APPENDIX C

Hydrology Documentation

Appendix C.1: Revised Draft EIR Section 3.5 Hydrology and Water Quality

3.5 HYDROLOGY AND WATER QUALITY

Introduction

This section discusses local and regional hydrology, including existing drainage facilities, flood hazards, water quality, erosion and sedimentation, and groundwater issues such as quantity, quality, availability, and recharge. Implementation of the proposed project could affect hydrology and water quality in the project area.

During the June 4, 2007 public scoping meeting before the Planning Commission, a commentor requested that the DEIR include consideration of the impacts of potential sea level rise at the project site. This issue is addressed in this section. No other hydrology and water quality issues were identified at the scoping meeting or in comment letters responding to the Notice of Preparation (see Appendix C). The Initial Study prepared for the project (see Appendix B) determined that the project would not place housing within a 100-year floodplain, because the project does not include a housing component, or result in an increased risk of inundation by seiche, tsunami, or mudflow. Therefore these issues are not addressed in this section.

Information presented in this section is based on the 2009 Preliminary Hydrology Report prepared for the Menlo Gateway development application ("Preliminary Hydrology Report," Philip Williams and Associates), the 2004 San Francisco Bay Basin Water Quality Control Plan ("Basin Plan," San Francisco Bay Regional Water Quality Control Board [RWQCB]), the 2005 Urban Water Management Plan ("UWMP," City of Menlo Park), the 2003 Citywide Storm Drainage Study ("Storm Drainage Study," City of Menlo Park), the 2006 Annual Water Quality Report (City of Menlo Park), the 2007 Grading and Drainage Guidelines and Checklist ("Drainage Guidelines," City of Menlo Park), and additional reference materials as noted in the text (e.g., USGS Topomaps, climate information).

Setting

Location

The project area is located in the City of Menlo Park near the US 101/Marsh Road interchange. The project area includes two sets of parcels that comprise the Independence site and the Constitution site. The Constitution site is approximately 8.9 acres and the Independence site is approximately 7.1 acres, for a total area of 16 acres. The project area falls within the U.S. Geological Survey (USGS) Palo Alto 7.5-minute series topographic quadrangle.

Regional Hydrology and Drainage

The project area is within a narrow alluvial plain defined by the Santa Cruz Mountains (to the west) and the San Francisco Bay (to the east). The project area has an elevation of about 5 feet above mean

sea level (msl), slopes gently to the north,[1] and is underlain by fill material.[2] The project area is in a developed area of the City and a majority of the ground surface is covered by pavement (roads and parking lots) and structures (office and commercial buildings). The total impervious area is approximately 11.4 acres, approximately 71 percent of the total site area.[3] The undeveloped portion of the project area includes two vacant parcels and areas of lawn and landscaping adjacent to roads and buildings.

The City has a Mediterranean climate characterized by dry, relatively cool summers and wet, mild winters. The City receives an average annual rainfall of approximately 15.5 inches per year, with most of the rainfall (89 percent) occurring from November through April.[4]

The project area is located within the Atherton Channel drainage basin. The Atherton Channel is a lined channel[5] that carries flow from the upper reaches of Atherton Creek, running in a south-north direction for approximately seven miles before draining into Flood Slough north of the Bayfront Expressway.[6] The Atherton Channel is approximately 400 feet west of the project area. Flood Slough flows east from a point of origin on the north side of the Bayfront Expressway, approximately 50 feet from the project area. Flood Slough is one of many sloughs that run through the salt ponds and salt marsh flats north of Bayfront Expressway and that interact with flow from San Francisco Bay. After passing through the salt marsh flats for approximately three miles (including channel meanders), Flood Slough drains into the San Francisco Bay. These drainages are not susceptible to hydrograph modification[7] effects (see Figure 2 in Appendix E). Other drainages in the vicinity of the project area include San Francisquito Creek, which runs in a north-south direction approximately 2 miles southeast of the project area, and Redwood Creek, which runs in a north-south direction approximately 2 miles west of the project area.[8]

The project area is served by the City's storm drainage system, which is maintained by the Menlo Park Public Works Department. Existing surface drainage from the project area is either directed to catch basins, or drains directly to the street before flowing into the storm drain system. The existing storm

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1 United States Geological Survey, *Palo Alto Quadrangle, California*, 7.5 Minute Series (Topographic), 1991.

2 Secor International, Inc., *Phase I Environmental Site Assessment Report: 155 Constitution Drive*, prepared on behalf of the David B. Bohannon Organization, 2007.

3 Philip Williams and Associates, *Preliminary Hydrology Report*, 2009 (see Appendix E).

4 Western Regional Climate Center, *Palo Alto, California Monthly Total Precipitation (inches) (046646)*, www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6646, accessed June 9, 2009.

5 The Atherton Channel is an alternating earth- and concrete-lined channel. The channel runs through a one-mile underground culvert immediately south of the project area.

6 Oakland Museum of California, *Atherton Channel Watershed Map,* 2005. www.museumca.org/creeks/1470-OMAtherton.html#, accessed April 24, 2008.

7 Hydrograph modification refers to the changes in runoff pattern (rate, volume, and timing of runoff) as a result of changes in site drainage patterns (e.g., more impervious surfaces, changes in slopes, and others). If runoff patterns are altered (hydrograph modification), it can alter bed and bank erosion, other channel-forming factors, and other aquatic habitat factors in susceptible surface waters, such as unlined channels and natural creeks.

8 United States Geological Survey, *Palo Alto Quadrangle, California*, 7.5 Minute Series (Topographic), 1961, photo revised 1968 and 1973.

drain system for the Constitution site consists of a 24-inch line through the northern portion of the site, an 18-inch line along Constitution Drive, and a 54-inch line along Chrysler Drive, to the east (Figure 3.5-1). These pipes deliver flow to a pump station at the northeast corner of the Constitution site.

The existing storm drain system for the Independence site includes a 48-inch pipe running along Chrysler Drive, and an 18-inch pipe at Independence Drive, running from 120 Independence Drive to the east (Figure 3.5-2). A 42-inch storm drain and drainage ditch are located along the southern edge of the site and drain in an eastward direction. The storm drain pipe connects to the 48-inch main line at Chrysler Drive.[9] Runoff from the Independence site is directed to the 48-inch line that ultimately delivers flows to a pump station at the northeast corner of the Constitution site, which discharges to the Atherton Channel and Flood Slough.

Existing runoff conditions were estimated for the project area using the Rational Method,[10] a copy of the Preliminary Hydrology Report, including runoff calculations, is provided in Appendix E. The Rational Method determines peak flows for storms of certain frequencies. Based on these calculations, the existing 10-year peak flow rate (Q_{10})[11] is approximately 7.6 cubic feet per second (cfs) for the Constitution site and approximately 3.9 cfs for the Independence site. The 100-year peak flow rate (Q_{100}) is approximately 11.5 cfs for the Constitution site and approximately 5.9 cfs for the Independence site.[12]

Flooding

The project area is not subject to flooding from tsunami, seiche, or dam failure inundation.[13] The project area and its vicinity are, however, subject to flooding from San Francisco Bay. The 100-year floodplain designated by the Federal Emergency Management Agency (FEMA) spans the northernmost portions of the City, including the northern half of the project area (north of Jefferson Drive). The Constitution site and a portion of the Independence site are located within an area designated Zone AE, which has a base flood elevation of 7.0 ft.[14] A portion of the Independence site is within an area designated Zone X, which is subject to flooding during a 500-year event or shallow flooding during the 100-year event.[15] Figure 3.5-3 shows the location of the 100-year and 500-year floodplains in relation to the project area.

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9 Philip Williams and Associates, *Preliminary Hydrology Report*, 2009.

10 Conducted by Phillip Williams and Associates, 2009. All hydrologic calculations are based on the City's engineering standards.

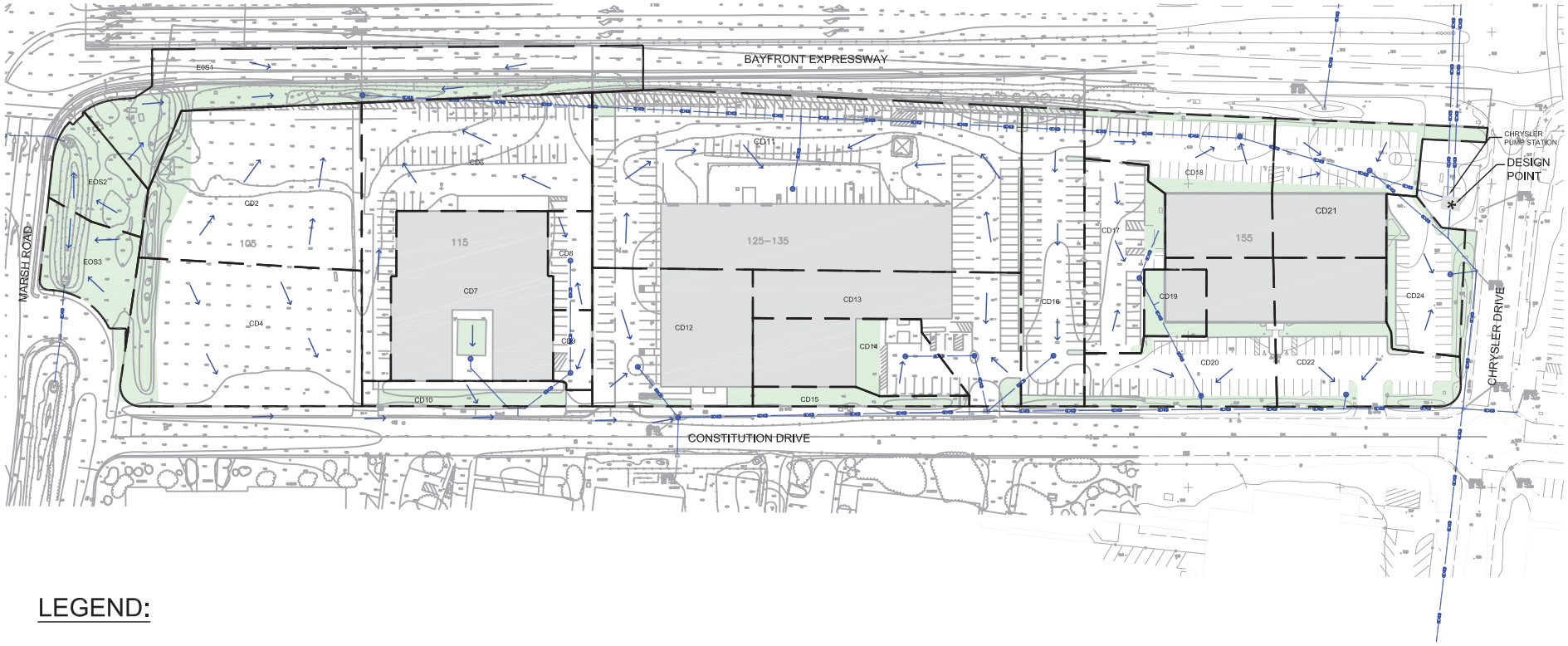
11 The intensity assumed for these design storms is based on the time of concentration, discussed in detail in the *Preliminary Hydrology Report*. The 10-year peak flow rate is the flow rate with a 10 percent chance of occurring in any given year. The 100-year peak flow rate is the flow rate with a 1 percent chance of occurring in any given year.

12 Philip Williams and Associates, *Preliminary Hydrology Report*, 2009, pp. 13-14.

13 County of San Mateo, San Mateo County General Plan Natural Hazards Map, 1986, www.sforoundtable.org/P&B/pb_general_plan.html.

14 Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map: City of Menlo Park, California, San Mateo County,* Panel 4 of 13, April 21, 1999. Cited in Philip Williams and Associates, *Preliminary Hydrology Report*, 2009.

15 FEMA, 1999.



LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- VACANT
- WATERSHED BOUNDARY
- CD68 WATERSHED ID
- (E) STORM DRAIN
- FLOW PATH

Source: PWA, 2009.

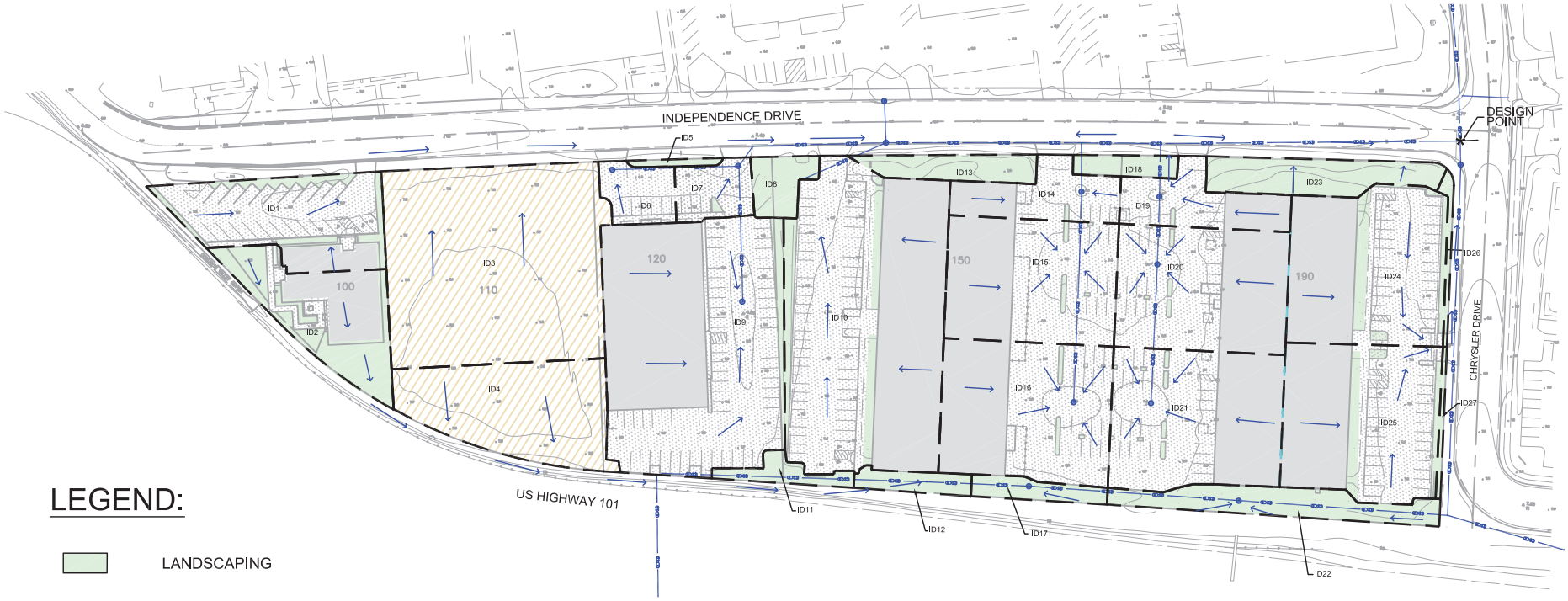
0 25 50 100
SCALE (FEET)

NORTH
SCALE IN FEET

PBSJ

FIGURE **3.5-1**

Constitution Site – Existing Conditions Land Use and Drainage



LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- VACANT
- WATERSHED BOUNDARY
- ID68 WATERSHED ID
- (E) STORM DRAIN
- FLOW PATH

0 25 50 100
SCALE (FEET)

NORTH
SCALE IN FEET

Source: PWA, 2009.

FIGURE **3.5-2**

Independence Site – Existing Conditions Land Use and Drainage

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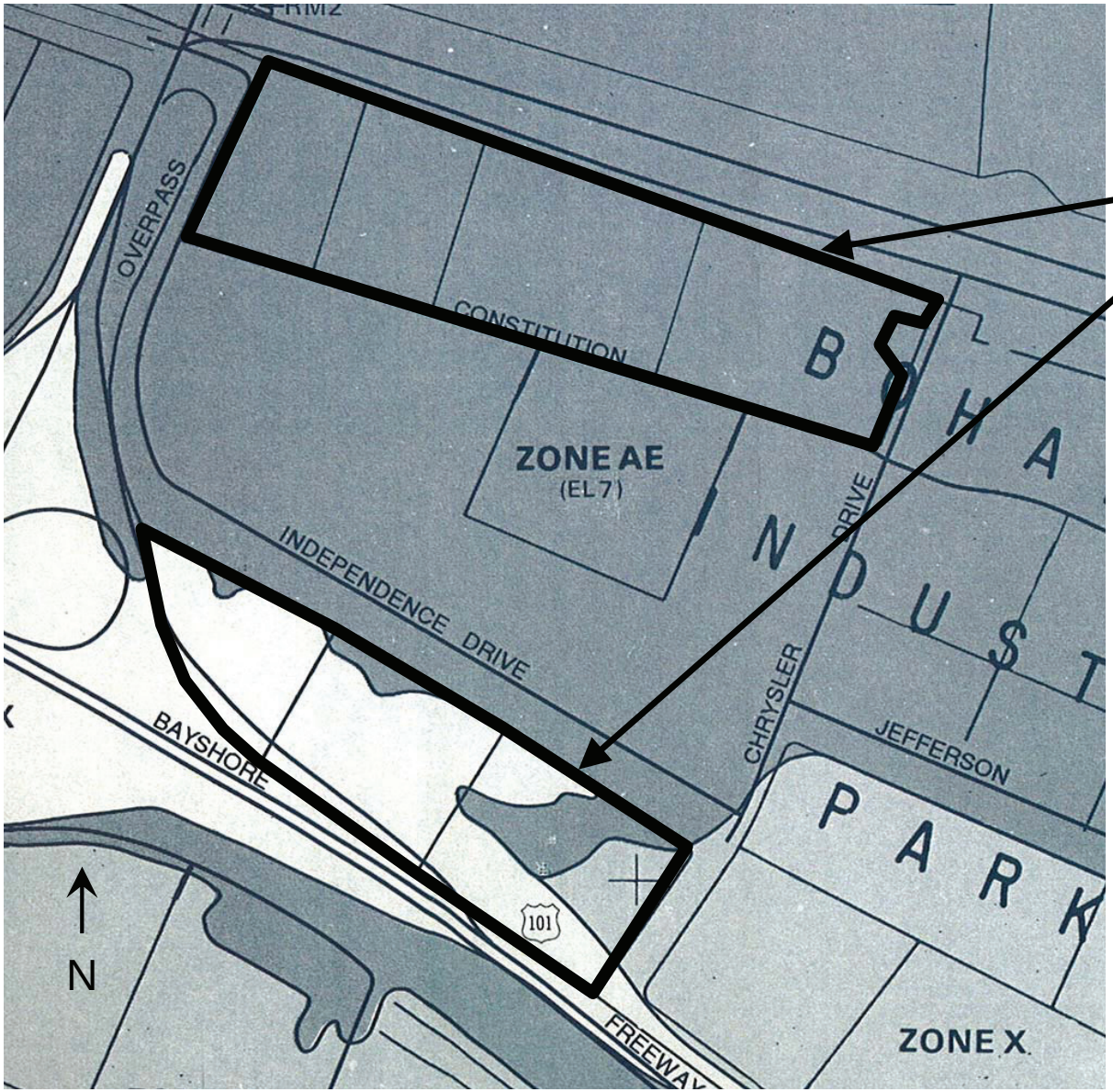

LEGEND

Zone AE: An area inundated by 100-year flooding

Zone X: An area that is determined to be outside the 100- and 500-year floodplains

NORTH
NOT TO SCALE

Source: FEMA, City of Menlo Park, 2009

PBSJ

FIGURE 3.5-3
Project Area within Flood Hazard Zones

D411048.01

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Surface Water Quality

Water quality of stormwater runoff varies with surrounding land uses, topography, and amount of impervious cover, as well as the intensity (energy) and frequency of irrigation or rainfall. Runoff may contain oil, grease, and metals accumulated in streets and driveways, as well as pesticides, herbicides, particulate matter, nutrients, animal waste, and other oxygen-demanding substances from landscaped areas. The highest pollutant concentrations are generally in stormwater runoff generated at the beginning of the wet season and during the so-called "first-flush." Approximately 80 percent of total accumulated pollutants are washed off surfaces with the first 0.5 inch of rainfall, with street surfaces as the primary source of pollutants in urban areas.[16]

The most common sources of stormwater pollution in urban areas are from construction sites, streets, parking lots, large landscaped areas, and household and industrial materials dumped into storm drains. In some areas, rooftops can also contribute a significant amount of stormwater pollution in urban areas. Grading and earthmoving activities associated with new construction can accelerate soil erosion, even in flat areas. Grease, oil, hydrocarbons, and heavy metals deposited by vehicles and heavy equipment can accumulate on streets and paved parking lots and are carried into storm drains by runoff. Pesticides, herbicides, and fertilizers used for landscape maintenance are washed into storm drains by over-watering (irrigation in excess of soil infiltration rates and plant uptake). Paints, solvents, soap products, and other toxic materials may be inadvertently or deliberately deposited in storm drains in residential and industrial areas. Deposition of particulate matter and dissolution of roofing material and other exposed materials can also contribute pollutants to urban stormwater. The federal Clean Water Act (CWA) requires local municipalities to implement measures to control these types of pollutants from entering their storm drainage systems. Further discussion of federal and local regulations and compliance is presented below in the Regulatory Setting.

