APPENDIX 3.6

Hydrology and Water Quality Technical Report for the San Diego State University Plaza Linda Verde Project, **Dudek (May 2009)**

HYDROLOGY AND WATER QUALITY TECHNICAL REPORT
for the
SAN DIEGO STATE UNIVERSITY PLAZA LINDA VERDE PROJECT

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MAY 2009

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LIST OF ABBREVIATIONS AND ACRONYMS

the Act	Porter-Cologne Water Quality Control Act
amsl	above mean sea level
Basin Plan	Water Quality Control Plan for the San Diego Basin
BMP	best management practice
City	City of San Diego
County	County of San Diego
CWA	Clean Water Act
DWR	California Department of Water Resources
EPA	U.S. Environmental Protection Agency
FCS	fuel contaminated soils
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
HA	hydrologic area
HSA	hydrologic subarea
HU	hydrologic unit
I-8	Interstate 8
IMPs	Integrated Management Practices
LID	Low Impact Development
MC	Municipal Code
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NPDES	National Pollution Discharge Elimination System
SDSU	San Diego State University
SDCWA	San Diego County Water Authority
SDRWQCB	San Diego Regional Water Quality Control Board

SRWCB	State Water Resources Control Board
SUSMP	Standard Urban Stormwater Mitigation Plan
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WLA	waste load allocation
WQO	water quality objective

SUMMARY OF FINDINGS

This report analyzes the potential impacts to water quality and hydrology that would occur as a result of the proposed San Diego State University ("SDSU") Plaza Linda Verde project ("Proposed Project"). The project site is located adjacent to the SDSU campus, approximately 8 miles east of downtown San Diego. The project consists of a transit-based, mixed-use development featuring ground-floor commercial and upper-floor student housing; a campus green featuring a public promenade; pedestrian malls linking proposed mixed-use buildings to the main campus; a multi-story parking structure to accommodate increased parking demand within the area; and student apartments.

Due to the existing developed nature of the area proposed for development, and in combination with the proposed mitigation measures, the Proposed Project would not result in impacts to hydrology and water quality.

The project would contribute to a cumulative change in discharge rates when compared to the existing condition. This would entail a significant impact, therefore mitigation has been provided to ensure that all runoff is equal to or less in volume compared to the existing condition. With respect to water quality, the Proposed Project would have a potentially significant impact to downstream receiving water bodies, largely due to the types of pollutants that typically result from housing, retail and parking uses, however mitigation measures have been incorporated that would reduce potential impacts to a level below significance. Mitigation measures that are included ensure that all project components will be planned, constructed, and managed in accordance with regional best management practices and discharge requirements. Adherence with regional standards would eliminate unlawful discharge quantities or poor water quality management practices from occurring on a cumulatively considerable scale. Further, it is assumed that other projects that are in the process or are proposed in the future would also adhere to regional and other applicable drainage attenuation and water quality protection measures. Therefore, the Proposed Project would not result in significant cumulative impacts to hydrology and water quality.

The project is not located in a 100-year or 500-year flood zone, so it would not result in introduction of future residents/retail customers or structures into areas which may be subject to flooding. The project is not located within the inundation zone associated with Murray Dam, located to the northeast of the project site. Therefore, the project would not place future residents/retail customers or structures within areas which could potentially be affected by a dam failure. The Proposed Project's location atop Montezuma Mesa would result in an unlikely exposure to seiche or mudflow hazards. The Proposed Project's location within an inland, elevated area of the City of San Diego would eliminate the potential hazard associated with a tsunami from the Pacific Ocean. Finally, because the Proposed Project site is currently developed, it does not contribute to significant local or regional groundwater recharge activity. The proposed redevelopment of the site would result in similar, minimal, groundwater recharge. The project would not entail the introduction of wells so localized drawdown of groundwater resources would not occur as a result of the project.

1.0 INTRODUCTION

1.1 Regional and Local Setting

The proposed project would be located adjacent to the main San Diego State University ("SDSU") campus, which is located approximately 8 miles east of downtown San Diego (Figure 1). The Proposed Project would be developed on California State University ("CSU")-owned property south of the existing Campus Master Plan boundary, north of Montezuma Road (Figure 2). The land is currently owned by SDSU, the SDSU Foundation, and private entities. Lands that are owned by private entities would be purchased by SDSU prior to redevelopment. The existing boundaries of the SDSU campus generally are Hardy Avenue on the south, East Campus Drive on the east, 55th Street/Remington Road on the west, and Adobe Falls Road/Del Cerro Boulevard (north of Interstate 8 ["I-8"]) on the north.

Aside from the pedestrian corridors that would be located on existing streets/alleyways, the project would be located on 24 existing parcels. These parcels are owned by SDSU, the SDSU Research Foundation, and private property owners. These parcels currently support parking lots, buildings, and a service station. Table 1 provides a summary of each parcel, the ownership status, existing use, and existing size. Each parcel is depicted in Figure 3.

Table 1
Development Parcels/Ownership/Existing Uses

Parcel ID	Address	Ownership	Existing Uses			
			Square Feet (Commercial/ Retail/ Office)	Dwelling Units (Residential)	Beds (Residential)	Parking Spaces (Parking Lots)
1	5850–82 Hardy Avenue	CSU Board of Trustees				49*
2	5194–98 College Avenue	CSU Board of Trustees				37*
3	5186–92 College Avenue	CSU Board of Trustees				37*
4	5178 College Avenue	CSU Board of Trustees	7,600			
5	5168–74 College Avenue	CSU Board of Trustees	4,600			
6	5164 College Avenue	CSU Board of Trustees				44**
7	5140 College Avenue	CSU Board of Trustees				44**
8	5830–5840 Lindo Paseo	CSU Board of Trustees		24	54	
9	5822 Lindo Paseo	CSU Board of Trustees		1	0 (vacant)	
10	5104 College Avenue	CSU Board of Trustees				8***
11	5130 College Avenue	CSU Board of Trustees				31***

Table 1 (Continued)

Parcel ID	Address	Ownership	Existing Uses: Square Feet (Commercial/ Retail/ Office)	Existing Uses: Dwelling Units (Residential)	Existing Uses: Beds (Residential)	Existing Uses: Parking Spaces (Parking Lots)
12	5185 and 5187 College Avenue	Private	5,480			
13	5157 College Avenue	SDSU Research Foundation	3,160			
14	5155 College Avenue	Private	2,160			
15	5141 College Avenue	Private	2,430			
16	5131 College Avenue	SDSU Research Foundation	15,370			
17	5119 College Avenue	Private	2,100			
18	5111 College Avenue	Private	1,300			
19	5721 Lindo Paseo	Private		1	18	
20	5723 Lindo Paseo	SDSU Research Foundation		1	3	
21	5118–5132 Lindo Paseo	SDSU Research Foundation				38
22	5734 Montezuma Road	SDSU Research Foundation		1	14	
23	5742 Montezuma Road	SDSU Research Foundation		1	0 (vacant)	
24	5750 Montezuma Road	SDSU Research Foundation		1	18	
		Total	**44,200**	**30**	**107**	**288**

* Parcels 1, 2, and 3 consist of an existing unnamed parking lot. SDSU catalogues existing parking lot capacities by Lot rather than underlying parcel. The unnamed lot that is located on Parcels 1, 2 and 3 consists of 123 spaces; this total was divided between the three parcels, based on rough percentage located on each parcel, and is therefore approximated.

** Parcels 6 and 7 consist of existing O Lot. O Lot consists of 88 spaces; this total was divided between the two parcels, based on rough percentage located on each parcel, and is therefore approximated.

***Parcels 10 and 11 consist of existing P Lot. P Lot consists of 39 spaces; this total was divided between the two parcels, based on rough percentage located on each parcel, and is therefore approximated.

1.2 Project Description

The Proposed Project consists of the development of additional on-campus student housing and retail services to support SDSU and the surrounding community. The Proposed Project is a mixed-use development featuring ground-floor commercial and upper-floor student housing, student apartments, additional parking facilities to accommodate increased parking demand within the area, a Campus Green featuring a public promenade, and pedestrian malls in place of existing streets/alleys linking the proposed mixed-use buildings to the main campus.

