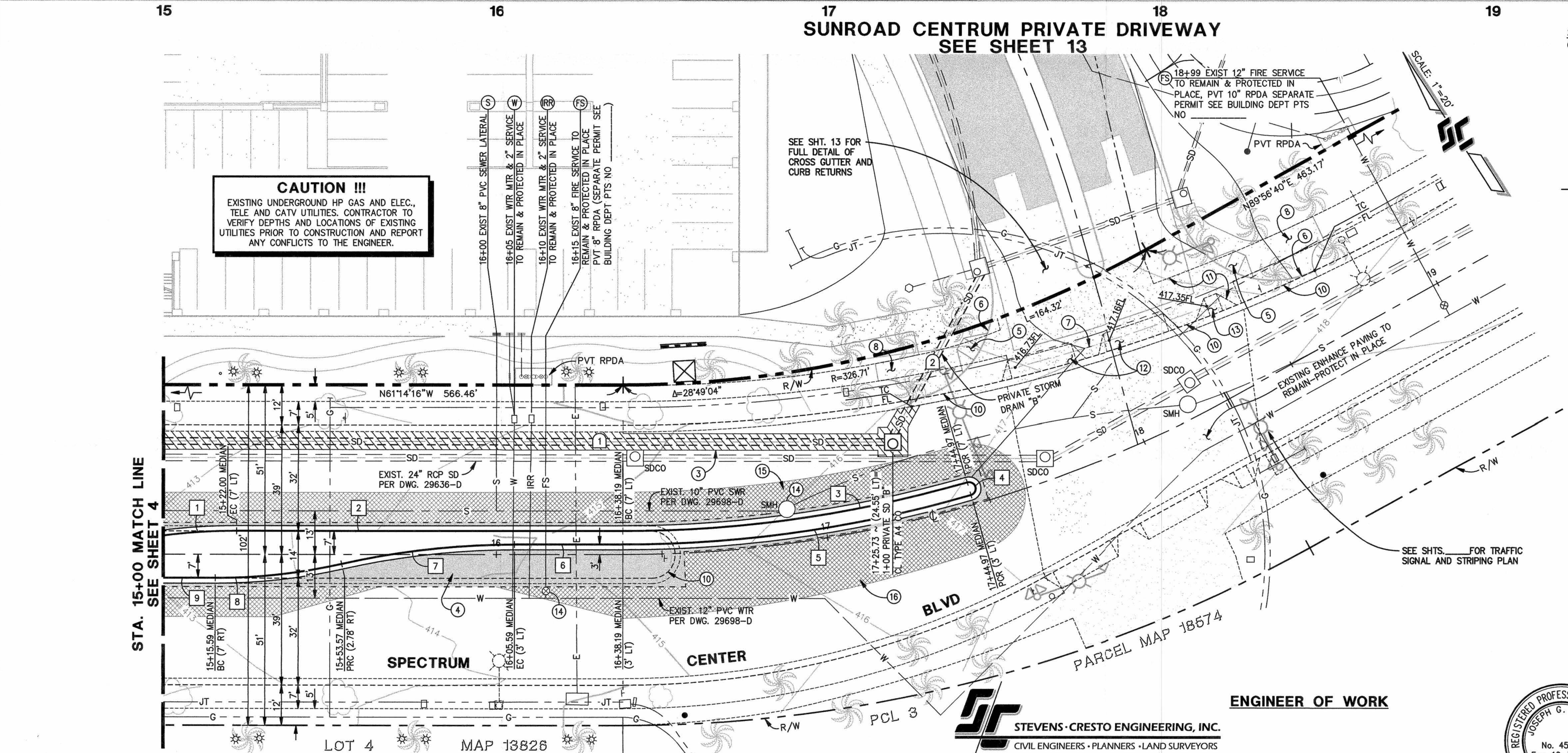


PROFILE: SPECTRUM CENTER BLVD
SCALE: 1"= 20' HORIZ.; 1"= 4' VERT.

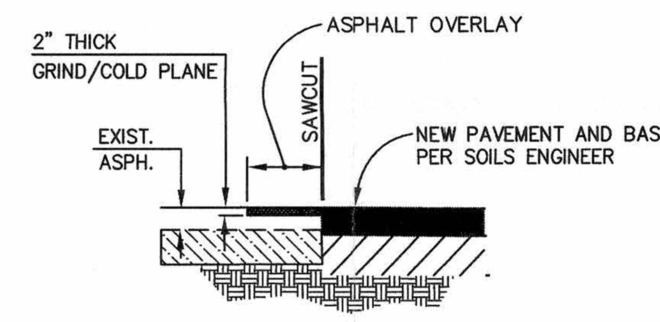


PROFILE: PVT STORM DRAIN "B" SPECTRUM CENTER BLVD
SCALE: 1"=20' HORIZ.; 1"=4' VERT.

15 16 17 18 19



PLAN: SPECTRUM CENTER BLVD
SCALE: 1"=20'



PAVEMENT JOINT DETAIL
PER CONSTRUCTION NOTE (17) SHT. 4 — A/5
NO SCALE

CURB DATA

NO.	BEARING-DELTA	RADIUS	LENGTH	REMARKS
	Δ =07°18'24"	173.00'	22.06'	6" TYPE B-2 MEDIAN
	N61°14'16"W	--	116.19'	6" TYPE B-2 MEDIAN
3	Δ =16°11'54"	370.71'	104.80'	6" TYPE B-2 MEDIAN
4	Δ =180°00'00"	2.00'	6.28'	6" TYPE B-2 MEDIAN
5	Δ =16°11'54"	374.71'	105.94'	6" TYPE B-2 MEDIAN
6	N61°14'16"W	--	32.60'	6" TYPE B-2 MEDIAN
7	Δ =12°40'49"	237.00'	52.45'	6" TYPE B-2 MEDIAN
8	Δ =12°40'49"	173.00'	38.29'	6" TYPE B-2 MEDIAN
9	N61°14'16"W	--	15.59'	6" TYPE B-2 MEDIAN

STORM DRAIN DATA (PVT.) (1350-D)

NO.	BEARING-DELTA	RADIUS	LENGTH	REMARKS
1	N61°14'16"W	--	217.31'	24" RCP (WTJ)
2	N57°32'48"E	--	55.02'	24" RCP (WTJ)

(WTJ) INDICATES WATER TIGHT JOINTS PER DETAIL A/3

CONSTRUCTION NOTES

(3) TRENCH RESURFACING PER SDG-107
(4) SCHEDULE "J" PAVEMENT PER SDG-113
(5) PEDESTRIAN RAMP (TYPE A) PER RSD SDG-132, SDG-130 & SDG-137
(6) 6" CURB INTEGRAL TO CROSS GUTTER
(7) CONCRETE CROSS GUTTER PER G-12
(8) 4" P.C.C. NON-CONTIGUOUS SIDEWALK PER RSD G-7, G-9 AND G-11.
(10) REMOVE EXISTING CONCRETE CURB & GUTTER OR MEDIAN CURB
(11) REMOVE EXISTING PCC SIDEWALK
(12) REMOVE EXISTING PCC DRIVEWAY
(13) REMOVE EXISTING PEDESTRIAN RAMP
(14) ADJUST FRAME AND COVER TO NEW GRADE.
(15) COLD PLANE EXIST ASPHALT 2" DEEP AT CONTACT BETWEEN NEW AND EXIST PAVEMENT. PROVIDE 2"-3.5" OVERLAY ON COLD PLANED AREA FOR SMOOTH TRANSITION.
(16) COLD PLANE EXIST ASPHALT 2" DEEP AT CONTACT BETWEEN NEW AND EXIST PAVEMENT. PROVIDE 2" MIN OVERLAY ON COLD PLANED AREA FOR SMOOTH TRANSITION.

PRIVATE CONTRACT
IMPROVEMENT PLAN FOR:

SPECTRUM CENTER BOULEVARD

SUNROAD CENTRUM 12

CITY OF SAN DIEGO, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
SHEET 5 OF SHEETS

W.O. NO.
P.T.S NO.
V.T.M.

FOR CITY ENGINEER DATE

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	SCE			
AS-BUILTS				

1882-6289 NAD83 COORDINATES
242-1729 LAMBERT COORDINATES

CONTRACTOR ____ DATE STARTED ____
INSPECTOR ____ DATE COMPLETED ____

-5-D

STEVENS-CRESTO ENGINEERING, INC.
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PHONE: 858.694.5660
FAX: 858.694.5661
www.scengr.com

ENGINEER OF WORK

JOSEPH G. CRESTO DATE
R.C.E. 45601

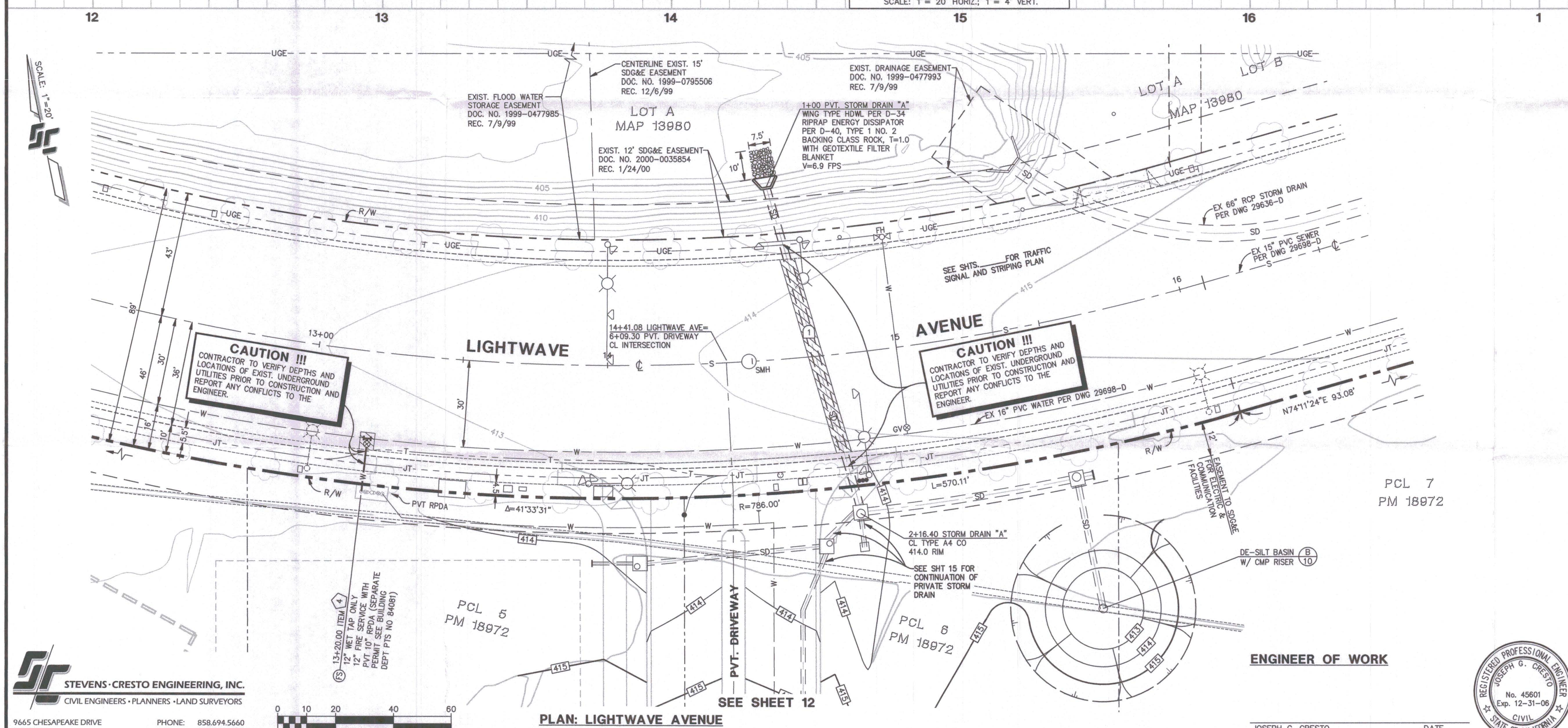
REGISTERED PROFESSIONAL ENGINEER JOSEPH G. CRESTO No. 45601 Exp. 12-31-06 CIVIL STATE OF CALIFORNIA

BENCH MARK
BRASS PLUG IN TOP OF CURB INLET AT THE NE CORNER OF KEARNY VILLA ROAD AND BALBOA AVENUE
ELEV: 414.797 M.S.L.

X:\DWG\Job\00018\CIVIL\OFFICE 12\IMP & GRD PLN\00018 F004-05.dwg 2/13/2006 12:41:07 PM PST

NOT FOR CONSTRUCTION

PROFILE: LIGHTWAVE AVENUE
SCALE: 1"= 20' HORIZ.; 1"= 4' VERT.



PLAN: LIGHTWAVE AVENUE
SCALE: 1"=20'

SCALE: 1" = 20' (0, 10, 20, 40, 60)

STORM DRAIN DATA (PVT.)				
NO.	BEARING–DELTA	RADIUS	LENGTH	REMARKS
1	N16°23'49"W	---	114.40'	30" RCP (WTJ)

(WTJ) INDICATES WATER TIGHT JOINTS PER DETAIL (A/3)

THE WORK INCLUDED UNDER THE ENGINEERING PERMIT FOR THESE DRAWINGS INCLUDES GRADING AND DRAINAGE. PRIVATE IMPROVEMENTS SHOWN HEREON ARE COVERED UNDER SEPARATE BUILDING PERMIT FOR THIS DEVELOPMENT.

STEVENS·CRESTO ENGINEERING, INC.
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ENGINEER OF WORK

JOSEPH G. CRESTO
R.C.E. 45601
DATE

REGISTERED PROFESSIONAL ENGINEER JOSEPH G. CRESTO No. 45601 Exp. 12-31-06 CIVIL STATE OF CALIFORNIA

PRIVATE CONTRACT
IMPROVEMENT PLAN FOR:

LIGHTWAVE AVENUE

SUNROAD CENTRUM 12

CITY OF SAN DIEGO, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
SHEET 6 OF SHEETS

FOR CITY ENGINEER DATE

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	SCE			
AS-BUILTS				

W.O. NO.
P.T.S NO.
V.T.M.

1882-6289
NAD83 COORDINATES

242-1729
LAMBERT COORDINATES

CONTRACTOR DATE STARTED
INSPECTOR DATE COMPLETED

-6-D

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NOT FOR CONSTRUCTION

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SECTION 5

APPENDIX A

~ 095217010

00018.02 | MKS

GOVT/IN | MKS

Kimley-Horn
and Associates, Inc.

agreed

M. Sammak

10/17/00

Suite 301
517 Fourth Avenue
San Diego, California
92101

Memorandum

To: File, Distribution

From: John Morris, Chuck Spinks

Date: October 11, 2000

Subject: Meeting with Mo Sammak, Senior Civil Engineer, City of San Diego, Land Development Review Division.

- A meeting was held with Mo Sammak at 3:30 on Wednesday, October 4 to discuss an hydrology issue for the Spectrum project. The issue is the higher Q's calculated for the private systems in the individual lots using the standard City Rational Method than the design Q's for the public system calculated using HEC-1.

- The detention basins, the back bone system in the streets, and the public laterals connecting this system to the individual lots, were designed for the 50 year Q using HEC-1. The storm drain laterals to the individual lots where placed at a flat slope to keep the connection point on each individual lot as low as practical. The low connection point increases the flexibility for the design of the on-site private systems, which is important on the very flat Spectrum project.

- The 50 year Q's calculated using the Rational Method for the individual lots are usually slightly larger than the Q's calculated using HEC-1. As a result, the laterals connecting to the main system may be surcharged using the higher Rational Method Q's.

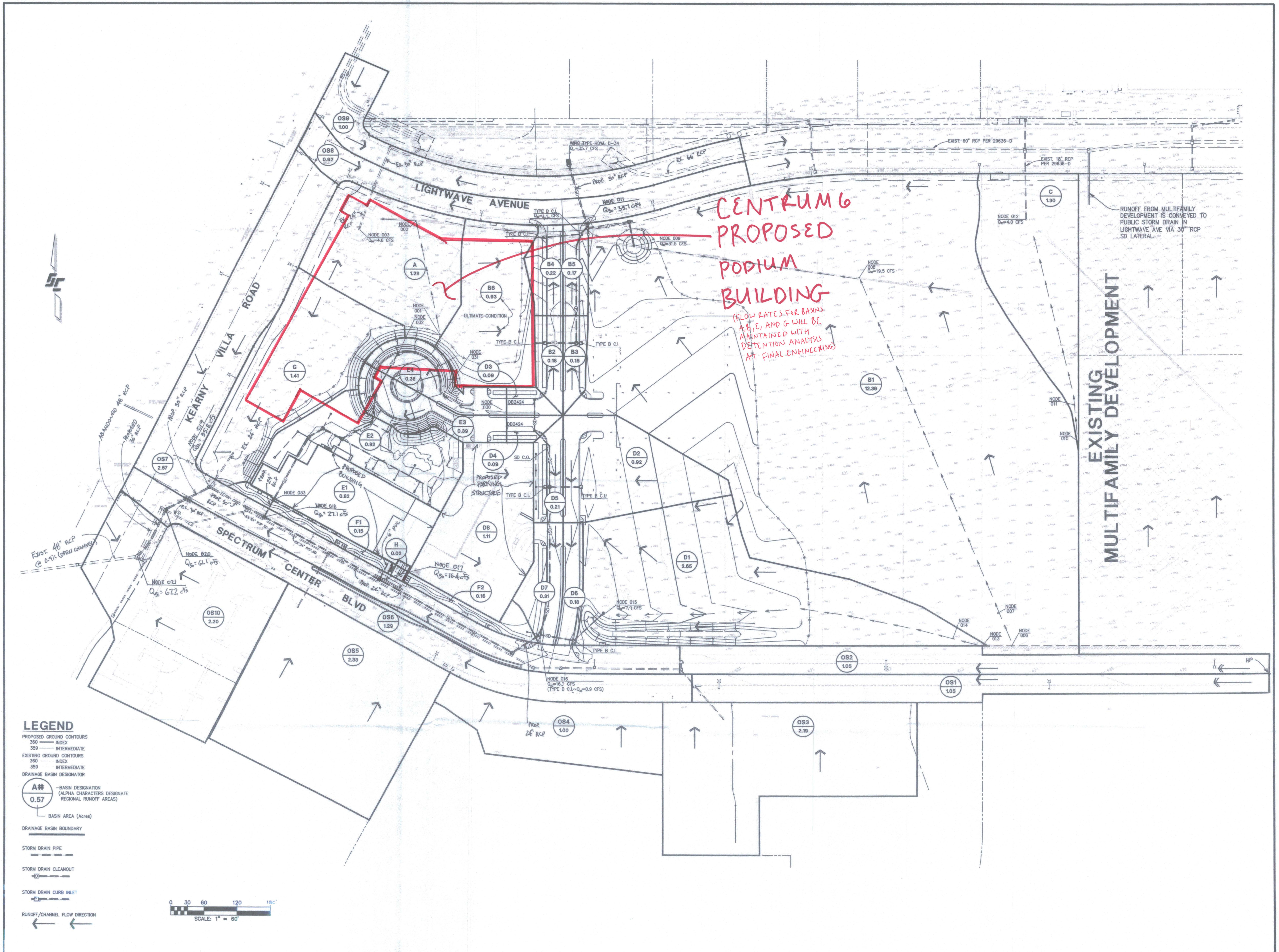
TEL 619 234 9411
FAX 619 234 9433

Kimley-Horn
and Associates, Inc.