The quality of the stormwater runoff from the project area is probably typical of urban watersheds with similar land uses and may contain constituents such as landscaping chemicals (e.g., nitrates, phosphates, herbicides, and pesticides), automobile and traffic pollutants (e.g., oil, grease, metal brake dust, metal wear), trash and debris, pathogens (e.g., wildlife and pet waste), sediment with associated attached pollutants from soil erosion or aerial deposition of dust, and chemicals leaching from structures (e.g., metals from metal roofs and architectural features, calcium from limestone).

The Central San Francisco Bay is listed by the EPA as impaired by pollutants from the following three sources: (1) chlordane, DDT, dieldrin, and mercury from nonpoint sources; (2) dioxin compounds, furan compounds, and mercury from atmospheric deposition; and (3) exotic species from ballast water. In addition, the bay is impaired by PCBs and dioxin-like PCBs from unknown nonpoint sources.[17] Industrial and municipal point sources, resource extraction, and natural sources also contribute to mercury and selenium degradation of the Central San Francisco Bay.

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[16] Shueler, T. R., First Flush of Stormwater Pollutants Investigated in Texas, Article 9 in The Practice of Watershed Protection, Center for Watershed Protection, 2000.

[17] San Francisco Regional Water Quality Control Board (SFRWQCB), *2006 CWA Section 303(d) List of Water Quality Limited Segments Requiring TMDLs*, approved by the USEPA June 28, 2007.

Groundwater Storage[18]

The project area is located above the Santa Clara Valley groundwater basin and San Mateo subbasin (ID 2-9.03). The San Mateo subbasin is bounded by the Santa Cruz Mountains to the west, the San Francisco Bay to the east, San Francisquito Creek to the south, and the Westside basin to the north. The subbasin's underlying water bearing formations include Quaternary and Plio-Pleistocene alluvial deposits composed of gravel, sand, silt, and clay. A relatively shallow water table aquifer overlies confined and semi-confined aquifers near the margins of the San Francisco Bay, with most wells drawing from the deeper deposits. Shallow groundwater is expected to be encountered in the project area at depths of less than 10 feet below ground surface.[19] The direction of groundwater flow is generally to the north.[20]

Recharge of the subbasin occurs through infiltration into stream beds and through infiltration of precipitation on the valley floor. Little is known about the actual storage capacity of the subbasin or existing groundwater levels, but it is estimated that groundwater levels have rebounded somewhat since the early twentieth century when groundwater was used as the primary source for drinking and irrigation.

The majority of water supplies serving the City are obtained from the San Francisco Public Utilities Commission (SFPUC - Hetch-Hetchy). However, a small amount of connections are served by local groundwater. The O'Connor Tract Co-operative Water Company is a small municipal water supplier that services parts of Menlo Park and East Palo Alto. This company operates two groundwater wells that are 250 to 500 feet deep and are located over 2 miles up-gradient from the project area.

Groundwater Quality[21]

The USGS and the Town of Atherton, which is approximately 2 miles west of the project area, conducted a water quality study of wells in the project area in 1997. The study found that the water is a calcium magnesium carbonate bicarbonate type and has a pH of approximately 7.3. The water contains 471 milligrams per liter (mg/L) of CaCO3 and is classified as very hard. Some of the wells in the project vicinity have a high concentration of sodium, which makes the water unsuitable for irrigation, while other samples exceeded the nitrate-nitrogen primary maximum contaminant level set by the US EPA.

Regulatory Setting

Water resources are regulated by a variety of statutes at the local, State, and federal levels. Agencies with regulatory and enforcement jurisdiction in the City of Menlo Park include the City, the San Mateo

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18 California Department of Water Resources (DWR), *California Groundwater Bulletin 118; Santa Clara Valley Groundwater Basin, San Mateo Subbasin*, 2004. www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs_desc/2-9.03.pdf, accessed April 24, 2008.

19 Secor, 2007.

20 Secor, 2007.

21 Information in this section is from DWR, 2004.

Countywide Water Pollution Prevention Program (SMCWPPP), the San Mateo County Flood Control District (SMCFCD), the State Water Resources Control Board (SWRCB), the San Francisco Bay RWQCB, the California Department of Fish and Game, FEMA, the US Army Corps of Engineers, and the US Environmental Protection Agency (EPA). Plans, policies, and regulations pertaining to hydrology and water quality in the project area are outlined below.

Clean Water Act (CWA). The CWA was enacted with the primary purpose of restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. The CWA directs states to establish water quality standards for all "waters of the United States" and to review and update such standards on a triennial basis. The EPA has delegated responsibility for implementation of portions of the CWA, including water quality control planning and control programs, such as the National Pollutant Discharge Elimination System (NPDES) Program, to the SWRCB and the RWQCB for water quality control planning and control programs, such as the NPDES Program.

Responsibility for the protection of water quality in California rests with the SWRCB and nine RWQCBs. The SWRCB establishes statewide policies and regulations for the implementation of water quality control programs mandated by federal and state water quality statutes and regulations. The RWQCBs develop and implement Water Quality Control Plans (Basin Plans) that consider regional beneficial uses, water quality characteristics, and water quality problems. The San Francisco Bay RWQCB (Region 2) implements a number of federal and state laws, the most important of which are the state Porter-Cologne Water Quality Control Act and the federal CWA. The project area is located within Region 2 and is subject to CWA requirements.

Section 303(d) and Total Maximum Daily Loads (TMDLs). The CWA contains two strategies for managing water quality. One is a technology-based approach that includes requirements to maintain a minimum level of pollutant management using the best available technology. The other is a water quality-based approach that relies on evaluating the condition of surface waters and setting limitations on the amount of pollution that the water can be exposed to without adversely affecting the beneficial uses of those waters. Section 303(d) of the CWA bridges these two strategies. Section 303(d) requires that the states make a list of waters that are not attaining standards after the technology-based limits are put into place. For waters on this list (and where the EPA administrator deems they are appropriate), the states are to develop total maximum daily loads or TMDLs. TMDLs are established at the level necessary to implement the applicable water quality standards. The CWA does not expressly require the implementation of TMDLs. However, federal regulations require that an implementation plan be developed along with the TMDL and Section 303(d), 303(e), and their implementing regulations require that approved TMDLs be incorporated into water quality control plans. The EPA has established regulations (40 CFR 122) requiring that NPDES permits be revised to be consistent with any approved TMDL. All discharges associated with proposed project buildout would be subject to the Urban Pesticide TMDL, Mercury TMDL, and any other approved TMDLs at the time of development.

Discharges to Atherton Creek associated with the proposed project are subject to the Urban Pesticide TMDL that has been incorporated into the San Francisco Bay Area Basin Water Quality Control Plan (SWRCB Order No. R2-3005-0063). Numeric targets have been established for pesticide-related toxicity and diazinon concentrations to protect cold and warm freshwater habitats at all urban creek

locations, including those near storm drain outfalls where urban runoff enters receiving waters. The diazinon concentration target in urban creeks shall not exceed 100 ng/l as a one-hour average. The target addresses both acute and chronic diazinon-related toxicity.

A Mercury TMDL has been established for the San Francisco Bay and approved by the SWRCB (Resolution 2007-0045). TMDLs for the other constituents contributing to impairment are scheduled to be completed by 2019.

National Pollutant Discharge Elimination System (NPDES). The NPDES permit system was established in the CWA to regulate point source discharges. Point sources include a municipal or industrial discharge at a specific location or pipe. Nonpoint pollution sources are diffuse and originate over a wide area rather than from a definable point. Nonpoint pollution often enters receiving water in the form of surface runoff and is not conveyed by way of pipelines or discrete conveyances. As defined in the federal regulations, such nonpoint sources are generally exempt from federal NPDES permit program requirements. Urban stormwater runoff and construction site runoff are diffuse sources regulated under the NPDES permit program because they are conveyed in a discrete system and discharge at a specific location(s).

For individual point source discharges, each NPDES permit contains limits on allowable concentrations and mass emissions of pollutants contained in the discharge; however, the project area would not be considered such an individual point source for NPDES permit purposes because the source of discharge is diffuse. For stormwater runoff, the NPDES program establishes a comprehensive stormwater quality program to manage urban stormwater and minimize pollution of the environment to the maximum extent practicable. The NPDES program consists of (1) characterizing receiving water quality, (2) identifying harmful constituents, (3) targeting potential sources of pollutants, and (4) implementing a comprehensive Stormwater Management Program. The EPA implemented the NPDES stormwater program in two phases. Phase I addressed large dischargers and construction activities that affect 5 acres or greater, while Phase II, which was implemented in 1999, adds smaller dischargers and construction activities that affect 1 or more acres.

To meet the goals of the NPDES permit, each local stormwater program and each permittee within a program establishes a Stormwater Management Plan (SWMP). These SWMPs provide specific local requirements targeted to meet the environmental needs of each watershed, as well as to reflect the political consensus of each community. The goal of the NPDES diffuse source (stormwater) regulations is to improve the quality of stormwater discharged to receiving waters to the "maximum extent practicable" (MEP)[22] through the use of best management practices (BMPs).

BMPs can include the development and implementation of various practices including educational measures (e.g., workshops informing public of what impacts result when household chemicals are

[22] BMPs are intended to reduce impacts to the Maximum Extent Practicable (MEP), a general standard created by Congress to allow regulators the flexibility necessary to tailor programs to the site-specific nature of municipal stormwater discharges. Regulations do not define a single MEP standard, but reducing impacts to the MEP generally relies on BMPs that emphasize pollution prevention and source control, with additional structural controls as needed.

dumped into storm drains), regulatory measures (e.g., local authority of drainage facility design), public policy measures (e.g., label storm drain inlets as to impacts of dumping on receiving waters), and structural measures (e.g., filter strips, grass swales, and detention ponds). The proposed project would be subject to the NPDES permit system through the following NPDES permits:

- *California Regional Water Quality Control Board San Francisco Bay Region (Municipal Regional Stormwater NPDES Permit).* The County of San Mateo and its incorporated cities form the SMCWPPP and are permitted under Phase I for municipal stormwater and urban runoff discharges under NPDES Permit No. CAS612008 Order No. R2-2009-0074. One of the primary objectives of the regulations for pollutant dischargers is the reduction of pollutants in urban stormwater discharge through the use of structural and nonstructural BMPs. The Regional Stormwater NPDES Permit requires the permittees, including the City of Menlo Park, to address eight general control measures associated with construction and operational activities, including (1) public education and outreach; (2) public participation/involvement; (3) illicit discharge detection and elimination; (4) construction site stormwater runoff control for sites greater than 1 acre; (5) post-construction stormwater management in new development and redevelopment; (6) pollution prevention/good housekeeping for municipal operations, (7) water quality monitoring; and (8) implementation of controls to meet TMDLs. These control measures are implemented through the use of BMPs.

  Regulated Projects, as defined in the Construction General Permit (Provision C.3.b.), are required to implement certain construction and post-construction stormwater quality BMPs.

  Regulated Projects include redevelopment projects that create or replace 10,000 square feet and of impervious surfaces. Regulated Projects must provide permanent/post-construction treatment controls for stormwater according to specific calculations. If the redevelopment results in an alteration of more than 50 percent of the existing impervious surfaces, permanent BMPs must be implemented to treat runoff from the entire project site. The proposed project is a Regulated Project that alters more than 50 percent of the existing impervious surfaces.

  Low Impact Development (LID) (C.3.c). The goal of LID is to reduce runoff and mimic a site's predevelopment hydrology by minimizing disturbed areas and impervious cover and then infiltrating, storing, detaining, evapotranspiring, and/or biotreating stormwater runoff close to its source. LID employs principles such as preserving and recreating natural landscape features and minimizing imperviousness to create functional and appealing site drainage that treats stormwater as a resource, rather than a waste product. All Regulated Projects must comply with minimum LID requirements by the implementation date (December 1, 2011). For any private development project, such as the proposed project, for which a planning application has been deemed complete on or before the Permit effective date (December 1, 2009), the requirements of Provisions C.3.c.i. (LID required BMPs) shall not apply so long as the project applicant is diligently pursuing the project. Diligent pursuance may be demonstrated by the applicant's submittal of supplemental information to the original application, plans or other documents required for any necessary approvals of the project. The City of Menlo Park deemed the planning application complete in July 2009, prior to the release of the Draft EIR. As the project applicant has submitted supplemental information to the original application and plans since that time, the applicant has demonstrated diligent pursuance of the project. As a result, LID required BMPs do not apply.

Numeric Sizing Criteria for Stormwater Treatment Systems (C.3.d). Stormwater treatment measures must be numerically sized in accordance with criteria identified under Provision C.3.d. The permittees must also verify that infiltration devices are designed and installed such that they would not cause or contribute to the degradation of groundwater quality at project sites. An infiltration device is any structure that is deeper than wide and designed to infiltrate stormwater into the subsurface and, as designed, bypass the natural groundwater protection afforded by surface soil. Specific requirements are specified in Provision C.3.d.iv.(2).

Hydromodification[23] Management (C.3.g). A Hydromodification Management (HM) Project is a Regulated Project that creates and/or replaces one acre or more of impervious surface and is not specifically excluded within the requirements of Attachments B–F of the Construction General Permit. A project that does not increase impervious surface area over the pre-project condition is not an HM Project. The project site is located within an HM exempt area on the San Mateo County HM map and the proposed project would not increase impervious area over the pre-project condition. Therefore, the proposed project is not an HM Project subject to HM controls.

Industrial and Commercial Site Controls (C.4.). Each Permittee is required to implement an industrial and commercial site control program at all sites which could reasonably be considered to cause or contribute to pollution of stormwater runoff, with inspections and effective follow-up and enforcement to abate actual or potential pollution sources consistent with each Permittee's respective Enforcement Response Plan (ERP), to prevent discharge of pollutants and impacts on beneficial uses of receiving waters. Inspections shall confirm implementation of appropriate and effective BMPs and other pollutant controls by industrial and commercial site operators.

Construction Site Control (C.6). Each Permittee is required to implement a construction site inspection and control program at all construction sites, with follow-up and enforcement consistent with each Permittee's respective Enforcement Response Plan (ERP), to prevent construction site discharges of pollutants and impacts on beneficial uses of receiving waters. Inspections shall confirm implementation of appropriate and effective erosion and other construction pollutant controls by construction site operators/developers; and reporting shall demonstrate the effectiveness of this inspection and problem solution activity by the Permittees.

Permittees shall review erosion control plans for consistency with local requirements, appropriateness and adequacy of proposed BMPs for each site before issuance of grading permits for projects. Permittees shall also verify that sites disturbing one acre or more of land have filed a Notice of Intent for coverage under the Construction General Permit.

Before approval and issuance of local grading permits, each Permittee shall perform the following:

- Review the site operator's/developer's erosion/pollution control plan or Stormwater Pollution Prevention Plan (SWPPP) to verify compliance with the Permittee's grading ordinance and other local requirements. Also review the site operator's/developer's erosion/pollution control plan or SWPPP to verify that seasonally appropriate and effective BMPs for the six categories listed in C.6.c.i. are planned;

[23] Changes in the timing, flow rate, and/or volume of runoff from a site are known as "hydrograph modification" or "hydromodification."

- For sites disturbing one acre or more of soil, verify that the site operators/developers have filed a Notice of Intent for permit coverage under the Construction General Permit; and
- Provide construction stormwater management educational materials to site operators/developers, as appropriate.

TMDLs. Additional BMPs required for compliance with existing and proposed TMDLs within the San Francisco Bay Region including: Pesticides Toxicity Control (C.9.), Trash Load Reduction (C.10.), Mercury Controls (C.11.), Polychlorinated Biphenyls (PCBs) Controls (C.12.), Copper Controls (C.13.), Polybrominated Diphenyl Ethers (PBDE), Legacy Pesticides and Selenium (C.14.).

- *NPDES General Construction Activity Stormwater Permit (Construction General Permit)*. Pursuant to the CWA Section 402(p) and as related to the goals of the Porter-Cologne Water Quality Control Act, described below, the SWRCB has issued a statewide NPDES General Permit for Storm Water Discharges Associated with Construction Activity (Construction General Permit) (Order No. 2009-0009-DWQ, NPDES No. CAR000002), adopted September 2, 2009. Every construction project that disturbs one or more acres of land surface or that are part of a common plan of development or sale that disturbs more than one acre of land surface would require coverage under the Construction General Permit. To obtain coverage under the Construction General Permit, the landowner or other applicable entity must file Permit Registration Documents (PRDs) prior to the commencement of construction activity, which include a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other documents required by the Construction General Permit. Every regulated construction project, including those covered under the previous Construction General Permit (Water Quality Order No. 98-08-DWQ), are required to seek coverage under the newly adopted Construction General Permit by July 1, 2010. Because the proposed project would disturb more than one acre, construction of the proposed project would be subject to the Construction General Permit requirements.

  Construction activities subject to the Construction General Permit include clearing, grading, and disturbances to the ground, such as stockpiling or excavation, that result in soil disturbances of at least one acre of total land area. The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of stormwater discharges; and (2) to describe and ensure the implementation of BMPs to reduce or eliminate sediment and other pollutants in stormwater as well as non-stormwater discharges. BMPs are intended to reduce impacts to the Maximum Extent Practicable (MEP), a standard created by Congress to allow regulators the flexibility necessary to tailor programs to the site-specific nature of municipal stormwater discharges. Reducing impacts to the MEP generally relies on BMPs that emphasize pollution prevention and source control, with additional structural controls as needed.

  - Rainfall Erosivity Waiver. The Construction General Permit allows those overseeing construction on a small site (between 1 and 5 acres) to self-certify if the rainfall erosivity value (R value) for the site, given the construction time frame, is less than or equal to 5.
  - Risk-Based Permitting Approach. The Construction General Permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: 1) Project Sediment Risk, and 2) Receiving Water Risk.

- Technology-based Numeric Action Levels (NALs). The Construction General Permit includes NALs for pH and turbidity for Risk Level 2 projects.
- Technology-Based Numeric Effluent Limitations (NELs). The Construction General Permit contains NELs for pH during any construction phase where there is a high risk of pH discharge and turbidity for all discharges in Risk Level 3. The daily average NEL for turbidity is set at 500 NTU to represent the minimum technology that sites need to employ (to meet the traditional Best Available Technology Economically Achievable (BAT)/ Best Conventional Pollutant Control Technology (BCT) standard and the traditional, numeric receiving water limitations for turbidity.
- Minimum Requirements Specified. The Construction General Permit specifies more minimum BMPs and requirements that were previously only required as elements of the SWPPP or were suggested by guidance.
- Project Site Soil Characteristics Monitoring and Reporting. The Construction General Permit provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.
- Effluent Monitoring and Reporting. The Construction General Permit requires effluent monitoring and reporting for pH and turbidity in stormwater discharges. The purpose of this monitoring is to be used to determine compliance with the NELs and evaluate whether NALs included in this General Permit are exceeded.
- Receiving Water Monitoring and Reporting. The Construction General Permit requires some Risk Level 3 dischargers to monitor receiving waters and conduct bioassessments.
- Post-Construction Storm Water Performance Standards. The Construction General Permit specifies runoff reduction requirements for all sites not covered by a Municipal General NPDES permit, to avoid, minimize, and/or mitigate post-construction stormwater runoff impacts.
- Rain Event Action Plan. The Construction General Permit requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.
- Annual Reporting. The Construction General Permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and pubic information.
- Certification/Training Requirements for Key Project Personnel. The Construction General Permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.
- Linear Underground/Overhead Projects. The Construction General Permit includes requirements for all Linear Underground/Overhead Projects (LUPs).