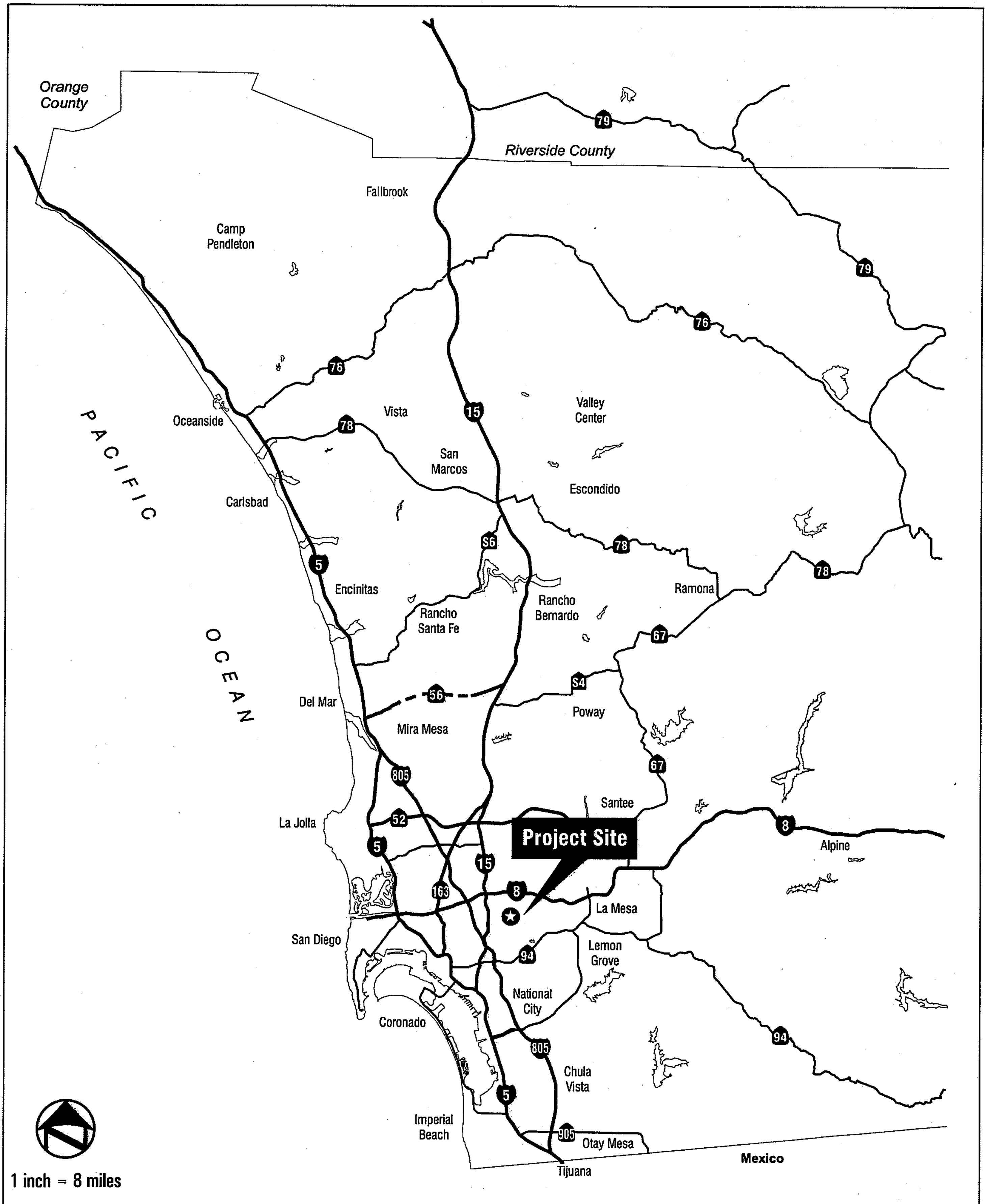

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Figure 1

Regional Map

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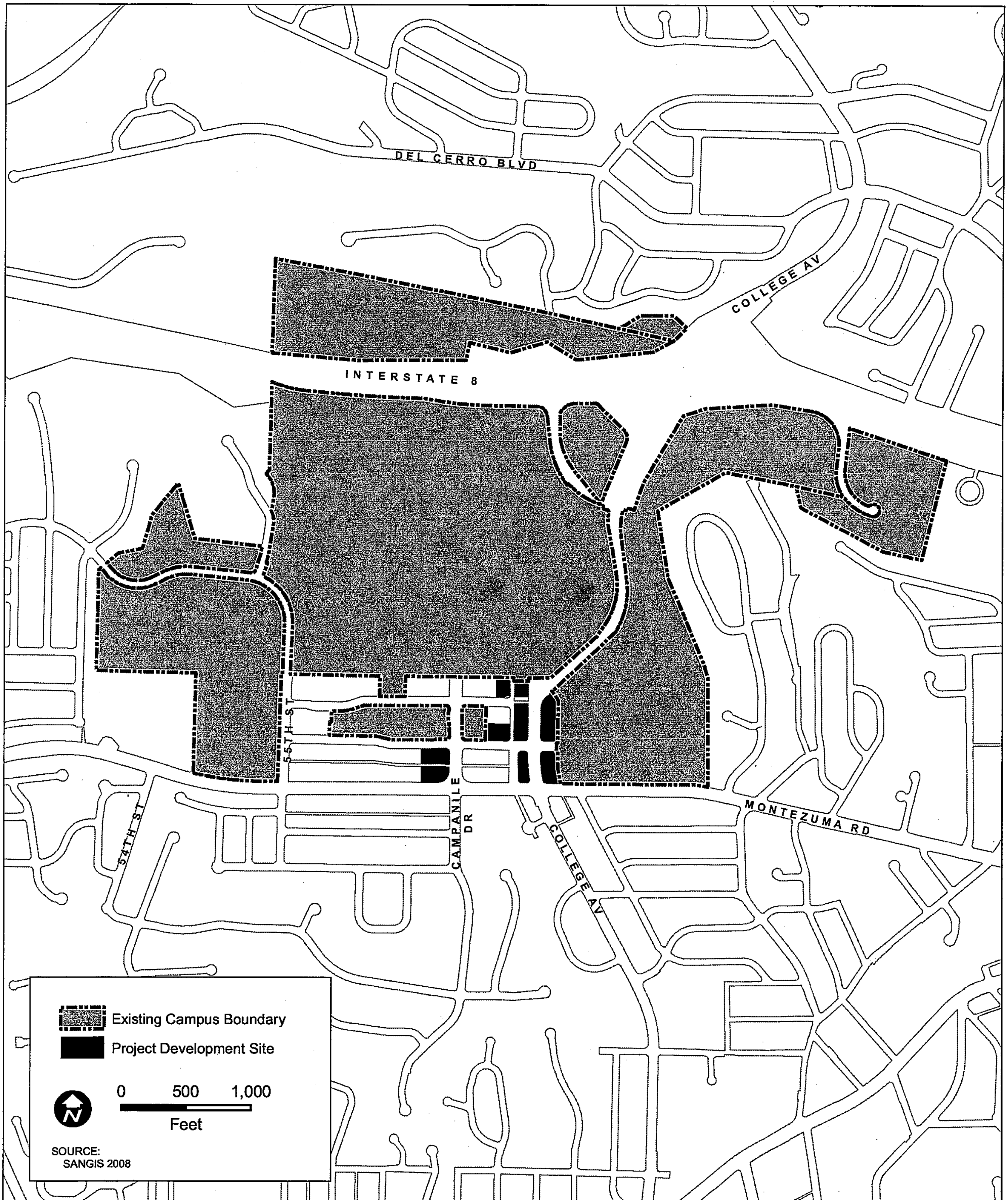

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Figure 2

Vicinity Map

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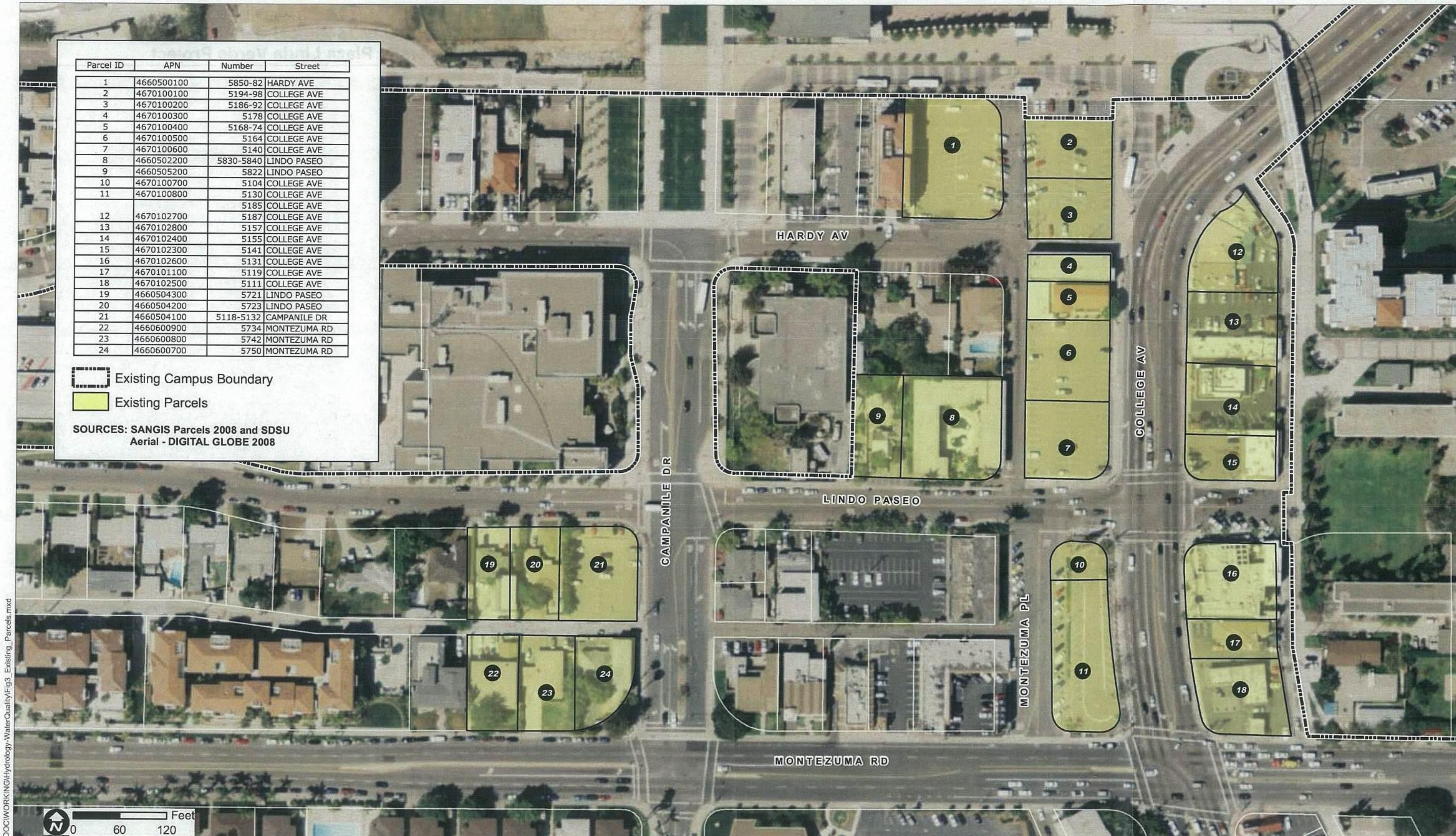

Parcel ID	APN	Number	Street
1	4660500100	5850-82	HARDY AVE
2	4670100100	5194-98	COLLEGE AVE
3	4670100200	5186-92	COLLEGE AVE
4	4670100300	5178	COLLEGE AVE
5	4670100400	5168-74	COLLEGE AVE
6	4670100500	5164	COLLEGE AVE
7	4670100600	5140	COLLEGE AVE
8	4660502200	5830-5840	LINDO PASEO
9	4660505200	5822	LINDO PASEO
10	4670100700	5104	COLLEGE AVE
11	4670100800	5130	COLLEGE AVE
12	4670102700	5185	COLLEGE AVE
		5187	COLLEGE AVE
13	4670102800	5157	COLLEGE AVE
14	4670102400	5155	COLLEGE AVE
15	4670102300	5141	COLLEGE AVE
16	4670102600	5131	COLLEGE AVE
17	4670101100	5119	COLLEGE AVE
18	4670102500	5111	COLLEGE AVE
19	4660504300	5721	LINDO PASEO
20	4660504200	5723	LINDO PASEO
21	4660504100	5118-5132	CAMPANILE DR
22	4660600900	5734	MONTEZUMA RD
23	4660600800	5742	MONTEZUMA RD
24	4660600700	5750	MONTEZUMA RD

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Figure 3

Existing Parcels

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The Proposed Project would be located adjacent to the main SDSU campus, which is located approximately 8 miles east of downtown San Diego (Figure 1). The existing boundaries of the SDSU campus generally are Hardy Avenue on the south, East Campus Drive on the east, 55th Street/Remington Road on the west, and Adobe Falls Road/Del Cerro Boulevard (north of I-8) on the north. The Proposed Project would be developed on property located south of the existing Campus Master Plan boundary, generally between Aztec Walk and Montezuma Road (Figure 2). The land on which the Proposed Project would be developed is currently owned by SDSU, the SDSU Foundation, and private entities. Lands currently owned by private entities would be purchased by SDSU prior to development.

The project consists of the demolition of existing structures and parking lots and is on an approximately 18-acre site located immediately south of the SDSU main campus. The development of certain portions of the Proposed Project, primarily including the pedestrian malls, would be contingent upon the vacation of certain existing vehicular rights-of-way; if the subject vacations are not approved, the Proposed Project would proceed on a modified basis.

In conjunction with the Proposed Project, SDSU also is proposing to amend the SDSU Campus Master Plan boundary such that the southern campus boundary between 55th Street and one block east of College Avenue would extend south generally from Aztec Walk to Montezuma Road.

The Proposed Project would consist of development of the following five project components (Figure 4):

I. **Mixed-Use Retail/Student Housing.** This project component consists of the development of four ground-floor retail and upper-floor residential buildings located south of Hardy Avenue, north of Montezuma Road, and west and east of College Avenue. Collectively, the four buildings would contain approximately 294 apartments to house approximately 1,216 students, and also would contain approximately 75,394 square feet of university/community-serving retail uses.

II. **Student Apartments.** This project component would consist of two four-story buildings located west of Campanile Drive, north of Montezuma Road, and south of Lindo Paseo. Collectively, the two buildings would contain approximately 96 apartments to house 416 students.

III. **Parking Facilities.** A freestanding parking structure would be constructed at the northwest corner of Lindo Paseo and Montezuma Place. The structure would consist of five levels—one underground parking deck and four aboveground decks—and would provide approximately 342 parking spaces. The parking structure also would support approximately 1,815 square feet of ground-floor retail space. The Mixed-Use Retail/Student Housing buildings to be developed east of College Avenue would contain underground parking for an additional 160 to 210 vehicles, depending on the ultimate configuration.

IV. **Campus Green.** A Campus Green is planned for development south of the existing SDSU Transit Center and would consist of active and passive recreational areas for public use.

V. **Pedestrian Malls.** The Proposed Project also would include two pedestrian malls, in place of existing streets/alleys, to be located along the western and eastern flanks of the main mixed-use building area. These corridors would facilitate non-motorized movement between the proposed buildings and main campus and would support meeting/resting space and outdoor eating facilities associated with the adjacent retail shops. This project component would be ancillary to the Mixed-Use Retail/Student Housing component and would not be essential to development of the overall project site.

A combination of landscape and hardscape features would be installed in and around the Proposed Project site. Large trees and planters would be installed adjacent to College Avenue and Montezuma Road near the Project components. Trees and planters would also be installed on the Campus Green and near proposed pedestrian access points. In conjunction with the Proposed Project, the existing median in College Avenue would be landscaped. Landscaping treatment would include low-maintenance, drought-tolerant plant materials that would avoid costly watering and maintenance.

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Figure 4

Proposed Project

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Table 2 provides a snapshot of the characteristics of each project component.