Conclusion

- Mo is very comfortable with the public system design. It has been approved and signed by the City, and constructed according to the approved plans.
- Mo will accept some surcharge in the laterals and in the private, on-site systems, as long as the calculated HGL using the higher Rational Method Q's, is below the ground elevations on the site.
- Mo will ensure that the Plan Check process will not be delayed because of this issue.

Distribution: Mo Sammak- City of San Diego
Jack Ritchie- Lennar Partners



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FAX: 858.694.5661
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REVISIONS

CENTRUM 12
KEARNY MESA, CALIFORNIA

EXHIBIT "B"
PROPOSED CONDITION

DATE: 2/01/06
SCE NO. 00018.14
SHEET B
1 OF 1 SHEETS

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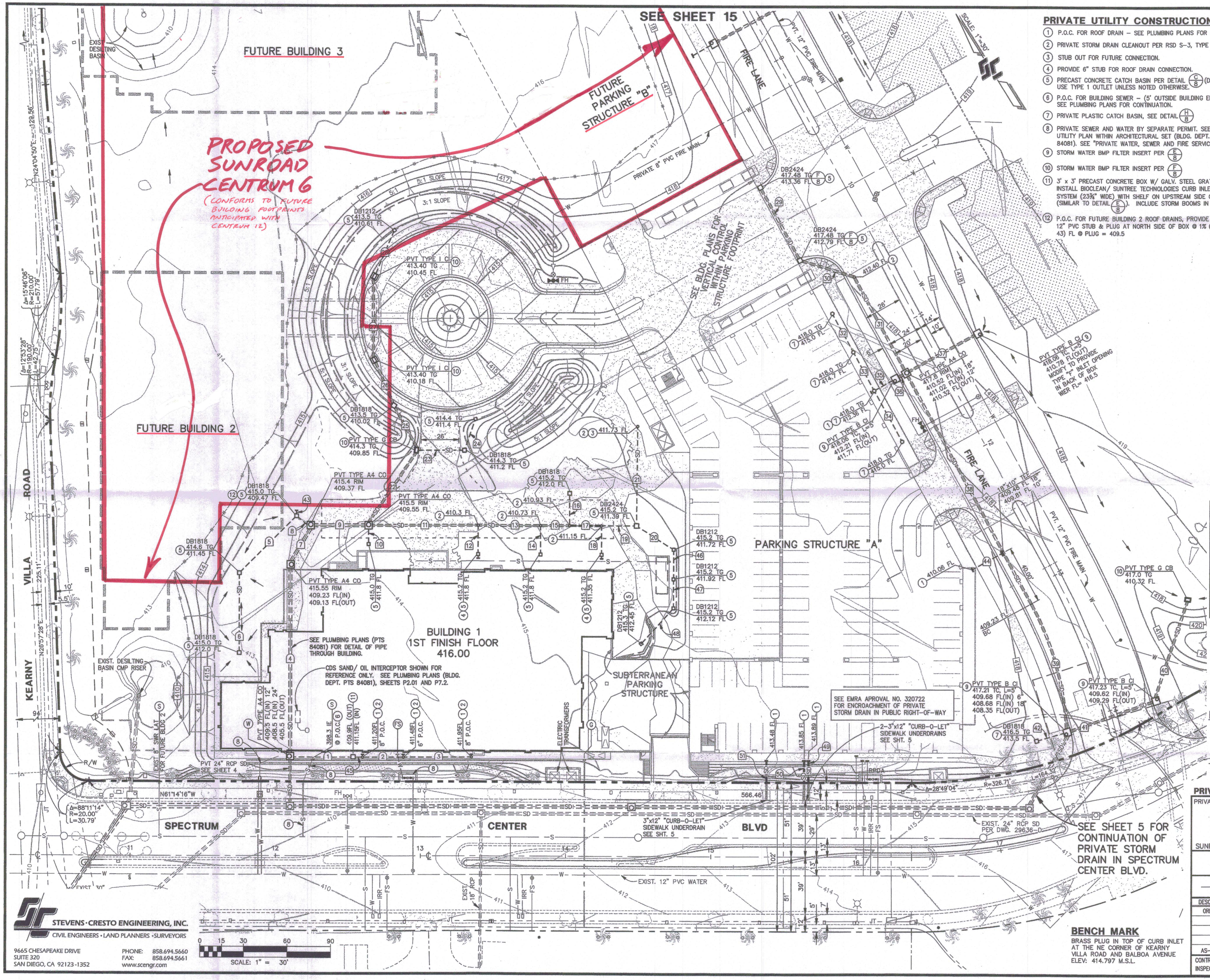
SECTION 4

CITY OF SAN DIEGO DRAWING NO. 34009-14-D AND 34009-15-D



PRIVATE UTILITY CONSTRUCTION NOTES

1. P.O.C. FOR ROOF DRAIN – SEE PLUMBING PLANS FOR CONTINUATION.
2. PRIVATE STORM DRAIN CLEANOUT PER RSD S-3, TYPE B.
3. STUB OUT FOR FUTURE CONNECTION.
4. PROVIDE 6" STUB FOR ROOF DRAIN CONNECTION.
5. PRECAST CONCRETE CATCH BASIN PER DETAIL C/8 (DB1212 U.N.O.) USE TYPE 1 OUTLET UNLESS NOTED OTHERWISE.
6. P.O.C. FOR BUILDING SEWER – (5' OUTSIDE BUILDING ENVELOPE) SEE PLUMBING PLANS FOR CONTINUATION.
7. PRIVATE PLASTIC CATCH BASIN, SEE DETAIL H/8
8. PRIVATE SEWER AND WATER BY SEPARATE PERMIT. SEE PRIVATE SITE UTILITY PLAN WITHIN ARCHITECTURAL SET (BLDG. DEPT. PROJ. NO. PTS 84081). SEE "PRIVATE WATER, SEWER AND FIRE SERVICE NOTE" BELOW.
9. STORM WATER BMP FILTER INSERT PER E/8
10. STORM WATER BMP FILTER INSERT PER F/8
11. 3' x 3' PRECAST CONCRETE BOX W/ GALV. STEEL GRATE. INSTALL BIOCLEAN/ SUNTREE TECHNOLOGIES CURB INLET BASKET SYSTEM (23¾" WIDE) WITH SHELF ON UPSTREAM SIDE OF BOX (SIMILAR TO DETAIL E/8). INCLUDE STORM BOOMS IN BASKET.
12. P.O.C. FOR FUTURE BUILDING 2 ROOF DRAINS, PROVIDE 3' LONG 12" PVC STUB & PLUG AT NORTH SIDE OF BOX @ 1% (PIPE NO. 43) FL @ PLUG = 409.5

STORM DRAIN DATA (PVT.)

NO.	LENGTH	SLOPE	SIZE	REMARKS
1	40.00'	1.00%	12"	HDPE
2	28.00'	1.00%	10"	PVC
3	47.00'	1.00%	8"	PVC
4	126.00'	0.50%	24"	DIP – SEE PLUMBING
5	55.00'	3.6%	8"	PVC
6	55.00'	1.00%	6"	PVC
7	26.41'	0.50%	24"	HDPE
8	10.00'	1.00%	12"	PVC
9	36.00'	0.50%	24"	HDPE
10	10.50'	21.4%	6"	PVC
11	73.50'	1.00%	15"	HDPE
12	19.50'	7.70%	6"	PVC
13	43.00'	1.00%	15"	HDPE
14	19.50'	5.50%	6"	PVC
15	20.00'	1.00%	15"	HDPE
16	22.00'	4.90%	8"	PVC
17	22.00'	1.00%	12"	HDPE
18	19.50'	1.00%	8"	PVC
19	24.00'	1.00%	8"	PVC
20	30.00'	1.00%	8"	PVC
21	67.77'	0.50%	6"	PVC
22	57.84'	0.50%	18"	HDPE
23	32.03'	4.21%	8"	PVC
24	22.52'	1.00%	6"	PVC
25	33.14'	0.50%	18"	HDPE
26	32.27'	0.50%	6"	PVC
27	54.45'	0.50%	12"	HDPE
28	32.27'	0.50%	8"	PVC
29	57.00'	1.00%	12"	HDPE
30	38.89'	1.00%	12"	HDPE
31	72.50'	1.90%	12"	HDPE
32	30.00'	1.00%	6"	PVC
33	30.00'	7.80%	6"	PVC
34	40.00'	6.60%	6"	PVC
35	14.75'	1.00%	12"	HDPE
36	4.25'	2.80%	18"	HDPE
37	52.25'	0.50%	18"	HDPE
38	177.15'	0.60%	18"	HDPE
39	88.92'	0.60%	18"	HDPE, R=200'
40	69.92'	1.00%	18"	HDPE
41	60.57'	1.00%	18"	HDPE
42	20.00'	19%	8"	PVC
43	3.00'	1.00%	12"	PVC
44	24.50'	1.00%	10"	PVC
45	5.00'	1.00%	12"	PVC
46	20.00'	1.00%	8"	PVC
47	20.00'	1.00%	6"	PVC
48	33.00'	1.00%	6"	PVC
49	15.50'	2.00%	6"	PVC
50	15.50'	2.00%	6"	PVC
51	15.50'	2.00%	6"	PVC

- ALL PVC STORM DRAIN PIPE SHALL CONFORM TO SDR-35.
- PIPE LENGTHS SHOWN ARE TO INSIDE FACE OF STRUCTURE FOR CAST-IN-PLACE STRUCTURES AND TO CENTER OF PRECAST CATCH BASINS.
- HDPE PIPE SHALL HAVE WATER-TIGHT JOINTS.
- ALL BEDDING FOR STORM DRAIN PIPE SHALL BE PER RSD S-4 (TYPE C).

PRIVATE WATER, SEWER AND FIRE SERVICE NOTE

1. ALL PROPOSED PRIVATE SEWER AND WATER IMPROVEMENTS SHOWN ON THESE PLANS ARE FOR REFERENCE ONLY TO AVOID CONFLICTS AND TO SHOW CONNECTIONS TO PUBLIC SEWER AND WATER LATERALS AND MAINS. CITY ENGINEER SIGNATURE DOES NOT CONSTITUTE APPROVAL OF PRIVATE SEWER AND WATER SHOWN ON THESE PLANS. ALL PROPOSED PRIVATE SEWER AND WATER SHOWN ON THESE PLANS SHALL BE INSTALLED UNDER SEPARATE PLUMBING PERMIT ISSUED BY THE CITY OF SAN DIEGO.
2. ALL PLANS FOR PRIVATE FIRE SERVICE MAINS AND PRIVATE FIRE HYDRANTS MUST BE SUBMITTED SEPARATELY TO FIRE PLAN CHECK FOR APPROVAL PRIOR TO INSTALLATION. ALL PRIVATE FIRE SYSTEMS WILL BE DESIGNED IN ACCORDANCE WITH CALIFORNIA BUILDING CODE; CALIFORNIA FIRE CODE; AND NFPA 24, PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES. PLANS SHALL BE SINGLE LINE DRAWINGS SHOWING ALL OF THE APPLICABLE REQUIREMENTS OF THE CODES SPECIFIED ABOVE.

THE WORK INCLUDED UNDER THE ENGINEERING PERMIT FOR THESE DRAWINGS INCLUDES GRADING AND DRAINAGE. PRIVATE IMPROVEMENTS SHOWN HEREON ARE COVERED UNDER SEPARATE BUILDING PERMIT FOR THIS DEVELOPMENT.

ENGINEER OF WORK

JOSEPH G. CRESTO — 8/8/06
R.C.E. 45601 — DATE

REGISTERED PROFESSIONAL ENGINEER
JOSEPH G. CRESTO
No. 45601
Exp. 12-31-06
CIVIL
STATE OF CALIFORNIA

BENCH MARK

BRASS PLUG IN TOP OF CURB INLET AT THE NE CORNER OF KEARNY VILLA ROAD AND BALBOA AVENUE
ELEV: 414.797 M.S.L.

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PRIVATE CONTRACT

PRIVATE STORM DRAIN PLAN FOR:

SUNROAD CENTRUM 12

SUNROAD CENTRUM 12

CITY OF SAN DIEGO, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
SHEET 14 OF 33 SHEETS

W.O. NO. 426200
P.T.S NO. 98300
V.T.M.

FOR CITY ENGINEER — DATE 8/15/06

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	SCE			
AS-BUILTS				

1882-6289
NAD83 COORDINATES

242-1729
LAMBERT COORDINATES

CONTRACTOR ______ DATE STARTED ______
INSPECTOR ______ DATE COMPLETED ______

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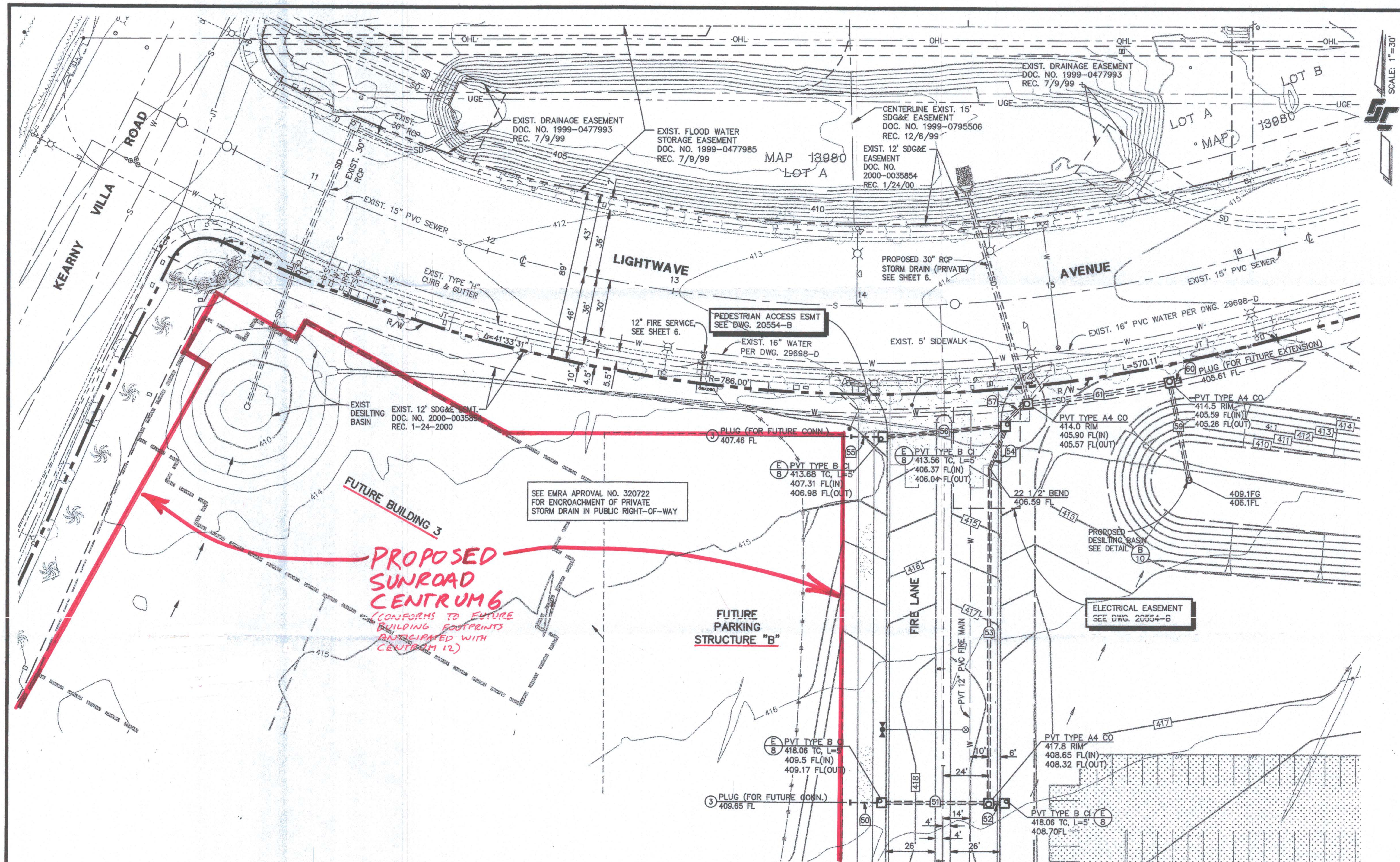

SEE SHEET 14 FOR CONTINUATION

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STORM DRAIN DATA (PVT.)

NO.	LENGTH	SLOPE	SIZE	REMARKS
50	14.75'	1.00%	12"	HDPE
51	52.25'	1.00%	18"	HDPE
52	4.25'	1.00%	18"	HDPE
53	172.88'	1.00%	18"	HDPE
54	21.56'	1.00%	18"	HDPE
55	14.75'	1.00%	12"	HDPE
56	60.77'	1.00%	18"	HDPE
57	13.63'	1.00%	24"	HDPE
59	50.00'	1.00%	24"	HDPE
60	4.00'	0.50%	30"	HDPE
61	71.60'	0.50%	30"	HDPE, R=795.00'
62				
63				
64				
65				

- –ALL PVC STORM DRAIN PIPE SHALL CONFORM TO SDR-35.
- –PIPE LENGTHS SHOWN ARE TO INSIDE FACE OF STRUCTURE FOR CAST-IN-PLACE STRUCTURES AND TO CENTER OF PRECAST CATCH BASINS.
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ENGINEER OF WORK

JOSEPH G. CRESTO 8/8/06
R.C.E. 45601 DATE

REGISTERED PROFESSIONAL ENGINEER
JOSEPH G. CRESTO
No. 45601
Exp. 12-31-06
CIVIL
STATE OF CALIFORNIA

PRIVATE CONTRACT

PRIVATE STORM DRAIN PLAN FOR:

SUNROAD CENTRUM 12

SUNROAD CENTRUM 12

CITY OF SAN DIEGO, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
SHEET 15 OF 33 SHEETS

W.O. NO. 426200
P.T.S NO. 98300

FOR CITY ENGINEER 8/15/06 DATE

V.T.M.