Risk levels are based on a matrix of project sediment risk and receiving water risk. Sediment risk is based on estimated soil loss, as calculated by the Revised Universal Soil Loss Equation (RUSLE) where: soil loss of less than 15 tons/acre is considered low risk; soil loss between 15 and 75 is medium risk; and, Soil loss over 75 acres is considered high risk. Receiving water risk is based on whether a project drains to a sediment-sensitive waterbody. A sediment-sensitive waterbody is either on the most recent 303(d) list for waterbodies impaired for sediment; has a US EPA-approved TMDL implementation plan for sediment; or has the beneficial uses of cold freshwater habitat, fish spawning, and fish migration.

There are three levels of risk; Risk Level 1 projects are subject to minimum BMP and visual monitoring requirements; Risk Level 2 projects are subject to NALs and some additional monitoring requirements; and Risk Level 3 projects are subject to NELs and more rigorous monitoring requirements, such as receiving water monitoring and in some cases bioassessment. Discharge to a sediment-sensitive waterbody is automatically a Risk Level 2 or greater.

The project site does not discharge to a sediment-sensitive waterbody; the lower portion of the Atherton Channel and Central San Francisco Bay are not listed as impaired by sediment and do not have the beneficial uses of cold freshwater habitat, fish spawning, and fish migration. Therefore, it would not automatically be categorized as a Risk Level 3 project. Depending upon the erosivity of project site soils, the proposed project would be categorized as a Risk Level 1 or 2 project.

- *Individual NPDES Permits (Potentially Required).* An individual permit is tailored for a specific discharge that does not fall under one of the General Permit categories (e.g., substantial amounts of construction or post-construction dewatering). The SWRCB or RWQCB issues a permit for that particular discharge based on information (type of activity, nature of discharge, receiving water quality, etc.) contained in the application. If discharge is not directly related to surface water, a state Waste Discharge Requirement (WDR) is used instead of an NPDES permit to regulate the discharge (discussed below under State regulation). The proposed project is not expected to need an individual NPDES permit/WDR.

- *NPDES General Industrial Permit for Discharges of Storm Water Associated with Industrial Activities (Industrial General Permit).* Pursuant to the CWA Section 402(p), the SWRCB has issued a statewide permit for certain types of industrial activities (Industrial General Permit)(Order No. 97-03-DWQ). A wide range of industries is covered under the Industrial General Permit, as determined by the facility Standard Industrial Classification (SIC) code, a four-digit code that refers to the type of business conducted.

  The Industrial General Permit requires control of pollutant discharges using Best Available Technology/Best Conventional Technology (BAT/BCT) to meet water quality standards. The Industrial General Permit generally requires facility operators to: 1) eliminate unauthorized non-stormwater discharges; 2) develop and implement a SWPPP; and 3) perform monitoring of stormwater discharges and authorized non-stormwater discharges.

  Stormwater discharges from project site may be regulated under the Industrial General Permit, depending upon the SIC. And, depending upon the type of R&D, certain discharges from the proposed project may be regulated under the Industrial General Permit. It is possible that future

tenants within the project site may include industrial facilities that would be covered under the Industrial General Permit.

Floodplain Development. FEMA is responsible for determining flood elevations and floodplain boundaries based on Corps studies. FEMA is also responsible for distributing the Flood Insurance Rate Maps (FIRMs), which are used in the National Flood Insurance Program (NFIP). These maps identify the locations of special flood hazard areas, including the 100-year floodplain.

FEMA allows non-residential development in the floodplain; however, construction activities are restricted within the flood hazard areas depending upon the potential for flooding within each area. Federal regulations governing development in a floodplain are set forth in Title 44, Part 60 of the Code of Federal Regulations (CFR), which enables FEMA to require municipalities that participate in the NFIP to adopt certain flood hazard reduction standards for construction and development in 100-year floodplains. Because the City participates in the NFIP, the proposed project would be subject to FEMA regulations for development within a floodplain.

Porter-Cologne Water Quality Control Act. The Porter-Cologne Water Quality Control Act establishes the SWRCB and each RWQCB as the principal State agencies for coordinating and controlling water quality in California. Specifically, the Porter-Cologne Water Quality Control Act authorizes the SWRCB to adopt, review, and revise policies for all waters of the state (including both surface water and groundwater) and directs the RWQCBs to develop regional Basin Plans. Section 13170 of the California Water Code also authorizes the SWRCB to adopt water quality control plans on its own initiative.

The San Francisco Bay RWQCB has the authority to implement water quality protection standards through the issuance of permits for discharges to waters at locations within its jurisdiction. Water quality objectives for the San Francisco Bay and its tributaries are specified in the San Francisco Bay Basin Water Quality Control Plan Basin (Basin Plan) prepared by the RWQCB in compliance with the federal CWA and the State Porter-Cologne Water Quality Control Act. Because the City of Menlo Park is located within the San Francisco RWQCB's jurisdiction, all discharges to surface water or groundwater are subject to the Basin Plan requirements.

The principal elements of the Basin Plan are a statement of beneficial water uses protected under the plan; water quality objectives necessary to protect the designated beneficial water uses; and strategies and time schedules for achieving the water quality objectives. The water quality objectives are achieved primarily through the establishment and enforcement of WDRs. WDRs may include effluent limitations or other requirements that are designed to implement applicable water quality control plans, including designated beneficial uses and the water quality objectives established to protect those uses and prevent the creation of nuisance conditions.

The designated beneficial uses for the South San Francisco Bay, specified in Table 2-1 of the Basin Plan, are industrial processing, shellfish harvesting, ocean, commercial and sport fishing, preservation of rare and endangered species, estuarine and other wildlife habitat, fish migration, navigation, and water contact and noncontact water recreation. Cold and warm freshwater habitats and fish spawning

are also listed as potential beneficial uses. Designated beneficial uses for the San Mateo Plain Subbasin are municipal and domestic water supply, industrial processes water supply, industrial services water supply, and potential agricultural water supply.

Together, the narrative and numerical objectives define the level of water quality that shall be maintained within the region. Beneficial uses and their associated water quality objectives, together, comprise the relevant water quality standards. In instances where water quality is better than that prescribed by the objectives, the state Antidegradation Policy applies (State Board Resolution 68-16: Statement of Policy with Respect to Maintaining High Quality of Waters in California). This policy is aimed at protecting relatively uncontaminated aquatic systems where they exist and preventing further degradation. The state's Anti-degradation Policy is consistent with the federal Anti-degradation Policy, as interpreted by the SWRCB in State Board Order No. 86-17.

Waste Discharge Requirements. The RWQCBs have the primary responsibility for issuing WDRs. All discharges are regulated under WDRs for discharge to land surfaces or NPDES permits for discharge to surface waters (the NPDES permit also serves as a WDR). The RWQCBs may issue individual WDRs to cover individual discharges or general WDRs to cover a category of discharges. As noted previously, the proposed project is not expected to need an individual NPDES permit/WDR, although there is a possibility if extensive dewatering were necessary.

California Toxics Rule (CTR). Numeric criteria are required by the CWA for many priority toxic pollutants. However, in 1994, a state court overturned the state's water quality control plans containing water quality criteria for priority toxic pollutants. To fill in the gap between the water quality control plans and CWA requirements, on May 18, 2000, the EPA promulgated the California Toxics Rule based on the Administrator's determination that numeric criteria are necessary in the State of California to protect human health and the environment. These federal criteria are numeric water quality criteria for priority toxic pollutants and other provisions for water quality standards legally applicable in the State of California for inland surface waters, enclosed bays, and estuaries for all purposes and programs under the CWA. Although the proposed project would not be expected to directly discharge priority toxic pollutants to water resources, the CTR comprises water quality criteria for meeting applicable water quality objectives and water quality standards. Additionally, the proposed project may result in higher amounts of priority toxic pollutants in stormwater runoff (e.g., metals, pesticides, and others).

California Water Code. All projects resulting in discharges, whether to land or water, are subject to Section 13263 of the California Water Code. Section 13260 states that persons discharging or proposing to discharge waste that could affect the quality of waters of the state, other than into a community sewer system, shall file a Report of Waste Discharge containing information that may be required by the appropriate RWQCB. The projects are then required to obtain approval of WDRs from the appropriate RWQCB. Land and groundwater-related WDRs (i.e., non-NPDES WDRs) regulate discharges of privately or publicly treated domestic wastewater and process and wash-down wastewater. WDRs for discharges to surface waters also serve as NPDES permits, which are further described below.

Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Plan, or SIP). In March of 2000, the State Water Board adopted the SIP in Resolution No. 2000-015, which establishes the following: (1) implementation provisions for priority pollutant criteria promulgated by the EPA through the National Toxics Rule (40 CFR 131.36) (promulgated on December 22, 1992 and amended on May 4, 1995) and through the California Toxics Rule (40 CFR 131.38) (promulgated on May 18, 2000 and amended on February 13, 2001), and for priority pollutant objectives established by Regional Water Boards in their basin plans; (2) monitoring requirements for 2,3,7,8-TCDD (dioxin) equivalents; and (3) chronic toxicity control provisions. In addition, this policy includes special provisions for certain types of discharges and factors that could affect the application of other provisions in this policy. A list of priority pollutants and associated criteria can be found in the CFR, Section 40, Part 131.

City of Menlo Park Municipal Code. Several ordinances in the Menlo Park Municipal Code pertain to hydrology and water quality. These include the following:

Chapter 7.38. discusses general water conservation principals and adopts water conservation as a citywide goal.

Chapter 7.42. officially adopts the SMCWPPP Stormwater Management Plan and its provisions as City policy.

Chapter 12.42. contains methods and provisions designed to prevent flood damage. Under Section 12.42.41, a development permit is required before grading activities in a flood hazards area can begin. The standards of construction listed in Section 12.42.51 include anchoring, the use of flood damage-resistant construction materials and methods, and elevation and floodproofing standards.

Chapter 12.44. defines water-efficient landscaping standards that must be employed by new developments.

City of Menlo Park General Plan. The Menlo Park General Plan contains several policies pertaining to hydrology and water quality. These include the following:

Policy I-F-1. Industrial development shall be allowed only in already established industrial areas and shall not encroach upon Bay wetlands.

Policy I-H-3. Plant material selection and landscape and irrigation design for City parks and other public facilities and in private developments shall adhere to the City's Water Efficient Landscaping Ordinance.

Policy I-H-7. The use of reclaimed water for landscaping and other feasible uses shall be encouraged.

Policy I-H-9. Urban development in areas with geological and earthquake hazards, flood hazards, and fire hazards shall be regulated in an attempt to prevent loss of life, injury, and property damage.

Policy I-H-10. The City shall continue to participate in the National Flood Insurance Program. To this end, the City shall work to keep its regulations in full compliance with standards established by the Federal Emergency Management Agency.

Impacts and Mitigation Measures

Standards of Significance

The proposed project would result in a significant impact if it would:

- **Impact Criterion #1**: Violate any water quality standards or waste discharge requirements;
- **Impact Criterion #2**: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be 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);
- **Impact Criterion #3**: 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 siltation on- or off-site;
- **Impact Criterion #4**: 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 of amount of surface runoff in a manner which would result in flooding on- or off-site;
- **Impact Criterion #5**: Create or contribute runoff water which would exceed pre-project levels or provide substantial additional sources of polluted runoff;
- **Impact Criterion #6**: Otherwise substantially degrade water quality;
- **Impact Criterion #7**: Place within a 100-year flood hazard area structures which would impede or redirect flood flows; or
- **Impact Criterion #8**: Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.

Project Evaluation

The following analysis discusses potential impacts of the proposed project that would be allowed under the GPA/ZOA and the Menlo Gateway project compared to existing baseline conditions.

Impact HY-1: *The proposed project would not violate any water quality standards or waste discharge requirements. Accordingly, this impact would be less than significant. (LTS)*

The pertinent NPDES permits are the Construction General Permit (General Permit for Discharges of Storm Water Associated with Construction Activity [Order No. 2009-0009-DWQ, NPDES No. CAR000002]), Regional Stormwater NPDES Permit (the San Francisco Bay Region Municipal Regional NPDES General Permit [Order R2-2009-0074, NPDES Permit No. CAS612008]), and potentially the Industrial General Permit (NPDES General Industrial Permit for Discharges of Storm

Water Associated with Industrial Activities [Order No. 97-03-DWQ)]). If substantial groundwater dewatering is required during or after construction, an individual NPDES Permit/WDR may be required. The relevant water quality standards are listed in the Basin Plan.

Construction. Development associated with the proposed project would include construction activities, such as clearing and grubbing, pavement removal and replacement, excavation and trenching for foundations and utilities, soil compaction, cut and fill activities, and grading, all of which would temporarily disturb soils. Disturbed soils are susceptible to high rates of erosion from wind and rain, resulting in sediment transport from the project area. Erosion and sedimentation affect water quality through interference with photosynthesis, oxygen exchange, and the respiration, growth, and reproduction of aquatic species. Other pollutants, such as nutrients, trace metals, and hydrocarbons, can attach to sediment and be transported with sediment to downstream locations. Sediment-associated pollutants could also cause or contribute to degradation of water quality.

The delivery, handling, and storage of construction materials and wastes, as well as the use of construction equipment, could also introduce a risk for stormwater contamination that could impact water quality. Spills or leaks from heavy equipment and machinery can result in oil and grease contamination, and some hydrocarbon compound pollution associated with oil and grease can be toxic to aquatic organisms at low concentrations. Staging areas or building sites can be sources of pollution because of the use of paints, solvents, cleaning agents, and metals during construction. Impacts associated with metals in stormwater include toxicity to aquatic organisms, such as bioaccumulation, and the potential contamination of drinking supplies. Pesticide use (including herbicides, fungicides) associated with site preparation work (as opposed to pesticide use for landscaping) is another potential construction activities source of stormwater contamination. Pesticide impacts to water quality include toxicity to aquatic species and bioaccumulation in larger species. Larger pollutants, such as trash, debris, and organic matter, are additional pollutants that could be associated with construction activities. Impacts include health hazards and aquatic ecosystem damage associated with bacteria, viruses, and vectors and physical changes to the aquatic ecosystem. Construction impacts on water quality are potentially significant and could lead to exceedance of water quality objectives or criteria.

All construction activities, including installation and realignment of utilities, would be subject to existing regulatory requirements. The NPDES Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). As mentioned above in the Regulatory Setting, the proposed project would be a Risk Level 1 or 2 project, depending upon the project site erosion potential. As such, the SWPPP must include, but would not necessarily be limited to, the following BMPs:

- Good Site Management "Housekeeping"
    1. Risk Level 1 and 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:
        a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced.

b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers or in a storage shed (completely enclosed), with appropriate secondary containment to prevent any spillage or leakage.

d. Minimize exposure of construction materials with precipitation.

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 1 and 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

   a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

   b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the stormwater drainage system or receiving water.

   c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

   d. Cover waste disposal containers at the end of every business day and during a rain event.

   e. Prevent discharges from waste disposal containers to the stormwater drainage system or receiving water.

   f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

   g. Implement procedures that effectively address hazardous and nonhazardous spills.

   h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

      i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

      ii. Appropriate spill response personnel are assigned and trained.

      iii. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 1 and 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains, or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained, and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 1 and 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:
    a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.
    b. Contain all fertilizers and other landscape materials when they are not actively being used.
    c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.
    d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.
    e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.
5. Risk Level 1 and 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in stormwater discharges and authorized non-stormwater discharges. This potential pollutant list shall be kept with the SWPPP and shall identify all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 1 and 2 dischargers shall do the following:
    a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.
    b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with stormwater.
    c. Consider the direct and indirect pathways that pollutants may be exposed to stormwater or authorized non-stormwater discharges. This shall include an assessment of past spills or leaks, non-stormwater discharges, and discharges from adjoining areas.
    d. Ensure retention of sampling, visual observation, and inspection records.
    e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in stormwater discharges and authorized non-stormwater discharges.
6. Risk Level 1 and 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.
7. Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s)[24] in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects

[24] Rain Event Action Plan. See below for a description of the REAP.

include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

- Non-Stormwater Management
  1. Risk Level 1 and 2 dischargers shall implement measures to control all non-stormwater discharges during construction.
  2. Risk Level 1 and 2 dischargers shall wash vehicles in such a manner as to prevent non-stormwater discharges to surface waters or MS4 drainage systems.
  3. Risk Level 1 and 2 dischargers shall clean streets in such a manner as to prevent non-stormwater discharges from reaching surface water or MS4 drainage systems.
- Erosion Control
  1. Risk Level 1 and 2 dischargers shall implement effective wind erosion control.
  2. Risk Level 1 and 2 dischargers shall provide effective soil cover for inactive areas and all finished slopes, open space, utility backfill, and completed lots and shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.
- Sediment Controls
  1. Risk Level 1 and 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
  2. On sites where sediment basins are to be used, Risk Level 1 and 2 dischargers shall, at minimum, design sediment basins according to the method provided in Appendix 2 of the Construction General Permit.
  3. Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active construction.
  4. Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths in accordance specific requirements.
  5. Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.
  6. Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.
  7. Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

- Run-on and Run-off Controls

  Risk Level 1 and 2 dischargers shall evaluate the quantity and quality of run-on and runoff through observation and sampling. Risk Level 1 and 2 dischargers shall effectively manage all run-on, all runoff within the site, and all runoff that discharges off the site. Run-on from off-site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

- Inspection, Maintenance, and Repair

  1. Risk Level 1 and 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger.
  2. Risk Level 1 and 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 1 and 2 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.
  3. For each inspection required, Risk Level 1 and 2 dischargers shall complete an inspection checklist, including minimum required for inspection items. The checklists shall remain onsite with the SWPPP.

- Rain Event Action Plan

  1. Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event as specified in the Construction General Permit. The discharger shall begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event. Risk Level 2 dischargers shall ensure that all REAPs be prepared and certified by a QSP. A paper copy of each REAP shall be kept onsite.
  2. Additional Risk Level 2 Requirement: The Risk Level 2 discharger shall develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Post-Construction and include specific minimum site and construction phase information.
  3. Additional Risk Level 2 Requirement: The Risk Level 2 discharger shall develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include specific minimum information on the site and project phase.

- Risk Level 1 and 2 Monitoring and Reporting Requirements

  1. Construction Site Monitoring Program Requirements

     a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to the General Permit shall develop and implement a written site specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the

commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

b. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger(s) [responsible party(ies)] shall comply with these requirements as of the date the ownership change occurs.

2. Objectives

The CSMP shall be developed and implemented to address the following objectives:

a. To demonstrate that the site is in compliance with the Discharge Prohibitions, including applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit for Risk Level 2 dischargers;

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges; and

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

3. For Risk Level 1 and 2 projects, specific monitoring (inspection) requirements for qualifying rain events are identified in the Construction General Permit.

Risk Level 1 and 2 projects shall perform and record visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures in the CSMP.

Risk Level 2 projects shall perform quantitative water quality sampling and analysis. Specific sampling times, minimum number of samples, sample methods, and sample collection and handling are required. Samples must represent construction activity discharge from the entire project site disturbed areas. Exceptions to sampling including dangerous weather conditions and sampling outside of scheduled business hours. Samples must be analyzed for pH and turbidity and any additional parameters for which monitoring is required by the Regional Water Board.