Table 2
Proposed Project Summary

Project Component	Size	Rentable Retail Space	Housing Units	Student Beds	Parking Spaces
Buildings					
Building 1	118,550 GSF	24,340 SF	84	352	—
Building 2	85,640 GSF	17,975 SF	60	264	—
Building 3	128,925 GSF	1,815 SF	—	—	342
Building 4	123,004 GSF	13,445 SF	63	256	69–110*
Building 5	157,971 GSF	19,634 SF	87	344	91–110*
Building 6	48,070 GSF	—	44	192	—
Building 7	55,300 GSF	—	52	224	—
Total	**717,460 GSF**	**77,209 SF**	**390**	**1,632**	**502–562***
Outdoor Space					
Campus Green	1.00 acres	—	—	—	—
Pedestrian Malls	0.44 acres	—	—	—	—
Total	**1.44 acres**	**—**	**—**	**—**	**—**

GSF = gross square feet; SF = square feet
* Parking spaces are dependent on final configuration of subterranean site plan for Buildings 4 and 5.
NOTE: All square footages, housing units, and beds are approximated.

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2.0 METHODOLOGY

Data regarding hydrology and water quality for the site were obtained through a review of pertinent literature, proposed site plans, and Federal Emergency Management Agency Flood Insurance Rate Maps (FIRM) (FEMA 2009). Hydrologic data was evaluated to identify existing drainage basins and flow characteristics. The San Diego County Hydrology Manual procedure was used to determine peak flows on a conceptual level (County of San Diego 2003). The City of San Diego ("City") Storm Water Standards Manual (SWS Manual) (contained in the San Diego Municipal Code for Land Development) (City of San Diego 2009) and the County-wide Model Standard Urban Stormwater Mitigation Plan ("SUSMP") Requirements for Development Applications were utilized to develop permanent and construction stormwater quality best management practice (BMP) recommendations (County of San Diego 2009).

2.1 Literature Review

Surface water and groundwater information was obtained from the San Diego County Water Authority (SDCWA 1997), County of San Diego (County) Hydrology Manual (2003), and additional sources noted in the references section. Water quality information for the site was obtained through a literature review using the San Diego Regional Water Quality Control Board's 2006 List of Water Quality Limited Segments (SDRWQCB 2006), Water Quality Control Plan for the San Diego Basin (SDRWQCB 1994, with amendments not yet published in the Basin Plan available at the SDRWQCB website), and National Pollutant Discharge Elimination System (NPDES) "Municipal Permits" (Order No.R9-2007-0001, NPDES No. CAS0108758) (SDRWQCB 2007a). The SDRWQCB approved Total Maximum Daily Loads for Indicator Bacteria Project I – Beaches and Creeks in the San Diego Region (Resolution No. R9-2007-0044) (SDRWQCB 2007b) was also used to assess potential impacts to the downstream impaired waterbodies. Soils information for the SDSU campus and project area was obtained from Southland Geotechnical Consultants (2009) and Golder Associates, Inc. (2004).

2.2 Limitations

This report is based on review of the pertinent literature referred to in Section 2.1. Aquifer characteristics, stream flow, and channel characteristics were defined by other professionals, and their data was interpreted by Dudek; however, a detailed field study was beyond the scope of this report. Runoff peak flow rates were estimated based on available information using the rational method outlined in the County of San Diego Hydrology Manual.

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3.0 EXISTING CONDITIONS

The Proposed Project site is within Sections 15 and 22 in Range 2 West, Township 16 South of the San Bernardino Base and Meridian, U.S. Geological Survey ("USGS") 7.5 minute series La Mesa, California Quadrangle (USGS 1994). As outlined in Section 1.2, the Proposed Project consists of two phases, including seven buildings and a Campus Green, totaling approximately 18 acres in the vicinity of the SDSU campus (Figure 4). The SDSU campus is located atop a mesa terrace intersected by canyon drainages on the north, east, and west sides, which drain into the San Diego River system. The surrounding area is coastal plain surrounded by foothills and mountains.

The climate of San Diego County is characterized by warm, dry summers and mild, wet winters. The average rainfall is approximately 10–13 inches per year, most of which falls between November and March (NOAA 2009). The average mean temperature for the area is approximately 65°F in the coastal zone and 57°F in the surrounding foothills (SDRWQCB 1994).

3.1 Site Topography

The elevations of the project site vary between 440 and 460 feet above mean sea level (amsl) (USGS 1994). Parcels 1–18 are located at an elevation of approximately 440 feet amsl. Parcels 19–24 are located at an elevation of approximately 460 feet amsl. These Proposed Project components are located atop a mesa, just south of the existing SDSU campus.

3.2 Site Soil Types

The surficial soil type at the project site is classified as Redding-Urban land complex, 2% to 9% slopes, by U.S. Department of Agriculture Soil Survey (USDA 1973). Additionally, review of geotechnical analysis indicates the Proposed Project is underlain by various deposits consisting of artificial fills, Stadium Conglomerate, Linda Vista Formation, and the Mission Valley Formation (Golder 2004). Dudek has classified the surficial soil at the site as group D based on the surrounding land use. Coverage by the County of San Diego Hydrology Manual's Hydrologic Soil Groups Map for the Proposed Project site is unavailable (County of San Diego 2003). Soils are classified by the Natural Resources Conservation Service (NRCS) into four Hydrologic Soil Groups based on the soil's runoff potential: groups A, B, C, and D. Group A generally has the smallest runoff potential and group D the greatest (NRCS 1993).

3.3 Surface Water

The Proposed Project is within the San Diego hydrologic unit (HU), which is one of eleven HUs within the San Diego Basin (SDRWQCB 1994). The San Diego HU is divided into four hydrologic areas (HA): Lower San Diego, San Vicente, El Capitan, and Boulder Creek. The Proposed Project site is located within the Lower San Diego HA (907.10) (Figure 5). The Lower San Diego HA is subdivided into five hydrologic subareas (HSA); the proposed project sites are within the Mission San Diego HSA (907.11). The San Diego Watershed encompasses approximately 440 square miles and is the second largest HU in San Diego County (Project Clean Water 2009). It has the highest population of San Diego County's watersheds and contains portions of San Diego, El Cajon, La Mesa, Poway, Santee, and several unincorporated jurisdictions. There are five water storage reservoirs, a groundwater aquifer, riparian and wetland habitats, and tidepools within the watershed. The watershed consists of approximately 58.4% of undeveloped land, mostly in the upper eastern portion of the watershed. The remaining lower portions consist of residential, roads, freeways, and commercial land uses (Project Clean Water 2009).

The Lake Murray reservoir, located in the San Diego River system, is the nearest of the five reservoirs in the watershed. The reservoir is located approximately 1.75 miles northeast of the proposed development and will not be affected by runoff from the Proposed Project sites. An intermittent stream runs along the bottom of Alvarado Canyon approximately 0.5 mile to the north. Surface runoff from the proposed project locations will enter Municipal Separate Storm Sewer System ("MS4") along College Avenue, Lindo Paseo, and Montezuma Road and discharge to the San Diego River via Alvarado Canyon or unnamed tributaries.

3.4 Groundwater

A groundwater basin is defined as a hydrogeologic unit containing one large aquifer and several connected and interrelated aquifers. All major watersheds in the San Diego Region contain groundwater basins. The Proposed Project site is in an area designated as being outside of the groundwater basin as defined by the SDCWA footprint and is approximately 0.75 mile south of the 6.28-square-mile Mission Valley Groundwater Basin (SDCWA 1997) (Figure 6). Drained by the San Diego River, this basin underlies an east–west trending valley and is bound by lower permeability San Diego, Poway, and Linda Vista formations (California Department of Water Resources [DWR] 2003). The principal water-bearing deposit is alluvium, consisting of medium to coarse-grained sand and gravel. This alluvium has an average thickness of 80 feet and a maximum thickness of about 100 feet (SDCWA 1997). The Mission Valley Groundwater Aquifer is summarized in Table 3.