DESCRIPTION	BY	APPROVED	DATE	FILMED
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242-1729
LAMBERT COORDINATES

CONTRACTOR ______ DATE STARTED ______
INSPECTOR ______ DATE COMPLETED ______

34009-15-D

BENCH MARK

BRASS PLUG IN TOP OF CURB INLET AT THE NE CORNER OF KEARNY VILLA ROAD AND BALBOA AVENUE
ELEV: 414.797 M.S.L.

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0 15 30 60 90
SCALE: 1" = 30'

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NOISE ANALYSIS REPORT

ARIVA 6
SAN DIEGO, CA

June 25, 2018

Prepared for:

Sunroad Centrum Office Land, L.P.
4445 Eastgate Mall, Suite 400
San Diego, CA 92121

Prepared by:

dBF Associates, Inc.
3129 Tiger Run Court, Suite 202
Carlsbad, CA 92010
619-609-0712

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Appendix A. Roadway Noise Modeling

1.0 INTRODUCTION AND SUMMARY

This report evaluates noise affecting and produced by the proposed Ariva 6 project. The project site is located east of State Route 163, between Kearny Villa Road, Lightwave Avenue, Spectrum Center Boulevard, and Sunroad Centrum Lane, in the Kearny Mesa community of the City of San Diego, CA (Figure 1). The project would entail the demolition of the existing structures and on-site surface parking, and the construction of a seven-story multifamily residential apartment building.

Future exterior composite transportation noise levels at the proposed project site would range from approximately 60 dBA CNEL at the interior courtyards to approximately 74 dBA CNEL at the west building façade. Future exterior transportation noise levels at all required outdoor spaces in the project would be 65 dBA CNEL or below, and would be considered “less than significant” by the City. The impact of traffic noise affecting the project site would be less than significant.

Future exterior noise levels would exceed 60 dBA CNEL at project building façades. Therefore, interior noise levels in habitable rooms could exceed the City of San Diego General Plan Noise Compatibility Guidelines and CBC Section 1207.4 requirement of 45 dBA CNEL in residences.

To avoid a potential land use impact, as a condition of project approval, an interior noise analysis would be required. This interior noise analysis must identify the sound transmission loss requirements for building façade elements (windows, walls, doors, and exterior wall assemblies) necessary to limit interior noise to 45 dBA CNEL in habitable residential rooms.

Upgraded windows and/or doors with Sound Transmission Class (STC) ratings of 35 or higher may be necessary. If the interior noise limit can be achieved only with the windows closed, the building design must include mechanical ventilation that meets CBC requirements.

With the implementation of the findings of the interior noise analysis, interior noise levels would be 45 dBA CNEL or below in residences, and the project would comply with the City of San Diego General Plan Noise Compatibility Guidelines and the CBC Section 1207.4 requirement.

The project would result in a less than significant interior noise impact with project features incorporated in accordance with the interior noise analysis.

The project site is exposed to an existing and projected future noise level of approximately 60 dBA CNEL from MCAS Miramar [SDCALUC 2011]. Therefore, the project is consistent with the MCAS Miramar ALUCP.

The project site is exposed to an existing and projected future Montgomery Field noise level of less than 60 dBA CNEL [SDCRAA 2010]. Therefore, the project is consistent with the Montgomery Field ALUCP.

Construction activity would occur during allowable times and generate sound levels below 75 dBA Leq (12 hours) at residential zones, in compliance with Section 59.5.404 of the City of San Diego Municipal Code. The project would result in no construction noise impact.

The project would produce noise levels less than 55 / 50 / 45 dBA Leq at multifamily residential uses, and less than 60 / 55 / 52.5 dBA Leq at commercial uses, during daytime / evening / nighttime hours. Refuse vehicles or parking lot sweepers would operate on the project site between 7:00 a.m. and 7:00 p.m. The project would comply with City of San Diego Municipal Code noise limits. The impact of project-generated operational noise would be less than significant.

dBF Associates, Inc.

FIGURE 1
Vicinity Map

1.1 PROJECT DESCRIPTION

This project is a part of the New Century Center Master Plan. The project consists of one residential building located at the southeast corner of the intersection of Lightwave Avenue and Kearny Villa Road in the Kearny Mesa Community, San Diego, California.

There are five existing lots that are proposed to be consolidated into three lots via the VTM.

Within the project's boundary, the project proponent would also provide the continuation and completion of the jogging path that loops around the master community within a portion of a 1.42-acre linear park.

This project would be Type V construction: five floors of residential units over three levels of Type I parking garage. The lowest parking level (#1) will be subterranean. Parking level 2 and 3 would have residential units facing the streets and court yards.

The project proposes 441 residential units. Unit sizes average 811 square feet (sf) with units ranging in size from 660 sf to 1,322 sf.

A 3,250-sf ground floor leasing center would be located in the central courtyard and 6,600 sf of amenity and fitness centers would be located on the third level.

1.2 NOISE BACKGROUND

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and that interferes with or disrupts normal activities. The human environment is characterized by a certain consistent noise level that varies by location and is termed ambient noise. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, perceived importance of the noise and its appropriateness in the setting, time of day and type of activity during which the noise occurs, and sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the sound's pitch and is measured in cycles per second, or hertz (Hz), whereas intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually as pain at still higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. The average person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness; this relation holds true for sounds of any loudness. Sound levels of typical noise sources and environments are provided in Table 1.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. A simple rule is useful, however, in dealing with sound levels. If a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example, 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB.

The normal human ear can detect sounds that range in frequency from about 20 Hz to 20,000 Hz. However, all sounds in this wide range of frequencies are not heard equally well by the human ear, which is most sensitive to frequencies in the range of 1,000 Hz to 4,000 Hz. This frequency dependence can be taken into account by applying a correction to each frequency range to approximate the human ear's sensitivity within each range. This is called A-weighting and is commonly used in measurements of community environmental noise. The A-weighted sound pressure level (abbreviated as dBA) is the sound level with the "A-weighting" frequency correction. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Table 1. Sound Levels of Typical Noise Sources and Noise Environments

Noise Source (at Given Distance)	**Noise Environment**	**A-Weighted Sound Level**	**Human Judgment of Noise Loudness (Relative to Reference Loudness of 70 Decibels*)**
Military Jet Takeoff with Afterburner (50 ft)	Carrier Flight Deck	140 Decibels	128 times as loud
Civil Defense Siren (100 ft)		130	64 times as loud
Commercial Jet Take-off (200 ft)		120	32 times as loud **Threshold of Pain**
Pile Driver (50 ft)	Rock Music Concert Inside Subway Station (New York)	110	16 times as loud
Ambulance Siren (100 ft) Newspaper Press (5 ft) Gas Lawn Mower (3 ft)		100	8 times as loud **Very Loud**
Food Blender (3 ft) Propeller Plane Flyover (1,000 ft) Diesel Truck (150 ft)	Boiler Room Printing Press Plant	90	4 times as loud
Garbage Disposal (3 ft)	Noisy Urban Daytime	80	2 times as loud
Passenger Car, 65 mph (25 ft) Living Room Stereo (15 ft) Vacuum Cleaner (10 ft)	Commercial Areas	70	Reference Loudness **Moderately Loud**
Normal Speech (5 ft) Air Conditioning Unit (100 ft)	Data Processing Center Department Store	60	1/2 as loud
Light Traffic (100 ft)	Large Business Office Quiet Urban Daytime	50	1/4 as loud
Bird Calls (distant)	Quiet Urban Nighttime	40	1/8 as loud **Quiet**
Soft Whisper (5 ft)	Library and Bedroom at Night Quiet Rural Nighttime	30	1/16 as loud
	Broadcast and Recording Studio	20	1/32 as loud **Just Audible**
		0	1/64 as loud **Threshold of Hearing**

Source: Compiled by dBF Associates, Inc.

Because community noise fluctuates over time, a single measure called the Equivalent Sound Level (Leq) is often used to describe the time-varying character of community noise. The Leq is the energy-averaged A-weighted sound level during a measured time interval, and is equal to the level of a continuous steady sound containing the same total acoustical energy over the averaging time period as the actual time-varying sound. Additionally, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the Lmax and Lmin indicators, which represent the root-mean-square maximum and minimum noise levels obtained during the measurement interval. The Lmin value obtained for a particular monitoring location is often called the “acoustic floor” for that location.

To describe the time-varying character of environmental noise, the statistical noise descriptors L10, L50, and L90 are commonly used. They are the noise levels equaled or exceeded during 10, 50, and 90 percent of a stated time, respectively. Sound levels associated with L10 typically describe transient or short term events, whereas levels associated with L90 describe the steady-state (or most prevalent) noise conditions.

The Community Noise Equivalent Level (CNEL) is a descriptor representing a 24-hour, time-weighted, annual average noise level based on the “A-weighted” decibel. In the calculation process, noise occurring in the evening time period (7 p.m. to 10 p.m.) is penalized by adding 5 dB, while noise occurring in the nighttime period (10 p.m. to 7 a.m.) is penalized by adding 10 dB. These time periods and decibel increases were selected to reflect a typical person's increased sensitivity to noise during late-night and early morning hours. This descriptor is used by the State of California and the City of San Diego to evaluate land-use compatibility with regard to noise.

Sound Transmission Class (STC) is a single-number rating of the effectiveness of a material or construction assembly to impede the transmission of airborne sound.

2.0 APPLICABLE STANDARDS

2.1 CITY OF SAN DIEGO

2.1.1 General Plan

The City of San Diego requires new projects to meet noise level standards as established in the Noise Element of the General Plan [City of San Diego 2008, Amended 2015: Policy NE-A.4].

In the Residential – Multiple Dwelling Units land use category, noise levels up to 60 dBA CNEL are considered Compatible with outdoor use areas; noise levels up to 70 dBA CNEL are considered Conditionally Compatible. The building structure must attenuate exterior noise in occupied areas to 45 dBA CNEL or below.

2.1.2 CEQA Significance Thresholds

The Development Services Department (DSD) California Environmental Quality Act (CEQA) Significance Determination Thresholds (SDTs) [City of San Diego 2011] address noise. Relevant portions are reproduced below.

Temporary Construction Noise

Temporary construction noise which exceeds 75 dB (A) Leq at a sensitive receptor would be considered significant. Construction noise levels measured at or beyond the property lines of any property zoned residential shall not exceed an average sound level greater than 75-decibles [sic] (dB) during the 12-hour period from 7:00 a.m. to 7:00 p.m. In addition, construction activity is prohibited 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, that would create disturbing, excessive, or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator, in conformance with San Diego Municipal Code Section 59.5.0404.

Additionally, where temporary construction noise would substantially interfere with normal business communication, or affect sensitive receptors, such as day care facilities, a significant noise impact may be identified.

Noise from Adjacent Stationary Uses (Noise Generators)

A project which would generate noise levels at the property line which exceed the City's Noise Ordinance Standards is considered potentially significant (such as potentially a carwash or projects operating generators or noisy equipment).

If a non-residential use, such as a commercial, industrial or school use, is proposed to abut an existing residential use, the decibel level at the property line should be the arithmetic mean of the decibel levels allowed for each use as set forth in Section 59.5.0401 of the Municipal Code. Although the noise level above could be consistent with the City's Noise Ordinance Standards, a noise level above 65 dB (A) CNEL at the residential property line could be considered a significant environmental impact.

Traffic Noise

Table 2. City of San Diego Traffic Noise Significance Thresholds (dBA CNEL)

Structure or Proposed Use that would be impacted by Traffic Noise	Interior Space	Exterior Useable Space†
Single-family detached	45 dB	65 dB
Multi-family, schools, libraries, hospitals, day care, hotels, motels, parks, convalescent homes	Development Services Department (DSD) ensures 45 dB pursuant to Title 24	65 dB
Offices, Churches, Business, Professional Uses	n/a	70 dB
Commercial, Retail, Industrial, Outdoor Spectator Sports Uses	n/a	75 dB

† 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.

Table K-4 specifies noise land use compatibility. In the residential land use category, noise levels up to 65 dBA CNEL are considered compatible.

2.1.3 Municipal Code

2.1.3.1 Construction Noise

Construction noise within the City is governed by Municipal Code Section 59.5.0404: Construction Noise.

> 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 unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator. In granting such permit, the Administrator shall consider whether the construction noise in the vicinity of the proposed work site would be less objectionable at night than during the daytime because of different population densities or different neighboring activities; whether obstruction and interference with traffic particularly on streets of major importance, would be less objectionable at night than during the daytime; whether the type of work to be performed emits noises at such a low level as to not cause significant disturbances in the vicinity of the work site; the character and nature of the neighborhood of the proposed work site; whether great economic hardship would occur if the work were spread over a longer time; whether proposed night work is in the general public interest; and he shall prescribe such conditions, working times, types of construction equipment to be used, and permissible noise levels as he deems to be required in the public interest.
>
> Except as provided in subsection C. hereof, 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 provisions of subsection B. of this section shall not apply to construction equipment used in connection with emergency work, provided the Administrator is notified within 48 hours after commencement of work.
>
> *(Amended 1-3-1984 by O-16100 N.S.)*

2.1.3.2 Operational Noise

Operational noise within the City is governed by Municipal Code Section 59.5.401: Sound Level Limits.

> 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 given in the following table, at any location in the City of San Diego on or beyond the boundaries of the property on which the noise is produced. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said person.
>
> **TABLE OF APPLICABLE LIMITS**
>
> | Land Use | Time of Day | One-Hour Average Sound Level (decibels) |
> |---|---|---|
> | 1. Single Family Residential | 7 a.m. to 7 p.m.
7 p.m. to 10 p.m.
10 p.m. to 7 a.m. | 50
45
40 |
> | 2. Multi-Family Residential (up to a maximum density of 1/2000) | 7 a.m. to 7 p.m.
7 p.m. to 10 p.m.
10 p.m. to 7 a.m. | 55
50
45 |
> | 3. All other Residential | 7 a.m. to 7 p.m.
7 p.m. to 10 p.m.
10 p.m. to 7 a.m. | 60
55
50 |
> | 4. Commercial | 7 a.m. to 7 p.m.
7 p.m. to 10 p.m.
10 p.m. to 7 a.m. | 65
60
60 |
> | 5. Industrial or Agricultural | any time | 75 |
>
> 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. Permissible construction noise level limits shall be governed by Section 59.5.0404 of this article.
>
> …
>
> *(Amended 9-11-1989 by O-17337 N.S.)*
> *(Amended 11-28-2005 by O-19446 N.S.; effective 2-9-2006.)*

The project is multi-family residential. Surrounding land uses include parking lots, commercial, and multi-family residential uses beyond.

At boundary lines between multi-family residential land uses, the operational sound level limits are:

- 55 dBA Leq during daytime hours (7:00 a.m. to 7:00 p.m.),
- 50 dBA Leq during evening hours (7:00 p.m. to 10:00 p.m.), and
- 45 dBA Leq during nighttime hours (10:00 p.m. to 7:00 a.m.).

At boundary lines between multi-family residential and commercial land uses, the operational sound level limits are:

- 60 dBA Leq during daytime hours (7:00 a.m. to 7:00 p.m.),
- 55 dBA Leq during evening hours (7:00 p.m. to 10:00 p.m.), and
- 52.5 dBA Leq during nighttime hours (10:00 p.m. to 7:00 a.m.).

2.1.3.3 Refuse Vehicles and Parking Lot Sweepers

Refuse vehicle and parking lot sweeper noise within the City is governed by Municipal Code Section 59.5.0406: Refuse Vehicles and Parking Lot Sweepers.

> No person shall operate or permit to be operated a refuse compacting, processing, or collection vehicle between the hours of 7:00 p.m. to 6:00 a.m. or a parking lot sweeper between the hours of 7:00 p.m. to 7:00 a.m. in any residential area unless a permit has been applied for and granted by the Administrator.
>
> *("Refuse Vehicles" added 9-18-1973 by O-11122 N.S.;*
> *amended 9-22-1976 by O-11916 N.S.)*
> *(Amended 6-9-2010 by O-19960 N.S.; effective 7-9-2010.)*

2.2 STATE OF CALIFORNIA

2.2.1 Multi-Family Residential

California Building Code (CBC), Chapter 12: Interior Environment, Section 1207: Sound Transmission regulates noise levels in buildings with multiple habitable units [State of California 2015]. Relevant portions are reproduced below.

> 1207.4 Allowable interior noise levels. Interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either the day-night average sound level (Ldn) or the community noise equivalent level (CNEL), consistent with the noise element of the local general plan.

3.0 ENVIRONMENTAL SETTING AND EXISTING CONDITIONS

The vacant project site is bounded by Lightwave Avenue on the north, Spectrum Center Boulevard on the south, Sunroad Centrum Lane on the east, and Kearny Villa Road on the west. Commercial uses are across Lightwave Avenue to the north; an office building and parking garage are adjacent to the south; multi-family residences are across Sunroad Centrum Lane to the east; and an auto dealership is beyond Kearny Villa Road and State Route (SR) 163 to the west.

Noise-sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise-sensitive and may warrant unique measures for protection from intruding noise.

The primary existing noise source in the vicinity of the project is vehicular traffic on adjacent and nearby roadways. A secondary noise source is aircraft operations associated with Marine Air Corps Station (MCAS) Miramar and Montgomery Field. The project site is exposed to an existing (year 2004) MCAS Miramar noise level of approximately 60 dBA CNEL [MCAS Miramar 2005]. The project site is within the AIA (Review Area 1) but outside the existing 60 dBA CNEL noise contour of Montgomery Field [SDCRAA 2010].

3.1 ROADWAY TRAFFIC

SR 163 is a two-way eight-lane Freeway roadway with an existing (year 2016) Average Daily Traffic (ADT) volume of 141,000 vehicles between Balboa Avenue and Clairemont Mesa Boulevard [Caltrans 2017a] and a posted speed limit of 65 mph. SR 163 is approximately 250 feet west of the west project site boundary.

In the project vicinity, Kearny Villa Road is a two-way four-lane Major Arterial roadway with an existing (year 2017) peak hour traffic volume of 1,375 vehicles between Lightwave Avenue and Spectrum Center Boulevard [KHA 2018], and a posted speed limit of 40 miles per hour (mph). Kearny Villa Road is adjacent to the project site on the west.

In the project vicinity, Lightwave Avenue a two-way two-lane Collector roadway with an existing (year 2017) peak hour traffic volume of 772 vehicles east of Kearny Villa Road [KHA 2018], and an unposted speed limit. Lightwave Avenue is adjacent to the project site on the north.

In the project vicinity, Spectrum Center Boulevard a two-way two-lane Collector roadway with an existing (year 2017) peak hour traffic volume of 863 vehicles east of Kearny Villa Road [KHA 2018], and an unposted speed limit. Lightwave Avenue is adjacent to the project site on the south.