The City's Municipal Code and permit review process would require preparation and approval of a SWPPP and Grading and Drainage Plan. The Regional Stormwater NPDES Permit requires Construction Site Controls by the City of Menlo Park including:

- Review of the erosion control plan for consistency with local requirements, appropriateness and adequacy of proposed BMPs for each site before issuance of grading permits for projects;
- Verification that sites disturbing one acre or more of land have filed a Notice of Intent for coverage under the Construction General Permit;

- Conduction of inspections to determine compliance with local ordinances (grading and stormwater) and determine the effectiveness of the BMPs in the six categories listed in C.6.c.i.;

Requirement of timely corrections of all actual and threatened violations of local ordinances observed.

Additionally, because of the project area's high water table, it is likely that construction activities, which would include trenching to install subgrade utilities and excavation of building foundations to install footings, would require dewatering and potential discharge of this water to surface waterbodies. Such activities could adversely affect surface water and groundwater quality. This extracted water would likely reflect similar characteristics of nearby Bay waters because of its close proximity to the Bay and likely subsurface interaction with the Bay. If substantial construction dewatering is required and disposal would be to land or surface water, an individual WDR must be obtained from the RWQCB. The WDR would specify the specific treatment (e.g., desedimentation, filtration, flocculation, and others) and discharge (e.g., maximum rate and volume of discharge) requirements, if any, necessary to ensure discharges do not cause or contribute to water quality degradation. The WDR would require testing to make sure that discharged waters do not pose a substantial risk to water quality. Minor construction dewatering would be covered under the Construction General Permit. Additionally, approval from the San Francisco Bay RWQCB is required for all discharges of water from construction dewatering activities.

Preparation of an approved SWPPP and Grading and Drainage Plan, as required by the City and construction site controls, as required by the Regional Stormwater NPDES Permit, would ensure that the Construction General Permit WDR is not violated. The SWRCB has identified compliance with the Construction General Permit requirements as protective of water quality during construction activities. Therefore, the proposed project would not violate water quality standards. With existing regulatory requirements and City approval process, construction impacts on violation of WDRs and water quality standards would be less than significant.

Operation. Development of the project site has the potential to degrade the quality of surface receiving waters through the creation or replacement of impervious surfaces that contribute to stormwater runoff and from the mobilization of pollutants in stormwater that would be generated by the proposed land uses. The proposed project would remove existing structures and result in a net reduction in impervious surfaces by about 3 percent.[25] This reduction in impervious surface would reduce the stormwater runoff potential and the surface area where pollutants could be deposited and easily picked up and transported in stormwater runoff to receiving waters.

Operation of the proposed project would result in a change in land use that could affect pollutants in stormwater runoff and the total amount of runoff from the project site. During the operational phase of the Menlo Gateway project, the major source of pollution in stormwater runoff would be pollutants that have accumulated on rooftops and other impervious surfaces, such as surface parking lots, driveways, and pedestrian walkways, prior to connecting to the storm drain system. Typical stormwater pollutants

[25] Philip Williams and Associates, *Final Hydrology Study,* 2009.

may include sediment, nutrients (from landscaping, gross debris, and atmospheric deposition), heavy metals, pathogens, petroleum hydrocarbons and polyaromatic hydrocarbons (PAHs), pesticides and herbicides (from landscaping), and trash.

The proposed project would replace existing land uses that have historically been more light industrial in nature with uses that are generally more commercial in nature. Table 3.5-1 lists median storm event concentrations for various pollutants for both commercial and industrial land uses. These data are based on the National Storm Water Quality Database.

Table 3.5-1
Typical Pollutant Concentrations in Stormwater for Industrial and Commercial Land Uses

Constituent of Concern (COC)	Event Mean Concentration (EMC)		
	Units	Industrial	Commercial
Oil and Grease	*mg/L*	5.0	4.7
Total Dissolved Solids	*mg/L*	92	74
Total Suspended Solids	*mg/L*	78	42
Biochemical Oxygen Demand	*mg/L*	9	11
Fecal Coliforms	*mpn/100 mL*	2500	4300
Total Nitrogen	*mg/L*	2.13	2.12
Total Kjeldahl Nitrogen	*mg/L*	1.4	1.6
Nitrate + Nitrite	*mg/L*	0.73	0.60
Heavy Metals			
Total Cadmium	*µg/L*	2.0	0.89
Dissolved Cadmium)	*µg/L*	0.6	0.3
Total Chromium	*µg/L*	14	2.0
Dissolved Chromium	*µg/L*	3.0	2.0
Total Copper	*µg/L*	22	17
Dissolved Copper	*µg/L*	8.0	7.6
Total Lead	*µg/L*	25	18
Dissolved Lead	*µg/L*	5.0	5.0
Total Mercury	*µg/L*	0.2	0.2
Dissolved Mercury	*µg/L*	NA	NA
Total Nickel	*µg/L*	16	7.0
Dissolved Nickel	*µg/L*	5.0	3.0
Total Zinc	*µg/L*	210	150
Dissolved Zinc	*µg/L*	112	59

Source: NSQD Version 1.1 http://unix.eng.ua.edu/~rpitt/Research/ms4/mainms4.shtml.

With the exception of fecal coliforms and biochemical oxygen demand, most pollutants are found in equal or higher concentrations in stormwater runoff from light industrial land uses compared to stormwater runoff from commercial land uses. These data indicate that the concentration of pollutants

in runoff would likely be similar, or slightly less than, existing conditions following implementation of the proposed project.

The project sponsor would be required to submit the SMCWPPP checklist to show compliance with the NPDES Permit requirements. This submittal would include identification of site design measures to minimize impervious areas; source control measures to minimize the potential introduction of pollutants into stormwater runoff; and stormwater treatment control measures to removed pollutants from stormwater runoff.

The SMCWPPP is designed to prevent violation of water quality standards through mitigation and control of pollutant transport in stormwater runoff and infiltrating waters. Under NPDES Permit C.3. provisions dischargers must:

- Incorporate treatment measures and other appropriate source control measures (such as pesticide reduction strategies) and site design measures to manage increases in runoff flows to the maximum extent practicable;
- The permittees must also verify that infiltration devices are designed and installed such that they would not cause or contribute to the degradation of groundwater quality at project sites. An infiltration device is any structure that is deeper than wide and designed to infiltrate stormwater into the subsurface and, as designed, bypass the natural groundwater protection afforded by surface soil. Specific requirements are specified in Provision C.3.d.iv.(2).
- Implement site design/landscape characteristics to maximize infiltration (where appropriate), provide retention or detention, slow runoff, and minimize impervious land coverage to reduce post-development pollutant loads to the maximum extent practicable;
- For new and redevelopment projects that discharge directly to water bodies listed as impaired by pollutants pursuant to CWA Section 303(d), ensure that post-project runoff does not exceed pre-project levels for such pollutants, through implementation of the control measures addressed in this provision;[26] and
- Prevent a net increase in flow where such an increase would increase erosion or otherwise degrade stream habitat (this is not required where increased flows would not cause degradation).

Treatment BMPs must be sized based on one of the following considerations (Provision C.3.d):

- Treatment BMPs whose primary mode of action depends on volume capacity, such as detention/retention units or infiltration structures, must be designed to treat the volume of annual stormwater runoff for the area or achieve 80 percent or more capture.[27]
- Treatment measures whose primary mode of action depends on volume capacity, such as detention/retention units or infiltration structures, shall be designed to treat stormwater runoff equal to:

[26] The project area drains to the Lower San Francisco Bay, which is listed as a 303(d) impaired water body by the US EPA.

[27] Calculation methods are specified in the SMCWPPP Stormwater Management Plan.

1. The maximized stormwater capture volume for the area, based on historical rainfall records, determined using the formula and volume capture coefficients set forth in *Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998)*, pages 175-178 (e.g., approximately the 85th percentile 24-hour storm runoff event); or
2. The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology set forth in Section 5 of the *California Stormwater Best Management Practices Handbook, (2003)*, using local rainfall data.

- Treatment BMPs whose primary mode of action depends on flow capacity (e.g., swales, sand filters, or wetlands) must be sized to treat:
  - 10 percent of the 50-year peak flow rate; or
  - The flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or
  - The flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.
- Treatment systems that use a combination of flow and volume capacity shall be sized to treat at least 80 percent of the total runoff over the life of the project, using local rainfall data.

Additional project site BMPs may be required for assuring regional compliance with existing and proposed TMDLs within the San Francisco Bay Region including BMPs for pesticides toxicity, trash load reduction, mercury, polychlorinated biphenyls (PCBs), copper, polybrominated diphenyl ethers (PBDE), legacy pesticides, and selenium. BMPs included in site designs and plans for the proposed project would be reviewed by City of Menlo Park engineering staff to assure appropriateness and adequate design capacity, prior to permit issuance. Dischargers must provide annual reports to the RWQCB to demonstrate compliance with the requirements of Provision C.3 of Water Quality Order Number R2-2003-0023 and the San Mateo County Water Pollution Prevention Program.

Additionally, any allowed industrial land uses (including certain types of R&D) with the potential to contribute to stormwater pollution (as identified in the Industrial General Permit) would be required to comply with the Industrial General Permit, including preparation and implementation of a SWPPP. In compliance with the Regional Stormwater NPDES Permit, the City of Menlo Park must implement Industrial Site Control and Commercial Site Controls including:

- Development and implement an inspection plan to serve as a prioritized inspection workplan; the City of Menlo Park is required to conduct inspections to determine compliance with its ordinances and the Regional Stormwater NPDES Permit. Inspections must include but are not limited to the following:
  - Prevention of stormwater runoff pollution or illicit discharge by implementing appropriate BMPs;
  - Visual observations for evidence of unauthorized discharges, illicit connections, and potential discharge of pollutants to stormwater;

- Noncompliance with Permittee ordinances and other local requirements; and
- Verification of coverage under the Industrial General Permit, if applicable.

- Development and implementation of an Enforcement Response Plan (ERP) that will serve as a reference document for inspection staff to take consistent actions to achieve timely and effective compliance from all commercial and industrial site operators.

Implementation of the BMPs below would assure compliance with potential NPDES permit regulations.

Site Planning BMPs

- Minimize directly connected impervious surfaces using site lot design, such as alternative pavement materials, providing landscaping, and others. Pervious paving materials may also be incorporated to further decrease impervious surface area. These BMPs apply to development in the entire project area.
- Provide source controls for stormwater pollutants, such as roofed trash areas, covered material storage, etc.
- Landscaping shall be used around buildings to trap and filter contaminants before stormwater reaches the storm drain system. This BMP applies to all proposed buildings in the project area.
- Use the Bay Area Stormwater Management Agencies Design Guidance Manual to modify roadway and landscaping improvement projects, incorporating recommended design elements such as sediment traps, gravel strips and/or trenches, concave planting areas, permeable substrate, and infiltration basins and/or vaults at the end of downspouts.

Post-Construction BMPs

- The project sponsor or developer shall distribute educational materials to the first and all subsequent tenants of all commercial properties included in the project. These materials shall address good housekeeping practices relating to stormwater quality, prohibited discharges, and proper disposal of hazardous materials.
- The business park association or other similar entity responsible for any common landscaped areas shall implement a program of efficient irrigation and proper maintenance including minimizing use of fertilizer, herbicides and pesticides.
- The business park association or other similar entity responsible for maintaining common areas shall implement a trash management, recycling, and litter control program to mitigate the impacts of gross pollutants on stormwater quality. This program shall include litter patrol, emptying trash receptacles in common areas, and reporting and investigating and trash disposal violations.
- Any new storm drain inlets shall be labeled with the phrase "No dumping – flows to Bay," or a similar phrase to mitigate the impact of potential for discharges of pollutants to the storm drain system.
- Measures shall be incorporated into drainage projects (storm drains, conduits, collection points, and outlets) to maximize infiltration, permeability, trapping of pollutants and sediment from

stormwater runoff. These measures may include structural BMPs, including vortex separators (Stormceptor©, Vortechnics©, etc.), to separate oil and solids (contaminants, sediment, etc.) from stormwater runoff and design based on the anticipated type and quantity of pollutants to be removed and the flow rate to be treated.

- Properly designed vegetated filter strips shall be installed wherever feasible in the project to mitigate sediment and pollutant transport from stormwater sheetflow.
- The restaurant shall be designed with contained areas for cleaning mats, containers, and sinks connected to the sanitary sewers. Grease shall be collected and stored in a contained area and will be removed regularly by a disposal recycling service. This BMP would mitigate potential impacts due to oil and grease.
- Streets in the project area shall be swept immediately prior to and once during the storm season. If the City of Menlo Park does not agree to accept responsibility for street sweeping, the developer would arrange for this service within the project area for developed portions of the project.
- A pesticide reduction plan shall be developed and implemented. This plan will include recommendations for landscape planting to minimize pesticide use.

The Menlo Gateway development application has incorporated site design measures to minimize impervious surfaces; the proposed development plan would reduce the amount of impervious surfaces by about 5 percent compared to existing conditions (reduced impervious surfaces to 66 percent) and includes pervious pavement, which would need to be properly maintained in perpetuity, within surface parking areas.[28] Additionally, the proposed development plan would incorporate self-treating areas (e.g., landscaping), flow-through planters to treat the majority of runoff from rooftops and would incorporate vegetated swales to treat runoff from some of the parking areas.[29] Tree planters would also be used to store and treat stormwater runoff from sidewalks and other areas where flow through planters and swales cannot be incorporated because of drainage and area constraints.[30] Because of the high groundwater table, no infiltration BMPs are proposed.[31] Where site area and drainage constraints limit the incorporation of surface water quality treatment devices, the Menlo Gateway development would incorporate subgrade (underground) stormwater quality treatment devices [32] that must be approved by the City, and potentially the RWQCB during the final design phase. These features have been designed in accordance with the Regional Stormwater NPDES Permit.

Maximum development under the proposed GPA/ZOA could increase the amount of impervious surfaces. However, compliance with existing City regulations would still be required, including the above mentioned site design and source control BMPs. Additionally, the proposed project would be required to implement stormwater quality treatment BMPs that must be approved by the City during the

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[28] Philip Williams and Associates, *Preliminary Hydrology Report*, 2009.

[29] Ibid.

[30] Ibid.

[31] Ibid.

[32] Ibid.

permit review process and must comply with the Industrial General Permit for regulated industrial activities.

The SFBRWQCB has incorporated requirements in the Regional Stormwater NPDES Permit and Industrial General Permit to be protective of water quality. The Final Hydrology Report describes project BMPs that are designed in compliance with the NPDES Permit. The City review and permitting process would ensure that the Regional Stormwater NPDES Permit WDR is not violated for either the Menlo Gateway project or any other development under the proposed GPA/ZOA. The Industrial Commercial Business Site Controls required under the Regional Stormwater NPDES Permit would ensure that the Industrial General Permit's WDR is not violated for either the Menlo Gateway project or development under the GPA/ZOA.

Furthermore, as mentioned above, the type and amount of pollutants in stormwater runoff without BMPs would not be expected to be substantially different than existing conditions (see Table 3.5-1). Consequently, incorporation of site design, source control, and treatment BMPs would be expected to reduce the amount of pollutants in stormwater runoff compared to existing conditions.

As a result of these measures, the proposed project would not violate water quality standards or WDRs during operation, and water quality impacts would be less than significant.

Impact HY-2: *The proposed project would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be net deficit in aquifer volume or a lowering of the local groundwater table level. As a result, this impact would be less than significant. (LTS)*

As described in the Setting, natural groundwater recharge of the San Mateo Subbasin occurs primarily by infiltration of water from streams. Additional recharge occurs by percolation of precipitation that falls directly on the ground surface. While the City-wide local water supply does contain some groundwater, the majority of the water supplied to the project area is from surface water sources. Additionally, no new groundwater wells would be implemented as part of the proposed project.

It is anticipated that dewatering activities would be necessary during the construction phase of the proposed project. This would locally and temporarily lower the local aquifer table and reduce aquifer volume. Dewatering would not continue after construction, so that long-term effects on the groundwater depth or volume would not occur. Large underground structures may be built to accommodate subgrade flow control and stormwater quality treatment devices. These structures would not substantially reduce the aquifer volume such that there would be a lowering of the local groundwater table; groundwater volume would simply be displaced by the underground structures if structures extend to within the local groundwater table, and the groundwater table levels would remain primarily controlled by upland recharge and interaction with the Bay. Therefore, direct impacts on the local aquifer would be temporary and less than significant.

The proposed project would not significantly increase the amount of impervious surface area within the project area. Under existing conditions, the project area contains over 71 percent impervious surface

area. Other remaining undeveloped areas have compacted fill soils and very low permeability. Therefore, existing groundwater recharge potential within the project area is minimal. The Menlo Gateway project would reduce the amount of impervious surfaces by about 5 percent. Maximum development under the proposed GPA/ZOA would result in an increase of impervious cover compared to existing conditions. Therefore, post-construction groundwater recharge potential would be similar to existing conditions and indirect impacts to the local groundwater table would be less than significant.

Impact HY-3: *The proposed project would not substantially alter the existing drainage pattern of the project area, including alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site. Accordingly, this impact would be less than significant. (LTS)*

Construction activities associated with the proposed project would alter existing drainage patterns and could result in substantial erosion or siltation. However, the project would be required to comply with existing NPDES permits (General Permit and Construction General Permit) and the City's Municipal Code sections for construction and stormwater management (Chapter 7.42 Storm Water Management Program) including preparation of a Grading and Drainage Plan and incorporation of erosion and sediment controls during construction. Operation of the proposed project would also require soil stabilization (e.g., vegetation, other protective cover, and stabilized slopes and fills) in accordance with the SMCWPPP, SWPPP, and City Municipal Code (Chapter 7.42 Storm Water Management Program). Therefore, potential on-site erosion and sediment transport during project construction or operation would not be substantial.

Development in accordance with the Menlo Gateway project, without planned detention, would reduce the impervious surface and decrease the amount of stormwater runoff from the project area. Flow rates without detention would increase from 7.2 cfs to 7.3 cfs at the Constitution site and 3.9 cfs to 5.3 cfs for the Independence site for the 10-year storm event.[33] Flow rates would increase from 10.7 cfs to 10.8 cfs for the Constitution site and 5.8 cfs to 7.8 cfs for the Independence site for the 100-year storm event.[34] Modifications to the site grading, including overland flow lengths and slopes, reduces the time of concentration for the Constitution site from approximately 30 minutes to 25 minutes and from 52 minutes to 30 minutes for the Independence site. As a result of the decreased time of concentration, the calculated rainfall intensity for the site increased for both the 10-year and 100-year events and consequently the Constitution site runoff increased even though the amount of impervious surface was reduced. However, the Menlo Gateway project has incorporated detention to reduce off-site flow to existing conditions levels or less. In accordance with City requirements, about 4,000 cubic feet (ft^3) of underground storage has been incorporated into the site design for the Constitution site and 6,335 ft^3 of underground storage has been incorporated into the site design for the Independence site.[35] Based on the Final Hydrology Report and site design, the resulting flow rates for the 10-year storm event are 6.7 cfs for the Constitution site and 2.5 cfs for the Independence site. The resulting flow rates for the 100-year storm event are 9.6 cfs for the Constitution site and 5.1 cfs for the Independence

[33] Philip Williams and Associates, *Final Hydrology Report*, 2009.
[34] Ibid.
[35] Ibid.

site. The total reduction in stormwater volume for the 10-year storm event is 3,025 cubic feet (cf) for Constitution site and 3,942 cf for the Independence site. The total reduction in stormwater volume for the 100-year storm event is 4,590 cf for the Constitution site and 6,074 cf for the Independence site. Furthermore, the project area does not drain to an area where hydrograph modification[36] controls may be required; the project area drains to the Atherton Channel and San Francisco Bay.[37] Therefore, drainage from the project area is not expected to cause or contribute to off-site erosion in channels or creeks. Additionally, all project area runoff would be routed through new and existing on-site storm drainage systems to existing off-site storm drains/channels, so that off-site overland erosion would not occur.