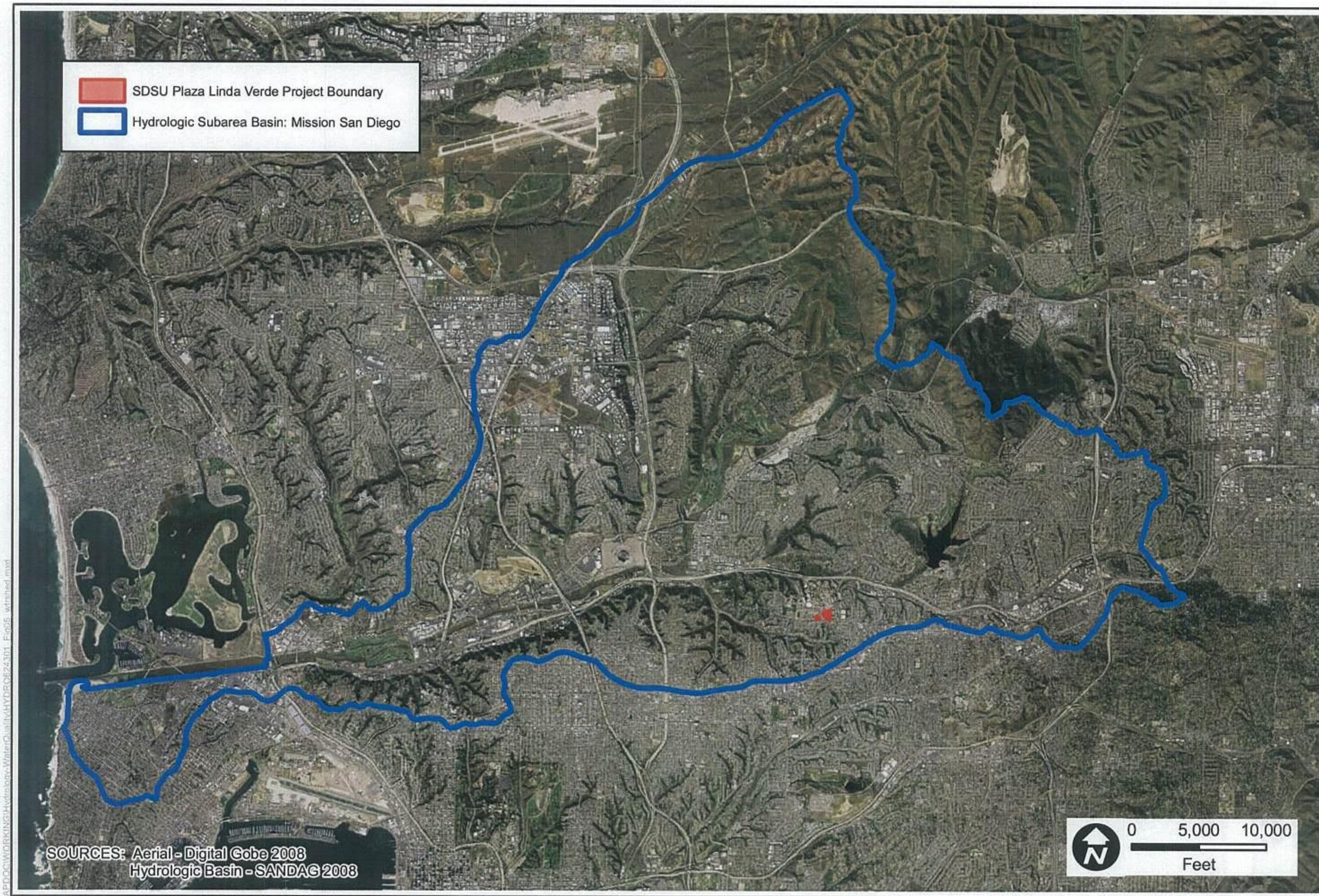

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Figure 5

San Diego Watershed Map

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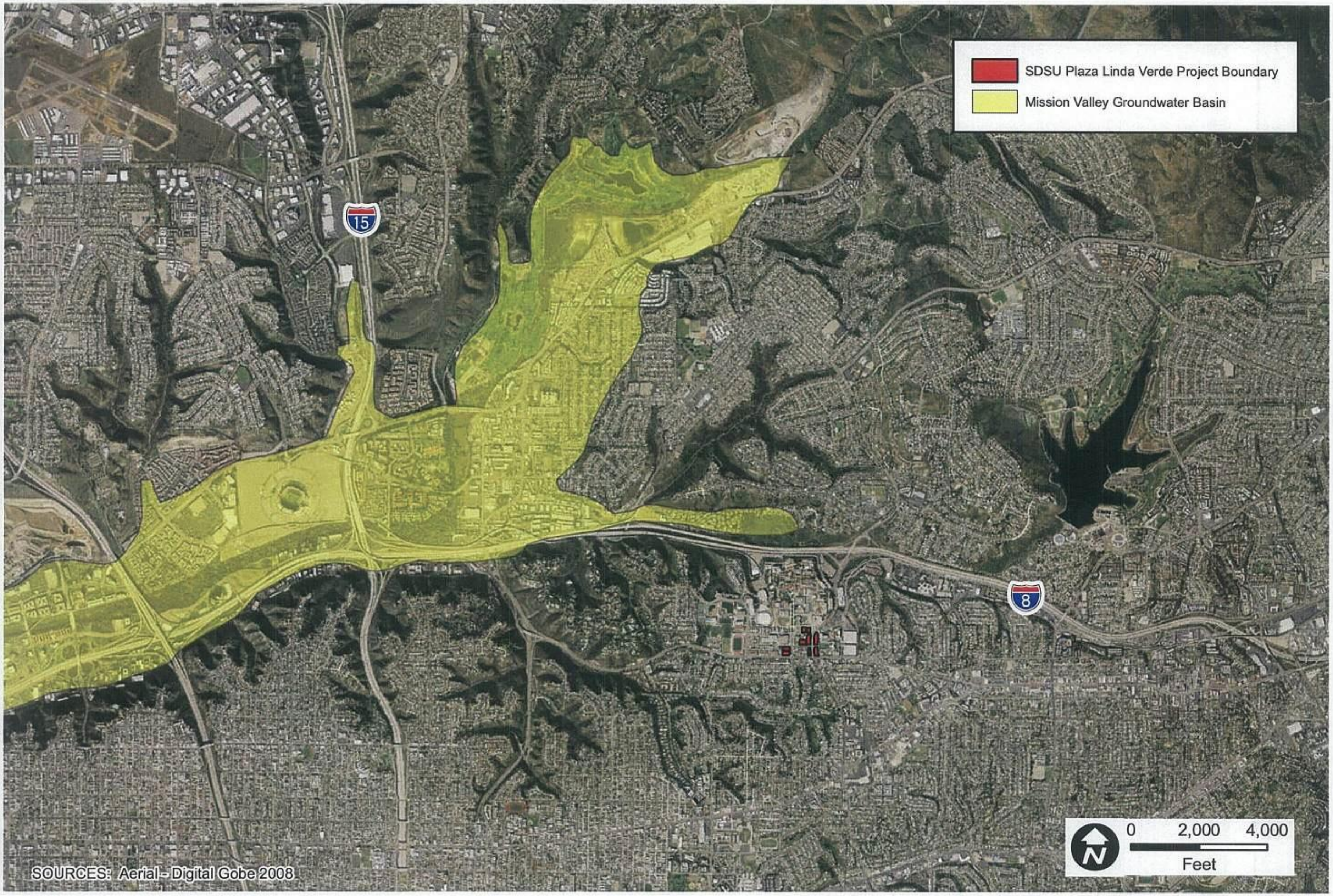

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Figure 6

Mission Valley Groundwater Basin Map

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Table 3
Mission Valley Groundwater Aquifer

Aquifer	Description	Thickness
Shallow Alluvium	Quaternary age medium to coarse-grained sand and gravel	Approximately 80–100 feet
San Diego Formation	Thick accumulation of older, semi-consolidated alluvial sediments	Generally less than 100 feet [1]

[1] The San Diego Formation thickens westward across the Rose Canyon fault system, reaching a maximum thickness of about 1,000 feet (Huntley et al. 1996).

The Proposed Project is underlain by various deposits consisting of artificial fills, Stadium Conglomerate, Linda Vista Formation, and the Mission Valley Formation (Golder 2004). The depth to groundwater at the Proposed Project site is approximately 23 to 26 feet below land surface based on groundwater monitoring reports prepared for 5111 and 5140 College Avenue (ENSR 2005 and SECOR 2000). Perched water potentially exists at shallower depth on the Proposed Project. Non-porous sand and clay materials are mixed amongst the strata and create groundwater "lenses," or isolated pockets of groundwater. Sporadic groundwater lenses were encountered on the campus during previous construction activities (as discovered during San Diego Trolley Extension boring activity). Seasonal fluctuations of the on-site groundwater conditions are assumed. The most probable sources of groundwater within the project vicinity are infiltration of landscape irrigation water and precipitation (Southland Geotechnical 2009).

3.5 Floodplain

Federal Emergency Management Agency Flood Insurance Rate Maps identify flood zones and areas that are susceptible to 100- and 500-year floods. The nearest floodplain to the project site is associated with Alvarado Creek to the north. Based on a review of the San Diego County Flood Insurance Rate Maps, the Proposed Project is not located in any 100- or 500-year floodplains (FEMA 2009). The Project is not located within the Dam Inundation Zone associated with Lake Murray.

3.6 Water Quality

The State Water Resources Control Board (SWRCB) and SDRWQCB designated SDSU as a Non-Traditional Small MS4 and subject to compliance with permanent and construction stormwater quality requirements. As part of Phase II of the Municipal Permit, the SWRCB adopted Order No. 2003-0005-DWR (General Permit No. CAS000004) for small MS4s, which requires these MS4s to develop and implement a Stormwater Management Plan (SWMP) with the goal of reducing the discharge of pollutants to the maximum extent possible. SDSU completed its SWMP in February 2005, but as of April 2009 the SDRWQCB has not yet reviewed SDSU's plan. In the absence of an SDRWQCB-approved SWMP, the City's SWS

Manual was used for guidance. The following section provides a background of water quality regulations relevant to SDSU.

3.6.1 Federal Water Pollution Control Act

The Federal Water Pollution Control Act ("Clean Water Act") was amended in 1972. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the waters of the U.S. Two main components of the Clean Water Act, Sections 303(d) and 402(p), are pertinent to the Proposed Project and are therefore outlined below.

Section 303(d)

Section 303(d) requires states to develop a list of waters that do not meet water quality standards. These waters are called water quality limited segments. This list classifies seven segments within the San Diego HU as impaired water bodies. Three of these are located in areas which runoff water from the Proposed Projects could potentially reach. The three impaired bodies are the San Diego River (Lower), Famosa Slough and Channel, and Pacific Ocean Shoreline (San Diego HU, San Diego River Mouth, aka Dog Beach), which are located approximately 2.0, 9.5, and 10.0 miles west of SDSU, respectively. The pollutant/stressors and potential sources for these impaired waterbodies are identified in Table 4, Clean Water Act 303(d) List of Water Quality Limited Segments.

Table 4
Clean Water Act 303(d) List of Water Quality Limited Segments

Location	Pollutant/ Stressor	Potential Source	Proposed TMDL Completion	Estimated Size Affected
San Diego River (Lower)	Fecal Coliform	Urban Runoff/Storm Sewers, Wastewater, Nonpoint/Point Source	2005	16 Miles
	Low Dissolved Oxygen	Urban Runoff/Storm Sewers, Unknown Nonpoint Source, Unknown Point Source	2019	16 Miles
	Phosphorus	Urban Runoff/Storm Sewers, Unknown Nonpoint Source, Unknown Point Source	2019	16 Miles
	Total Dissolved Solids	Urban Runoff/Storm Sewers, Flow Regulation/Modification, Natural Sources, Unknown Nonpoint Source, Unknown Point Source	2019	16 Miles
Famosa Slough and Channel	Eutrophic	Nonpoint Source	2019	32 Acres
Pacific Ocean Shoreline, San Diego HU (San Diego River Mouth, aka Dog Beach)	Indicator Bacteria	Nonpoint/Point Source	2005	0.37 Miles

SOURCE: SDRWQCB 2006

Urban runoff/storm sewers are a potential source for fecal coliform, low dissolved oxygen, phosphorus, and total dissolved solids in the San Diego River (Lower). Nonpoint/point sources are a potential source for indicator bacteria at the Pacific Shoreline, San Diego HU. Table 5 is excerpted from the City's SWS Manual and presents the probable pollutants causing Clean Water Act Section 303(d) Impairment Listing for the three impaired water bodies located downstream of the Proposed Project.

Table 5
Probable Pollutants Causing Clean Water Act Section 303(d) Impairment Listing

Probable Pollutants	Eutrophic	Benthic Community Degradation	Sediment Toxicity	Toxicity (in Stormwater Runoff)	Low Dissolved Oxygen
Sediments					
Nutrients	X				X
Heavy Metals		X	X		
Organic Compounds		X	X		X
Trash & Debris					X
Oxygen-Demanding Substances	X				X
Oil & Grease					
Bacteria & Viruses					
Pesticides				X	

SOURCE: City of San Diego SWS Manual

States must address water quality limited segments by establishing priority rankings and developing Total Maximum Daily Loads ("TMDLs") to improve water quality. A TMDL attains water quality objectives and restores beneficial uses for impaired water bodies listed under Section 303(d) of the Clean Water Act. TMDLs represent a strategy for meeting water quality objectives by allocating quantitative limits for point and non-point pollution sources. A TMDL is defined as the sum of individual waste load allocations for point sources and load allocations for non-point sources and natural background such that the capacity of the water body to assimilate pollutant loading (i.e., the loading capacity) is not exceeded. Therefore, the TMDL is the maximum amount of pollutant of concern that the water body can receive and still attain water quality objectives.

The SDRWQCB released *Total Maximum Daily Loads for Indicator Bacteria, Project I – Beaches and Creeks in the San Diego Region, Final Technical Report* on December 12, 2007, as required by Section 303(d) of the Clean Water Act. The numeric targets for TMDLs, which include the San Diego River and downstream beach (San Diego River Mouth, aka Dog Beach), are presented in Tables 6 and 7, which are excerpted from the 2007 SDRWQCB *Final Technical Report*. The TMDLs are calculated for fecal coliforms, total coliforms, and enteroccoci in wet and dry weather and in interim and final phases. The SDRWQCB concluded that water quality objectives without any allowable exceedances are sufficient for use as dry weather TMDL targets. The SDRWQCB is considering a Basin Plan amendment to incorporate these TMDLs.

Table 6
Interim and Final Wet Weather Numeric Targets for Beaches and Creeks

Indicator Bacteria	Interim Targets		Final Targets	
	Numeric Target (MPN/100mL)	Allowable Exceedance Frequency [1]	Numeric Target (MPN/100mL)	Allowable Exceedance Frequency [2]
Fecal Coliform	400 [A]	22%	400 [A]	NA
Total Coliform	10,000 [A]	22%	10,000 [B]	NA
Enteroccoci	61 [C]	22%	61 [C]	NA

1 Exceedance frequency based on reference system in the Los Angeles Region.
2 Not applicable because there is no authorization for a reference system approach in the Basin Plan.
A Targets based on single sample maximum WQOs for contact recreation (REC-1) at creeks and beaches.
B Target based on single sample maximum WQOs for REC-1 at beaches.
C Targets based on single sample maximum WQOs for at impaired creeks and downstream beaches.
MPN = most probable number
WQO = water quality objective

Table 7
Final Dry Weather Numeric Targets for Beaches and Creeks

Indicator Bacteria	Final Targets (MPN/100 mL)	
	Beaches	Creeks
Fecal Coliform	200*	200*
Total Coliform	1,000*	1,000*
Enteroccoci	35**	33

* Targets based on 30-day geometric mean REC-I WQOs.
** Target based on 30-day geometric mean REC-I WQOs at beaches.
MPN = most probable number
WQO = water quality objective

Section 402 (National Pollution Discharge Elimination System Program)

Section 402, added via the Water Quality Act of 1987, established the National Pollution Discharge Elimination System ("NPDES") stormwater permit program. The California SWRCB, through nine regional boards, administers the NPDES stormwater municipal permitting program to regulate discharges. In 1990, the U.S. Environmental Protection Agency ("EPA") promulgated rules establishing Phase I of the NPDES stormwater program for categories of stormwater discharge including "medium" and "large" MS4s, which generally serve populations of 100,000 or greater. In 1999, EPA promulgated rules establishing Phase II of the NPDES stormwater program for categories of stormwater discharge not covered by Phase I, including "small" MS4s such as public campuses.