In the project vicinity, Sunroad Centrum Lane a two-way two-lane Local Collector roadway with an existing (year 2017) peak hour traffic volume of 154 vehicles south of Lightwave Avenue [KHA 2018], and an unposted speed limit. Sunroad Centrum Lane is adjacent to the project site on the east. However, the portion of Sunroad Centrum Lane between Lightwave Avenue and the project site was not open to through traffic at the time of this analysis.

3.2 SOUND LEVEL MEASUREMENTS

Sound level measurements were conducted at four locations to estimate the existing acoustical environment at the project site. A RION Model NL-31 American National Standards Institute (ANSI) Type 2 Integrating Sound Level Meter (SLM) was used as the data-collection device. The meter was mounted on a tripod roughly 5 feet above ground to simulate the average height of the human ear. The microphone was fitted with a windscreen. Weather conditions during the measurements were approximately 76°F, 40% relative humidity, 2-4 mph wind speed, and clear skies. The measurements were performed on Tuesday, June 12, 2017. The sound level meter was calibrated before the measurement period. Simultaneous traffic counts were conducted during the measurement periods as applicable. The measurement results are summarized in Table 3 and correspond to the locations depicted on Figure 2. During all measurements, traffic was the dominant noise source.

dBF Associates, Inc.

FIGURE 2
Sound Level Measurement Locations

Table 3. Sound Level Measurements (dBA)

Measurement Location		Time	Leq	Lmin	Lmax	L10	L50	L90	Traffic
ML1	West property line ~250' from SR 163 CL ~70' from Kearny Villa Road CL	10:50 – 11:00	69.4	64.8	75.5	70.8	69.1	67.1	SR 163: 1,520 cars, 32 medium trucks, 46 heavy trucks, 2 buses, 8 motorcycles Kearny Villa Road: 78 cars, 2 buses
ML2	Northeast property line corner ~50' from Lightwave Avenue CL ~50' from Sunroad Centrum Lane CL	11:05 – 11:15	63.7	56.7	77.3	67.0	61.0	58.3	Lightwave Avenue: 54 cars, 3 medium trucks Sunroad Centrum Lane: 4 cars
ML3	Northwest corner of parking garage, level P7l	11:25 – 11:30	67.6	63.3	73.3	69.2	67.1	65.2	Not counted
ML3	~50' from Spectrum Center Boulevard CL	11:35 – 11:45	64.2	59.0	73.0	67.1	62.8	60.4	64 cars, 3 medium trucks

Notes:

Measurements conducted on Tuesday, June 12, 2017.

3.3 FUTURE NOISE LEVELS

The project proposes development of the project site with a multi-family residential building. The primary future noise source in the vicinity of the project is vehicular traffic on adjacent and nearby roadways. A secondary noise source is aircraft operations associated with Marine Air Corps Station (MCAS) Miramar. The project site is projected to be exposed to a future MCAS Miramar noise level of approximately 60 dBA CNEL [SDCALUC 2011]. The project site is projected to be exposed to a future Montgomery Field noise level of less than 60 dBA CNEL [SDCRAA 2010].

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM) version 2.5 was used to estimate traffic noise levels. The modeling effort considered the peak-hour traffic volumes, average estimated vehicle speeds, estimated vehicle mix, i.e., percentage of cars, medium trucks, heavy trucks, buses, and motorcycles; and locations of existing and project buildings. Agencies such as the City of San Diego and the United States Department of Housing and Urban Development (HUD) consider the peak-hour Leq to be reasonably equivalent to the CNEL for vehicular traffic.

Sound levels caused by line sources (i.e., variable or moving sound sources such as traffic) generally decrease at a rate of 3 to 4.5 dBA when the distance from the road is doubled, depending on the ground surface hardness between the source and the receiving property. The model assumed “lawn” propagation conditions, which corresponds to a drop-off rate of 4.5 dBA per doubling of distance. The actual sound level at any receptor location is dependent upon such factors as the source-to-receptor distance and the presence of intervening structures (walls and buildings), barriers, and topography. The model was calibrated using actual traffic counts and sound level measurements; modeled sound levels were within 2 dBA of measured levels. Future vehicular traffic calculations are summarized in Appendix A.

The future (year 2035) ADT volume on SR 163 is projected to be 162,000 vehicles between Balboa Avenue and Clairemont Mesa Boulevard [SANDAG 2018]. The peak-hour traffic volume was assumed to be 10% of the ADT. The speed limit of 65 mph is expected to remain constant. The existing vehicle mix of 96.5% cars, 1.5% medium trucks [Caltrans 2017b], 1.5% heavy trucks [Caltrans 2017b], and 0.5% motorcycles (observed during the site visit) was expected to remain constant.

The Horizon Year (2035) with Project peak hour traffic volume on Kearny Villa Road is projected to be 1,598 vehicles between Lightwave Avenue and Spectrum Center Boulevard [KHA 2018]. The speed limit (40 mph) and vehicle mix observed during the site visit (97.5% cars and 2% buses) are expected to remain constant.

The Horizon Year (2035) with Project peak hour traffic volume on Lightwave Avenue is projected to be 1,283 vehicles east of Kearny Villa Road [KHA 2018]. The average vehicle speed was assumed to be 35 mph, and the vehicle mix (94.5% cars and 5.5% medium trucks) observed during the site visit was expected to remain constant.

The Horizon Year (2035) with Project peak hour traffic volume on Spectrum Center Boulevard is projected to be 1,285 vehicles east of Kearny Villa Road [KHA 2018]. The average vehicle speed was assumed to be 35 mph, and the vehicle mix (95.5% cars and 4.5% medium trucks) observed during the site visit was expected to remain constant.

The Horizon Year (2035) with Project peak hour traffic volume on Sunroad Centrum Lane is projected to be 477 vehicles south of Lightwave Avenue [KHA 2018]. The average vehicle speed was assumed to be 25 mph, and the vehicle mix was assumed to be 100% cars.

Future exterior traffic noise levels at the proposed project site would range from below 50 dBA CNEL at the interior courtyards to approximately 74 dBA CNEL at the west building façade. The MCAS Miramar noise level of 60 dBA CNEL was logarithmically added to the traffic noise levels. The future exterior composite transportation noise levels would range from approximately 60 dBA CNEL at the interior couryards to approximately 74 dBA CNEL at the west building façade, as shown on Figure 3.

The project includes several common outdoor usable areas for residents:. Private decks are also distributed throughout the sides and levels of the project building.

The project would include 68,908 square feet (sf) of common outdoor open space, distributed in a street level plaza, courtyards on Level 3, and a terrace on Level 5; 11,050 sf is required. Approximately 14,000 sf of outdoor open space, at the southwest corner of the street level plaza, would be exposed to noise levels higher than 65 dBA CNEL as designed. Over 54,000 sf of outdoor open space would be exposed to noise levels of 65 dBA or below as designed. The outdoor open space requirement is met with the outdoor areas of the project site exposed to noise levels of 65 dBA CNEL or below. Future exterior traffic noise levels at all required open spaces in the project would be 65 dBA CNEL or below.

The impact of traffic noise affecting the project site would be less than significant.

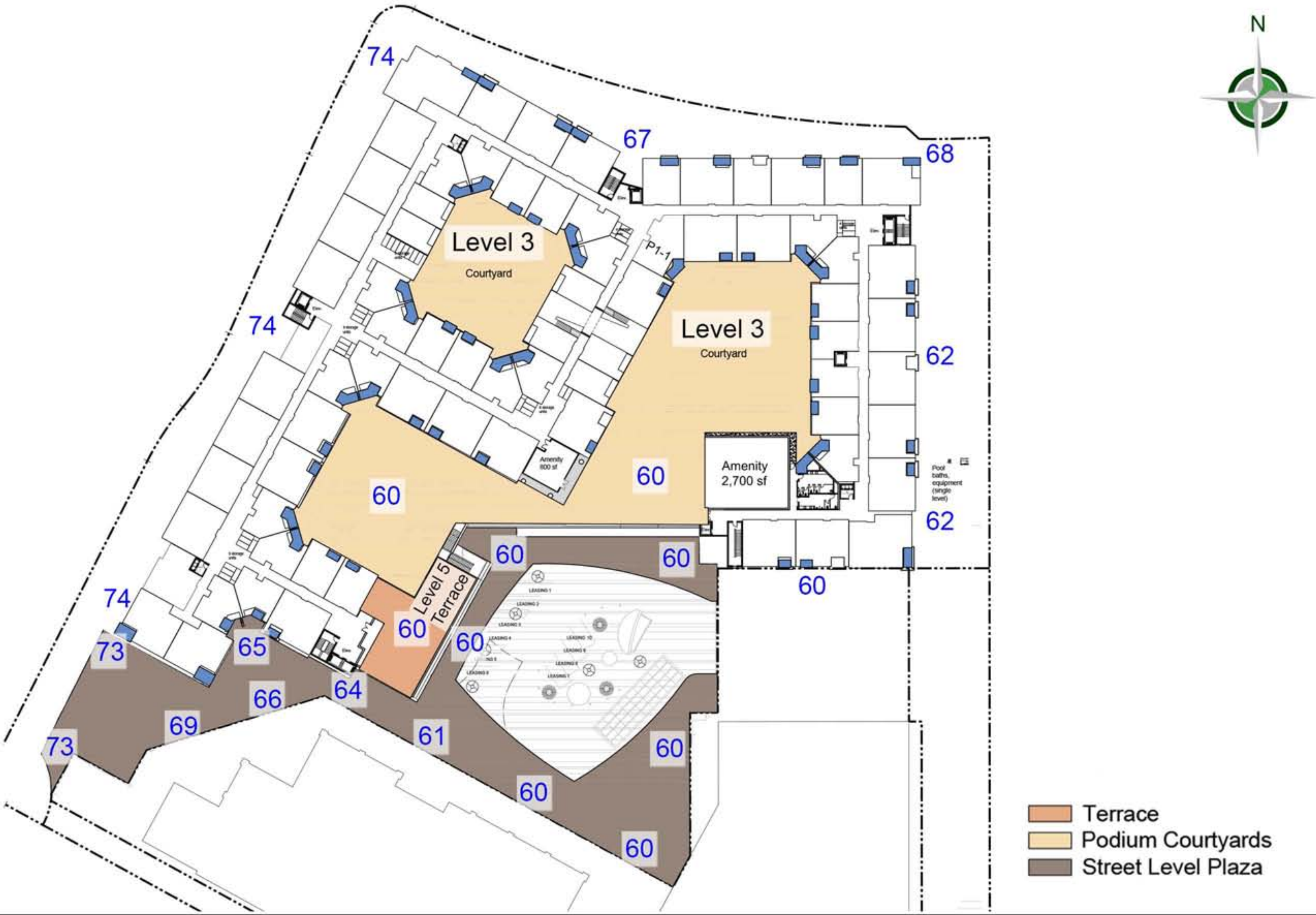

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FIGURE 3

Future Exterior Composite Transportation Noise Levels (CNEL)

3.3.1 Interior Noise

Because future exterior noise levels would exceed 60 dBA CNEL at some project residential building façades, interior noise levels in habitable rooms could exceed the City of San Diego General Plan Noise Compatibility Guidelines and CBC Section 1207.4 requirement of 45 dBA CNEL in residences.

To avoid a potential land use impact, as a condition of project approval, an interior noise analysis would be required. This interior noise analysis must identify the sound transmission loss requirements for building façade elements (windows, walls, doors, and exterior wall assemblies) necessary to limit interior noise to 45 dBA CNEL in habitable residential rooms and 50 dBA CNEL / 50 dBA Leq in occupied commercial areas.

Upgraded windows and/or doors with Sound Transmission Class (STC) ratings of 35 or higher may be necessary. If the interior noise limit can be achieved only with the windows closed, the building design must include mechanical ventilation that meets CBC requirements.

With the implementation of the findings of the interior noise analysis, interior noise levels would be 45 dBA CNEL or below in residences, and the project would comply with the City of San Diego General Plan Noise Compatibility Guidelines and CBC Section 1207.4 requirement.

The project would result in a less than significant interior noise impact with project features incorporated in accordance with the interior noise analysis.

However, noise associated with aircraft operations may be periodically audible on the project site or within the project building.

3.4 PROJECT EXPOSURE TO AIRPORT NOISE

The project would expose people to current or future transportation noise levels which exceed standards established an adopted airport Comprehensive Land Use Plan (CLUP), or would result in land uses which are not compatible with aircraft noise levels as defined by an adopted airport CLUP, if:

> The project site is located in an area exposed to airport noise levels over 60 dBA CNEL, and interior noise levels would exceed 45 dBA CNEL in residences.

The project site is exposed to an existing and projected future noise level of approximately 60 dBA CNEL from MCAS Miramar [SDCALUC 2011]. Therefore, the project is consistent with the MCAS Miramar ALUCP.

The project site is exposed to an existing and projected future Montgomery Field noise level of less than 60 dBA CNEL [SDCRAA 2010]. Therefore, the project is consistent with the Montgomery Field ALUCP.

4.0 CONSTRUCTION NOISE

Construction of the project would generate a temporary increase in noise in the project area. The increase in noise level would be primarily experienced close to the noise source. The magnitude of the impact would depend on the type of construction activity, noise level generated by various pieces of construction equipment, duration of the construction phase, and distance between the noise source and receiver.

Construction activity and delivery of construction materials and equipment would be limited to between 7:00 a.m. and 7:00 p.m. This project would implement conventional construction techniques and equipment. Standard equipment such as scrapers, graders, backhoes, rollers, loaders, tractors, cranes, and miscellaneous trucks would be used for construction of most project facilities. Sound levels of typical construction equipment range from approximately 65 dBA to 95 dBA at 50 feet from the source [U.S. Environmental Protection Agency (U.S. EPA) 1971].

Worst-case noise levels are typically associated with grading. Noise sources associated with grading of the proposed project, and associated noise levels are shown in Table 4. Project construction would not require pile driving or on-site rock crushing.

Table 4. Grading Noise Source Levels

Noise Source	Noise Level	Number
Bulldozer	85 dBA at 50 feet	1
Scraper	85 dBA at 50 feet	1
Backhoe	85 dBA at 50 feet	1
Water Truck	85 dBA at 50 feet	1
Roller	75 dBA at 50 feet	1

The Datakustik Cadna/A industrial noise prediction model was used to estimate noise levels from construction activity on the project site. The closest noise-sensitive land uses are multi-family residences located in the Ariva Apartments development adjacent on the east; the property line is approximately 275 feet from the centroid of construction activity on the site. It was assumed that one bulldozer, one scraper, one backhoe, one water truck and one roller would operate continuously throughout the site. No noise reduction related to ground effects, atmospheric absorption, or intervening topography was included in the model.

Without noise abatement, under the assumptions detailed above, project construction activity would generate up to approximately 72 dBA Leq (12 hours) at a residential property line. Construction activity would occur during allowable times and generate sound levels of 75 dBA Leq (12 hours) or less at residential land uses, in compliance with Section 59.5.404 of the City of San Diego Municipal Code. The project would result in no construction noise impact.

5.0 OPERATIONAL (NON-CONSTRUCTION) NOISE

The project is expected to include the following noise sources: heating / ventilation / air conditioning (HVAC) units, an emergency generator, exhaust / supply / transfer / relief fans, and maintenance activities such as parking lot sweepers and trash collection trucks. The project would not include any trash compactors or refrigeration units.

The project operational noise sources that produce outdoor noise are detailed in Table 5. Fans providing airflows of less than 500 cubic feet per minute, such as residential exhaust and supply fans, were not included in the analysis.

The Datakustik Cadna/A industrial noise prediction model was used to estimate noise levels from noise sources on the project site. The locations of the project building and noise sources were imported from the site plan [KTGY Architecture + Planning 2017] and mechanical plans [TAD Engineering, Inc. 2018].

All HVAC units, corridor supply fans, and trash room exhaust fans were treated as stationary point sources, 3 feet in height above rooftop level, and assumed to be constantly operational. The roof would include a 42-inch-high parapet. The emergency generator was assumed to be operational during a 30-minute daytime testing period. There would be an 8-foot-high solid wall along the southeast edge of the generator pad.

The garage exhaust system would operate on a limited and intermittent basis, activated by carbon monoxide sensors within the garage; however, in the interest of a worst-case scenario, it was assumed that all fans would be constantly operational. All garage ventilation fans were treated as vertical area sources parallel to the building and assumed to be constantly operational.

Table 5. Operational Noise Sources

Noise Source	Make & Model No.	(Vent) Location(s)	Noise Level
Garage Exhaust Fan Level 0-1	Cook 402QMX	West/North, Level 1	99 dBA SWL
Garage Exhaust Fan Level 0-2	Cook 402QMX	West/South, Level 1	99 dBA SWL
Garage Exhaust Fan Level 1-1	Cook 365QMX	West/North, Level 1	92 dBA SWL
Garage Exhaust Fan Level 1-2	Cook 365QMX	West/South, Level 1	92 dBA SWL
Garage Exhaust Fan Level 2-1	Cook 365QMX	West/North, Level 2	92 dBA SWL
Garage Exhaust Fan Level 2-2	Cook 365QMX	West/South, Level 2	92 dBA SWL
Garage Supply Fan Level 0-1 - Minimum 3 meters of duct, and all duct elbows, lined with 25mm thick fiberglass or equivalent	Cook 445QMX	East/North, Level 2	96 dBA SWL, 68 dBA SWL with lining
Garage Supply Fan Level 0-2 - All ductwork, including elbows, lined with 25mm thick fiberglass or equivalent	Cook 36XLWHS	South/East, Level 1	87 dBA SWL, 61 dBA SWL with lining
Garage Supply Fan Level 0-3	Cook 330CAFDW	South, Level 1	86 dBA SWL
Garage Supply Fan Level 0-4	Cook DB-8	North, Level 1	83 dBA SWL
Garage Supply Fan Level 2-1 - All ductwork, including elbows, lined with 25mm thick fiberglass or equivalent	Cook 402QMX	East/North, Level 2	99 dBA SWL, 74 dBA SWL with lining
Trash Room Exhaust Fan 1	Cook DB-8	Roof (x3)	83 dBA SWL
Corridor Supply Fan 1	Cook 135CF	South/East, Level 2 Roof (x5)	83 dBA SWL
Single Zone Outdoor Cooling Unit AOU 1	Mitsubishi PUY-A12NKA7	South/East, Ground	46 dBA at 1 foot
Residential Split System Outdoor Heat Pump 1	Carrier CH14NB018	Roof (x214)	69 dBA SWL
Residential Split System Outdoor Heat Pump 2	Carrier CH14NB024	Roof (x190)	76 dBA SWL
Residential Split System Outdoor Heat Pump 3	Carrier CH14NB036	Roof (x32)	77 dBA SWL
Amenities Outdoor Heat Pump 1	Carrier CH14NB060	Roof (x5)	77 dBA SWL
Amenities Outdoor Heat Pump 2	Carrier CH14NB036	Roof (x4)	77 dBA SWL
Emergency Generator	MTU 6R1600 DS275	South Courtyard	76.5 dBA at 7 meters

Note: Ductwork lining sound attenuation estimated using ASHRAE methodology [2007], based on the equipment layout shown on the mechanical plans [TAD Engineering, Inc. 2018].