The maximum development allowed under the GPA/ZOA could also increase stormwater runoff rates and volumes, depending upon the final design configuration. As with the Menlo Gateway development plan, an increase in flow rate above existing 10-year flow rates would require on-site detention; flow would be routed to existing off-site storm drains; and the off-site storm drain system is not considered susceptible to hydrograph modification. Therefore, as with the Menlo Gateway development plan, the maximum development associated with the proposed GPA/ZOA would not substantially cause or contribute to off-site erosion.

As explained under Impact HY-1, compliance with existing regulations and project area drainage characteristics would be expected to reduce potential erosion and siltation impacts to a less-than-significant level.

Impact HY-4: *The proposed project would not substantially alter the existing drainage pattern of the site or area, including 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. Thus, this impact would be less than significant. (LTS)*

The proposed project would not alter the course of an existing stream or river, because there are no natural drainage features onsite. Changes to existing drainage patterns could increase the rate and/or amount of stormwater runoff, contributing to on- or off-site flooding; however, as addressed under Impact HY-3, implementation of the proposed project would not significantly increase stormwater runoff from the project. Figures 3.5-4 and 3.5-5 show the proposed project drainage.

As also described under Impact HY-3, based on the Final Hydrology Report, the Menlo Gateway development plan would reduce the peak flow rates for the 10-year and 100-year storm events; flow rates would be reduced by up to 10.3 percent for the Constitution site and by up to 35.9 percent for the

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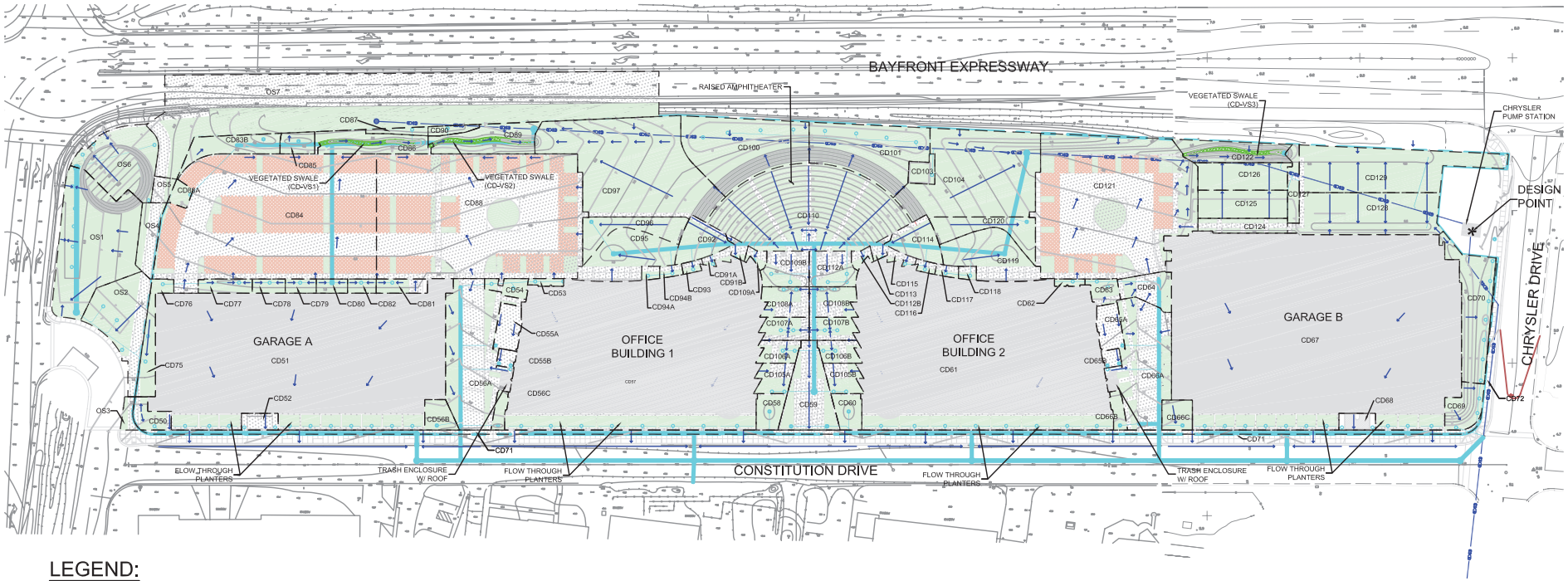
[36] Hydrograph modification refers to changes in the peak flow, volume, or amount of stormwater runoff; a change in the runoff hydrograph. Where hydrograph modification could cause or contribute to stream bed or bank erosion or otherwise alter the flow regime such that aquatic and riparian habitat and channel form or function could be adversely affected, controls are required to mitigate runoff characteristics to existing flow characteristics. Flows up to and including the 10-year storm event flow rates are the most important for maintaining channel form and function.

[37] Philip Williams and Associates, *Figure 2 Project Location within Menlo Park Storm Drain System, Final Hydrology Study*, 2009.



LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- OPEN WATER
- PERMEABLE PAVING (w/ SUBDRAIN)
- WATERSHED BOUNDARY
- CD68 WATERSHED ID
- (E) STORM DRAIN
- (N) STORM DRAIN

***Source*:** PWA, 2009.

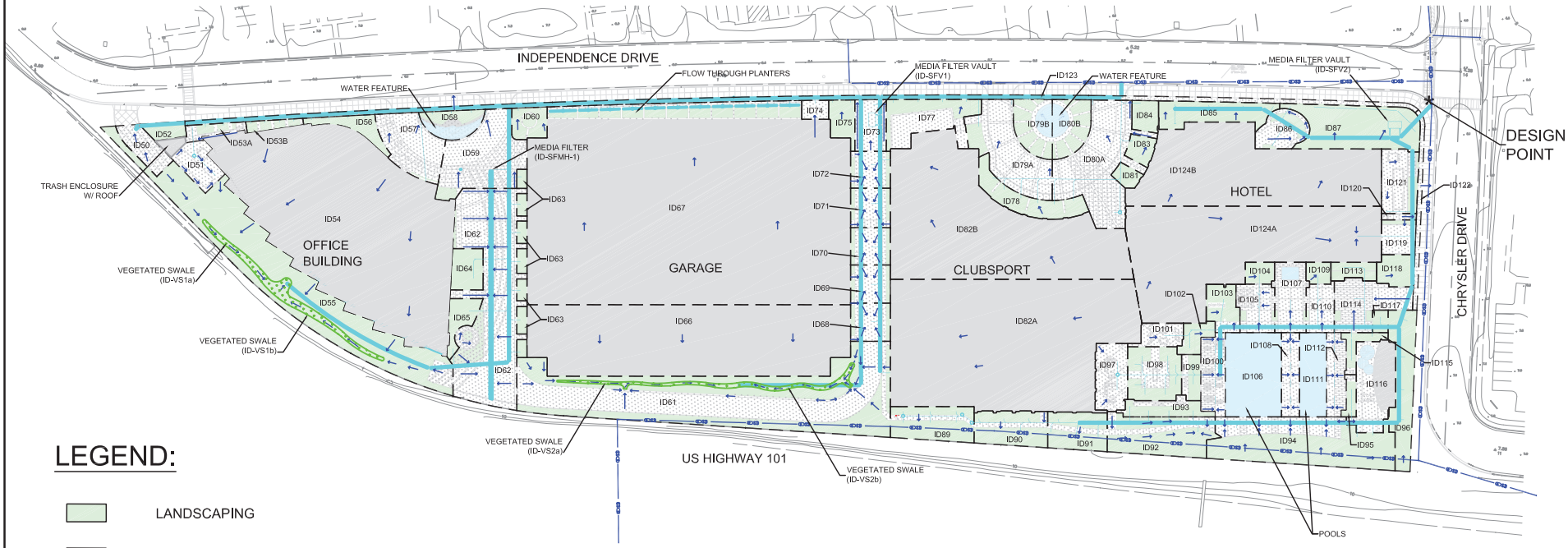
0 25 50 100
SCALE (FEET)

NORTH
SCALE IN FEET

FIGURE **3.5-4**

Constitution Drive – Proposed Conditions Land Use and Drainage

11133 | JCS | 09



LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- OPEN WATER
- WATERSHED BOUNDARY
- ID68 WATERSHED ID
- (E)SD (E) STORM DRAIN
- (N) STORM DRAIN
- FLOW PATH
- CATCH BASIN/ INLET

0 25 50 100
SCALE (FEET)

NORTH
SCALE IN FEET

Source: PWA, 2009.

PBSJ

FIGURE **3.5-5**

Independence Drive – Proposed Conditions Land Use and Drainage

D411048.01

Menlo Gateway Draft EIR

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Independence site. Additionally, the Atherton Channel drains into the Flood Slough, which runs through the salt ponds and salt marsh flats north of Bayfront Expressway and increased 100-year flow rates would not be expected to substantially cause or contribute to flood effects within the salt marsh flats.

While full buildout under the maximum development under the GPA/ZOA could convert the currently vacant land (approximately 15 percent of the project area) to impervious surface cover. Currently, only 13 percent of the project area is landscaped. Because landscaping would be more permeable than the compacted fill soils found on the vacant lands of the project area, it is anticipated that surface runoff flows would be slightly attenuated under the maximum development of the proposed project.

As required by City, no net-increase over the existing condition in drainage to City streets is allowed. In accordance with the Menlo Gateway development plan, all sidewalk drainage in excess of existing flow rates would be detained and any resultant on-site drainage would be routed through new and existing storm drains to the existing off-site main storm drains that ultimately discharge to the Atherton Channel. Project plans would be reviewed to ensure that on-site drainage is adequate to prevent on-site flooding.

Therefore, on- and off-site flooding impacts associated with alterations of on-site drainage patterns would be less than significant.

Impact HY-5: *The proposed project would not create or contribute runoff which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff. As a result, this impact would be less than significant. (LTS)*

Flooding has occurred in the project vicinity because of overflows of the Atherton Channel. However, such events are primarily associated with San Francisco Bay inflows and are not the result of insufficient storm drainage capacity. According to the City's 2003 Drainage Study, storm drainage facilities are sufficient to manage existing flows from the project area.[38]

Following buildout of the Menlo Gateway development plan, the peak runoff at the Constitution site would be reduced from 7.2 cfs to 6.7 cfs for a 10-year storm event and from 10.7 cfs to 9.6 cfs for a 100-year event.[39] The peak runoff at the Independence site would be reduced from 3.9 cfs to 2.5 cfs for a 10-year storm event and from 5.8 cfs to 5.1 cfs for a 100-year event.[40] Although the two sites are not contiguous and separate structural BMPs would be installed at each of the two sites, both sites drain to the pump station located at the northeast corner of the Constitution site. The Menlo Gateway development plan would therefore generate a net reduction in stormwater runoff of up to 2.6 cfs for the 100-year storm event. Buildout under the GPA/ZOA may also slightly increase runoff rates because it could further increase the amount of impervious surfaces by up to 2 percent and alter drainage patterns

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[38] BKF, *Citywide Storm Drainage Survey, City of Menlo Park,* 2003. Prepared for the City of Menlo Park.

[39] Philip Williams and Associates, *Final Hydrology Study,* 2009.

[40] Ibid.

for more efficient conveyance of stormwater from the project area. The City requires detention of stormwater runoff such that discharges do not exceed existing flow rates.

As explained under Impact HY-1, structural and non-structural BMPs would reduce the concentrations of pollutants reaching surface water bodies and groundwater. Because the project area drains to the San Francisco Bay, the BMPs must ensure that post-project runoff does not exceed pre-project levels for pollutants that impair the Bay (as listed on the Section 303(d) list). These pollutants include chlordane, DDT, dieldrin, and mercury. Structural BMPs would remove these substances from runoff, while non-structural BMPs, such as integrated pesticide management practices, would assist with source reduction. Because required BMPs would also attenuate increased flows, treat potentially polluted surface runoff, and contribute to reductions in key pollutants, and because the City requires no net-increase in stormwater flow rates, impacts associated with project runoff would be considered less than significant.

Impact HY-6: *The proposed project would not otherwise substantially degrade water quality. Thus, this impact would be less than significant. (LTS)*

The groundwater table is shallow in the project area, and pollutants and chemicals associated with construction activities could migrate or percolate into the groundwater and contribute to degradation of the local groundwater aquifer. Implementation of construction BMPs such as spill prevention and good housekeeping BMPs would be included in the SWPPP (described under Impact HY-1) and would prevent significant impacts to groundwater quality during construction.

Following completion of the proposed project, during project operation, implementation of the SMCWPPP would prevent substantial degradation of groundwater quality through adherence to source control and non-structural BMPs. Treatment BMPs proposed for the maximum development permitted under the GPA/ZOA would require approval by the City prior to implementation. The Menlo Gateway development application would include infiltration BMPs that could result in migration of stormwater pollutants to groundwater and any proposed treatment BMPs would also require City approval. Consequently, water quality impacts would be less than significant during both construction and operation of the Menlo Gateway project or under the GPA/ZOA.

Impact HY-7: *Structures placed within the 100-year flood hazard area as a result of the proposed project could impede or redirect flood flow, which would be a potentially significant impact. (PS)*

FEMA allows non-residential development in a 100-year floodplain; however, construction activities are restricted within flood hazard areas depending upon the potential for flooding to occur. The City of Menlo Park and the County of San Mateo have adopted local standards for construction in floodplain areas pursuant to Title 44, Part 60 of the CFR. The project area does not fall within an active flood control zone governed by the SMCFCD. As documented in the Setting, the project area is located within the 100-year flood zone (Special Flood Hazard Area [SFHA]) but is not located within a Dam Failure Inundation Area.

The proposed project would involve substantial fill to elevate structures above the 100-year flood hazard elevation. In order for the project area or structures to be considered outside the floodplain and no longer subject to special flood hazard development requirements, the project sponsor would have to submit an application to FEMA for a Letter of Map Revision – Fill (LOMR-F) after fill has been placed. After FEMA has revised the Flood Insurance Rate Map (FIRM) to show that the filled land is outside the SFHA, the City would no longer be required to apply the minimum NFIP floodplain management standards to structures built on the land and the mandatory flood insurance purchase requirements would no longer apply.

Until FEMA revises the FIRM, the floodplain development standards apply. Additionally, although a structure built on a site that has been elevated by the placement of fill may be removed by FEMA from the SFHA, the structure may still be subject to damage during the base flood and higher-magnitude floods. A structure with a basement (subgrade area) adjacent to or near the floodplain may still be impacted by subsurface flooding brought on by surface flooding.

Construction within SFHAs is governed by the City's Municipal Code Chapter 12, Section 12.42.51, Standards of Construction, which sets forth the standards for development within SFHAs that would minimize flood hazard risks, including anchoring and flood-proofing; limitations on use for structures below the base flood elevation; use of materials and utility equipment resistant to flood damage; the requirement that electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities are designed and/or located to prevent water from entering or accumulating within the components during flood conditions; and the requirement that all new and replacement water supply and sanitary sewage systems be designed to minimize or eliminate infiltration of floodwaters into the system and discharge from systems into floodwaters. Compliance with these City Municipal Code regulations would reduce potential flood hazards to the proposed project to less-than-significant levels.

As noted in the Setting, the base flood elevation on the Constitution site and a portion of the Independence site is 7 feet above mean sea level (msl). The project area is currently about 5 feet above msl and has several buildings that contribute to floodwater displacement within the flood zone. If substantial additional fill is used to elevate the project area or structures to above the base flood elevation, this additional fill material could have a substantial effect on local flooding; water displaced from the study area could increase flood depths on adjacent properties or redirect flood flows to adjacent properties, which would be a potentially significant impact.

However, potential effects of redirecting flood flows or changing the flood depth and extent, by placement of fill or structures, are primarily a concern within regulatory floodways or flood hazard areas classified as Zones V/VE (coastal areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves). This is because fill within these areas would reduce the flood flow carrying capacity of the flood source (in this case, the flood source is the San Francisco Bay). There are no regulatory floodways or Zones V/VE located on the project sites.

Additionally, as noted in the Philip Williams & Associates Technical Memorandum[41] prepared for the proposed project, when considering the potential for flooding in the vicinity of the Menlo Gateway project, the potential mechanism for flooding must be considered. Examination of the FEMA FIRM indicates that the base flood elevation in the vicinity of Menlo Gateway project area is related to extreme tides in San Francisco Bay, since the base flood elevation does not change between the site vicinity and areas within San Francisco Bay including the historic salt ponds and tidal marsh nearby the Menlo Gateway sites. Flooding conditions could be generated by extreme high tides potentially including storm surge and their storm-related effects in San Francisco Bay. Under this scenario, flood waters could enter the site vicinity over low points along the Bayfront Expressway or through existing storm drain connections to drainage channels that discharge to San Francisco Bay. The flood elevations in the vicinity of the Menlo Gateway sites would be directly related and relatively similar to the extreme tidal levels in the San Francisco Bay. Water from the Bay would flow towards the project area until water levels in the vicinity of the Menlo Gateway sites achieved equilibrium with the water levels in the adjacent San Francisco Bay. As such, additional flooding of off-site areas from the 100-year flood event would only occur if the proposed project would change water levels in the San Francisco Bay.

Water levels in San Francisco Bay would not be measurably altered by the proposed grading plans at the Menlo Gateway sites, including the Constitution site. Instead, the grading proposed at the Independence and Constitution sites would reduce the inflow of tidal waters into the industrial park area by about 124,713 cubic feet and would not measurably or significantly alter water levels in the site vicinity.[42] Furthermore, fill within the San Francisco Bay would have essentially no effect on the San Francisco Bay water surface elevations during a flood event.

Fill material on the project sites could, however, contribute to redirection of stormwater runoff that could cause or contribute to off-site flooding. As shown in Figure 2 of the July 15, 2009 PWA Memorandum,[43]the Bayfront Expressway is at an elevation of about 6 feet along the eastern boundary of the project site. The elevation of off-site properties between the project sites is about 6 feet, with some areas slightly lower, and some areas slightly higher. The elevation of Chrysler Drive is about 8 feet near US 101 to 6 feet near the Bayfront Expressway and the elevation of Marsh Road is 10 to 8 feet. South of Chrysler Drive, the Bayfront Expressway elevation is up to 8 feet. As noted in the Final Hydrology Report, this area is essentially a bathtub drained by the Chrysler Drive pump station and a few culverts under the Bayfront Expressway.

No analysis was conducted to identify flood flow paths for the 100-year storm event. However, based on this topography, stormwater runoff from the project area, in excess of the storm drain system design capacity (e.g., 100-year storm event), would pond on surfaces up to an elevation of at least 6 feet, and then flow eastward and over top the Bayfront Expressway, or flow southward and then eastward along Chrysler Drive and over the Bayfront Expressway. As such, excess runoff from areas south of the

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41 Phillip Williams and Associates, LLC, 2009.

42 Phillip Williams and Associates, LLC, 2009.

43 Philip Williams and Associates, Menlo Gateway - Fill Volumes and Flooding Potential Memorandum, Prepared for the City of Menlo Park, July 15, 2009.

project site would flow towards Chrysler Drive and then across the Bayfront Expressway, or into the project area. In both cases, in order to flow either across the Bayfront Expressway or along or over Chrysler Drive, water surface elevations would have to reach at least 6 feet.

A 100-year 24-hour storm event has a total depth of precipitation of 4 inches.[44] However, runoff from up to the peak of the 10-year storm event would be conveyed through the storm drain system. The 10-year 24-hour storm event precipitation is 3 inches of rainfall.[45] Assuming a worst-case situation, the excess 1-inch of rainfall (difference between the 100-year and 10-year 24-hour storm events), with no impediments to flow, would pond in low spots within the project area. Runoff from the Independence site would likely flow towards the off-site area between the project sites and Chrysler Drive because its elevation is higher than those areas. Runoff from the off-site area between project sites, including the contributions from the Independence site, would likely flow towards the Constitution site, or possibly to Chrysler Drive. Fill material on the Independence site would be minimal and not be expected to contribute substantially to alterations in excess storm flow drainage patterns. According to the PWA Memorandum, there would be a net reduction in elevation on the Independence site (1,200 cubic yards or 32,400 cubic feet net soil removed). Fill material in the Constitution site would raise the building pads to elevations higher than the off-site area between the project sites, but would also create flow paths through cut areas that are lower than existing conditions. As such, excess runoff from the project site would still be allowed to flow into the Constitution site and Bayfront Expressway.