The SDRWQCB issued the Municipal Permit (Order No.R9-2007-0001, NPDES No. CAS0108758) to the County, the City, the Port of San Diego, the County Regional Airport Authority, and 17 other cities (called Copermittees or dischargers by owning or operating an MS4) on January 24, 2007. The Municipal Permit requires each Copermittee to adopt its own Local SUSMP and ordinances consistent with the SDRWQCB-approved model SUSMP. The City implements its SUSMP through its SWS Manual, which provides information on how to comply with the construction and permanent stormwater quality requirements for new development and redevelopment projects. The SWS Manual was effective as of December 2, 2002 (revised March 24, 2008).

As part of the Phase II of the Municipal Permit, the SWRCB adopted Order No. 2003-0005-DWR (General Permit No. CAS000004) for small MS4s. This order requires these MS4s to develop and implement an SWMP with the goal of reducing the discharge of pollutants to the maximum extent possible. The SDRWQCB requires the owners or operators of these MS4s in watersheds subject to TMDLs to submit notices of intent to comply with this order. The SWRCB and SDRWQCB designated SDSU as a Non-Traditional Small MS4. SDSU completed its SWMP in February 2005. As of April 2009, the SDRWQCB has not reviewed the Draft SDSU SWMP. Each SWMP and notice of intent must be reviewed and approved, and in some cases considered in a public hearing, prior to the Small MS4 obtaining coverage under the General Permit. The SDRWQCB indicated that a review of Phase II permits would be conducted in the near future (C. Arias (SDRWQCB), pers. comm., 2009).

Since the SDSU SWMP has not been reviewed or approved by the SDRWQCB, and because the Proposed Project is currently not within the SDSU campus boundary, this analysis utilized the approved SWS Manual (2008) and County-wide Model SUSMP (2009) in assessing the project impacts and mitigation measures. However, while SDSU is physically located in the City, SDSU is a state agency. Therefore, the SWS Manual serves as guidance in selecting, designing, and incorporating stormwater BMPs into the SDSU project review and permitting process.

It should be noted that bacteria densities in the waters of beaches and creeks have chronically exceeded the numeric water quality objectives for total, fecal, and enterococci bacteria. Because bacteria loads within urbanized areas generally originate from urban runoff discharged from MS4s, the primary mechanism for TMDL implementation will be increased regulation of these discharges through NPDES regulations. For example, the 2007 SDRWQCB Final Technical Report lists the following percent reductions (expressed as an annual load) for municipal MS4s for interim wet weather TMDLs for San Diego HU (907.11) at the San Diego River Mouth (also known as Dog Beach): 53.3% fecal coliform, 38.2% total coliform, and 42.8% enterococci.

The percent reduction (expressed as an annual load) for municipal MS4s for final wet weather TMDLs for San Diego HU (907.11) at the San Diego River Mouth (Dog Beach) is 100% for all these bacteria. The 2007 SDRWQCB Final Technical Report also reports the following percent reductions (expressed as a monthly load) for municipal MS4s for final dry weather TMDSL for San Diego HU (907.11) at the San Diego River Mouth (Dog Beach): 69.4% for fecal coliform, 74% for total coliform, and 93.9% for enterococci.

3.6.2 California Water Code

Division 7 (Porter-Cologne Water Quality Control Act)

The Porter-Cologne Water Quality Control Act ("the Act") is aimed at the control of water quality. The Act establishes the SWRCB and its nine regional boards as the principal state agencies responsible for control of water quality. As such, each regional board is required to formulate and adopt a Water Quality Control Plan ("Basin Plan") that designates beneficial uses and establishes water quality objectives to protect these beneficial uses.

The San Diego Regional Water Quality Control Basin Plan was approved by the SWRCB in 1994 and includes Triennial Reviews in 1998 and 2004, as well as amendments approved by the SDRWQCB, as noted on the SDRWQCB's website. The SDRWQCB designates beneficial uses in the Basin Plan under CWC Section 13240. Beneficial uses are defined as the uses of water necessary for the survival or well-being of man, plants, and wildlife. The designated beneficial uses for the inland surface waters and groundwaters near the Proposed Project are summarized in Tables 8 and 9.

Table 8
Summary of Beneficial Uses of Inland Surface Water: San Diego River, Unnamed Tributary, and Alvarado Creek

Inland Surface Waters	Basin Number	Beneficial Uses								
		MUN	AGR	IND	REC 1	REC 2	BIOL	WARM	WILD	RARE
San Diego River	907.11	+	X	X	X	X	X	X	X	X
Unnamed Tributary	907.11	+	X	X	X	X		X	X	X
Alvarado Creek	907.11	+	X	X	X	X		X	X	

\+ Excepted from MUN (State Board Resolution No. 88-63, *Sources* of Drinking Water Policy).
X Existing Beneficial Use

Table 9
Summary of Beneficial Uses of Groundwater: San Diego Hydrologic Unit (HU), Lower San Diego Hydrologic Area (HA), Mission San Diego Hydrologic Subarea (HSA)

Groundwater	Basin Number	Beneficial Uses			
		MUN	AGR	IND	PROC
San Diego HU	907.00				
Lower San Diego HA	907.10				
Mission San Diego HSA[1]	907.11	O	X	X	X

[1] These beneficial uses do not apply westerly of the easterly boundary of the right-of-way of Intestate Highway 5 and this area is excepted from the sources of drinking water policy.
O Potential Beneficial Use
X Existing Beneficial Use

Designated beneficial uses in inland surface waters and groundwaters near the Proposed Project are defined in Table 10, as excerpted from the Basin Plan.

Table 10
Basin Plan List of Beneficial Uses

Beneficial Use	Description
MUN – Municipal and Domestic Supply	Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
AGR – Agricultural Supply	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
IND – Industrial Services Supply	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
PROC – Industrial Process Supply	Uses of water for industrial activities that depend primarily on water quality.
FRSH – Freshwater Replenishment	Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g. salinity).
GWR – Groundwater Recharge	Uses of water for artificial recharge of groundwater for purpose of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.
REC I – Contact Water Recreation	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, whitewater activities, fishing, and use of natural hot springs.
REC II – Non-Contact Water Recreation	Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
WARM – Warm Freshwater Habitat	Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.
COLD – Cold Freshwater Habitat	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Table 10 (Continued)

Beneficial Use	Description
WILD – Wildlife Habitat	Uses of water that support terrestrial ecosystems including, but not limited to, the preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
RARE – Threatened or Endangered Species	Uses if water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.
NAV – Navigation	Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.
COMM – Commercial and Sport Fishing	Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended to human consumption or bait process.
BIOL – Preservation of Biological Habitats of Special Significance	Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.
EST – Estuarine Habitat	Uses of water that support estuarine habitat ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
MAR – Marine Habitat	Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates or wildlife water and food sources.
AQUA – Aquaculture	Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption and bait.
MIGR – Migration of Aquatic Organisms	Uses of water that support habitats necessary for migration, acclimatization between fresh and salt water.
SPWN – Spawning, Reproduction, and/or Early Development	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish. This use is applicable only for the protection of anadromous fish.
SHELL – Shellfish Harvesting	Uses of water that support habitats suitable for collection of filter-feeding shellfish (e.g., clams, oysters and mussels) for human consumption, commercial, or sport purposes.

SOURCE: SDRWQCB 1994

Surface runoff from the Proposed Project flows into the San Diego River via Alvarado Creek to the north and an unnamed tributary of the San Diego River to the south. The existing beneficial uses of all inland surface waters include agricultural supply; industrial service supply; contact and non-contact water recreation; warm freshwater habitat; biological habitats of special significance; wildlife habitat; and rare, threatened, or endangered species (excluding Alvarado Creek). These inland surface waters are all excepted from municipal and domestic supply.

SDSU is located in the San Diego HU, which is sub-divided into the Lower San Diego HA and further sub-divided into the Mission San Diego HSA. Table 10 is excerpted from the Basin Plan. There is no information available for the San Diego HU and Lower San Diego HA. The existing beneficial uses within the Mission San Diego HSA include agricultural supply, industrial services supply, and industrial process supply. The potential beneficial uses within the Mission San Diego HSA are municipal and domestic supply.

The SDCWA and its member agencies have identified potential or planned groundwater projects throughout the region in order to reduce dependence on imported water. However, no existing, planned, or potential groundwater projects are located in the Lower San Diego Hydrologic Area (SDCWA 1997).

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4.0 SIGNIFICANCE THRESHOLDS

Appendix G of the CEQA Guidelines (14 CCR 15000 et seq.) provides that a proposed project may have a significant impact on hydrology and water quality if the project would:

a) Violate any water quality standards or waste discharge requirements?

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or situation on- or off-site?

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

f) Otherwise substantially degrade water quality?

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of a failure of a levee or a dam?

j) Inundation by seiche, tsunami, or mudflow?

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5.0 IMPACTS

Would the project violate any water quality standards or waste discharge requirements?

Would the project otherwise substantially degrade water quality?

Construction

The SWRCB requires dischargers whose projects disturb 1 or more acres of soil to obtain coverage under the NPDES General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit, 99-08-DWQ). Construction activity subject to this permit includes clearing, grading, and ground disturbances such as stockpiling or excavation. Because the project would result in more than 1 acre of soil disturbance during construction, a potentially significant impact to water quality would occur (see Section 6.0, Mitigation Measures, Mitigation Measure 1).

During construction of the Proposed Project, there is potential that soil impacted with hydrocarbons associated with existing and former gas stations may be encountered at 5111 College Avenue, 5140 College Avenue, and 5187 College Avenue. Potential significant water quality impacts would occur if impacted soil is not disposed of appropriately. In order to mitigate for impacts and ensure that impacted soil is disposed of in a safe and legal manner, mitigation is provided (see Section 6.0, Mitigation Measures, Mitigation Measure 2).

During construction of the Proposed Project, groundwater may be encountered while excavating for belowground parking and foundations. In order to allow for proper construction and site work, dewatering may be required. Potential significant water quality impacts would occur if this pumped groundwater is not disposed of correctly. In order to mitigate for impacts and ensure that groundwater is disposed of in a safe and legal manner, mitigation is provided (see Section 6.0, Mitigation Measures, Mitigation Measure 3).

Operation

The Proposed Project would not generate significant amounts of non-visible pollutants. However, urban redevelopment projects in southern California, such as that proposed, commonly result in the generation of pollutants once they have been constructed. The City's SWS Manual directs project applicants to identify pollutants of concern from the project area and in receiving waters and to incorporate appropriate BMPs to mitigate for anticipated pollutants. Although SDSU is not subject to this manual, it was used as guidance to identify the following categories of pollutants that are anticipated and/or that the Proposed Project could potentially generate.

These potential pollutants, and the impacts they can have on receiving water bodies and/or aquatic habitats are described below:

- ***Sediments*** - Sediments are soils or other surficial materials eroded and then transported or deposited by the action of wind, water, ice, or gravity. Sediments can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth.

- ***Nutrients*** - Nutrients are inorganic substances, such as nitrogen and phosphorus. They commonly exist in the form of mineral salts that are either dissolved or suspended in water. Primary sources of nutrients in urban runoff are fertilizers and eroded soils. Excessive discharge of nutrients to water bodies and streams can cause excessive aquatic algae and plant growth. Such excessive production, referred to as cultural eutrophication, may lead to excessive decay of organic matter in the water body, loss of oxygen in the water, release of toxins in sediment, and the eventual death of aquatic organisms.

- ***Metals*** - Metals are raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. Primary sources of metal pollution in stormwater are typically commercially available metals and metal products. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and cooling tower systems. At low concentrations naturally occurring in soil, metals are not toxic. However, at higher concentrations, certain metals can be toxic to aquatic life. Humans can be impacted from contaminated groundwater resources and bioaccumulation of metals in fish and shellfish. Environmental concerns regarding the potential for release of metals to the environment have already led to restricted metal usage in certain applications. In respect to the Proposed Project, metals pollutants may be generated from parking areas. Metals concentrations in stormwater runoff increase as traffic volumes increase (EPA 2005). Heavy metals expected to be encountered include cadmium, copper, cobalt, iron, nickel, lead and zinc, which are deposited into the environment by vehicle exhaust, brake linings, and tire and engine wear.