As shown in Table 6 and on Figure 4, the project would produce noise levels less than 55 / 50 / 45 dBA Leq at multifamily residential uses, and less than 60 / 55 / 52.5 dBA Leq at commercial uses, during daytime / evening / nighttime hours. Refuse vehicles or parking lot sweepers would operate on the project site between 7:00 a.m. and 7:00 p.m. The project would comply with City of San Diego Municipal Code noise limits. The impact of project-generated operational noise would be less than significant.

Table 6. Project-Generated Noise Levels (dBA Leq)

Location	Use	Sound Level Limits *	Project Noise Levels
North property line	Commercial	60 / 55 / 52.5	49
East property line	Multifamily Residential	55 / 50 / 45	45
Southeast property line	Parking Structure	N/A	60
Southwest property line	Office Structure	60 / 55 / 52.5	60 / 40 / 40
West property line	Roadways	N/A	69
BMW of San Diego, 400 feet west	Commercial	60 / 55 / 52.5	50

* Sound level limits are for daytime (7 a.m. – 7 p.m.) / evening (7 p.m. – 10 p.m.) / nighttime (10 p.m. – 7 a.m.) time periods.

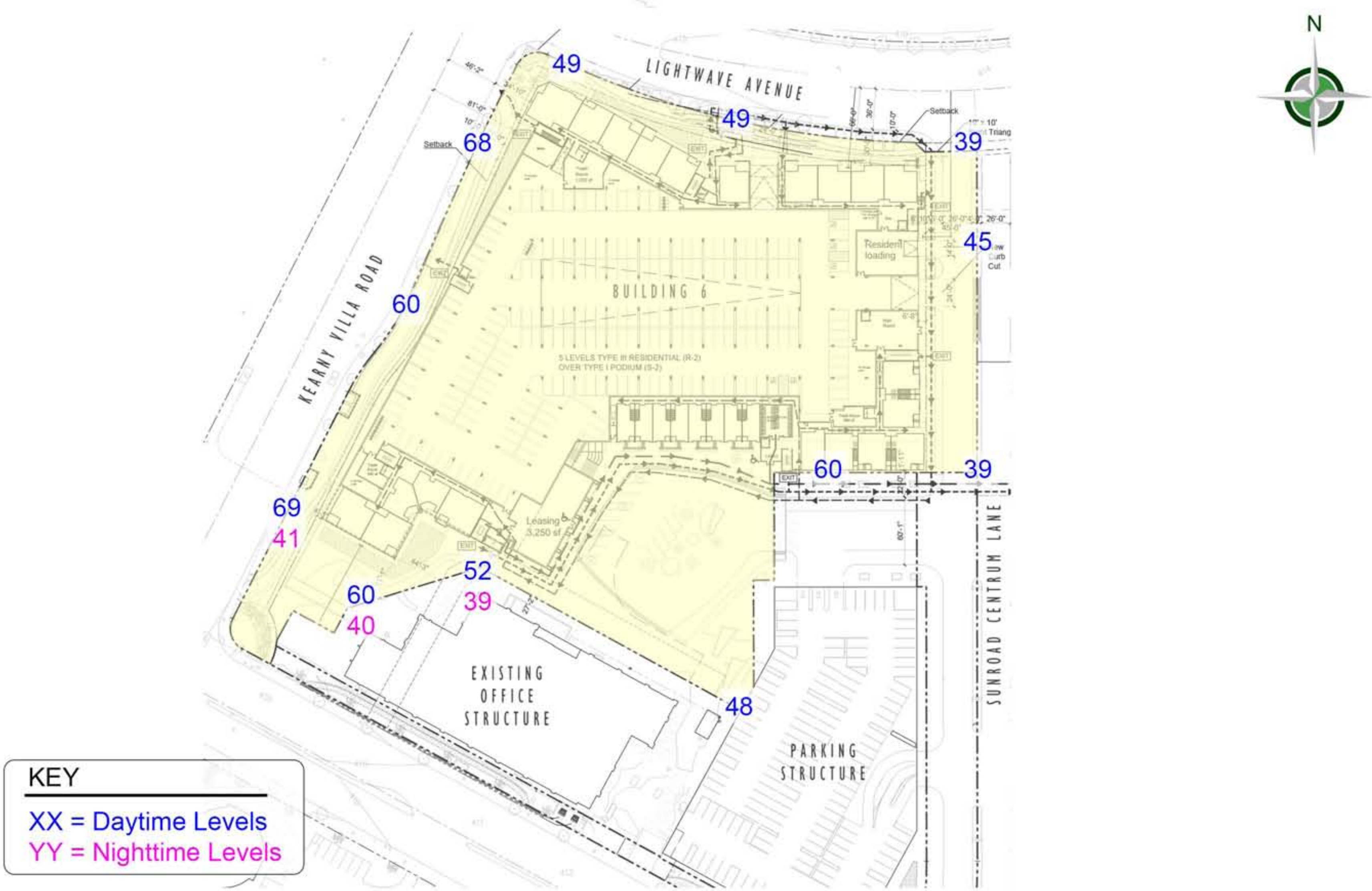

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FIGURE 4

Project-Generated Noise Levels (dBA Leq)

6.0 FINDINGS AND MITIGATION

6.1 PROJECT EXPOSURE TO ROADWAY NOISE

No impacts were identified. No mitigation is necessary.

6.2 PROJECT EXPOSURE TO AIRPORT NOISE

No impacts were identified. No mitigation is necessary.

6.3 PROJECT-GENERATED CONSTRUCTION NOISE

No impacts were identified. No mitigation is necessary.

Although impacts from project construction would be less than significant, minimization disturbance from construction noise is often desired. The following measures should be considered:

- Select equipment capable of performing the necessary tasks with the lowest sound level and the lowest acoustic height possible.
- Implement alternatives to the standard backup beepers as feasible. These alternatives include strobe lights or products such as the Brigade Electronics, Inc. Broadband Sound system, which is equally effective while generating a lower noise level.
- Use specially-quieted equipment, such as quieted and enclosed air compressors and properly-working manufacturer-recommended mufflers on all engines.
- Construct enclosures around noise-producing stationary sources such as generators used for night lighting.
- Perform construction vehicle maintenance as far from any residential land use as possible.
- Place the laydown area as far as possible from the closest noise sensitive receptors.
- Limit the delivery of material to the hours between 7:00 a.m. and 7:00 p.m.

6.4 PROJECT-GENERATED OPERATIONAL NOISE

No impacts were identified. No mitigation is necessary.

7.0 REFERENCES

American Society for Testing and Materials. 1990. Annual Book of ASTM Standards: Volume 04.06, Thermal Insulation; Environmental Acoustics.

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 2007. ASHRAE Handbook – HVAC Applications. Chapter 47: Sound and Vibration Control.

City of San Diego. 2011. Development Services Department (DSD) California Environmental Quality Act (CEQA) Significance Determination Thresholds.

2006 / 2010. Municipal Code.

Harris, Cyril M. 1998. Handbook of Acoustical Measurements and Noise Control, Third Edition. Acoustical Society of America. Woodbury, NY.

KTGY Architecture + Planning. 2017. Sunroad Centrum 6 Site Plan. PDP (Second) Submittal. December 1.

Marine Corps Air Station (MCAS), Miramar. 2005. Air Installations Compatible Use Zones. March. Chapter 3: Noise Environment.

San Diego County Airport Land Use Commission (SDCALUC). 2011. MCAS Miramar Airport Land Use Compatibility Plan. Adopted October 2008; Amended December 2010 and November 2011.

San Diego County Regional Airport Authority (SDCRAA). 2010. Montgomery Field Airport Land Use Compatibility Plan. Adopted January 25. Amended December 10.

TAD Consulting, Inc. 2018. Sunroad Ariva 6 Mechanical Plans. 1st City Submittal. March 7.

8.0 LIST OF PREPARERS

Steven Fiedler, INCE
Principal

APPENDIX A

ROADWAY NOISE MODELING

dBF Associates, Inc.					**20 June 2018**							
SPF					**TNM 2.5**							
INPUT: ROADWAYS							**Average pavement type shall be used unless**					
PROJECT/CONTRACT:	**Sunroad Ariva 6**						**a State highway agency substantiates the use**					
RUN:	**Measured**						**of a different type with the approval of FHWA**					
Roadway		**Points**										
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**			**Flow Control**			**Segment**		
				X	**Y**	**Z**	**Control Device**	**Speed Constraint**	**Percent Vehicles Affected**	**Pvmt Type**	**On Struct?**	
	ft			ft	ft	ft		mph	%			
SR 163 NB1	33.0	point1	1	6,139.5	8,219.7	0.00				Average		
		point2	2	7,444.8	10,794.7	0.00						
SR 164 NB2	12.0	point3	3	6,150.2	8,214.2	0.00				Average		
		point4	4	7,455.5	10,789.3	0.00						
SR 163 NB3	12.0	point5	5	6,160.9	8,208.8	0.00				Average		
		point6	6	7,466.2	10,783.9	0.00						
SR 163 NB4	58.0	point7	7	6,171.6	8,203.4	0.00				Average		
		point8	8	7,476.9	10,778.4	0.00						
SR 163 SB1	33.0	point10	10	7,414.5	10,810.1	0.00				Average		
		point9	9	6,109.2	8,235.0	0.00						
SR 163 SB2	12.0	point12	12	7,403.8	10,815.5	0.00				Average		
		point11	11	6,098.5	8,240.5	0.00						
SR 163 SB3	12.0	point14	14	7,393.1	10,820.9	0.00				Average		
		point13	13	6,087.8	8,245.9	0.00						
SR 163 SB4	12.0	point16	16	7,382.4	10,826.4	0.00				Average		
		point15	15	6,077.1	8,251.3	0.00						
Sunroad Centrum Lane NB1	21.0	point67	67	7,635.4	9,040.5	0.00				Average		
		point68	68	7,642.2	9,072.2	0.00				Average		
		point69	69	7,649.1	9,124.7	0.00				Average		
		point70	70	7,650.8	9,166.7	0.00				Average		
		point71	71	7,650.2	9,796.1	0.00						
Sunroad Centrum Lane NB2	12.0	point72	72	7,647.1	9,038.0	0.00				Average		
		point73	73	7,654.1	9,070.2	0.00				Average		
		point74	74	7,661.1	9,123.6	0.00				Average		
		point75	75	7,662.8	9,166.5	0.00				Average		

		point76	76	7,662.2	9,796.1	0.00					
Sunroad Centrum Lane SB1	21.0	point81	81	7,630.2	9,796.1	0.00				Average	
		point80	80	7,630.8	9,167.1	0.00				Average	
		point79	79	7,629.2	9,126.4	0.00				Average	
		point78	78	7,622.5	9,075.7	0.00				Average	
		point77	77	7,615.9	9,044.8	0.00					
Sunroad Centrum Lane SB2	12.0	point86	86	7,618.2	9,796.1	0.00				Average	
		point85	85	7,618.8	9,167.3	0.00				Average	
		point84	84	7,617.2	9,127.4	0.00				Average	
		point83	83	7,610.7	9,077.7	0.00				Average	
		point82	82	7,604.1	9,047.3	0.00					
Spectrum Center Boulevard WB2	12.0	point66	66	8,613.7	9,019.1	0.00				Average	
		point65	65	7,643.8	9,018.2	0.00				Average	
		point112	112	7,557.6	9,028.9	0.00				Average	
		point111	111	7,474.7	9,061.4	0.00				Average	
		point125	125	6,948.7	9,350.1	0.00					
Spectrum Center Boulevard WB1	29.0	point64	64	8,613.7	9,006.1	0.00				Average	
		point63	63	7,643.8	9,005.2	0.00				Average	
		point115	115	7,555.4	9,016.0	0.00				Average	
		point114	114	7,468.4	9,050.0	0.00				Average	
		point126	126	6,942.5	9,338.8	0.00					
Spectrum Center Boulevard EB1	29.0	point128	128	6,929.0	9,314.2	0.00				Average	
		point117	117	7,455.0	9,025.5	0.00				Average	
		point119	119	7,547.4	8,989.1	0.00				Average	
		point61	61	7,643.8	8,977.2	0.00				Average	
		point62	62	8,613.7	8,978.1	0.00					
Spectrum Center Boulevard EB2	12.0	point127	127	6,922.7	9,302.8	0.00				Average	
		point122	122	7,448.7	9,014.1	0.00				Average	
		point123	123	7,545.2	8,976.3	0.00				Average	
		point59	59	7,643.8	8,964.2	0.00				Average	
		point60	60	8,613.7	8,965.1	0.00					
Kearny Villa Road NB2	12.0	point28	28	6,307.4	8,132.8	0.00				Average	
		point27	27	6,817.2	9,120.4	0.00				Average	
		point35	35	7,266.4	10,003.6	0.00				Average	
		point36	36	7,614.5	10,711.5	0.00					
Kearny Villa Road NB1	34.0	point30	30	6,298.5	8,137.4	0.00				Average	
		point29	29	6,808.3	9,125.0	0.00				Average	
		point37	37	7,257.4	10,008.0	0.00				Average	
		point38	38	7,605.5	10,715.9	0.00					

Kearny Villa Road SB1	34.0	point40	40	7,576.8	10,730.0	0.00				Average	
		point23	23	7,228.8	10,022.3	0.00				Average	
		point31	31	6,779.9	9,139.7	0.00				Average	
		point32	32	6,270.1	8,152.1	0.00					
Kearny Villa Road SB2	12.0	point42	42	7,567.8	10,734.4	0.00				Average	
		point25	25	7,219.9	10,026.9	0.00				Average	
		point33	33	6,771.0	9,144.2	0.00				Average	
		point34	34	6,261.2	8,156.7	0.00					
Lightwave Avenue WB2	12.0	point50	50	8,309.8	10,043.5	0.00				Average	
		point49	49	7,796.4	9,900.3	0.00				Average	
		point91	91	7,669.5	9,876.4	0.00				Average	
		point90	90	7,568.3	9,873.9	0.00				Average	
		point89	89	7,475.0	9,884.4	0.00				Average	
		point88	88	7,372.7	9,910.6	0.00				Average	
		point87	87	7,276.7	9,950.9	0.00					
Lightwave Avenue WB1	25.0	point48	48	8,313.1	10,032.0	0.00				Average	
		point47	47	7,799.6	9,888.7	0.00				Average	
		point97	97	7,677.1	9,865.1	0.00				Average	
		point96	96	7,581.8	9,861.4	0.00				Average	
		point95	95	7,475.3	9,872.1	0.00				Average	
		point94	94	7,368.7	9,899.3	0.00				Average	
		point93	93	7,271.3	9,940.2	0.00					
Lightwave Avenue EB1	25.0	point99	99	7,263.0	9,917.5	0.00				Average	
		point100	100	7,363.3	9,875.8	0.00				Average	
		point101	101	7,464.2	9,849.7	0.00				Average	
		point102	102	7,575.1	9,837.6	0.00				Average	
		point103	103	7,683.7	9,841.7	0.00				Average	
		point43	43	7,806.0	9,865.6	0.00				Average	
		point44	44	8,319.5	10,008.9	0.00					
LIghtwave Avenue EB2	12.0	point105	105	7,255.0	9,908.1	0.00				Average	
		point106	106	7,363.1	9,863.2	0.00				Average	
		point107	107	7,461.0	9,838.1	0.00				Average	
		point108	108	7,581.9	9,825.4	0.00				Average	
		point109	109	7,687.3	9,830.0	0.00				Average	
		point45	45	7,809.3	9,854.0	0.00				Average	
		point46	46	8,322.7	9,997.3	0.00					

dBF Associates, Inc.			20 June 2018									
SPF			TNM 2.5									
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	Sunroad Ariva 6											
RUN:	Measured											
Roadway	Points											
Name	Name	No.	Segment									
			Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
SR 163 NB1	point1	1	972	65	27	65	15	65	0	0	3	65
	point2	2										
SR 164 NB2	point3	3	972	65	27	65	15	65	0	0	3	65
	point4	4										
SR 163 NB3	point5	5	972	65	27	65	15	65	0	0	3	65
	point6	6										
SR 163 NB4	point7	7	972	65	27	65	15	65	0	0	3	65
	point8	8										
SR 163 SB1	point10	10	1308	65	21	65	54	65	3	65	9	65
	point9	9										
SR 163 SB2	point12	12	1308	65	21	65	54	65	3	65	9	65
	point11	11										
SR 163 SB3	point14	14	1308	65	21	65	54	65	3	65	9	65
	point13	13										
SR 163 SB4	point16	16	1308	65	21	65	54	65	3	65	9	65
	point15	15										
Sunroad Centrum Lane NB1	point67	67	0	0	0	0	0	0	0	0	0	0
	point68	68	0	0	0	0	0	0	0	0	0	0
	point69	69	0	0	0	0	0	0	0	0	0	0
	point70	70	0	0	0	0	0	0	0	0	0	0
	point71	71										
Sunroad Centrum Lane NB2	point72	72	0	0	0	0	0	0	0	0	0	0
	point73	73	0	0	0	0	0	0	0	0	0	0

		point74	74	0	0	0	0	0	0	0	0	0	0
		point75	75	0	0	0	0	0	0	0	0	0	0
		point76	76										
Sunroad Centrum Lane SB1		point81	81	0	0	0	0	0	0	0	0	0	0
		point80	80	0	0	0	0	0	0	0	0	0	0
		point79	79	0	0	0	0	0	0	0	0	0	0
		point78	78	0	0	0	0	0	0	0	0	0	0
		point77	77										
Sunroad Centrum Lane SB2		point86	86	0	0	0	0	0	0	0	0	0	0
		point85	85	0	0	0	0	0	0	0	0	0	0
		point84	84	0	0	0	0	0	0	0	0	0	0
		point83	83	0	0	0	0	0	0	0	0	0	0
		point82	82										
Spectrum Center Boulevard WB2		point66	66	132	35	6	35	0	0	0	0	0	0
		point65	65	132	35	6	35	0	0	0	0	0	0
		point112	112	132	35	6	35	0	0	0	0	0	0
		point111	111	132	35	6	35	0	0	0	0	0	0
		point125	125										
Spectrum Center Boulevard WB1		point64	64	132	35	6	35	0	0	0	0	0	0
		point63	63	132	35	6	35	0	0	0	0	0	0
		point115	115	132	35	6	35	0	0	0	0	0	0
		point114	114	132	35	6	35	0	0	0	0	0	0
		point126	126										
Spectrum Center Boulevard EB1		point128	128	60	35	3	35	0	0	0	0	0	0
		point117	117	60	35	3	35	0	0	0	0	0	0
		point119	119	60	35	3	35	0	0	0	0	0	0
		point61	61	60	35	3	35	0	0	0	0	0	0
		point62	62										
Spectrum Center Boulevard EB2		point127	127	60	35	3	35	0	0	0	0	0	0
		point122	122	60	35	3	35	0	0	0	0	0	0
		point123	123	60	35	3	35	0	0	0	0	0	0
		point59	59	60	35	3	35	0	0	0	0	0	0
		point60	60										
Kearny Villa Road NB2		point28	28	126	40	0	0	0	0	6	40	0	0
		point27	27	126	40	0	0	0	0	6	40	0	0
		point35	35	126	40	0	0	0	0	6	40	0	0