The area of the properties between the project sites is unknown, but assuming it is equal to the area of the project sites, the total area bounded by the at least 6 foot elevation roads would be about 15.3 acres. Assuming a worst-case scenario of the entire excess precipitation (difference between the 100-year and 10-year storm event, or 1 inch of rainfall) contributing to runoff, this would result in about 5.51 acre-feet of water that could pond on the project site.

For this amount of water to flow across the Bayfront Expressway or Chrysler Drive under existing conditions, less than 2.74 acres (8.7 percent) of the project area, including the off-site area between the project sites, must be below 6 feet in elevation and at least as low as 4 feet in elevation; or 5.51 acres of the project area are below 6 feet and at least as low as 5 feet in elevation. Based on the topography in Figure 2, it is reasonable to assume that this is the case and at least that the majority of excess stormwater runoff remains on site, stored in the low areas, and does not overtop the Bayfront Expressway or Chrysler Drive. Therefore, the effect of fill within the Constitution site would not block flood flows from the project area, but would remove storage area for runoff from the Independence site and off-site area between the project sites.

Table 1 in the PWA Memorandum indicates that the grading effect is a net fill of 1,598 cubic yards (43,146 cubic feet, about 1 acre-foot) at the Constitution site. Consequently, in the worst-case

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44 National Oceanic and Atmospheric Administration Hydrometeorological Design Studies Center, 1973, Western U.S. Precipitation Frequency Maps from NOAA Atlas 2 published in 1973. http://www.wrcc.dri.edu/pcpnfreq/nca100y24.gif, accessed November 4, 2009.

45 National Oceanic and Atmospheric Administration Hydrometeorological Design Studies Center, 1973, Western U.S. Precipitation Frequency Maps from NOAA Atlas 2 published in 1973, http://www.wrcc.dri.edu/pcpnfreq/nca10y24.gif, accessed November 4, 2009.

situation, about 1.65 acre-feet could pond on the off-site area between the project sites and the Constitution site. If all this water ponded on just the off-site area between the project sites, it could contribute to an additional flood depth of 1.29 inches, if spread across the entire off-site area. However, the storm drain systems would be designed to convey the peak 10-year storm event runoff and, in accordance with the Final Hydrology Report, detain runoff in excess of existing conditions for both the 10-year and 100-year storm events such that post-development runoff is not greater than existing conditions runoff. This would include 4,590 cubic feet of storage detention for the Constitution site and 6,070 cubic feet for the Independence site. The majority of rainfall intensities for the entire 100-year 24-hour storm event would be below the storm drain system design intensity.[46] As such, the majority of runoff from the entire 100-year 24-hour storm event would also be conveyed or stored in the storm drain system and potential impacts of fill on the Constitution site would be less than significant.

MITIGATION MEASURES. Mitigation Measure HY-7.1 would remove the project area from the floodplain (SFHA) and ensure that effects on the base flood elevation are not substantial and would reduce potential impacts to less-than-significant levels. (LTS)

HY-7.1 *Prior to the first grading or building permit submittal for each phase of construction, the project sponsor shall submit a FEMA CLOMR-F application to the Public Works Department for review and approval.* In accordance with the National Flood Insurance Program (NFIP) (Code of Federal Regulations (CFR) 44 Part 65), Section 65.6 (Revision of base flood elevation determinations), the project sponsor shall prepare supporting data, including relevant hydraulic and hydrologic analyses, delineation of floodplain boundaries and all other information required by FEMA to review and evaluate the request for a CLOMR-F. The analyses shall clearly show revised and new floodplain boundaries, for the project area and adjacent areas not affected by the revision. Upon receiving City approval, the project sponsor shall submit the CLOMR-F application to FEMA. Prior to issuance of a grading or building permit, the project sponsor shall obtain a CLOMR-F from FEMA. The project sponsor shall submit an elevation certificate prior to final signoff of the foundation inspection for each structure.

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[46] The 10-year storm event 5-minute rainfall intensity is 2.81 inches per hour, the 10-minute intensity is 2.07 inches per hour, and the 15-minute intensity is 1.68 inches per hour. The exact rainfall intensity used in determining peak flow rates depends on the time it takes a drop of water in the farthest reaches of the drainage area to exit the drainage area (time of concentration). It is not expected that the time of concentration will be greater than 15 minutes. Regardless, by 30 minutes into a 100-year storm event, the rainfall intensity would be 1.79 inches per hour, less than the 10-year storm event storm drain design capacity. By 2 hours into the 24-hour storm event average rainfall intensity is 0.90 inches per hour. By 12 hours into the 100-year storm event, it would be 0.33 inches per hour and the average rainfall intensity for the 24-hour storm event is 0.21 inches per hour. California Department of Water Resources, 2005, Flood and Safety, Climate Data, Climate Data and Information for California, Depth-Duration-Frequency, San Francisco Airport Station No. E70 7769 00, September 30, 2005, ftp://ftp.water.ca.gov/users/dfmhydro/Rainfall%20Dept-Duration-Frequency/Rain%20H%20DDF%20Hourly/DDF%20H%20E60-E80/ Accessed November 4, 2009.

A CLOMR-F is FEMA's comment on a proposed project that would, upon construction, affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing base flood elevations or the SFHA. The conditional letter does not revise an effective NFIP map; however, it indicates whether the project, if built as proposed, would be recognized by FEMA as being outside the SFHS. Once the project has been completed, the project sponsor must request a LOMR-F from FEMA to reflect the project's "As-built" certification. Additional data may be required to support the revision request.

In accordance with the Code of Federal Regulations, Section 60.3 (Flood plain management criteria for flood-prone areas) floodplain development requirements, section 60.3 (e) (1) no new construction or fill material would be permitted in the project site special flood hazard area (Zone AE) unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, would not increase the water surface elevation of the base flood more than one foot at any point within the community. In many areas of special flood hazard (excluding V zones and floodways), it may be feasible to elevate areas with engineered earthen fill above the base flood elevation (Section 65.5 Revision to special hazard area boundaries with no change to base flood elevation determinations, (a) Data requirements for topographic changes). Scientific and technical information to support a request to gain exclusion from an area of special flood hazard of a structure or parcel of land that has been elevated by the placement of engineered earthen fill is required.

If the community cannot assure that it has complied with the appropriate minimum floodplain management requirements under Section 60.3 (including Section 60.3 (e) (1)), the map revision request will be deferred until the community remedies all violations to the maximum extent possible through coordination with FEMA (Section 65.5 (a) (15)). If any questions or problems arise during review, FEMA will consult the Chief Executive Officer of the community (CEO), the community official designated by the CEO, and/or the requester for resolution (Section 65.9 Review and response by the Administrator).

As such, Mitigation Measure HY 7-1, which requires obtaining a CLOMR-F application, would ensure FEMA review of the analysis, floodplain boundaries, and flood surface elevations are not substantially altered and that floodplain management requirements set forth in Section 60.3 (e) (1) are met and substantial redirection of flood flows does not occur when the project is developed.

Impact HY-8: *The proposed project could expose people or structures to a significant risk of loss, injury, or death involving flooding, resulting in a less than significant impact. (LTS)*

Levees are located throughout the salt ponds north of the project area. However, because the elevations of the levees are at sea level, lower than the elevation of the project area, failure of the salt pond levees would not result in substantial flooding of the project area. Furthermore, as described under Impact HY-7, the project area is not located within a Dam Failure Inundation Area. In addition, Municipal Code Chapter 12, Section 12.42.51 Standards of Construction, includes requirements for development in flood hazard areas to minimize risks from flooding.

For planning purposes, the U.S. Army Corps of Engineers evaluates three scenarios of sea level rise; low risk, assuming a sea level rise of 19.7 inches (0.5 meters) by 2100; moderate risk, assuming a sea level rise of 39.4 inches (1.0 meters) by 2100; and high risk, assuming a sea level rise of 59.0 inches (1.5 meters) by 2100.[47] California Executive Order S-13-08 (November 14, 2008) states that all state agencies planning construction projects in areas vulnerable to future sea level rise shall consider a range of sea level rise scenarios for the years 2050 and 2100 to assess project vulnerability, and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise. This Executive Order also directs the California Resources Agency, in cooperation with the Department of Water Resources and the California Energy Commission, to prepare a Sea Level Rise Assessment Report by December 1, 2010 to advise how California should plan for future sea level rise. The San Francisco Bay Conservation and Development Commission (BCDC) has prepared maps for areas inundated by 16 inches of sea level rise by 2050 and 55 inches of sea level rise by 2100.[48] The Governor of California's Delta Vision Blue Ribbon Task Force has adopted a sea level rise of 55 inches by 2100 for planning purposes, until issuance of an Executive Order determining otherwise.[49]

Therefore, it is reasonable to assume a sea level rise of 16 inches (1.33 feet) by 2050,[50] as predicted by BCDC, for project planning purposes. Assuming a sea level rise of 16 inches by 2050, the sea level rise by 2025 would be expected to be about 0.83 feet and the sea level rise by 2040, a 25-year planning horizon following buildout of the proposed project, would be expected to be about 1.0 foot.

However, measurements taken in the San Francisco Bay indicate that the current rate of sea level rise is about 3.5 inches per century.[51] A higher mean sea level would increase flood depth and area of inundation within the project area. Additionally, the California Climate Change Center predicts that accelerated sea level rise, because of climate change, could result in a sea level rise in California of 4.3 to 27.6 inches above the existing mean sea level (msl) by 2099.[52] The California Climate Action Team

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47 US Army Corps of Engineers, July 1, 2009. Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Works Programs. Circular No. 1165-2-211, p. B-1 to B-13.

48 San Francisco Bay Conservation and Development Commission (BCDC), April 7, 2009, Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline, Draft Staff Report.

49 Delta Vision Blue Ribbon Task Force, State of California Resources Agency, March 24, 2008, Letter to Governor Schwarzenegger, Agenda Item 2, Attachment 1.

50 San Francisco Bay Conservation and Development Commission (BCDC), April 7, 2009, Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline, Draft Staff Report.

51 Floyd, M., M. Anderson, M. Roos, R. Peterson, M. Perrone, and D. Todd. 2006. Chapter 2: Potential Impacts of Climate Change on California's Water Resources, Table 2-6 Relative Sea Level Trends for Eight Tide Gauges Along the Coast of California with 50 Years or More of Record. p. 2-43. In Medelin, J., J. Harou, M. Olivares, J. Lund, R. Howitt, S. Tanaka, M. Jenkins, K. Madani, and T. Zhu (Eds), Climate Warming and Water Supply Management In California: White Paper. A Report From Climate Change Center CEC-500-2005-195-SF.

52 Cayan, D., P. Bromirski, K. Hayhoe, M. Tyree, M. Dettinger, and R. Flick. 2006. Projecting Future Sea Level: Table 3 Projected global sea level rise (SLR) (cm) for the SRES A1fi, A2, and B1 greenhouse gas emission scenarios. SLR for A2 and B1 scenarios is estimated by combining output recent global climate change model simulations with MAGICC projections for the ice melt component. SLR estimates for A1fi estimated from MAGICC based on A2 temperature changes scaled according to those in A1fi. A Report From the California Climate Change Center CEC-500-2005-2002-SF. p. 19.

projects that sea levels would rise between 20 and 55 inches by the year 2100.[53] Different scenarios and models used to predict sea level rise result in different estimates of the magnitude of sea level rise; regardless, an increase in mean sea level would have a substantial effect on flooding within the project area. When combined with astronomical tides, even a 1-foot increase in msl would result in the 100-year event high tide peak occurring at the 10-year event frequency.[54] In other words, the frequency of a current 100-year high tide (about 9.5 feet above current msl) would occur 10 times more often when sea levels increase to 1 foot above current msl.

The project area, like much of the City of Menlo Park east of El Camino Real, could be inundated with a sea level rise of 16 inches, which might be expected to occur by mid-century, depending upon the sea level rise scenario.[55] In order to comply with flood hazard area development regulations, the proposed project would have to be flood-proofed to or elevated above the base flood elevation of 7 feet; however, sea level rise flooding could still occur. While the project area is about 5 feet above msl and would remain above msl with a 1-foot sea level rise (in year 2040), the base flood elevation would also be expected to rise by at least 1 foot. The Menlo Gateway project proposes to raise the occupied project structures' finished floor to 8.1 feet, which is over a foot above the 7 foot base flood elevation. As such, the proposed project would be above the expected base flood elevation in the event of expected sea level rise through the 25-year planning horizon following buildout (2040). Therefore, the risks to people and structures would not be substantial.

In the future, precipitation events are predicted to vary in terms of timing, intensity and volume according to many climate change models.[56] Extreme storm events may occur with greater frequency.[57] The effect on peak runoff is not known because most climate change models have not used a temporal (or spatial) scale necessary to identify effects on peak flows, and existing precipitation/runoff models for assessing the effects of climate change do not yet adequately predict rainfall/runoff scenarios.[58] Changes in rainfall and runoff could affect flows in surface water bodies, causing increased flooding and runoff to the storm drain system or, alternatively, reduce the amount of

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53 San Francisco Bay Conservation and Development Commission, Climate Change, 2007, www.bcdc.ca.gov/planning/climate_change/climate_change.shtml.

54 Floyd, M., M. Anderson, M. Roos, R. Peterson, M. Perrone, and D. Todd. 2006. Chapter 2: Potential Impacts of Climate Change on California's Water Resources, Figure 2.32 Impact of One Foot Sea Level rise on the Relative Effect of Astronomical tides in the Delta. p. 2-53. In Medelin, J., J. Harou, M. Olivares, J. Lund, R. Howitt, S. Tanaka, M. Jenkins, K. Madani, and T. Zhu (Eds), Climate Warming and Water Supply Management In California: White Paper. A Report From Climate Change Center CEC-500-2005-195-SF.

55 San Francisco Bay Conservation and Development Commission, *Climate Change Bay Area Regional Map*, 2009, www.bcdc.ca.gov/planning/climate_change/index_map.shtml

56 EPA, 2008. Climate Change Science: Precipitation and Storm Changes. www.epa.gov/climatechange/science/recentpsc.html, accessed January 16, 2009.

57 EPA, 2008. Climate Change Science: Precipitation and Storm Changes. www.epa.gov/climatechange/science/recentpsc.html, accessed January 16, 2009.

58 Anderson. M. 2006. Chapter 6: Climate Change Impacts on Flood Management p. 6-22 and 6-27. In Medelin, J., J. Harou, M. Olivares, J. Lund, R. Howitt, S. Tanaka, M. Jenkins, K. Madani, and T. Zhu (Eds), Climate Warming and Water Supply Management In California: White Paper. A Report From Climate Change Center CEC-500-2005-195-SF.

runoff and flood potential. The effect that future changes on the hydrologic cycle may have on the project area is speculative and is not addressed further in this section. However, because the project area would be raised above the base flood elevation the impact is less than significant.

Cumulative Impacts

The context for the analysis of cumulative surface water quality and hydrology impacts includes future growth and development within the Atherton Channel watershed for surface water and the San Mateo subbasin for groundwater quality impacts. Those issues for which the proposed project would have no impact are not analyzed, because the proposed project would have no potential to contribute to cumulative impacts.

Global climate change could alter the local hydrology and change the seasonal and annual rainfall and runoff patterns in the area; rainfall and runoff could increase, decrease, change in pattern and frequency, or not change at all. The scale of global climate models is too large to identify potential local or even regional effects and there is no agreement on the nature or magnitude of this change. Therefore, the analysis of potential cumulative impacts because of alterations in hydrology would be entirely speculative and no further analysis is provided.

Impact HY-1CM: *The proposed project combined with future development within the Atherton Channel watershed for surface water would not substantially degrade water quality. This cumulative impact would be less than significant. (LTS)*

The Atherton Channel watershed starts in the Town of Woodside and is primarily within the Town of Atherton, although some portions are within the City of Menlo Park. Development within this region would expand as growth continues. Development or redevelopment could affect water quality if the land use changes, the intensity of land use changes, and/or drainage conditions are altered to facilitate the introduction of pollutants to surface or groundwater resources. Changes in land use would alter the associated type and amount of pollutants in stormwater runoff (e.g., higher fecal coliform concentrations in runoff from residential lands compared to commercial lands). Increased intensity of land use would increase the potential pollutant loads. Alterations in drainage patterns could increase pollutant loads by increasing the amount of stormwater runoff transporting pollutants in stormwater runoff; could cause or contribute to erosion if the rate of runoff is increased; or could expose vulnerable areas to infiltration or runoff.

Future growth and development would not be expected to greatly alter the existing land use, land use intensity, or overall drainage patterns within the Atherton Channel watershed. The Atherton Channel watershed is considered already 99 percent built out with an estimated 69 percent impervious cover.[59] Consequently, potential growth would likely occur as redevelopment, with little infill. The existing land use within the watershed east of Interstate 280 (I-280) is primarily undeveloped, with some residential and commercial lands. However, the Town of Woodside General Plan for the northwestern

[59] San Mateo Countywide Stormwater Pollution Prevention Program, *Hydromodification Management Plan* Table 3-4, May 12, 2005.

half of this largely undeveloped area is rural residential and special conservation planning with four or more development constraints. Land uses between I-280 and US 101 are primarily residential, with some concentrated commercial/industrial development between Bohannon Drive, US 101, and Marsh Road. Land uses east of US 101 are primarily commercial/industrial. These land uses would not be expected to be greatly altered with future growth and development within the watershed, and future development and growth is not expected to cause or contribute to substantial increases in pollutants to water resources and degradation of water quality.

New and re-development within the County of San Mateo is subject to requirements of the SMCSPPP and associated Municipal NPDES Permit and Hydromodification Management Plan (HMP), the statewide Construction General Permit, and local municipal and county codes. If substantial dewatering is required, an individual permit would be required. These WDRs have been developed to protect water quality standards and require implementation of stormwater quality BMPs. The HMP ensures that potential increases in stormwater discharge do not adversely affect the habitat, form, or function of susceptible creek systems; where discharges are to a susceptible stream or creek, hydromodification controls are required if there would be an increase in impervious area and/or flow rate or flow volume.

In addition to the City of Menlo Park Municipal Code regulating pollutants in stormwater, other jurisdictions within the Atherton Channel watershed have similar codes and ordinances to protect water quality from new development and re-development and ensure that WDRs are complied with. These similar codes include Town of Atherton Chapter 8.54 Grading, Erosion and Sediment Control, Chapter 8.50 Storm Water Management And Discharge Control; Town of Woodside Title XV: Site Development; Chapter 151 Site Development, Section 151.03 Purpose - Protect public and private lands from erosion, earth movement, flooding, and degradation of water quality and ensure the maximum preservation of the natural and scenic character of the Town by establishing minimum standards and requirements relating to land grading, excavations and fills, erosion control and sedimentation control, quality of materials, and installations of driveways, swimming pools, tennis courts, and creek crossings and by establishing procedures by which such standards and requirements may be enforced; and County of San Mateo Title 4 Sanitation and Health Chapter 4.100 Storm Water Management and Discharge Control Sections 4.100.110 Reduction of pollutants in storm water, 4.100.140 Best Management Practices for new Development and Redevelopment, 4.100.150 Compliance with Best Management Practices, and 4.100.160 Water Course Protection.

Additionally, development projects would have to go through the environmental review process, which would identify any site- or project-specific potential impacts. All of these programs have been designed and implemented to be protective of water quality. Implementation of TMDLs for pollutants listed as contributing to impairment of water resources would further protect water resources from water quality degradation. Continued monitoring of receiving waters by the SFRWQCB and SMCSPPP ensure that these programs remain effective and protective of water quality. Therefore, cumulative effects of potential future growth and development on degradation of water quality through discharge of pollutants to surface or groundwater, or by increased erosion and sedimentation, would be less than significant.