- ***Organic Compounds*** - Organic compounds are carbon-based. Commercially available or naturally occurring organic compounds are found in pesticides, solvents, and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to storm drains. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life.

- ***Trash and Debris*** - Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) are general waste products on the landscape. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Excess organic matter can create a high biochemical oxygen demand in a stream and lower its water quality. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions, resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.

- ***Oxygen-Demanding Substances*** - This category includes biodegradable organic material and chemicals that react with dissolved oxygen in water to form other compounds. Proteins, carbohydrates, and fats are examples of biodegradable organic compounds. Compounds such as ammonia and hydrogen sulfide are examples of oxygen-demanding compounds. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions.

- ***Oil and Grease*** - Oil and grease are characterized as high-molecular weight organic compounds. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids. Introduction of these pollutants to the water bodies are very possible due to the wide uses and applications of some of these products in municipal, residential, commercial, industrial, and construction areas. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality.

- ***Bacteria and Viruses*** - Bacteria and viruses are ubiquitous microorganisms that thrive under certain environmental conditions. Their proliferation is typically caused by the transport of animal or human fecal wastes from a watershed. Water containing excessive bacteria and viruses can alter aquatic habitat and create a harmful environment for humans and aquatic life. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in water.

- ***Pesticides*** - Pesticides (including herbicides) are chemical compounds commonly used to control nuisance growth or prevalence of organisms. Excessive application of a pesticide may result in runoff containing toxic levels of its active component.

Table 11 summarizes the anticipated and potential pollutants for each Proposed Project component.

Table 11
Anticipated and Potential Pollutants Summary

Proposed Project Component	General Pollutant Categories								
	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash and Debris	Oxygen-Demanding Substances	Oil & Grease	Bacteria and Viruses	Pesticides
Building 1 (Mixed-Use Retail/Student Housing)	X	X			X	X	X	X	X
Building 2 (Mixed-Use Retail/Student Housing)	X	X			X	X	X	X	X
Building 3 (Parking/Retail)	X	X	X		X	X	X	X	X
Building 4 (Parking/Mixed-Use Retail/Student Housing)	X	X	X		X	X	X	X	X
Building 5 (Parking/Mixed-Use Retail/Student Housing)	X	X	X		X	X	X	X	X
Building 6 (Mixed-Use Retail/Student Housing)	X	X			X	X	X	X	X
Building 7 (Student Housing)	X	X			X	X	X	X	X
Campus Green	X	X	X		X	P	P	P	X

X Anticipated
P Potential
NOTE: Although none of the proposed land uses would likely generate organic compounds, this pollutant category was included in this table because the table is intended to reflect the typical pollutants that are anticipated with redevelopment projects.

The operational characteristics of the Proposed Project (student housing, retail/commercial establishments, parking lots and garages and roadways/walkways) may result in the introduction or continued contribution of the urban stormwater pollutants to downstream receiving water bodies outlined above. Since the San Diego River (Lower) is impaired by low dissolved oxygen, the probable pollutants that cause the impairment should be managed by permanent stormwater BMPs. These probable pollutants include nutrients, organic compounds, trash and debris, and oxygen-demanding substances. The probable pollutants of the eutrophic condition of Famosa Slough and Channel are nutrients and oxygen-demanding substances. The fact that receiver water bodies are currently impaired and the project could have the potential to contribute to these unacceptable conditions would result in a potentially significant project impact. In order to avoid contribution to downstream water quality concerns, project operational mitigation is provided (see *Section 6.0 Mitigation Measures*, Mitigation Measures 4 and 5).

Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering

of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

As depicted on Figure 6, the Project site is not located within the nearest groundwater basin (Mission Valley Groundwater Basin). The depth to groundwater at the Proposed Project site is approximately 23 to 26 feet below land surface. Perched water potentially exists at shallower depth throughout the Proposed Project site. Non-porous sand and clay materials are mixed amongst the strata and create groundwater "lenses," or isolated pockets of groundwater.

Because the Proposed Project is currently developed with urban uses, on-site surface percolation is minimal. This minimal percolation is therefore not resulting in a substantial contribution to local groundwater table recharge activity. Similar to the existing condition, exposed lawn or landscaping areas would result in some surface water percolation, which may eventually contribute to either localized or regional groundwater sources. However, because the Project would entail redevelopment of the site and the existing non-contributing nature of the site would remain unchanged, the Project would not result in a substantial increase or decrease in local groundwater recharge or significantly change local aquifer volumes. Finally, the Proposed Project would be served by the City's municipal water system; therefore, no wells would be developed. Given the existing and proposed developed nature of the Project site, coupled by the fact that the Project would not result in the introduction of new wells that could result in localized groundwater draw-down, the Project would have a less than significant impact on local and regional groundwater conditions.

Would the project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Changes in stormwater flow from existing conditions to post-Project conditions would be approximately +0.13 cfs, which is considered negligible for a 100-year storm event. The minimal changes in stormwater flow can primarily be attributed to the existing developed nature of the site. Due to the minor increase in stormwater flow generated by the Proposed Project, the existing stormwater infrastructure is adequately sized to serve the Project; therefore, a less than significant impact would occur.

The Project would be required to relocate the existing 18-inch stormwater drain currently located beneath proposed Building 1. The line would be relocated to the west (in the future pedestrian mall/Montezuma Place).

Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

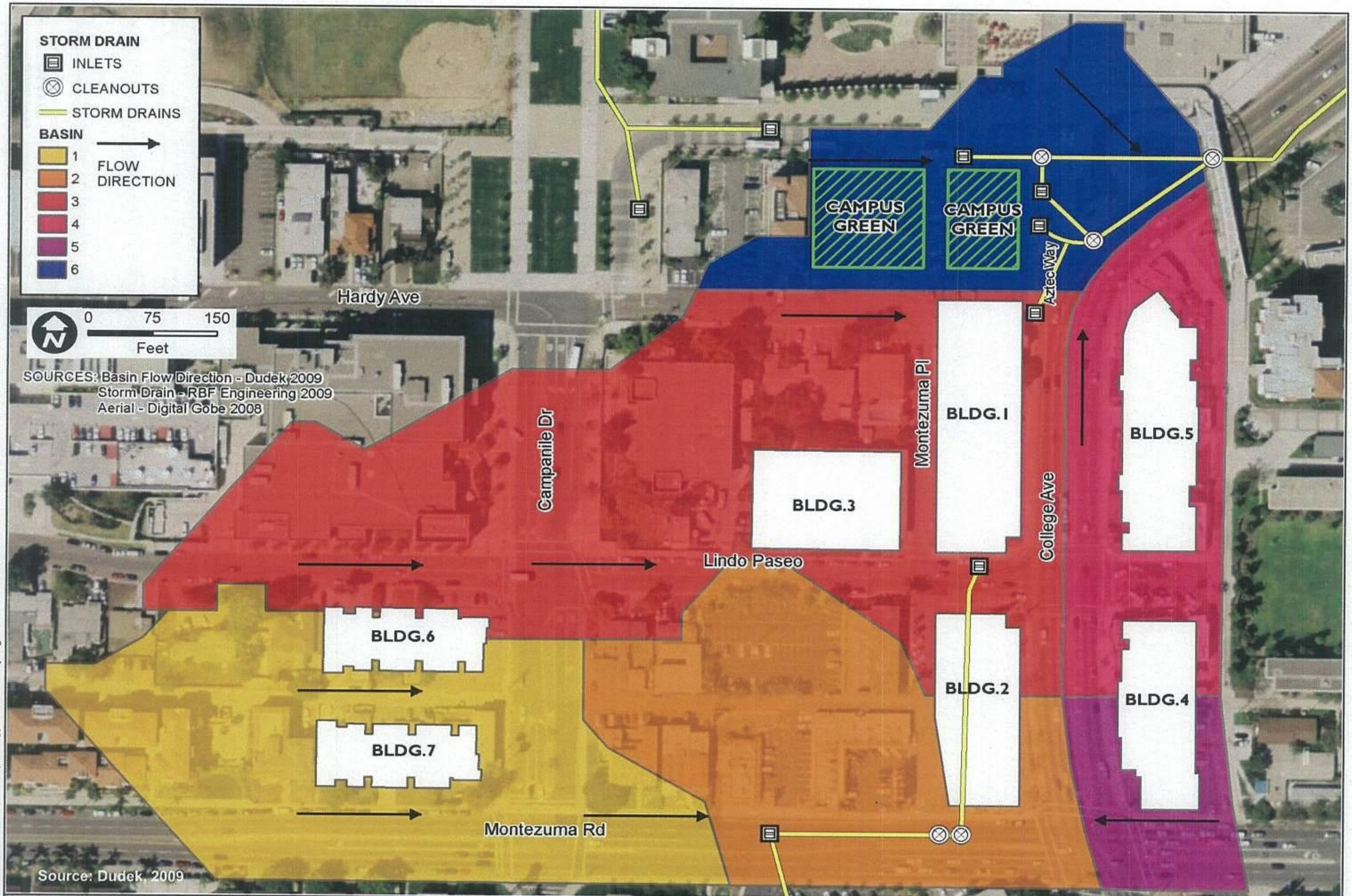
A common impact to the hydrologic regime from developments is the increase in impervious surfaces, which decreases travel time and increases runoff volumes. Figure 7 depicts existing drainage patterns, drainage basins, storm drains, inlets, and the proposed development footprint for the proposed project components. Table 12 presents a summary of the conceptual drainage calculations for 2-, 10-, and 100-year storm events. Both the existing and proposed runoff are calculated to evaluate hydrologic impacts from drainage.

Table 12
Conceptual Peak Flow Summary [1]

Storm event	Component	Existing Q (cfs)	Proposed Q (cfs)	Change in Q (cfs)
2-YEAR	Basin 1	4.44	5.73	1.29
	Basin 2	4.92	4.92	0.0
	Basin 3	10.02	11.17	1.15
	Basin 4	3.80	3.43	-0.37
	Basin 5	2.18	1.97	-0.21
	Basin 6	4.83	3.03	-1.8
	Total 2-Year	**30.19**	**30.25**	**0.06**
10-YEAR	Basin 1	6.40	8.26	1.86
	Basin 2	7.09	7.09	0.0
	Basin 3	14.43	16.09	1.66
	Basin 4	5.47	4.93	-0.54
	Basin 5	3.14	2.84	-0.30
	Basin 6	6.96	4.36	-2.6
	Total 10-Year	**43.49**	**43.57**	**0.08**
100-YEAR	Basin 1	9.24	11.93	2.69
	Basin 2	10.24	10.24	0.0
	Basin 3	20.84	23.24	2.4
	Basin 4	7.90	7.13	-0.77
	Basin 5	4.54	4.10	-0.44
	Basin 6	10.05	6.30	-3.75
	Total 100-Year	**62.81**	**62.94**	**0.13**

[1] Refer to the Stormwater Runoff Flow Calculations in Appendix A of this report for detailed calculations.
Q = discharge in cubic feet per second (cfs).

The calculated percent increase in runoff from the total 2-, 10-, and 100-year storms is approximately 0.002% each. However, because the project would result in a very slight increase in potential runoff, a significant impact would result. In order to mitigate for this potentially significant impact, mitigation is provided (see Section 6.0, Mitigation Measure 6).



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SDSU Plaza Linda Verde EIR

Hydrology and Water Quality Technical Report

San Diego State University

Figure 7

Plaza Linda Verde Drainage Area Map

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Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or situation on- or off- site?

As indicated in the discussion immediately above, the project would result in 0.13 cfs increase in drainage compared to the existing condition. Given the existing developed nature of the Proposed Project area, the Project can easily tie into the existing municipal stormwater conveyance system, which has been designed to convey water from urban areas to natural drainage courses in a non-erosive fashion. Due to the minor increase in stormwater flow generated by the Proposed Project, the existing stormwater infrastructure is adequately sized to serve the Project; therefore, a less than significant impact would occur.

It should be noted that the Project would not result in any modifications to natural drainage courses such as a stream or river.

Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

The Project is not located within the designated 100-year floodplain of Alvarado Creek and therefore would not result in construction of housing within a designated flood area.

Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

The Project is not located within the 100-year floodplain of Alvarado Creek; therefore, the Project would not impact flood flows.