	point36	36										
Kearny Villa Road NB1	point30	30	126	40	0	0	0	0	6	40	0	0
	point29	29	126	40	0	0	0	0	6	40	0	0
	point37	37	126	40	0	0	0	0	6	40	0	0
	point38	38										
Kearny Villa Road SB1	point40	40	108	40	0	0	0	0	0	0	0	0
	point23	23	108	40	0	0	0	0	0	0	0	0
	point31	31	108	40	0	0	0	0	0	0	0	0
	point32	32										
Kearny Villa Road SB2	point42	42	108	40	0	0	0	0	0	0	0	0
	point25	25	108	40	0	0	0	0	0	0	0	0
	point33	33	108	40	0	0	0	0	0	0	0	0
	point34	34										
Lightwave Avenue WB2	point50	50	78	35	6	35	0	0	0	0	0	0
	point49	49	78	35	6	35	0	0	0	0	0	0
	point91	91	78	35	6	35	0	0	0	0	0	0
	point90	90	78	35	6	35	0	0	0	0	0	0
	point89	89	78	35	6	35	0	0	0	0	0	0
	point88	88	78	35	6	35	0	0	0	0	0	0
	point87	87										
Lightwave Avenue WB1	point48	48	78	35	6	35	0	0	0	0	0	0
	point47	47	78	35	6	35	0	0	0	0	0	0
	point97	97	78	35	6	35	0	0	0	0	0	0
	point96	96	78	35	6	35	0	0	0	0	0	0
	point95	95	78	35	6	35	0	0	0	0	0	0
	point94	94	78	35	6	35	0	0	0	0	0	0
	point93	93										
Lightwave Avenue EB1	point99	99	84	35	3	35	0	0	0	0	0	0
	point100	100	84	35	3	35	0	0	0	0	0	0
	point101	101	84	35	3	35	0	0	0	0	0	0
	point102	102	84	35	3	35	0	0	0	0	0	0
	point103	103	84	35	3	35	0	0	0	0	0	0
	point43	43	84	35	3	35	0	0	0	0	0	0
	point44	44										
LIghtwave Avenue EB2	point105	105	84	35	3	35	0	0	0	0	0	0
	point106	106	84	35	3	35	0	0	0	0	0	0

		point107	107	84	35	3	35	0	0	0	0	0	0
		point108	108	84	35	3	35	0	0	0	0	0	0
		point109	109	84	35	3	35	0	0	0	0	0	0
		point45	45	84	35	3	35	0	0	0	0	0	0
		point46	46										

dBF Associates, Inc.						**20 June 2018**					
SPF						**TNM 2.5**					
INPUT: RECEIVERS											
PROJECT/CONTRACT:	**Sunroad Ariva 6**										
RUN:	**Measured**										
Receiver											
Name	**No.**	**#DUs**	**Coordinates (ground)**			**Height**	**Input Sound Levels and Criteria**				**Active**
			X	**Y**	**Z**	**above**	**Existing**	**Impact Criteria**		**NR**	**in**
						Ground	**LAeq1h**	**LAeq1h**	**Sub'l**	**Goal**	**Calc.**
			ft	ft	ft	ft	dBA	dBA	dB	dB	
ML1	1	1	7,130.1	9,640.8	3.00	5.00	69.40	66	10.0	8.0	Y
ML2	2	1	7,319.0	9,170.8	0.00	5.00	63.70	66	10.0	8.0	Y
ML3	3	1	7,588.5	9,798.7	0.00	5.00	64.20	66	10.0	8.0	Y
ML4	5	1	7,453.7	9,409.7	0.00	75.00	67.60	66	10.0	8.0	Y

dBF Associates, Inc.					**20 June 2018**														
SPF					**TNM 2.5**														
INPUT: BARRIERS																			
PROJECT/CONTRACT:	**Sunroad Ariva 6**																		
RUN:	**Measured**																		
Barrier									**Points**										
Name	**Type**	**Height**		**If Wall**	**If Berm**			**Add'tnl**	**Name**	**No.**	**Coordinates (bottom)**			**Height**	**Segment**				
		Min	**Max**	**$ per**	**$ per**	**Top**	**Run:Rise**	**$ per**			**X**	**Y**	**Z**	**at**	**Seg Ht Perturbs**			**On**	**Important**
				Unit	**Unit**	**Width**		**Unit**						**Point**	**Incre-**	**#Up**	**#Dn**	**Struct?**	**Reflec-**
				Area	**Vol.**			**Length**							**ment**				**tions?**
		ft	ft	$/sq ft	$/cu yd	ft	ft:ft	$/ft			ft	ft	ft	ft	ft				
Garage	W	0.00	99.99	0.00				0.00	point1	1	7,442.5	9,321.2	0.00	60.00	0.00	0	0		
									point2	2	7,373.8	9,195.8	0.00	60.00	0.00	0	0		
									point3	3	7,371.6	9,163.2	0.00	60.00	0.00	0	0		
									point4	4	7,512.3	9,088.3	0.00	60.00	0.00	0	0		
									point5	5	7,584.2	9,062.9	0.00	60.00	0.00	0	0		
									point6	6	7,597.8	9,166.8	0.00	60.00	0.00	0	0		
									point7	7	7,595.5	9,409.9	0.00	60.00	0.00	0	0		
									point8	8	7,442.4	9,415.8	0.00	60.00					
Ashford	W	0.00	99.99	0.00				0.00	point9	9	7,095.6	9,359.1	0.00	90.00	0.00	0	0		
									point10	10	7,125.1	9,343.1	0.00	90.00	0.00	0	0		
									point11	11	7,140.2	9,370.6	0.00	90.00	0.00	0	0		
									point12	12	7,173.8	9,356.1	0.00	90.00	0.00	0	0		
									point13	13	7,193.6	9,394.5	0.00	90.00	0.00	0	0		
									point14	14	7,370.1	9,297.6	0.00	90.00	0.00	0	0		
									point15	15	7,347.3	9,256.1	0.00	90.00	0.00	0	0		
									point16	16	7,329.7	9,267.1	0.00	90.00	0.00	0	0		
									point17	17	7,291.5	9,202.6	0.00	90.00	0.00	0	0		
									point18	18	7,074.5	9,320.5	0.00	90.00	0.00	0	0		
									point19	19	7,095.6	9,359.1	0.00	90.00					
SR 163 K-Rail	W	0.00	99.99	0.00				0.00	point38	38	6,124.3	8,227.3	0.00	3.50	0.00	0	0		
									point39	39	7,429.6	10,802.4	0.00	3.50					

dBF Associates, Inc.		20 June 2018	
SPF		TNM 2.5	
		Calculated with TNM 2.5	
RESULTS: SOUND LEVELS			
PROJECT/CONTRACT:	Sunroad Ariva 6		
RUN:	Measured		
BARRIER DESIGN:	INPUT HEIGHTS		Average pavement type shall be used unless
			a State highway agency substantiates the use
ATMOSPHERICS:	68 deg F, 50% RH		of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ML1	1	1	69.4	71.3	66	1.9	10	Snd Lvl	71.3	0.0	8	-8.0
ML2	2	1	63.7	63.9	66	0.2	10	----	63.9	0.0	8	-8.0
ML3	3	1	64.2	63.5	66	-0.7	10	----	63.5	0.0	8	-8.0
ML4	5	1	67.6	67.2	66	-0.4	10	Snd Lvl	67.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

dBF Associates, Inc.					**20 June 2018**							
SPF					**TNM 2.5**							
INPUT: ROADWAYS							**Average pavement type shall be used unless**					
PROJECT/CONTRACT:	**Sunroad Ariva 6**						**a State highway agency substantiates the use**					
RUN:	**Future**						**of a different type with the approval of FHWA**					
Roadway		**Points**										
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**			**Flow Control**			**Segment**		
				X	**Y**	**Z**	**Control Device**	**Speed Constraint**	**Percent Vehicles Affected**	**Pvmt Type**	**On Struct?**	
	ft			ft	ft	ft		mph	%			
SR 163 NB1	33.0	point1	1	6,139.5	8,219.7	0.00				Average		
		point2	2	7,444.8	10,794.7	0.00						
SR 164 NB2	12.0	point3	3	6,150.2	8,214.2	0.00				Average		
		point4	4	7,455.5	10,789.3	0.00						
SR 163 NB3	12.0	point5	5	6,160.9	8,208.8	0.00				Average		
		point6	6	7,466.2	10,783.9	0.00						
SR 163 NB4	58.0	point7	7	6,171.6	8,203.4	0.00				Average		
		point8	8	7,476.9	10,778.4	0.00						
SR 163 SB1	33.0	point10	10	7,414.5	10,810.1	0.00				Average		
		point9	9	6,109.2	8,235.0	0.00						
SR 163 SB2	12.0	point12	12	7,403.8	10,815.5	0.00				Average		
		point11	11	6,098.5	8,240.5	0.00						
SR 163 SB3	12.0	point14	14	7,393.1	10,820.9	0.00				Average		
		point13	13	6,087.8	8,245.9	0.00						
SR 163 SB4	12.0	point16	16	7,382.4	10,826.4	0.00				Average		
		point15	15	6,077.1	8,251.3	0.00						
Sunroad Centrum Lane NB1	21.0	point67	67	7,635.4	9,040.5	0.00				Average		
		point68	68	7,642.2	9,072.2	0.00				Average		
		point69	69	7,649.1	9,124.7	0.00				Average		
		point70	70	7,650.8	9,166.7	0.00				Average		
		point71	71	7,650.2	9,796.1	0.00						
Sunroad Centrum Lane NB2	12.0	point72	72	7,647.1	9,038.0	0.00				Average		
		point73	73	7,654.1	9,070.2	0.00				Average		
		point74	74	7,661.1	9,123.6	0.00				Average		
		point75	75	7,662.8	9,166.5	0.00				Average		

		point76	76	7,662.2	9,796.1	0.00					
Sunroad Centrum Lane SB1	21.0	point81	81	7,630.2	9,796.1	0.00				Average	
		point80	80	7,630.8	9,167.1	0.00				Average	
		point79	79	7,629.2	9,126.4	0.00				Average	
		point78	78	7,622.5	9,075.7	0.00				Average	
		point77	77	7,615.9	9,044.8	0.00					
Sunroad Centrum Lane SB2	12.0	point86	86	7,618.2	9,796.1	0.00				Average	
		point85	85	7,618.8	9,167.3	0.00				Average	
		point84	84	7,617.2	9,127.4	0.00				Average	
		point83	83	7,610.7	9,077.7	0.00				Average	
		point82	82	7,604.1	9,047.3	0.00					
Spectrum Center Boulevard WB2	12.0	point66	66	8,613.7	9,019.1	0.00				Average	
		point65	65	7,643.8	9,018.2	0.00				Average	
		point112	112	7,557.6	9,028.9	0.00				Average	
		point111	111	7,474.7	9,061.4	0.00				Average	
		point125	125	6,948.7	9,350.1	0.00					
Spectrum Center Boulevard WB1	29.0	point64	64	8,613.7	9,006.1	0.00				Average	
		point63	63	7,643.8	9,005.2	0.00				Average	
		point115	115	7,555.4	9,016.0	0.00				Average	
		point114	114	7,468.4	9,050.0	0.00				Average	
		point126	126	6,942.5	9,338.8	0.00					
Spectrum Center Boulevard EB1	29.0	point128	128	6,929.0	9,314.2	0.00				Average	
		point117	117	7,455.0	9,025.5	0.00				Average	
		point119	119	7,547.4	8,989.1	0.00				Average	
		point61	61	7,643.8	8,977.2	0.00				Average	
		point62	62	8,613.7	8,978.1	0.00					
Spectrum Center Boulevard EB2	12.0	point127	127	6,922.7	9,302.8	0.00				Average	
		point122	122	7,448.7	9,014.1	0.00				Average	
		point123	123	7,545.2	8,976.3	0.00				Average	
		point59	59	7,643.8	8,964.2	0.00				Average	
		point60	60	8,613.7	8,965.1	0.00					
Kearny Villa Road NB2	12.0	point28	28	6,307.4	8,132.8	0.00				Average	
		point27	27	6,817.2	9,120.4	0.00				Average	
		point35	35	7,266.4	10,003.6	0.00				Average	
		point36	36	7,614.5	10,711.5	0.00					
Kearny Villa Road NB1	34.0	point30	30	6,298.5	8,137.4	0.00				Average	
		point29	29	6,808.3	9,125.0	0.00				Average	
		point37	37	7,257.4	10,008.0	0.00				Average	
		point38	38	7,605.5	10,715.9	0.00					

Kearny Villa Road SB1	34.0	point40	40	7,576.8	10,730.0	0.00				Average	
		point23	23	7,228.8	10,022.3	0.00				Average	
		point31	31	6,779.9	9,139.7	0.00				Average	
		point32	32	6,270.1	8,152.1	0.00					
Kearny Villa Road SB2	12.0	point42	42	7,567.8	10,734.4	0.00				Average	
		point25	25	7,219.9	10,026.9	0.00				Average	
		point33	33	6,771.0	9,144.2	0.00				Average	
		point34	34	6,261.2	8,156.7	0.00					
Lightwave Avenue WB2	12.0	point50	50	8,309.8	10,043.5	0.00				Average	
		point49	49	7,796.4	9,900.3	0.00				Average	
		point91	91	7,669.5	9,876.4	0.00				Average	
		point90	90	7,568.3	9,873.9	0.00				Average	
		point89	89	7,475.0	9,884.4	0.00				Average	
		point88	88	7,372.7	9,910.6	0.00				Average	
		point87	87	7,276.7	9,950.9	0.00					
Lightwave Avenue WB1	25.0	point48	48	8,313.1	10,032.0	0.00				Average	
		point47	47	7,799.6	9,888.7	0.00				Average	
		point97	97	7,677.1	9,865.1	0.00				Average	
		point96	96	7,581.8	9,861.4	0.00				Average	
		point95	95	7,475.3	9,872.1	0.00				Average	
		point94	94	7,368.7	9,899.3	0.00				Average	
		point93	93	7,271.3	9,940.2	0.00					
Lightwave Avenue EB1	25.0	point99	99	7,263.0	9,917.5	0.00				Average	
		point100	100	7,363.3	9,875.8	0.00				Average	
		point101	101	7,464.2	9,849.7	0.00				Average	
		point102	102	7,575.1	9,837.6	0.00				Average	
		point103	103	7,683.7	9,841.7	0.00				Average	
		point43	43	7,806.0	9,865.6	0.00				Average	
		point44	44	8,319.5	10,008.9	0.00					
LIghtwave Avenue EB2	12.0	point105	105	7,255.0	9,908.1	0.00				Average	
		point106	106	7,363.1	9,863.2	0.00				Average	
		point107	107	7,461.0	9,838.1	0.00				Average	
		point108	108	7,581.9	9,825.4	0.00				Average	
		point109	109	7,687.3	9,830.0	0.00				Average	
		point45	45	7,809.3	9,854.0	0.00				Average	
		point46	46	8,322.7	9,997.3	0.00					

dBF Associates, Inc. **20 June 2018**
SPF **TNM 2.5**

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: **Sunroad Ariva 6**
RUN: **Future**