Impact HY-2CM: *The proposed project combined with future development within the San Mateo subbasin would not substantially degrade groundwater supplies. As a result, cumulative impacts on the subbasin would be less than significant. (LTS)*

Groundwater recharge in the area occurs primarily through streambeds with some direct recharge from percolating precipitation. Future growth and development could require increases in water supplies; however, water supplies in the area are primarily surface water. Development and growth within the area would also be subject to the applicable urban water management plan for water supplies and major development would require a water supply assessment to ensure that adequate water supplies are available without depleting water resources.

The environmental review process and water supply assessment (for major developments) would identify where and when new groundwater wells could be required or implemented. Because the San Mateo subbasin is not actively managed to control groundwater levels, new development and growth could result in greater groundwater use resulting in a potential cumulative impact.

Future growth and development would not be expected to substantially increase the amount of impervious surfaces, thereby impeding groundwater recharge from percolating rainfall and indirectly lowering the local groundwater table. The existing impervious amount of the watershed is about 69 percent and the watershed is estimated to be about 99 percent built out. Existing zoning regulations preclude a substantial increase in new impervious area (primarily rural residential and low density residential). Additionally, potential increases in impervious surface from future growth and development that would likely increase surface runoff (and thereby, reduce direct groundwater recharge through percolation of rainfall) would have a minimal effect on groundwater recharge. Reduced recharge from rainfall percolation would not be substantial because runoff waters would continue to recharge the underlying groundwater basin as they travel through the streams and channels. Indirect cumulative impacts to groundwater supplies would be less than significant.

The proposed project would not directly alter the groundwater table by development of any groundwater wells and potential direct impacts would be less than significant. Furthermore, the creation of impervious surfaces would not significantly reduce groundwater recharge potential from the project area; soils within the site do not readily allow percolation of rainfall for groundwater recharge and the proposed project would reduce the amount of impervious surfaces by about 0.8 acres within an area of the groundwater basin that is highly influenced by the San Francisco Bay. Therefore, indirect impacts from the proposed project would be less than significant. As a result, the proposed project's impacts on groundwater would not be cumulatively considerable and the project's contribution would be less than significant.

Impact HY-3CM: *The proposed project, combined with future development within the Atherton Channel watershed, would not substantially contribute to flooding but could be substantially affected by flooding. The proposed project's contribution to cumulative impacts would be less than significant. (LTS)*

Portions of the project area and Atherton Channel watershed are within a FEMA defined 100-year flood plain. However, flooding that has occurred in the Atherton Channel watershed has been primarily a function of water levels in the San Francisco Bay. Floodplain and floodway development within the Atherton Channel watershed is regulated by the Towns of Woodside (Chapter 55: Floodplain Management) and Atherton (Chapter 16.32: Improvements, Section 16.32.050 Drainage requirements), as well as the City of Menlo Park (Chapter 12.42: Flood Damage Protection), in addition to FEMA development requirements. These regulations include requirements for maintenance of flood flow conveyance and floodplain storage, as well as flood protection for public health and safety and risk to properties. However, in areas to the east of El Camino Real, sea level rise of 1.67 feet by 2050 could inundate areas beyond those that are currently identified as existing flood hazard areas and to greater depths than currently identified. This change would also affect the flow gradient within Atherton Channel such that there could be greater upstream flooding. The expansion of the flood hazard area would be a potentially significant cumulative impact.

Without incorporation of stormwater detention BMPs, the proposed project would increase the peak flow rates from the project area. However, like all projects within the City of Menlo Park, the project applicant would be required to implement stormwater detention to reduce flows to pre-project conditions and implement stormwater quality BMPs to reduce pollutants in stormwater runoff. In addition, the project area would be raised to above the base flood elevation. Therefore, the proposed project's contribution to cumulative impacts would not be considerable resulting in a less-than-significant cumulative impact.

Appendix C.2: Final Hydrology Report, Menlo Gateway Project (December 2009)

Final Hydrology Report

Menlo Gateway Project

100-190 Independence Drive &
101-155 Constitution Drive
Menlo Park, California

Prepared for

Bohannon Development Company

Prepared by

Philip Williams & Associates, Ltd.

December 21, 2009

PWA REF. # 1894

Services provided pursuant to this Agreement are intended solely for the use and benefit of the Bohannon Development Company. No other person or entity shall be entitled to rely on the services, opinions, recommendations, plans or specifications provided pursuant to this agreement without the express written consent of Philip Williams & Associates, Ltd., 550 Kearny Street, Suite 900, San Francisco, CA 94108.

PROFESSIONAL ENGINEER'S CERTIFICATION

This is to certify that the Hydrology Report for the Menlo Gateway Project, located in Menlo Park, California has been prepared under my direction and supervision.

12/21/2009

Philip L. Luecking, P.E. Date
California Certificate No. C 66113

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1. INTRODUCTION

1.1 HYDROLOGY REPORT

The proposed Menlo Gateway Project (Project), located at 100-190 Independence Drive and 101-155 Constitution Drive will redevelop approximately 16 acres (694,700 square feet) of industrial and commercial land within the City of Menlo Park. The City of Menlo Park (City) requires a Hydrology Report for all development projects in which "10,000 square feet or more of impervious surface area is either created or replaced" (Menlo Park, 2006).

Pursuant to the requirements of the City of Menlo Park, the final Hydrology Report, incorporating all elements as required by the City's *Requirements for the Preparation of Hydrology Reports* (*RPHR*) (City of Menlo Park, 2006), must be approved by the Engineering Division prior to scheduling the Planning Commission project recommendation hearing. Philip Williams and Associates (PWA) prepared this Hydrology Report in accordance with the City's requirements.

1.2 PROJECT DESCRIPTION

The Project is located in the northeast portion of the City of Menlo Park and is generally situated between US Highway 101 to the south and west, and Bayfront Expressway to the north and east. The project site consists of two non-contiguous tracts of land on Independence Drive and Constitution Drive, separated by one block of properties that are currently used for offices, commercial and light industry. The Constitution Drive site (Constitution Site) is approximately 8.9 acres while the Independence Drive site (Independence Site) is approximately 7.1 acres for a total area of approximately 16 acres. The proposed mixed-use redevelopment project will consist of three office buildings, three parking structures, and a hotel/health club complex.

1.2.1 Existing Conditions

The project site currently consists of professional offices and light industrial facilities with the majority of the site area covered by buildings and paved parking lots. A vacant lot and landscaping comprise the remaining area at each site. Surface runoff is directed to catch basins or drains directly to the street before flowing to the City's storm drain system. The storm drain system discharges into Atherton Channel and then to the San Francisco Bay. The project is located within the Atherton Channel drainage basin as shown in Figure 1. The location of the project site within the City's storm drainage system is shown in Figure 2. The project site is not located within an area of Menlo Park that is subject to hydrograph modification controls, per the *C.3 Stormwater Technical Guidance* for developers, builders and project applicants (SMCWPPP, 2007).

The Project is located within a FEMA special flood hazard area subject to inundation by the 100-year flood. The entire Constitution Site and a portion of the Independence Site are located within an area designated Zone AE, which has a base flood elevation of 7.0 feet (FEMA, 1999)[1]. A portion of the eastern most parcel of the Independence Site is located within an area designated Zone X, which is subject to flooding during the 500-year event or shallow flooding during the 100-year event (FEMA, 1999). The project location within the mapped flood hazard zones is shown in Figure 3.

Aerial photographs of the existing site conditions are shown in Figure 4 and Figure 5 for the Constitution and Independence Sites, respectively. The total impervious area under existing conditions is approximately 496,000 square feet, or 11.4 acres, which represents approximately 71% of the total site area. The composite runoff coefficient for the Constitution Site is 0.81, while the composite runoff coefficient is 0.78 for the Independence Site. A summary of the existing land use areas and runoff coefficients is presented Table 1. Detailed descriptions of the existing site use, drainage patterns, and estimated runoff for the Constitution and Independence Sites are included in subsequent sections of this report.

The estimated runoff coefficients were used with the Rational Method to estimate the 10-year and 100-year peak runoff flow rates, based on guidelines provided in *RPHR*. The 10-year peak flow rate (Q10) is approximately 7.2 cubic feet per second (cfs) for the Constitution Site and approximately 3.9 cfs for the Independence Site. The 100-year peak flow rate (Q100) is approximately 10.7 cfs for the Constitution Site and approximately 5.8 cfs for the Independence Site.

1.2.2 Proposed Conditions

The Project will redevelop the existing conditions to include two mixed-use office buildings and two parking structures on the Constitution Site and to include a hotel and health club facility, office building, and a parking structure on the Independence Site.

The total impervious area of the Project would decrease to approximately 455,900 square feet, or 10.5 acres, which is approximately 66% of the project site. The composite runoff coefficient (C-factor) for the entire Project would be 0.76. The composite runoff coefficient for the Constitution Site would be 0.74 and the composite runoff coefficient would be 0.79 for the Independence Site.

The City does not allow for any net increase in the peak flow rate over existing conditions from the Project site. The Project design utilizes site design, source control, and treatment measures to manage stormwater runoff and provide water quality treatment of runoff prior to discharge to the City's storm drain system. Subsurface detention facilities will be utilized to mitigate any increases in the peak flow rate of stormwater runoff to below existing conditions for the Project. Stormwater detention measures

[1] FEMA datum will change after adoption of updated DFIRM maps, currently anticipated for fall 2009.

include oversized pipes with orifice outlet controls at the Independence Site and subsurface storage with outlet control at the Constitution Site.

For the Independence Site, the Project would reduce the 10-year and 100-year peak flow rates to 2.5 and 5.1 cfs, respectively. At the Constitution Site, the Project would reduce peak flow rates to 6.7 and 9.6 cfs for the 10-year and 100-year events. The Project would reduce the combined 10-year and 100-year peak flow rates for the two sites by 1.9 cfs and 1.8 cfs as compared to existing conditions.

A summary of the proposed land use areas and runoff coefficients is presented in Table 1. A detailed description of the proposed site use, drainage patterns, and estimated runoff for the Constitution and Independence Sites is included in subsequent sections of this report. A detailed tabulation of the watersheds and land use area delineations for each site is provided in Appendix B.

Table 1. Summary of Land Use Areas and Estimated Runoff Coefficients

EXISTING CONDITIONS

	Vacant (ft^2)	Landscape (ft^2)	Buildings (ft^2)	Open Water (ft^2)	Paving (ft^2)	Total Impervious Area (ft^2)	Total Area (ft^2)	Composite C
	0.58	**0.5**	**0.9**	**0.0**	**0.9**			
Constitution Site	56,107	42,322	96,829	0	190,596	287,425	385,854	0.81
Percent of Total	15%	11%	25%	0%	49%	74%	100%	
Independence Site	49,950	50,268	84,210	0	124,387	208,597	308,815	0.78
Percent of Total	16%	16%	27%	0%	40%	68%	100%	
TOTAL	**106,057**	**92,590**	**181,039**	**0**	**314,983**	**496,022**	**694,669**	**0.80**
Percent of Total	15%	13%	26%	0%	45%	71%	100%	

PROPOSED CONDITIONS

	Permeable Paving (ft^2)	Landscape (ft^2)	Buildings (ft^2)	Open Water (ft^2)	Paving (ft^2)	Total Impervious Area (ft^2)	Total Area (ft^2)	Composite C
	0.58	**0.5**	**0.9**	**0.0**	**0.9**			
Constitution Site	23,360	136,882	148,621	0	76,991	225,612	385,854	0.74
Percent of Total	6%	35%	39%	0%	20%	58%	100%	
Independence Site	0	71,372	161,588	7,187	68,668	230,256	308,815	0.79
Percent of Total	0%	23%	52%	2%	22%	77%	100%	
TOTAL	**23,360**	**208,254**	**310,209**	**7,187**	**145,660**	**455,869**	**694,669**	**0.76**
Percent of Total	3%	30%	45%	1%	21%	66%	100%	

2. HYDROLOGIC ANALYSIS

2.1 APPROACH

The Menlo Gateway Project consists of two non-contiguous sites (101-155 Constitution Drive and 100-190 Independence Drive), which were analyzed separately for comparison of peak runoff rates between existing and proposed conditions. Each site was delineated by watersheds and land use areas for both the existing and proposed project conditions; drainage patterns were evaluated and a runoff coefficient was estimated for each subwatershed. The Rational Method was used to estimate the peak flow rate from each site in accordance with the guidelines provided in *RPHR*. The peak flow rates were then used to size the water quality treatment and detention facilities required for each site.

A separate hydrologic analysis was conducted to estimate the peak flow rates of the larger Chrysler Pump Station watershed, which includes the Constitution and Independence Sites. This analysis was used to inform the hydraulic analysis of the storm drain pipe network system.

2.2 DRAINAGE PATTERNS AND LAND USE DELINEATIONS

The existing site conditions were evaluated using historic as-built drawings, topographic surveys, aerial photographs, and reconnaissance level site visits. The site plan drawings by DES Architects and Engineers (DES) were used to evaluate the proposed site conditions. Detailed watershed delineations were developed for each of the project sites to evaluate runoff within the Project boundaries. Individual subwatersheds were delineated within the Project boundaries while areas located outside the project limits, such as the streets, were excluded from this analysis. One exception to this is the Caltrans right of way located at the northwest corner of the Constitution Site, which is included as a separate discussion.

2.2.1 Existing Conditions

2.2.1.1 Constitution Site

A total of four parcels of land make up the Constitution Site. Three of the parcels are occupied primarily by buildings and paved parking lots, while the fourth lot is currently vacant with exposed soil with sparse vegetative cover. The site is bounded by Constitution Drive to the south, Chrysler Drive to the east, Marsh Road to the west, and Bayfront Expressway to the north. The existing storm drain system at this site consists of a 24-inch line through the northern portion of the site, an 18-inch line along Constitution Drive, and a 54-inch line along Chrysler Drive. These pipes deliver stormwater to the Chrysler Pump Station located at the northeast corner of the Constitution Site. The subwatersheds, land use areas, and drainage patterns for the Constitution Site are presented in Figure 6.

The westernmost parcel (105 Constitution Drive) is vacant with bare soil and scattered vegetation. Approximately half of the lot drains to a catch basin connected to the existing 24-inch storm drain while

the southern half drains directly off-site to Constitution Drive, where it flows east in the gutter to a catch basin. The 115 Constitution Drive parcel is occupied by a building and a paved parking lot with minor landscaping adjacent to the building and along Constitution Drive. The western and northern areas of this parcel direct flow overland to the 24-inch storm drain at the same point as the vacant parcel. The western parking area drains to catch basins within the site that direct flows to the street in front of the building. Runoff from the landscaped area flows directly off site to the street. Flows that enter the street are directed to a catch basin in front of 125-135 Constitution Drive and to the 18-inch storm drain.

The 125-135 Constitution Drive parcel consists of a large building with paved parking lots on three sides of the building and a lawn and landscaping adjacent to Constitution Drive. The northern half of the site directs runoff overland to a catch basin that connects to the 24-inch storm drain. The southern half of this parcel directs flow to catch basins in the parking lot which then deliver flow to the existing 18-inch storm drain.

The eastern parcel (155 Constitution Drive) consists of a building, paved parking on all four sides and small landscaped areas adjacent to the building and along Constitution and Chrysler Drives. The drainage at this site is divided and runoff is directed to catch basins that deliver runoff to the 24-inch storm drain to the north, the 18-inch storm drain to the south, and east to the 54-inch storm drain located at Chrysler Drive. The point at which all runoff from the Constitution Site reaches the Chrysler Pump Station was utilized as the design point for estimating the total peak runoff from the site.

The northwest corner of the project site near the intersection of Marsh Road and Bayfront Expressway is located outside of the project boundary within the Caltrans right of way. The area includes landscaping and a vegetated swale near to the project boundary and a portion of Bayfront Expressway. Runoff from the landscaped area is directed to a grassy swale and catch basins along Marsh Road which connects to an existing 24-inch storm drain at the intersection of Marsh Road and Bayfront Expressway. The northern portion of the off-site area, including runoff from Bayfront Expressway, drains to a surface inlet to the 24-inch storm drain at the northern boundary of the Project site. The limits of the off-site area included in the analysis were defined to match the limits of the proposed conditions area that is being modified as part of the Project or will impact the storm drain analysis.

2.2.1.2 Independence Site

The Independence Site is comprised of five parcels, four of which are occupied primarily by buildings and paved parking lots, while the remaining lot is vacant with bare soil and scattered vegetation. The site is bounded by Independence Drive to the north, Chrysler Drive to the east and Highway 101 to the west and south. The existing storm drain system near this site includes a 48-inch pipe running along Chrysler Drive and an 18-inch pipe at Independence Drive, running from 120 Independence Drive to the east. A drainage ditch and a 42-inch storm drain are located along the southern edge of the site draining east. The 42-inch storm drain connects to the 48-inch main line at Chrysler Drive. The runoff from the Independence Site is directed to the 48-inch line which becomes a 54-inch line adjacent to the Constitution site and ultimately delivers runoff to the Chrysler Pump Station at the northeast corner of the

Constitution Site. The subwatersheds, land use areas, and drainage patterns for the Independence Site are presented in Figure 7.

The western most parcel (100 Independence Drive) consists of a paved parking lot along Independence Drive, a building and landscaping on the southern and western sides of the building. Runoff from the parking lot flows to the street while runoff from the remainder of the site flows toward an open ditch along the south and west edges of the site. The 110 Independence Drive parcel is a vacant lot with bare soil and some scattered vegetation. The majority of the site slopes towards Independence Drive and runoff flows directly to the street. The southern third of the parcel drains to the ditch at the southern edge of the site. Runoff entering Independence Drive travels along the gutter to the east and runoff entering the ditch travels to the east along the ditch.

The parcel at 120 Independence Drive consists of a building with paved parking on three sides. Runoff from this parcel is directed to three catch basins located in the parking lot that deliver flow to a 12-inch storm drain at Independence Drive. There are two small lawn areas that drain off-site to the street and ditch at the north and south of the parcel, respectively. The 150 Independence Drive parcel is occupied by a large building with paved parking on the east and west sides of the building and a small lawn and landscape area on the north and south sides. Runoff from the parking lots is directed to catch basins which then connect to the 18-inch storm drain at Independence Drive.

Runoff from 100 and 110 Independence Drive flows to a catch basin in front of 150 Independence Drive and joins the runoff from the parking lot runoff in the 18-inch storm drain. A narrow band of landscaping is located along the south edge of both the 150 and 190 Independence Drive parcels. Runoff from this area and the aforementioned drainage ditch flows into catch basins where it enters the storm drain system and flows to the 48-inch storm drain at Chrysler Drive.

The eastern most parcel (190 Independence Drive) is occupied by a large building and paved parking lots on the east and west sides of the building with a lawn area adjacent to Independence Drive. The western parking lot drains to catch basins and flows to the 18-inch storm drain. The eastern parking lot drains directly to Chrysler Drive where flows travel along the gutter to a catch basin at the intersection of Chrysler and Independence Drives. The point at which all runoff from the Independence Site reaches the 48-inch storm drain at the intersection of Chrysler and Independence Drive was utilized as the design point for estimating peak runoff from the site.

2.2.2 Proposed Conditions

The Project will redevelop the two sites to include two office buildings and two parking structures on Constitution Drive and a hotel/health club facility, an office building, and a parking structure on Independence Drive. The Project is located at the downstream end of the Atherton Channel drainage basin and drainage from the Project will be similar to existing conditions without impacts to areas located downstream of the Project. The Project will not impact or alter any upstream drainage patterns.

The site layouts and design for the Project reflect the design prepared by DES Architects and Engineers (DES) and submitted to the City on July 7, 2009. The site plans include grading, landscape, and utility plans. The stormwater utility plans were updated subsequent to the July 7, 2009 submittal and the storm drain system information (pipe diameters, lengths, slopes) is presented in Exhibits 1-4, included as attachments to this document. The proposed storm drain system will utilize both existing and new main lines for connection to the City's storm drain system including the Chrysler Pump Station.