Would the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of a failure of a levee or a dam?

The Project is not located within the Dam Inundation Zone associated with Lake Murray; therefore, the Project would not result in the exposure of future residents/customers or structures to hazards associated with the failure of a levee or dam.

Would the project be at risk of inundation by seiche, tsunami, or mudflow?

Given the Proposed Project's location atop a mesa, the site is not susceptible to inundation by seiche, tsunami, or mudflow (see Figure 6).

Seiche is generally associated with oscillation of large bodies of water (such as lakes or largely enclosed bays) immediately after a seismic event. The Project is located southwest of Lake Murray. However, the Project site is not located within the Dam Inundation Zone, which provides a good indication of where overflow water would be released in the case of a seiche. Further, the Alvarado Creek drainage separates the Project site from Lake Murray and so would serve as a buffer between the lake and Project site should a seiche event cause the release of substantial amounts of water from the dam.

The Project is not located adjacent to the coast, nor is it located in a low lying coastal drainage area. Therefore, the Project would not be susceptible to flooding hazards associated with a tsunami event.

Mudflow hazards are generally associated with slopes. Given the Proposed Project's location atop a relatively flat mesa, the Project would not be at risk of being affected by mudflow hazards.

5.1 Cumulative Impacts

Due to the existing developed nature of the area Proposed Project site, and in combination with the proposed mitigation measures, the Proposed Project will not contribute to a cumulative change in discharge rates. With respect to water quality, the Proposed Project's adherence to applicable BMPs for water quality management is consistent with the overall regional objective of improving water quality. All SDSU projects will be planned, constructed, and managed in accordance with regional BMPs and discharge requirements. Adherence with regional standards would eliminate unlawful discharge quantities or poor water quality management practices from occurring on a cumulatively considerable scale. Further, it is assumed that other projects that are in the process or are proposed in the future would also adhere to regional and other applicable water quality protection measures, thereby eliminating a cumulative water quality condition. Therefore, the Proposed Project will not result in significant cumulative impacts to hydrology and water quality.

6.0 MITIGATION MEASURES

The City's SWS Manual and County-wide Model SUSMP were utilized as guides to develop the following mitigation measures.

1. Prior to commencement of construction, SDSU shall development a project-specific Stormwater Pollution Prevention Plan (SWPPP). The SWPPP shall contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the project.

   The SWPPP must list BMPs that will be use to protect stormwater runoff throughout construction. The SWPPP must identify the placement of each BMP in accordance with the California Department of Transportation's Stormwater Quality Handbooks. Additionally, the SWPPP must contain a visual monitoring program and a chemical monitoring program for "non-visible" pollutants to be implemented if BMPs fail.

   SDSU shall implement all guidelines of the SWPPP throughout construction.

2. Should soil impacted with hydrocarbons be encountered at the Proposed Project, disposal shall be in accordance with SDRWQCB Order R9-2002-342: Waste Discharge Requirements for the Disposal and/or Reuse of Petroleum Fuel Contaminated Soils (FCS) in the San Diego Region. Order R9-2002-342 sets site-specific criteria and establishes waste discharge requirements of temporary waste piles of FCS wastes, and requires the discharger to develop and implement site-specific BMPs for control of erosion and conveyance of storm water (SDRWQCB 2003). Examples of BMPs include scheduling, public notification, run-on and run-off protection of stockpiles (covers and berms). SDSU shall fully comply with Order R5-2002-342.

3. Should groundwater dewatering be necessary during construction, discharges should be in accordance with the SDRWQCB requirements outlined in Order No. R9-2008-0002, "General Waste Discharge Requirements for Discharges from Groundwater Extraction and Similar Discharges to Surface Waters within the San Diego Region Except for San Diego Bay (WDR)" (SDRWQCB 2008).

   Prior to commencement of construction, SDSU shall test the local groundwater quality to determine if it is acceptable for use on site as dust control, whether it can be discharged to the sanitary sewer, or whether it can be tanked and hauled to a legal disposal site for treatment. If discharges of groundwater to surface water are anticipated at any point during construction, SDSU shall obtain a general NPDES dewatering permit from the SDRWQCB.

4. During project design, SDSU shall implement stormwater pollution control BMPs to reduce pollutant discharged from the project site to the maximum extent practicable. Similar to requirements outlined in the City of San Diego's SWP, post-construction pollution prevention shall be accomplished by implementing Low Impact Development ("LID"), source control and treatment control BMPs. In general, LID BMPs slow and filter runoff in a manner that attempts to mimic natural hydrologic conditions. Source control BMPs help prevent on-site contaminants from entering the drainage system and thereby creating a potential water quality issue. Finally, treatment control BMPs help to reduce or eliminate contaminants from entering the drainage system before water leaves the site.

   Suggested permanent project design BMPs for each Proposed Project component are outlined in Table 13.

Table 13
Suggested Project Design BMPs

Proposed Project Component	LID BMPs	Source Control BMPs	Treatment Control BMPs
Buildings 1, 2, 4 and 5 (Mixed-Use Retail/Student Housing)	Bioretention/Rain Harvesting	Loading dock facilities should drain directly to the sanitary sewer. For Buildings 4 and 5, interior parking garage floor drains shall be plumbed to the sanitary sewer.	Retention, hydrodynamic separator, vegetated buffer strip
Building 3 (Parking/Retail)	Flow-through planter with sub-surface drains or underground storage	Interior parking garage floor drains shall be plumbed to the sanitary sewer.	Hydrodynamic separator/ Vegetated buffer strip
Buildings 6 and 7 (Mixed-Use Retail/Student Housing)	Bioretention or flow-through planters with sub-surface drains	Trash/recycling facility will be covered, graded, and paved to preclude run-on and runoff from the area.	Retention/Vegetated buffer strip
Campus Green	Self-retaining area	Attempt to drain rooftops, impervious parking lots, sidewalks, and walkways into adjacent landscaping.	Retention

NA = not applicable
NOTE: Additional source control BMPs are applicable and should be selected as final designs are developed.

5. SDSU shall develop a maintenance plan assuring that permanent design BMPs will be maintained throughout project operation. Examples of maintenance include removal of accumulated sediment and trash, thinning of vegetative brush in biotreatment swales, and maintaining the appearance and general status of the vegetation. The operation and maintenance plan shall include:

   - Responsibilities for managing all stormwater BMPs
   - Employee training programs and duties to ensure compliance

- Operation/routine service schedule (annual inspection of facilities shall occur at a minimum)
- Maintenance frequency
- Specific maintenance activities (including maintenance of stormwater conveyance stamps)
- Copies of resource agency permits.

6. During Project design, SDSU shall ensure that no net increase of surface runoff would result once the Project is operational. This can be accomplished by incorporation of source control BMPs, as outlined in Mitigation Measure 4. This can also be accomplished by directing drainage from rooftops, impervious parking lots, sidewalks, and walkways to adjacent landscaping, if feasible, in order to filter and infiltrate stormwater runoff.

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7.0 SIGNIFICANCE OF IMPACTS AFTER MITIGATION

After application of the proposed mitigation measures, impacts would be mitigated to a level below significance.

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8.0 LIST OF PREPARERS

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9.0 REFERENCES

14 CCR 15000 et seq. Guidelines for Implementation of the California Environmental Quality Act.

Airphoto USA. 2006. January.

Arias, Christina. 2009. Phase II Permittee(s). Phone conversation between C. Arias (SDRWQCB) and T. Driscoll (Dudek). April 2009.

California Department of Water Resources. 2003.

California Regional Water Quality Control Board, San Diego Region. 2007. *Total Maximum Daily Loads for Indicator Bacteria, Project I – Beaches and Creeks in the San Diego Region, Final Technical Report*. December 12. Accessed May 5, 2009, at: http://www.swrcb.ca.gov/rwqcb9/water_issues/programs/tmdls/docs/bacteria/update121207/finaltechrpt.pdf

California Regional Water Quality Control Board, San Diego Region. 2008. Order No. R9-2008-0002, "General Waste Discharge Requirements for Discharges from Groundwater Extraction and Similar Discharges to Surface Waters within the San Diego Region Except for San Diego Bay (WDR)." March 12. Accessed May 5, 2009, at: http://www.swrcb.ca.gov/rwqcb9/board_decisions/adopted_orders/2008/2008_0002.pdf

Dudek. 2009.

ENSR International. 2005. Revised Closure Request for Former Unocal Station No. 3991. 5140 College Avenue. San Diego, CA. February 28.

Federal Emergency Management Agency. 2009. Flood Insurance Rate Map, San Diego County, California and Unincorporated Areas. Accesses 2009 at www.sangis.org

Golder Associates, Inc. 2004. Geotechnical Input for the Project EIR The Paseo at San Diego State University. March 8.

Huntley et al. 1996.

National Oceanic and Atmospheric Association. (NOAA 2009). Accessed March 2009 at www.noaa.gov.

Natural Resources Conservation Service. (NRCS 1993). Soil Survey Manual. Document avialble at: http://soils.usda.gov/technical/manual/contents/introduction.html

Project Clean Water. 2009.

San Diego, City of. 2008. San Diego Municipal Code, Land Development Manual, Storm Water Standards. Accessed March 24, 2008, at: http://www.sandiego.gov/development-services/news/pdf/stormwatermanual.pdf

San Diego, City of. 2008. Jurisdictional Urban Runoff Management Plan. Accessed March 20, 2008, at: http://www.sandiego.gov/thinkblue/pdf/urmp/jurmpfinal.pdf

San Diego, County of. 2003. Hydrology Manual. Document available at: http://www.co.san-diego.ca.us/dpw/floodcontrol/hydrologymanual.html

San Diego, County of. 2009. County-wide Model Standard Stormwater Mitigation Plan (SUSMP): Requirements for Development Applications. January 2. Document available at: http://www.projectcleanwater.org/html/wg_susmp.html

San Diego County Water Authority. 1997. San Diego County Water Authority Groundwater Report. June.

SANGIS (San Diego Geographic Information Source). 2006. Dam Inundation GIS Layer.

SANGIS. 2008.

SDRWQCB (San Diego Regional Water Quality Control Board). 1994. Water Quality Control Plan for the San Diego Basin – Region 9. Includes amendments adopted by the SDRWQCB. Accessed April 25, 2007, at: http://www.swrcb.ca.gov/sandiego/water_issues/programs/basin_plan/basinplan_amendments.shtml.

SDRWQCB. 2002. Order R9-2002-342: Waste Discharge Requirements for the Disposal and/or Reuse of Petroleum Fuel Contaminated Soils (FCS) in the San Diego Region.

SDRWQCB. 2006. CWA Section 303(d) List of Water Quality Limited Segments Requiring TMDLs. Approved by the U.S. EPA on June 28, 2007. Accessed April 2009 at: http://www.waterboards.ca.gov/tmdl/docs/303dlists2006/approved/r9_06_303d_reqtmdls.pdf.

SDRWQCB. 2007a. National Pollutant Discharge Elimination System "Municipal Permits" (Order No.R9-2007-0001, NPDES No. CAS0108758). Last NPDES permit issued on January 24, 2007.

SDRWQCB. 2007b. "Total Maximum Daily Loads for Indicator Bacteria, Project I – Beaches and Creeks in the San Diego Region, Final Technical Report." December 12.

SDRWQCB. 2008. General Waste Discharge Requirements for Dischargers from Groundwater and Similar Discharges to Surface Waters within the San Diego Region Except for San Diego Bay (WDR). Accessed March 12, 2008, at: http://www.swrcb.ca.gov/rwqcb9/board_decisions/adopted_orders/2008/2008_0002.pdf

SECOR International, Inc. November 16, 2000. Request for Responsible Party Re-Assignment Former Chevron Station No. 9-8565. 5111 College Ave. San Diego, CA 92115.

Southland Geotechnical Consultants. 2009. Geotechnical Input for the Environmental Impact Report SDSU 2005 Master Plan Revision. Prepared for Gatzke, Dillion and Balance. November 30.

U.S. Environmental Protection Agency (EPA). 2005 National Management Measures to Control Nonpoint Source Pollution from Urba. Areas

U.S. Geological Survey. 1994. La Mesa Quadrangle, California, San Diego Co., 7.5-Minute Series (Topographic). U.S. Department of Agriculture. (UDSA) Soil Survey. 1973.