Roadway	Points												
Name	Name	No.	Segment										
			Autos		MTrucks		HTrucks		Buses		Motorcycles		
			V	S	V	S	V	S	V	S	V	S	
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	
SR 163 NB1	point1	1	2029	65	32	65	32	65	0	0	11	65	
	point2	2											
SR 164 NB2	point3	3	2029	65	32	65	32	65	0	0	11	65	
	point4	4											
SR 163 NB3	point5	5	2029	65	32	65	32	65	0	0	11	65	
	point6	6											
SR 163 NB4	point7	7	2029	65	32	65	32	65	0	0	11	65	
	point8	8											
SR 163 SB1	point10	10	2029	65	32	65	32	65	0	0	11	65	
	point9	9											
SR 163 SB2	point12	12	2029	65	32	65	32	65	0	0	11	65	
	point11	11											
SR 163 SB3	point14	14	2029	65	32	65	32	65	0	0	11	65	
	point13	13											
SR 163 SB4	point16	16	2029	65	32	65	32	65	0	0	11	65	
	point15	15											
Sunroad Centrum Lane NB1	point67	67	120	25	0	0	0	0	0	0	0	0	
	point68	68	120	25	0	0	0	0	0	0	0	0	
	point69	69	120	25	0	0	0	0	0	0	0	0	
	point70	70	120	25	0	0	0	0	0	0	0	0	
	point71	71											
Sunroad Centrum Lane NB2	point72	72	120	25	0	0	0	0	0	0	0	0	
	point73	73	120	25	0	0	0	0	0	0	0	0	

	point74	74	120	25	0	0	0	0	0	0	0	0
	point75	75	120	25	0	0	0	0	0	0	0	0
	point76	76										
Sunroad Centrum Lane SB1	point81	81	120	25	0	0	0	0	0	0	0	0
	point80	80	120	25	0	0	0	0	0	0	0	0
	point79	79	120	25	0	0	0	0	0	0	0	0
	point78	78	120	25	0	0	0	0	0	0	0	0
	point77	77										
Sunroad Centrum Lane SB2	point86	86	120	25	0	0	0	0	0	0	0	0
	point85	85	120	25	0	0	0	0	0	0	0	0
	point84	84	120	25	0	0	0	0	0	0	0	0
	point83	83	120	25	0	0	0	0	0	0	0	0
	point82	82										
Spectrum Center Boulevard WB2	point66	66	307	35	15	35	0	0	0	0	0	0
	point65	65	307	35	15	35	0	0	0	0	0	0
	point112	112	307	35	15	35	0	0	0	0	0	0
	point111	111	307	35	15	35	0	0	0	0	0	0
	point125	125										
Spectrum Center Boulevard WB1	point64	64	307	35	15	35	0	0	0	0	0	0
	point63	63	307	35	15	35	0	0	0	0	0	0
	point115	115	307	35	15	35	0	0	0	0	0	0
	point114	114	307	35	15	35	0	0	0	0	0	0
	point126	126										
Spectrum Center Boulevard EB1	point128	128	307	35	15	35	0	0	0	0	0	0
	point117	117	307	35	15	35	0	0	0	0	0	0
	point119	119	307	35	15	35	0	0	0	0	0	0
	point61	61	307	35	15	35	0	0	0	0	0	0
	point62	62										
Spectrum Center Boulevard EB2	point127	127	307	35	15	35	0	0	0	0	0	0
	point122	122	307	35	15	35	0	0	0	0	0	0
	point123	123	307	35	15	35	0	0	0	0	0	0
	point59	59	307	35	15	35	0	0	0	0	0	0
	point60	60										
Kearny Villa Road NB2	point28	28	390	40	0	0	0	0	10	40	0	0
	point27	27	390	40	0	0	0	0	10	40	0	0
	point35	35	390	40	0	0	0	0	10	40	0	0

		point36	36										
Kearny Villa Road NB1		point30	30	390	40	0	0	0	0	10	40	0	0
		point29	29	390	40	0	0	0	0	10	40	0	0
		point37	37	390	40	0	0	0	0	10	40	0	0
		point38	38										
Kearny Villa Road SB1		point40	40	390	40	0	0	0	0	10	40	0	0
		point23	23	390	40	0	0	0	0	10	40	0	0
		point31	31	390	40	0	0	0	0	10	40	0	0
		point32	32										
Kearny Villa Road SB2		point42	42	390	40	0	0	0	0	10	40	0	0
		point25	25	390	40	0	0	0	0	10	40	0	0
		point33	33	390	40	0	0	0	0	10	40	0	0
		point34	34										
Lightwave Avenue WB2		point50	50	303	35	18	35	0	0	0	0	0	0
		point49	49	303	35	18	35	0	0	0	0	0	0
		point91	91	303	35	18	35	0	0	0	0	0	0
		point90	90	303	35	18	35	0	0	0	0	0	0
		point89	89	303	35	18	35	0	0	0	0	0	0
		point88	88	303	35	18	35	0	0	0	0	0	0
		point87	87										
Lightwave Avenue WB1		point48	48	303	35	18	35	0	0	0	0	0	0
		point47	47	303	35	18	35	0	0	0	0	0	0
		point97	97	303	35	18	35	0	0	0	0	0	0
		point96	96	303	35	18	35	0	0	0	0	0	0
		point95	95	303	35	18	35	0	0	0	0	0	0
		point94	94	303	35	18	35	0	0	0	0	0	0
		point93	93										
Lightwave Avenue EB1		point99	99	303	35	18	35	0	0	0	0	0	0
		point100	100	303	35	18	35	0	0	0	0	0	0
		point101	101	303	35	18	35	0	0	0	0	0	0
		point102	102	303	35	18	35	0	0	0	0	0	0
		point103	103	303	35	18	35	0	0	0	0	0	0
		point43	43	303	35	18	35	0	0	0	0	0	0
		point44	44										
LIghtwave Avenue EB2		point105	105	303	35	18	35	0	0	0	0	0	0
		point106	106	303	35	18	35	0	0	0	0	0	0

		point107	107	303	35	18	35	0	0	0	0	0	0
		point108	108	303	35	18	35	0	0	0	0	0	0
		point109	109	303	35	18	35	0	0	0	0	0	0
		point45	45	303	35	18	35	0	0	0	0	0	0
		point46	46										

dBF Associates, Inc.						**20 June 2018**					
SPF						**TNM 2.5**					
INPUT: RECEIVERS											
PROJECT/CONTRACT:	**Sunroad Ariva 6**										
RUN:	**Future**										
Receiver											
Name	**No.**	**#DUs**	**Coordinates (ground)**			**Height**	**Input Sound Levels and Criteria**				**Active**
			X	**Y**	**Z**	**above**	**Existing**	**Impact Criteria**		**NR**	**in**
						Ground	**LAeq1h**	**LAeq1h**	**Sub'l**	**Goal**	**Calc.**
			ft	ft	ft	ft	dBA	dBA	dB	dB	
Street Level Plaza 1	8	1	7,015.3	9,361.2	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 2	9	1	7,058.4	9,446.4	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 3	10	1	7,102.5	9,389.6	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 4	11	1	7,157.2	9,440.1	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 5	12	1	7,166.6	9,392.8	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 6	13	1	7,220.2	9,418.0	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 7	14	1	7,282.3	9,384.4	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 8	15	1	7,338.0	9,351.8	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 9	16	1	7,396.8	9,317.1	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 10	17	1	7,400.0	9,382.3	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 11	18	1	7,272.8	9,454.8	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 12	19	1	7,291.7	9,513.6	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 13	20	1	7,342.2	9,519.9	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 14	21	1	7,398.9	9,513.6	0.00	5.00	0.00	66	10.0	8.0	Y
Street Level Plaza 15	22	1	7,439.9	9,496.8	0.00	5.00	0.00	66	10.0	8.0	Y
Podium Courtyard SW	23	1	7,238.7	9,562.8	0.00	35.00	0.00	66	10.0	8.0	Y
Podium Courtyard S	24	1	7,416.4	9,568.1	0.00	35.00	0.00	66	10.0	8.0	Y
Podium Courtyard E	25	1	7,462.6	9,652.2	0.00	35.00	0.00	66	10.0	8.0	Y
Podium Courtyard NW	26	1	7,301.8	9,722.6	0.00	35.00	0.00	66	10.0	8.0	Y
Terrace	28	1	7,267.1	9,459.4	0.00	45.00	0.00	66	10.0	8.0	Y
W	29	1	7,068.5	9,493.0	0.00	5.00	0.00	66	10.0	8.0	Y
W	30	1	7,155.7	9,666.5	0.00	5.00	0.00	66	10.0	8.0	Y

NW	31	1	7,256.6	9,867.6	0.00	5.00	0.00	66	10.0	8.0	Y
N	32	1	7,403.7	9,791.9	0.00	5.00	0.00	66	10.0	8.0	Y
NE	33	1	7,592.9	9,788.8	0.00	5.00	0.00	66	10.0	8.0	Y
E	34	1	7,596.1	9,643.7	0.00	5.00	0.00	66	10.0	8.0	Y
SE	35	1	7,592.9	9,504.0	0.00	5.00	0.00	66	10.0	8.0	Y
S	36	1	7,532.0	9,504.0	0.00	5.00	0.00	66	10.0	8.0	Y

dBF Associates, Inc. **20 June 2018**
SPF **TNM 2.5**

INPUT: BARRIERS
PROJECT/CONTRACT: **Sunroad Ariva 6**
RUN: **Future**

Barrier									Points										
Name	Type	Height		If Wall	If Berm			Add'tnl	Name	No.	Coordinates (bottom)			Height	Segment				
		Min	Max	$ per Unit Area	$ per Unit Vol.	Top Width	Run:Rise	$ per Unit Length			X	Y	Z	at Point	Seg Ht Perturbs Incre-ment	#Up	#Dn	On Struct?	Important Reflec-tions?
		ft	ft	$/sq ft	$/cu yd	ft	ft:ft	$/ft			ft	ft	ft	ft	ft				
Garage	W	0.00	99.99	0.00				0.00	point1	1	7,442.5	9,321.2	0.00	60.00	0.00	0	0		
									point2	2	7,373.8	9,195.8	0.00	60.00	0.00	0	0		
									point3	3	7,371.6	9,163.2	0.00	60.00	0.00	0	0		
									point4	4	7,512.3	9,088.3	0.00	60.00	0.00	0	0		
									point5	5	7,584.2	9,062.9	0.00	60.00	0.00	0	0		
									point6	6	7,597.8	9,166.8	0.00	60.00	0.00	0	0		
									point7	7	7,595.5	9,409.9	0.00	60.00	0.00	0	0		
									point8	8	7,442.4	9,415.8	0.00	60.00					
Ashford	W	0.00	99.99	0.00				0.00	point9	9	7,095.6	9,359.1	0.00	90.00	0.00	0	0		
									point10	10	7,125.1	9,343.1	0.00	90.00	0.00	0	0		
									point11	11	7,140.2	9,370.6	0.00	90.00	0.00	0	0		
									point12	12	7,173.8	9,356.1	0.00	90.00	0.00	0	0		
									point13	13	7,193.6	9,394.5	0.00	90.00	0.00	0	0		
									point14	14	7,370.1	9,297.6	0.00	90.00	0.00	0	0		
									point15	15	7,347.3	9,256.1	0.00	90.00	0.00	0	0		
									point16	16	7,329.7	9,267.1	0.00	90.00	0.00	0	0		
									point17	17	7,291.5	9,202.6	0.00	90.00	0.00	0	0		
									point18	18	7,074.5	9,320.5	0.00	90.00	0.00	0	0		
									point19	19	7,095.6	9,359.1	0.00	90.00					
Project Building	W	0.00	99.99	0.00				0.00	point20	20	7,260.2	9,863.3	0.00	75.00	0.00	0	0		
									point21	21	7,063.3	9,468.5	0.00	75.00	0.00	0	0		
									point22	22	7,125.4	9,435.8	0.00	75.00	0.00	0	0		
									point23	23	7,148.0	9,473.6	0.00	75.00	0.00	0	0		
									point24	24	7,245.8	9,434.5	0.00	75.00	0.00	0	0		
									point25	25	7,278.6	9,494.7	0.00	75.00	0.00	0	0		
									point26	26	7,184.7	9,551.4	0.00	75.00	0.00	0	0		
									point27	27	7,225.1	9,623.2	0.00	75.00	0.00	0	0		
									point28	28	7,359.4	9,550.5	0.00	75.00	0.00	0	0		
									point29	29	7,439.6	9,710.7	0.00	75.00	0.00	0	0		
									point30	30	7,521.5	9,711.9	0.00	75.00	0.00	0	0		
									point31	31	7,521.4	9,588.7	0.00	75.00	0.00	0	0		
									point32	32	7,468.2	9,587.0	0.00	75.00	0.00	0	0		
									point33	33	7,467.1	9,512.3	0.00	75.00	0.00	0	0		
									point34	34	7,590.7	9,507.8	0.00	75.00	0.00	0	0		
									point35	35	7,590.4	9,783.2	0.00	75.00	0.00	0	0		

									point36	36	7,401.1	9,784.9	0.00	75.00	0.00	0	0		
									point37	37	7,260.2	9,863.3	0.00	75.00					
SR 163 K-Rail	W	0.00	99.99	0.00				0.00	point38	38	6,124.3	8,227.3	0.00	3.50	0.00	0	0		
									point39	39	7,429.6	10,802.4	0.00	3.50					

dBF Associates, Inc. | **20 June 2018**
SPF | **TNM 2.5**
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: **Sunroad Ariva 6**
RUN: **Future**
BARRIER DESIGN: **INPUT HEIGHTS**
ATMOSPHERICS: **68 deg F, 50% RH**

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Street Level Plaza 1	8	1	0.0	73.3	66	73.3	10	Snd Lvl	73.3	0.0	8	-8.0
Street Level Plaza 2	9	1	0.0	72.9	66	72.9	10	Snd Lvl	72.9	0.0	8	-8.0
Street Level Plaza 3	10	1	0.0	69.1	66	69.1	10	Snd Lvl	69.1	0.0	8	-8.0
Street Level Plaza 4	11	1	0.0	63.4	66	63.4	10	----	63.4	0.0	8	-8.0
Street Level Plaza 5	12	1	0.0	64.7	66	64.7	10	----	64.7	0.0	8	-8.0
Street Level Plaza 6	13	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0
Street Level Plaza 7	14	1	0.0	54.7	66	54.7	10	----	54.7	0.0	8	-8.0
Street Level Plaza 8	15	1	0.0	49.9	66	49.9	10	----	49.9	0.0	8	-8.0
Street Level Plaza 9	16	1	0.0	50.2	66	50.2	10	----	50.2	0.0	8	-8.0
Street Level Plaza 10	17	1	0.0	51.3	66	51.3	10	----	51.3	0.0	8	-8.0
Street Level Plaza 11	18	1	0.0	36.8	66	36.8	10	----	36.8	0.0	8	-8.0
Street Level Plaza 12	19	1	0.0	38.0	66	38.0	10	----	38.0	0.0	8	-8.0
Street Level Plaza 13	20	1	0.0	39.7	66	39.7	10	----	39.7	0.0	8	-8.0
Street Level Plaza 14	21	1	0.0	41.8	66	41.8	10	----	41.8	0.0	8	-8.0
Street Level Plaza 15	22	1	0.0	49.4	66	49.4	10	----	49.4	0.0	8	-8.0
Podium Courtyard SW	23	1	0.0	40.6	66	40.6	10	----	40.6	0.0	8	-8.0
Podium Courtyard S	24	1	0.0	41.1	66	41.1	10	----	41.1	0.0	8	-8.0
Podium Courtyard E	25	1	0.0	40.5	66	40.5	10	----	40.5	0.0	8	-8.0
Podium Courtyard NW	26	1	0.0	51.7	66	51.7	10	----	51.7	0.0	8	-8.0
Terrace	28	1	0.0	39.7	66	39.7	10	----	39.7	0.0	8	-8.0
W	29	1	0.0	73.5	66	73.5	10	Snd Lvl	73.5	0.0	8	-8.0
W	30	1	0.0	73.4	66	73.4	10	Snd Lvl	73.4	0.0	8	-8.0
NW	31	1	0.0	73.6	66	73.6	10	Snd Lvl	73.6	0.0	8	-8.0
N	32	1	0.0	66.4	66	66.4	10	Snd Lvl	66.4	0.0	8	-8.0

RESULTS: SOUND LEVELS **Sunroad Ariva 6**

NE	33	1	0.0	66.6	66	66.6	10	Snd Lvl	66.6	0.0	8	-8.0
E	34	1	0.0	58.4	66	58.4	10	----	58.4	0.0	8	-8.0
SE	35	1	0.0	57.7	66	57.7	10	----	57.7	0.0	8	-8.0
S	36	1	0.0	50.5	66	50.5	10	----	50.5	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	28	0.0	0.0	0.0
All Impacted	8	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Waste Management Plan
Sunroad Centrum Phase 6

PTS No. 565879

Prepared for:

City of San Diego

Environmental Services Department

9601 Ridgehaven Court
San Diego, CA 92123

March 21, 2018

Prepared By:

Tom Story Consulting

San Diego, CA 92120

858 229-5442

BACKGROUND

The State of California "Integrated Waste Management Act of 1989" requires local jurisdictions to prepare and implement plans to divert at least 50% of solid waste from landfills through source reduction, recycling, composting, and transformation. Assembly Bill 341 then set a new target at a 75% minimum diversion rate. The City of San Diego has enacted codes and policies aimed at exceeding the 50% diversion target and in conformance with AB 341, including the Refuse and Recyclable Materials Storage Regulations Ordinance (Municipal Code Chapter 14, Article 2, Division 8), Recycling Ordinance (Municipal Code Chapter 6, Article 6, Division 7), and the Construction and Demolition Debris Deposit Recycling Ordinance (Municipal Code Chapter 6, Article 6, Division 6). Projections indicate that diversion rates achieved by these regulations and ordinances alone will not be sufficient to achieve diversion targets consistent with City policies regarding waste reduction, recycling, and product procurement. To compound the problem the City's Miramar Landfill – the only municipal landfill in the City – is projected to reach capacity by 2022, making efforts to preserve landfill space especially important.

The City of San Diego CEQA Significance Determination Thresholds (January 2011) identifies the threshold level at which a proposed construction, demolition, and/or renovation project may have potentially significant direct or cumulative impacts on solid waste disposal. For projects that exceed these thresholds, preparation of a Waste Management Plan is required to ensure that overall waste produced by these projects is reduced sufficiently to comply with City policies regarding waste reduction, recycling, and product procurement. Implementation of a project specific Waste Management Plan is required in order to mitigate cumulative impacts of projects proposing construction, demolition, and/or renovation of 40,000 square feet or more of building space (generating 60 tons or more of waste), and to mitigate direct impacts of projects of 1,000,000 square feet or more (generating 1,500 tons of waste or more).

The Sunroad Centrum Phase 6 development proposes to construct 442 multi-family dwelling units in a single building totaling 866,060 gross square feet (gsf) including structured parking, and therefore has the potential to have cumulative impacts to the City's solid waste facilities. This Waste Management Plan has been prepared to identify mitigation measures that will be incorporated into the demolition, grading, construction, and operation (occupancy) phases of the development that will maximize diversion of solid waste from the Miramar Landfill and minimize demand on solid waste services. The plan has been prepared in accordance with the standards of the City Environmental Health Services Department for waste management plans and compliance with local and state regulations concerning diversion of solid waste materials.

PROJECT DESCRIPTION

Sunroad Centrum Phase 6 is a 442-unit residential development on 5.83 acres in the Kearny Mesa community of San Diego. It is developed in accordance with the New Century City Master Plan on the former General Dynamics property, the majority of which has been built out with office, industrial, and residential development. The property is located between Lightwave Avenue, Spectrum Center Drive, Kearny Villa Road (see Figure 1 - Vicinity Map).

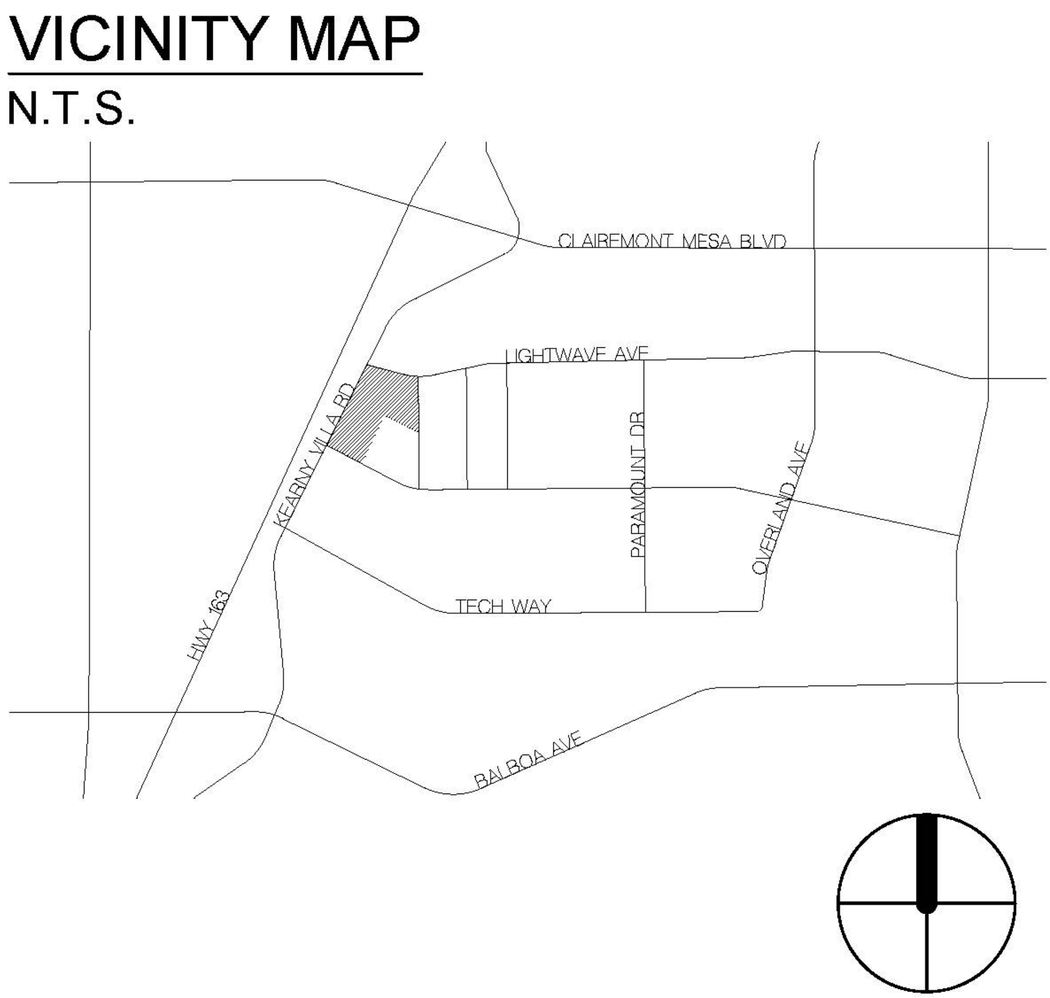

Figure 1 – Vicinity Map

The 5.83-acre site has been previously graded and partially developed with temporary surface parking and landscaping, which will be removed as part of the proposed project. The balance of the site has been graded and cleared in accordance with previous City-approved permits. The proposed development will occur on lots 1-5, of vesting tentative map No. 2003387 currently under review by the City of San Diego.

New construction will consist of the following:

- One 5-story residential building, 442 units, Type III construction over 2 levels Type I subterranean parking
- One on-site recreation center
- Landscaping of grounds

City approvals required prior to construction include a Vesting Tentative Map, Planned Development Permit, Grading Permit for excavation, and building permits.

WASTE GENERATION IMPACTS

Demolition Phase Waste

Demolition of the project will consist of removal of an existing (asphalt and concrete) surface parking lot and its associated landscaping. Concrete will be recycled at a City certified recycling plant – currently proposed is the Hansen Aggregates West plant at Miramar (all waste service haulers listed in this report are subject to change prior to construction of the project; all haulers will be selected from the City list of certified facilities). Asphalt will be processed on-site and reused as base material for the new development. Plant material from the landscaping will be saved and reused onsite as much as possible. Any remaining landscape material will be recycled at the City of San Diego Miramar Greenery where it will be converted to mulch. Remaining mixed debris consisting of irrigation materials and miscellaneous trash will be hauled to the EDCO facility on Dalbergia Street in San Diego where it will be sorted for recycling at a certified rate of 72% diversion. There is no other brush or debris on the remainder of the site, which has been previously graded and cleared.

Estimated quantities of materials that will be removed are shown in Table 1.

Table 1 – Estimated Demolition Waste and Diversion

Item	Volume (c.y.)	Tons per c.y.	Tons	Recycle Facility*	Diversion Rate	Tons Diverted	Tons Disposed
Asphalt (broken)	555	0.7	388	Re-use on-site	100%	388	0.0
Concrete (broken)	120	1.2	144	Hansen Miramar	100%	144	0.0
Vegetation	100	0.15	15	Re-use on-site or Miramar Greenery	100%	15	0.0
Mixed Debris	10	1.19	12	EDCO San Diego	72%	8	4
TOTAL							
%	**100 %**		**100 %**			**99.5 %**	**0.5 %**

<u>Grading Phase Waste</u>

The 5.83-acre site has been previously graded and partially developed with temporary surface parking and associated landscaping, all of which will be removed as part of the proposed project. There will be no on-site grading other than excavation for subterranean parking under the buildings. An estimated 100,000 cubic yards (130,000 tons) – 100% of excavated material - will be exported to a legally permitted clean fill site in the San Diego region, where it will all be reused as fill for a future public or private development. The location of this fill site will be determined based on market conditions when the grading occurs.

The disposition of cleared vegetation in and around the existing surface parking lot is discussed in the previous section regarding Demolition Phase Waste. The project will generate no Grading Phase Waste.

<u>Construction Phase Waste</u>

The City of San Diego uses the standard for new construction that any use generates approximately 60 tons of waste per 40,000 s.f. during the construction phase. By using construction efficiencies, the project will generate only 36 tons of waste per 40,000 s.f. The developer will contract with a facility certified by the City of San Diego as a construction and demolition recycling facility. At the time of the preparation of this draft Waste Management Plan, the applicant plans to contract with EDCO Recovery and Transfer at 3660 Dalbergia Street in San Diego. This EDCO facility is certified as achieving a recycle diversion rate of 72% for mixed construction and demolition debris. Using these standards, Table 2 shows the estimated amount of waste that would be generated and diverted from the proposed development.

Table 2 – Estimated Construction Waste and Diversion

Source	Gross Sq. Ft. or C.Y.	Tons Generated	Percent Diverted	Tons Diverted	Tons Disposed
GRADING ACTIVITY					
Excavation (c.y.)	100,000	130,000	100 %	130,000	0
Grading Total	**100,000**	**130,000**	**100 %**	**130,000**	**0**
CONSTRUCTION ACTIVITY					
Phase 6 bldg (s.f.)	866,060	518	72%	373	145
Construction Total	**866,060**	**518**	**72 %**	**373**	**145**
ALL ACTIVITY					
Total		**130,518**	**99.9%**	**130,373**	**145**
%		**100.0 %**		**99.9 %**	**0.1 %**

WASTE DIVERSION AND REDUCTION MEASURES

Solid Waste Management Coordinator

During the demolition and construction phases of the project, the developer will designate a Solid Waste Management Coordinator ("SWMC") who will have the responsibility for implementing the waste reduction and diversion measures outlined in this Waste Management Plan. The SWMC will be vested with the authority to manage the contracts of all construction personnel and will enforce guidelines and procedures for all contractors. The SWMC will be responsible for compliance with this Waste Management Plan and the requirements of the City's Construction and Demolition Debris Deposit Recycling Ordinance. Specific responsibilities will include:

- Coordinate with contractors to estimate quantities of materials by type that will be generated from the demolition and construction phases of the development, the quantities that will be salvaged, and the method of effectuating salvage.
- Educate contractors regarding this Waste Management Plan and its requirements. Copies of the plan will be distributed to all contractors prior to work so that all workers, subcontractors, and suppliers will be trained on proper waste management practices.
- Conduct on-site inspections to ensure that materials are properly recycled, including availability, labeling, and use of recycling containers and bins, and notify contractors of any required corrections.
- Work with contractors to document quantities, dates, and recycle/disposal locations for all trash, salvage, reuse, and recycling materials.
- Review and update procedures and methods for each trade as necessary to implement the recycling objectives of this Waste Management Plan.

- Possess the contractual authority to require compliance with this Waste Management Plan by all contractors.
- Coordinate with the City Environmental Services Department and/or Mitigation Monitoring staff to schedule a pre-construction meeting for each phase of the development and site investigations to ensure compliance with this Waste Management Plan.

Waste Reduction

The Solid Waste Management Coordinator for Sunroad Centrum Residential Phase 6 will coordinate with contractors during the materials ordering phase and on-site during construction in order to ensure that construction efficiencies are incorporated to reduce over-purchasing of materials, minimize wasteful cuts, and re-use any cut ends. Waste materials will be reviewed for onsite reuse in construction to both minimize waste generation and reduce construction costs.

Any excess materials that cannot be reused will be placed in readily accessible bins and containers for recycling at a City of San Diego certified recycling facility. Recycling containers will be clearly identified with large signs in order to minimize misuse and contamination. Lists of acceptable and unacceptable materials will be posted on recycling bins throughout the project site. All recycled material signage will be visible on at least two sides of haul containers. City Environmental Services Department staff will be notified when construction begins so that they may verify that efficient debris management steps are being taken, and recycling measures will be reviewed at the pre-construction meeting.

Currently, Sunroad plans to send recyclable construction waste to EDCO at its San Diego facility at Dalbergia Street. This facility is certified by the City for diverting a minimum of 72% of mixed C&D waste from the landfill. Because certified diversion rates are updated quarterly and the decision on which facility will be contracted for waste hauling will be made at the time of construction based on market conditions and the facility's certified rate, Sunroad reserves the right to select a different facility as long as that facility is City certified to meet minimum diversion requirements.

TOTAL DEMOLITION AND CONSTRUCTION WASTE AND DIVERSION

The total amount of waste generated by the Sunroad Centrum Phase 6 development is shown in Table 3, along with the amounts of that waste that will be diverted from the landfill and the amount that will be disposed of in the landfill. Demolition waste will be source separated and diverted for recycling. Demolition asphalt will be reused on-site at a 100% diversion rate; concrete will be recycled at the Hansen Miramar recycling facility, which is certified at a 100% recycling rate; vegetation will be recycled at the Miramar Greenery, which is certified at a 100% recycling rate; remaining mixed debris from demolition (such as irrigation materials) will be commingled and recycled at the EDCO San Diego recycling facility, which is certified at a 72% recycle rate. All construction debris will be commingled and hauled to the EDCO San Diego recycling facility, which is certified at a 72% recycle rate. Table 3 describes the expected amounts and disposition of demolition and construction waste.

Total waste generated from the development is expected to be 1.077 tons, of which 907 tons (84 %) will be diverted from the landfill, and 170 tons (16 %) will be deposited in the landfill.

Table 3 – Total Demolition and Construction Waste and Diversion

Phase	Material	Tons Generated	Facility	% Diverted	Tons Diverted	Tons Disposed
Demolition						
	Asphalt	388	Re-use on-site	100 %	388	0.0
	Concrete (broken)	144	Hansen Miramar	100 %	144	0.0
	Vegetation	15	Miramar Greenery	100 %	15	0.0
	Mixed Debris	12	EDCO San Diego	72 %	8	4
Construction						
	Apartments	439	EDCO San Diego	72 %	316	123
	Parking Structure	79	EDCO San Diego	72 %	57	22
TOTAL		**1077**			**928**	**149**
%		**100 %**			**86 %**	**14 %**

OCCUPANCY PHASE WASTE

Table 142.08B of the San Diego Municipal Code requires that a 442 unit residential project provide a minimum of 864 sf for refuse storage and 864 sf for recyclable materials storage. The Sunroad Centrum 6 project will provide the required refuse and recyclable storage area for the total minimum of 1,728 sf of storage area.

<u>Typical Occupancy Waste</u>

Household occupancy waste typically consists of normal household and consumer materials, including large amounts of paper and plastic items from packaging of household goods, food and beverage containers, food scraps, and other miscellaneous metals and plastics. Household waste is generated mostly by the tenants of the building, with an inherent lack of control and predictability over waste diversion because of the large discrepancy of effort and compliance by each independent tenant. Compliance with household recycling goals will be improved with tenant educational programs and provision of readily accessed and clearly marked recycling collection facilities. The City of San Diego Recycling Ordinance (SDMC Chapter 6, Article 6, Division 7) requires the provision of on-site recycling services to occupants of multi-family residential facilities as well as occupant education.

Occupancy waste also includes yard waste, which will be generated by the landscape vendors hired by the property owner and its management company. This allows a greater element of control and predictability over diversion of yard waste than of household waste. While reduction and recycling of household waste requires consumer education and opportunity, yard waste will be reduced by use of drought-tolerant landscaping that generates fewer clippings. Generally, drought tolerant landscaping results in a 50% reduction of yard waste. Additional measures to reduce yard waste include the re-use of clippings on-site as mulch, and enforcing the removal of excess yard waste to the Miramar Greenery Facility.

Multi-family residential developments are expected to generate waste at the rate of 1.2 tons per year for each dwelling unit. Sunroad Centrum Phase 6 will consist of 442 units, and is expected to generate waste as follows during the occupancy phase:

No. of Units	*Waste/unit/yr*	*Waste/yr*
442	1.2 tons	530 tons

Household Waste Recycling

The development will be served by a private waste management hauler. In accordance with the City's Recycling Ordinance, recycling service will be provided to the residents. These services shall include the following;

- Each resident will be notified of the local trash regulations which encourage recycling of household waste such as plastic, glass, paper and cardboard.
- A separate colored recycling bin will be provided by the trash collection company, which will be located in the trash enclosure and will be picked up on a weekly basis.
- Each recreation center will be furnished with recycle bins as well as trash bins.
- Each bin will be clearly labeled for trash and recyclables.
- Building maintenance vendors will be instructed as to the proper collection and handling of recyclable materials collected from these bins for recycling purposes.
- Signage on all recycling receptacles, containers, chutes, and/or enclosures which complies with the standards described in the Container and Signage Guidelines established by the City of San Diego Environmental Services Department

Occupant Education

As required by Section 66.0707 of the City of San Diego Land Development Code, the building management or other designated personnel shall ensure that occupants are educated about the recycling services as follows:

- Information, including the types of recyclable materials accepted, the location of recycling containers, dates of pick-up, and the occupants responsibility to recycle shall be distributed to all occupants annually; All new occupants shall be given information and instructions upon occupancy; and

- Similar information will be clearly posted in the areas where the recycling bins are located, and on common area bulletin boards.

- Any change in recycling service will be promptly communicated to all occupants and vendors.

Landscaping and Green Waste Recycling

Green waste will be handled by a private landscaping service. The property manager will contract with landscape contractors for maintenance of all landscaped areas. These contracts direct the landscape companies to recycle or mulch green waste for reuse to the highest extent possible. When mulching cannot be accomplished, the contractors are required to recycle greenery at the City's green waste diversion facility at Miramar.

Through consumer education and availability of recycle bins in the trash areas of the development, minimal use of turf, use of drought-tolerant plants, and recycling of green material, the development shall divert its waste in compliance with City policies regarding waste reduction, recycling, and product procurement.

CONCLUSION

Through the measures described by this Waste Management Plan for the Sunroad Centrum Phase 6, the proposed development is expected to reduce or divert a minimum of 84% of its construction and demolition waste from the landfill, and meet or exceed City policies regarding waste reduction, recycling, and product procurement.

This WMP will be implemented to the fullest degree of accuracy and efficiency. Additionally, the project will be required to adhere to City ordinances, including the *Construction and Demolition Debris Diversion Deposit Program*, the City's *Recycling Ordinance*, and the *Refuse and Recyclable Materials Storages Regulations*. The WMP plan for the *Sunroad Centrum 6 Project* is designed to implement and adhere to all city ordnance and regulations with regards to waste management. The measures in the WMP would ensure that impacts are mitigated to below a level of significance.

Prior to the issuance of any grading or construction permits, the Solid Waste Coordinator will ensure ESD's attendance at a precon. The Solid Waste Coordinator will ensure that 1) the proposed approach to contractor education is approved, and 2) that the ESD inspector approves the separate waste containers, signage, and hauling contract(s) for the following materials:

- Asphalt/concrete
- Brick/masonry/Tile
- Cardboard
- Carpet/padding/foam
- Drywall
- Landscape debris
- Mixed C&D debris
- Scrap metal
- UNTREATED woodwaste
- Refuse

While diversion activities during occupancy may not achieve the State target of 75 percent, the project incorporates several measures above and beyond the requirements of local ordinance. First, the project exceeds ordinance requirements and even the State waste reduction target during construction. Second, the project includes landscaping that will reduce yardwaste, and will provide transportation to a composting facility for the yard waste that is produced. The project proponent will ensure that ESD reviews the landscaping plans and hauling contract for the facility to verify that waste reduction goals are met. Third, the project would include LEED measures to reduce waste. Fourth the project will target 20 percent recycled content of construction materials and 75 percent for landfill diversion.

These measures ensure that the waste generated by the project will be properly managed and that solid waste services will not be impacted.

The following standard measures apply to the project to avoid cumulative impacts on solid waste:

I. Prior to Permit Issuance or Bid opening/Bid award

A. LDR Plan check

- Prior to the issuance of any construction permit, including but is not limited to, demolition, grading, building or any other construction permit, the Assistant Deputy Director (ADD) Environmental Designee shall verify that the all the requirements of the Refuse & Recyclable Materials Storage Regulations and all of the requirements of the waste management plan are shown and noted on the appropriate construction documents. All requirements, notes and graphics shall be in substantial conformance with the conditions and exhibits of the associated discretionary approval.
- The construction documents shall include a waste management plan.
- Notification shall be sent to:

MMC Environmental Review Specialist

Development Service Department	*Environmental Services Department (ESD)*
9601 Ridgehaven Cou/rt Ste. 220, MS 110B2	9601 Ridgehaven Cou/rt Ste. 210, MS 1102A
San Diego, California 92123 1636	San Diego, California 92123 1636
(619) 980 7122	(619) 573-1236

II. Prior to Start of Construction

A. Grading and Building Permit - Prior to issuance of any grading or building permit, the permittee shall be responsible to arrange a preconstruction meeting to coordinate the implementation of the Waste Management Plan. The Precon Meeting that shall include: the Construction Manager, Building/Grading Contractor; MMC; and ESD and the Building Inspector and/or the RE (whichever is applicable) to verify that implementation of the waste management plan shall be performed in compliance with the plan approved by LDR and the San Diego ESD, to ensure that impacts to solid waste facilities are mitigated to below a level of significance.

1. At the Precon Meeting, the Permittee shall submit reduced copies (11" x 17") of the approved waste management plan, the RE, BI, MMC, and ESD.
2. Prior to the start of construction,the Permittee/Construction Manager shall verify that the project targets 20 percent recycled content for construction materials and 75 of construction materials for landfill diversion.
3. Prior to the start of construction, the Permittee/Construction Manager shall submit a construction schedule to the RE, BI, MMC, and ESD.

III. During Construction The Permittee/Construction Manager shall call for inspections by the RE/BI and both MMC and ESD, who will periodically visit the demolition/construction site to verify implementation of the waste management plan. The Consultant Site Visit Record (CSVR) shall be used to document the Daily Waste Management Activity/progress.

IV. Post Construction

A. Within 30 days after the completion of the implementation of the Waste Management Plan, for any demolition or construction permit, a final results report shall be submitted to both MMC and ESD for review and approval to the satisfaction of the City. MMC will coordinate the approval with ESD and issue the approval notification. ESD will review/approve City Recycling Ordinance-required educational materials prior to occupancy.