Wallace Roberts & Todd, LLC. 2009. *Mixed Use Feasibility Study for San Diego State University Plaza Linda Verde.*

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APPENDIX A
Drainage Calculations

APPENDIX A
Drainage Calculations

Methodology

Rainfall runoff characteristics were calculated for the 2-, 10-, and 100-year frequency storms for coastal areas in San Diego County. Rainfall isopluvials were obtained from the San Diego County Hydrology Manual, and the rational method (see item 5 under "Calculations" below) was utilized to determine the projected runoff from the site given the rainfall events listed in this technical report. Existing runoff conditions from the site are also estimated for comparison (Tables A-1 through A-6).

Calculations

The following steps were taken to calculate the runoff from the Proposed Project site:

1) Determine the Basin Areas (see Figure 7 of this Hydrology and Water Quality Technical Report)

2) Obtain runoff coefficients per San Diego County Hydrology Manual Table 3-1, "Runoff Coefficients for Urban Areas"

3) Calculate the time of concentration (T_C) using the following equation for urban basins:

$$T_C = \frac{1.8\,(1.1-C) * \sqrt{D}}{\sqrt[3]{s}}$$

   Where:

   C = Runoff Coefficient

   D = Distance

   s = Slope %

4) Calculate intensities using the following equation from the San Diego County Hydrology Manual:

$$I = 7.44\,P_6 D^{-0.645}$$

   Where:

   P_6 = adjusted 6-hour storm rainfall amount

   D = duration in minutes (use T_C)

5) Solve for Q using the rational method formula as follows:

$$Q = CIA$$

Where:

Q = Runoff in cubic feet per second (cfs)

C = Runoff Coefficient

I = Rainfall Intensity

A = Drainage Area

Results

Table A-1
Existing 2-Year Frequency

Item	Basin 1 Pre Development	Basin 2 Pre Development	Basin 3 Pre Development	Basin 4 Pre Development	Basin 5 Pre Development	Basin 6 Pre Development
Basin Area, A (ac)	4.54	3.64	8.02	2.44	1	2.61
Basin Length, L (ft)	845	680	1,160	665	280	615
High Elevation, E_H (ft)	467	460	465	455	457	458
Low Elevation, E_L (ft)	457	452	452	446	452	448
Change In Elevation, (ΔE) (ft)	10	8	13	9	5	10
Slope, S (%)	1.18	1.18	1.12	1.35	1.79	1.63
Land Use	HDR	N. Com	G. Com	G. Com	G. Com	O.P. Com
Soil Group	D	D	D	D	D	D
Runoff Coefficient, C	0.71	0.79	0.82	0.82	0.82	0.85
1.1-C	0.39	0.31	0.28	0.28	0.28	0.25
$\sqrt{L}$	29.07	26.08	34.06	25.79	16.73	24.80
$\sqrt[3]{S}$	1.06	1.06	1.04	1.11	1.21	1.18
Time of Concentration, T_C (min)	19.29	13.78	16.53	11.75	6.95	9.49
P_6	1.25	1.25	1.25	1.25	1.25	1.25
P_{24}	2.00	2.00	2.00	2.00	2.00	2.00
P_6/P_{24}	63%	63%	63%	63%	63%	63%
$D^{-0.645}$	0.15	0.18	0.16	0.20	0.29	0.23
Rainfall Intensity, I (in/hr)	1.38	1.71	1.52	1.90	2.66	2.18
Peak Runoff, Q (cfs)	4.44	4.92	10.02	3.80	2.18	4.83

Table A-2
Existing 10-Year Frequency

Item	Basin 1 Pre Development	Basin 2 Pre Development	Basin 3 Pre Development	Basin 4 Pre Development	Basin 5 Pre Development	Basin 6 Pre Development
Basin Area, A (acres)	4.54	3.64	8.02	2.44	1	2.61
Basin Length, L (ft)	845	680	1,160	665	280	615
High Elevation, E_H (ft)	467	460	465	455	457	458
Low Elevation, E_L (ft)	457	452	452	446	452	448
Change In Elevation, (ΔE) (ft)	10	8	13	9	5	10
Slope, S (%)	1.18	1.18	1.12	1.35	1.79	1.63
Land Use	HDR	N. Com	G. Com	G. Com	G. Com	O.P. Com
Soil Group	D	D	D	D	D	D
Runoff Coefficient, C	0.71	0.79	0.82	0.82	0.82	0.85
1.1-C	0.39	0.31	0.28	0.28	0.28	0.25
$\sqrt{L}$	29.07	26.08	34.06	25.79	16.73	24.80
$\sqrt[3]{S}$	1.06	1.06	1.04	1.11	1.21	1.18
Time of Concentration, T_C (min)	19.29	13.78	16.53	11.75	6.95	9.49
P_6	1.80	1.80	1.80	1.80	1.80	1.80
P_{24}	3.25	3.25	3.25	3.25	3.25	3.25
P_6/P_{24}	55%	55%	55%	55%	55%	55%
$D^{-0.645}$	0.15	0.18	0.16	0.20	0.29	0.23
Rainfall Intensity, I (in/hr)	1.99	2.47	2.19	2.73	3.83	3.14
Peak Runoff, Q (cfs)	6.40	7.09	14.43	5.47	3.14	6.96

Table A-3
Existing 100-Year Frequency

Item	Basin 1 Pre Development	Basin 2 Pre Development	Basin 3 Pre Development	Basin 4 Pre Development	Basin 5 Pre Development	Basin 6 Pre Development
Basin Area, A (ac)	4.54	3.64	8.02	2.44	1	2.61
Basin Length, L (ft)	845	680	1,160	665	280	615
High Elevation, E_H (ft)	467	460	465	455	457	458
Low Elevation, E_L (ft)	457	452	452	446	452	448
Change In Elevation, (ΔE) (ft)	10	8	13	9	5	10
Slope, S (%)	1.18	1.18	1.12	1.35	1.79	1.63
Land Use	HDR	N. Com	G. Com	G. Com	G. Com	O.P. Com
Soil Group	D	D	D	D	D	D
Runoff Coefficient, C	0.71	0.79	0.82	0.82	0.82	0.85
1.1-C	0.39	0.31	0.28	0.28	0.28	0.25
$\sqrt{L}$	29.07	26.08	34.06	25.79	16.73	24.80
$\sqrt[3]{S}$	1.06	1.06	1.04	1.11	1.21	1.18
Time of Concentration, T_C (min)	19.29	13.78	16.53	11.75	6.95	9.49
P_6	2.60	2.60	2.60	2.60	2.60	2.60
P_{24}	5.00	5.00	5.00	5.00	5.00	5.00
P_6/P_{24}	52%	52%	52%	52%	52%	52%
$D^{-0.645}$	0.15	0.18	0.16	0.20	0.29	0.23
Rainfall Intensity, I (in/hr)	2.87	3.56	3.17	3.95	5.54	4.53
Peak Runoff, Q (cfs)	9.24	10.24	20.84	7.90	4.54	10.05

ac = acre(s)
ft = feet
in/hr = inches per hour
cfs = cubic feet per second

Table A-4
Potential 2-Year Frequency

Item	Basin 1 Post Development	Basin 2 Post Development	Basin 3 Post Development	Basin 4 Post Development	Basin 5 Post Development	Basin 6 Post Development
Basin Area, A (acres)	4.54	3.64	8.02	2.44	1	2.61
Basin Length, L (ft)	845	680	1,160	665	280	615
High Elevation, E_H (ft)	467	460	465	455	457	458
Low Elevation, E_L (ft)	457	452	452	446	452	448
Change In Elevation, (ΔE) (ft)	10	8	13	9	5	10
Slope, S (%)	1.18	1.18	1.12	1.35	1.79	1.63
Land Use	HDR	N. Com	O.P. Com	N. Com	N. Com	HDR
Soil Group	D	D	D	D	D	D
Runoff Coefficient, C	0.79	0.79	0.85	0.79	0.79	0.71
1.1-C	0.31	0.31	0.25	0.31	0.31	0.39
$\sqrt{L}$	29.07	26.08	34.06	25.79	16.73	24.80
$\sqrt[3]{S}$	1.06	1.06	1.04	1.11	1.21	1.18
Time of Concentration, T_C (min)	15.33	13.78	14.76	13.01	7.70	14.80
P_6	1.25	1.25	1.25	1.25	1.25	1.25
P_{24}	2.00	2.00	2.00	2.00	2.00	2.00
P_6/P_{24}	63%	63%	63%	63%	63%	63%
$D^{-0.645}$	0.17	0.18	0.18	0.19	0.27	0.18
Rainfall Intensity, I (in/hr)	1.60	1.71	1.64	1.78	2.49	1.64
Peak Runoff, Q (cfs)	5.73	4.92	11.17	3.43	1.97	3.03

Table A-5
Potential 10-Year Frequency

Item	Basin 1 Post Development	Basin 2 Post Development	Basin 3 Post Development	Basin 4 Post Development	Basin 5 Post Development	Basin 6 Post Development
Basin Area, A (acres)	4.54	3.64	8.02	2.44	1	2.61
Basin Length, L (ft)	845	680	1,160	665	280	615
High Elevation, E_H (ft)	467	460	465	455	457	458
Low Elevation, E_L (ft)	457	452	452	446	452	448
Change In Elevation, (ΔE) (ft)	10	8	13	9	5	10
Slope, S (%)	1.18	1.18	1.12	1.35	1.79	1.63
Land Use	HDR	N. Com	O.P. Com	N. Com	N. Com	HDR
Soil Group	D	D	D	D	D	D
Runoff Coefficient, C	0.79	0.79	0.85	0.79	0.79	0.71
1.1-C	0.31	0.31	0.25	0.31	0.31	0.39
$\sqrt{L}$	29.07	26.08	34.06	25.79	16.73	24.80
$\sqrt[3]{S}$	1.06	1.06	1.04	1.11	1.21	1.18
Time of Concentration, T_C (min)	15.33	13.78	14.76	13.01	7.70	14.80
P_6	1.80	1.80	1.80	1.80	1.80	1.80
P_{24}	3.25	3.25	3.25	3.25	3.25	3.25
P_6/P_{24}	55%	55%	55%	55%	55%	55%
$D^{-0.645}$	0.17	0.18	0.18	0.19	0.27	0.18
Rainfall Intensity, I (in/hr)	2.30	2.47	2.36	2.56	3.59	2.35
Peak Runoff, Q (cfs)	8.26	7.09	16.09	4.93	2.84	4.36

Table A-6
Potential 100-Year Frequency

Item	Basin 1 Post Development	Basin 2 Post Development	Basin 3 Post Development	Basin 4 Post Development	Basin 5 Post Development	Basin 6 Post Development
Basin Area, A (acres)	4.54	3.64	8.02	2.44	1	2.61
Basin Length, L (ft)	845	680	1,160	665	280	615
High Elevation, E_H (ft)	467	460	465	455	457	458
Low Elevation, E_L (ft)	457	452	452	446	452	448
Change In Elevation, (ΔE) (ft)	10	8	13	9	5	10
Slope, S (%)	1.18	1.18	1.12	1.35	1.79	1.63
Land Use	HDR	N. Com	O.P. Com	N. Com	N. Com	HDR
Soil Group	D	D	D	D	D	D
Runoff Coefficient, C	0.79	0.79	0.85	0.79	0.79	0.71
1.1-C	0.31	0.31	0.25	0.31	0.31	0.39
$\sqrt{L}$	29.07	26.08	34.06	25.79	16.73	24.80
$\sqrt[3]{S}$	1.06	1.06	1.04	1.11	1.21	1.18
Time of Concentration, T_C (min)	15.33	13.78	14.76	13.01	7.70	14.80
P_6	2.60	2.60	2.60	2.60	2.60	2.60
P_{24}	5.00	5.00	5.00	5.00	5.00	5.00
P_6/P_{24}	52%	52%	52%	52%	52%	52%
$D^{-0.645}$	0.17	0.18	0.18	0.19	0.27	0.18
Rainfall Intensity, I (in/hr)	3.32	3.56	3.41	3.70	5.19	3.40
Peak Runoff, Q (cfs)	11.93	10.24	23.24	7.13	4.10	6.30

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