The Project design utilized site design measures to maximize the impervious surfaces and to direct flow from impervious areas to landscaped areas to the extent possible. Source control measures will include roofed trash enclosures and an enclosed structure to contain the pool equipment and supplies. Several stormwater treatment measures will be in included at each site to remove pollutants from stormwater prior to entering the City storm drain system. Stormwater treatment features using natural process for treatment include vegetated swales, tree wells, and flow-through planters. Additional sub-surface mechanical treatment elements (e.g. media filters with pretreatment) will be used in areas where surface treatment measures are not feasible. Additional detention facilities including vaults and oversized storm drain pipes are planned for both sites to attenuate increased peak flow rates, capture net increases in runoff volume, and satisfy the City's policy of no net increase in stormwater runoff from the Project.

2.2.2.1 On-Site Sidewalks

The site plans for both the Constitution and Independence Sites include perimeter sidewalks that are located both within the project boundaries (on-site) and outside of the project boundaries within the City right of way (off-site). The stormwater runoff from the perimeter sidewalks located along Independence, Constitution, and Chrysler Drives will sheet flow toward the adjacent streets. The area of on-site sidewalk for each site is summarized in Table 2. A typical detail of the on-site and off-site contributing areas for runoff from the perimeter sidewalks is shown in Figure 8.

Table 2. On-Site Sidewalk Areas

Location	Subwatershed ID	Area (ft^2)
Constitution Site	CD71, 72	5,540
Independence Site	ID122, 123	5,070
Total		10,610

The runoff from on-site sidewalks will be treated in tree wells located within the City right of way. These tree wells will capture and treat runoff from the entire perimeter sidewalk in an amount equivalent to the runoff generated from the on-site sidewalk area. The volume of water generated by the on-site sidewalks that flows directly to the City streets will be balanced by capturing an equivalent volume of water in detention facilities to be located at each site. On-site detention facilities used to attenuate increases in peak flow rates will be oversized to account for runoff from the sidewalks.

2.2.2.2 Constitution Site

The proposed development on Constitution Drive consists of two office buildings, two parking garages, one large and two small paved surface parking lots, a grassy raised amphitheater, landscaped areas and pathways. Generally, stormwater runoff from the building roofs and areas between the buildings will drain south toward a new storm drain line (12- to 21-inch diameter) at Constitution Drive which connects to the existing 54-inch line at Chrysler Drive. The surface parking and landscaped areas will drain to the north and connect to the existing 24-inch storm drain. The subwatersheds, land use areas, and drainage patterns for the Constitution Site are presented in Figure 9.

All of the runoff from the roofs of the office buildings and garages will be directed to flow-through planters located on the Constitution Drive frontage of each building. Treated runoff exiting the planters will flow directly to the new storm drain system at Constitution Drive. Runoff from the paved area between Garage A and Office Building 1 and the area between Office Building 2 and Garage B will be captured by surface drains and directed to a catch basin with a subsurface media filter before being discharged to the City's storm drain system. Runoff from the sidewalks along Constitution Drive will drain directly to Constitution Drive. A portion of the sidewalk (approximately 4 feet wide) is located within the project boundary while the remaining sidewalk area is within the City right of way. Runoff from the perimeter sidewalks will be directed to tree well filters for treatment.

Runoff from the surface parking areas adjacent to Garage A and Office Building 1 will be directed to two vegetated swales located along the northern edge of the site. Surface runoff from the landscaped area and pathways in this area will also be directed overland to the two vegetated swales. The outlets of the vegetated swales will connect to the existing 24-inch storm drain. The parking stalls of the surface parking lots will be constructed using permeable paving with a subsurface drain system and storage reservoir with discharge controlled by an orifice.

The landscaped area and surface parking area north of Office Building 2 will drain toward a vegetated swale located near the northern site boundary. The outlet of the swale will connect to the existing 24-inch storm drain. Runoff from the raised amphitheater and the area between the office buildings will flow across landscaped areas before being captured in surface drains and French drains that connect to storm drain system. Runoff from the volleyball courts, bocce courts, and landscape area north of Garage B will be captured by French drains and directed to the storm drain system. The storm drain system will deliver runoff to the Chrysler Pump Station at the northeast corner of the site. This location was used as the design point for the peak flow rate estimate for the proposed conditions (similar to existing conditions).

The Caltrans right of way, located outside the project boundary, near the intersection of Marsh Road and Bayfront Expressway will be landscaped with a pathway connecting the project site to Marsh Road. The total area of this off-site right of way is approximately 46,600 square feet, which includes approximately 16,800 square feet of Bayfront Expressway. This portion area of Bayfront Expressway drains directly to the existing 24-inch storm drain, just outside of the project boundary. Approximately 2,200 square feet of this off-site area will drain from off-site to storm drain inlets within the western edge of the project

boundary. The remainder of the off-site area will flow overland to a series of inlets that deliver runoff to an existing 24-inch storm drain at the intersection of Marsh Road and Bayfront Expressway, where it travels under Marsh Road to the northwest, away from the site.

2.2.2.3 Independence Site

The proposed development on Independence Drive consists of a hotel/health club (Renaissance ClubSport) complex at the east end of the Independence Site, one parking garage and one office building at the west end of the Independence Site. The hotel complex will include a large deck area with two pools and landscaping. Additional landscaping and ornamental paving areas will be located between and around the buildings at the Independence Site. The majority of the runoff from the site will be directed to the storm drain systems at Independence Drive. A new storm drain line (15- to 18-inch) will be constructed beneath the sidewalk along the western extent of Independence Drive. This new line will connect to the existing 18-inch line located under Independence Drive, which connects to the existing 48-inch line at Chrysler Drive. The project will not use the 42-inch storm drain located at the southern edge of the Independence Site. The subwatersheds, land use areas, and drainage patterns for the Independence Site are presented in Figure 10.

The runoff from the roof of the office building will be directed to a vegetated swale located to the southwest of the building. Runoff from the paved area between the office building and garage will be directed to a trench drain that flows toward Independence Drive where it will flow to a manhole with a media filter before being discharged to the City storm drain system. Runoff generated by the roof of the parking garage will be directed to a series of flow-through planters located on the Independence Drive frontage and a vegetated swale on the southern side of the garage. A fire access road will be located on the east and south sides of the parking garage. Runoff from the portion of the road along the southern side of the garage will flow to the vegetated swale. Access road runoff on the east side of the garage will be collected in a series of catch basins and directed to a subsurface media filter vault, located at the access road entrance, before being discharged to the City storm drain system.

The roof drainage for the Renaissance ClubSport complex will be subdivided and directed to two separate locations. The ClubSport roof drainage will be delivered to subsurface media filter vaults prior to being discharged to the storm drain system at Independence Drive. These subsurface facilities will be located at the entrance to the access road and the northeast corner of the hotel.

Landscaping and plaza areas along the Independence Drive frontage of the site will drain to several catch basins, which are equipped with media filters, before entering the storm drain system. The deck and pool area of the complex is relatively flat. Runoff from this area will be collected via surface drains. Several French drains and slot drains will be used to capture sheet flow and direct it to the on-site storm drain system. All of the surface runoff from the pool deck area will be directed to the subsurface media filter vault at the northwest corner of the hotel before being discharged to the storm drain system.

Similar to the Constitution Site, a portion of the new sidewalk will be located within the project site that flows directly towards the streets. Runoff from this area will be captured and treated using tree wells located within the City right of way. The junction of the 18-inch and 48-inch storm drain line is near the intersection of Independence Drive and Chrysler Drive. This location was used as the design point for the peak flow rate estimate for the proposed conditions (similar to existing conditions).

2.2.3 Chrysler Pump Station Watershed

The hydraulic analyses of the proposed storm drain system for the Constitution and Independence Sites are dependent upon the hydraulic performance of the Chrysler Pump Station. Those analyses need to take into account tailwater at the Chrysler Pump Station and flows from adjacent sub-watersheds entering the existing storm drain line along Chrysler Drive that will accept stormwater runoff from the proposed Menlo Gateway development. Thus, hydrologic estimates of peak flow rates for the larger watershed that contributes runoff to the Chrysler Pump Station were developed.

The Chrysler pump station watershed encompasses 258 acres, and was delineated using storm drain maps provided by the City of Menlo Park. The land use within the watershed is highly impervious, comprised primarily of business parks and roads; a small portion of the watershed contains a school and community center with open space.

The Chrysler Pump Station watershed was divided into nine subwatersheds based upon the storm drain network and land use. The watershed delineation can be found in Appendix D-1. The watershed is bounded on the north by Bayfront Expressway (Hwy 84), on the west by the Highway 101 interchange with Marsh Road, and on the south by the railroad tracks. The watershed extends south of the railroad tracks to include approximately 15 acres that contain Onetta Harris Community Center and Beechwood School. The eastern boundary of the watershed was judged to be at the eastern end of the 27-inch storm drain line that is directly tied to the Chrysler pump station.

2.3 PEAK FLOW ANALYSIS

The peak flow rate of the runoff generated by each site was estimated using the Rational Method for the 10-year (Q10) and 100-year (Q100) storms. The methodology used to calculate the runoff rates is consistent with that prescribed in the Methods of Calculation section of the *RPHR*. The following sections describe the methods used and assumptions made to estimate the peak runoff rates for the existing and proposed conditions.

The Rational Method approach requires the calculation of a runoff coefficient, drainage area, and rainfall intensity to estimate the runoff from a given site. The equation for the Rational Method is shown below:

$$Q = C * I * A$$

Q = Rate of runoff (cubic feet per second or cfs)
C = Runoff coefficient (no units)
I = Rainfall intensity (inches per hour), based on storm frequency and time of concentration T_c
A = Drainage area (acres)

2.3.1 Runoff Coefficient

Each land use area was assigned a runoff coefficient (also referred to as the C-factor) based on *RPHR* guidance. PWA prepared a table of runoff coefficients to be used in this analysis and presented it to City staff for approval. The approved runoff coefficients are summarized in Table 3. PWA's July 12, 2007 memorandum on runoff coefficients, including calculations, is provided as Appendix A. Land use areas were delineated within each subwatershed in order estimate composite runoff coefficients. Subwatersheds were delineated based on the site grading and utility plans and were defined as an area that captures and directs surface runoff to a single point of entry to the on-site storm drain system. Each subwatershed was assigned an identification label (e.g. CD76) and composite runoff coefficient.

Table 3. Land Use Types and Runoff Coefficients

Land Use Type	Runoff Coefficient (C)
Building roofs	0.90
Parking lots	0.90
Paved areas	0.90
Vacant lots	0.58
Permeable pavers without gravel substrate	0.58
Landscaped areas	0.50
Open water (swimming pools, spas, water features)	0.00

The stormwater treatment measures (vegetated swales and flow-through planters) and the volleyball and bocce courts were assigned a runoff coefficient of 0.50, equivalent to that for landscaped areas. Permeable paving with a sub-drain system was assigned a runoff coefficient of 0.58. A tabulation of the individual subwatersheds, delineated land use areas and assigned runoff coefficients is presented in Appendix B.

Within the larger Chrysler Pump Station watershed, eight of the sub-watersheds (total land area is 243 acres) were considered highly developed and assigned an overall runoff coefficient of 0.80. The lone sub-watershed that contains open space (15 acres) in the vicinity of the Onetta Harris Community Center and Beechwood School was assigned a runoff coefficient of 0.40.

2.3.2 Rainfall Intensity

The rainfall intensity was estimated using equations developed based on data from a rain gauge located within Menlo Park and provided by the City in *RPHR*.

$$I_{10-year}(in/hr) = \frac{5.76}{T_c^{\,0.533}}$$

$$I_{100-year}(in/hr) = \frac{8.38}{T_c^{\,0.526}}$$

T_c = time of concentration (min)

2.3.3 Time of Concentration

The time of concentration is the total time required for runoff to travel from the furthest most point in the watershed to the design point. The design point is the point at which the peak flow rate of the runoff is to be calculated. The design point for the Constitution Site is the Chrysler Pump Station at the northeast corner or the site, and the design point for the Independence Site is the junction of existing storm drains at the intersection of Independence and Chrysler Drives. For the larger Chrysler Pump Station watershed, the design point was the pump station. The time of concentration must be calculated for both overland flow and pipe flow, separately. The time of concentration was calculated using the following equation:

$$T_c \text{ (min)} = T_{overland} + T_{pipe}$$

The overland travel time ($T_{overland}$) is the time required for the runoff to travel across the ground surface from most distant point in the watershed to the storm drain inlet or design point. The overland travel time was calculated using the US Federal Aviation Agency Equation, as presented in *RPHR*.

$$T_{overland}(\text{min}) = \frac{1.8(1.1 - C)\sqrt{L}}{[S(100)]^{1/3}}$$

C = Composite runoff coefficient of watershed
L = Length of overland travel (feet)
S = Effective slope of the path of overland travel (feet/feet)

The pipe flow time T_{pipe} is the time for the runoff to travel from the storm drain inlet or pipe junction to the point of interest or design point. The pipe flow time is calculated cumulatively along the flow path. The pipe flow time was estimated using the following equation:

$$T_{pipe}(\text{min}) = \Sigma \frac{L_i}{v_i}$$

L = Length of pipe (feet)
v = Flow velocity in the pipe (feet per second)

Flow velocities for existing pipes were estimated based on the flow in each pipe segment, pipe diameter, slope, and Manning's n-value using the pipe flow capacity calculator published by Denver Urban Drainage and Flood Control District (UDFCD). In some cases pipe diameters, slopes, and Manning's n-values were assumed based on information available on the as-built plans for adjacent storm drains. Pipe design information, including pipe diameters, slopes and critical invert elevations, for the proposed project was provided by DES. The City of Menlo Park design requirement for minimum flow velocity is 2 feet per second for the 10-year storm.

2.3.4 Peak Flow Estimate

The peak flow rate was estimated for the 10-year and 100-year storm events individually for each of the two sites for both the existing and design conditions. The sites were evaluated individually as they are not directly connected by land, though the runoff from both sites does eventually reach the Chrysler Pump Station. The flow rates were calculated at the same design points for the existing and proposed conditions to allow for accurate comparison of pre- and post-project runoff. The results of the peak flow estimate are provided in Table 6.

An iterative approach was used to determine the peak flow for the site due to the relationship between the rainfall intensity and the time of concentration ($I_n = 5.76/Tc^x$). The runoff from each subwatershed was estimated using the overland travel time and the corresponding rainfall intensity, area, and runoff coefficient. This provided an initial estimate of flow to each pipe which was then used to estimate the pipe flow velocity and subsequently the travel time in the pipe. This procedure was carried forth from the furthest most point at each site to the design point. This yielded a time of concentration at the design point for the entire site. This was then used to calculate the rainfall intensity and, the 10- and 100-year peak flow rate for each site and condition.

For the larger Chrysler Pump Station watershed, the length of the longest storm drain pipeline was utilized to estimate the time of concentration for the watershed. Velocities within the storm drain pipes were assumed to be 2 feet per second for the 10-year event based on the City of Menlo Park design standards.

The rainfall intensity for the entire site was then used to estimate the design 10-year and 100-year peak flow rate for each subwatershed. This was used as input to the hydraulic analysis of the storm drain pipe network discussed in Section 3.

The peak flow rate was calculated for the area within the Project boundaries for each site, with the exception of the Caltrans right of way at the Constitution Site. The Caltrans right of way added approximately 46,600 square feet to the total area analyzed at the Constitution Site. Due to the grading at the Constitution Site, a portion of the area within the project boundary actually flows off-site, while approximately 60% of the Caltrans area contributes flow to the design point by flowing to the Chrysler Pump Station. Detailed calculation tables used to estimate peak flow rates for each site are included as

Appendix C. The calculation tables include the calculated runoff, time of concentration, overland travel distances, pipe dimensions and pipe flow velocities used to estimate the peak runoff rate for each site. A discussion of these results and their implications is provided in Section 4.

2.3.5 Runoff Volume Estimate

The City does not allow any net increase in stormwater runoff to enter the public streets and storm drain system and requires detention facilities to be sized to capture runoff as needed to prevent increases in runoff from a 10-year event. In addition, the volume equivalent to that generated by the (perimeter) on-site sidewalks will be captured as needed within the project sites in order to offset the runoff flowing directly to the public streets.

The runoff volume for the 10-year and 100-year storm events was estimated for each site using a synthetic hydrograph approach. The peak flow rate and time of concentration for each site were used to develop a triangular hydrograph in which the total duration of the storm was assumed to be equal to three times the time of concentration. This method allows for comparison of runoff volumes under existing and proposed conditions. The estimated runoff volume from each site under the existing and proposed conditions is summarized in Table 7.

3. HYDRAULIC ANALYSIS

A storm drain system design was developed by DES for each of the two Project sites. The storm drain network was designed to meet the City's design criteria for storm drain systems. The design criteria require that the top of curb elevation and finished floor elevations be at least one foot above the hydraulic grade line (HGL) of the project. The energy grade line (EGL) must never exceed the rim elevation of the storm drain inlets (City of Menlo Park, 2006). The storm drain network for each site was evaluated using the modeling software program MOUSE Pipe Flow, developed by DHI Water & Environment. The storm drain systems were modeled for the proposed conditions with both 10-year and 100-year peak flow rates to develop a storm drain system design that meets the City's requirements. The storm drain system was sized to meet the design criteria for a 10-year storm event. The proposed storm drain network will utilize pressure pipe with water tight joints that will be ballasted against buoyant forces for all elements that will be below groundwater levels.

3.1 MOUSE PIPE FLOW MODEL

The MOUSE Pipe Flow model (MOUSE) is a computational network model that allows for simulations of unsteady flows in pipe networks. The software is capable of modeling backwater effects, flow reversals, surcharges in manholes, free-surface and pressure flow and can incorporate storage basins. The MOUSE computational scheme uses an implicit, finite-difference numerical solution of the complete St. Venant equations (DHI, 2003). MOUSE simulates both open and closed conduit systems, overflow weirs, orifice controls and flow regulation.

3.1.1 Model Inputs

The storm drain network is defined within the model using links (pipes) and nodes (manholes, junctions) with specific design data assigned to each link and node. Links are defined by conduit type (closed or open), conduit shape (circular or other), length, upstream and downstream invert elevations, and pipe material with Manning's n-value. The nodes are defined by an identifier, x- and y-coordinates, and node type (manhole, storage, structure, or outlet).

Storm drain network models were developed the proposed conditions for the Constitution Site and Independence Site. The storm drainage network developed for each site by DES was used to construct a pipe network within the model. The storm drain networks are presented graphically in Figures 11-14. Pipe diameters and lengths were obtained from the site utility plans. The pipe layout provided by DES was simplified to exclude the majority of the short 4-inch connector pipes that deliver water from the surface inlets to the main storm drain trunk lines. This simplification reduced the overall computation and analysis time. It was also determined that a minimum pipe diameter of 4 inches is sufficient to deliver flows from the small drainage areas within the sites to the main site storm drain pipes.

Invert elevations were calculated using known elevations at the connections to the City's existing storm drain system, pipe lengths, and slopes, to the extent possible. Some of the invert elevations at the Constitution Site required the use of assumed information (pipe slope, invert elevation) taken from Civil Site Plans provided by DES.

Invert elevations for the Constitution Site proposed conditions were based on surveyed elevations at the existing points of connection and design slopes for new pipes. The north side of the site drains to an existing 24-inch RCP storm drain, which extends from model node CD-PR-06 to CD-PR-13. The survey indicates an assumed slope of 0.004 feet/feet along this pipe. At the location of model node CD-PR-07 (Manhole 7 on the civil utility plans provided by DES), the civil plans indicate an assumed invert elevation of -1.45 feet NGVD. All node invert elevations were calculated using this assumed invert elevation in conjunction with design slopes for pipes or assumed slopes for existing pipes.

The south side of the proposed Constitution Site will drain to a new 21-inch RCP pipe. The surveyed invert is -6.88 at this location, known as model node CD-PR-61 (POC1 on the civil utility plan provided by DES). The inverts for the existing pipe continuing down to the pump station are from survey data. All of the proposed pipe inverts are calculated based on slopes provided by DES in the civil site plans and existing pipe inverts. A tabulation of the model nodes, invert elevations and source of information for the Constitution Site is presented in Appendix D-2.

The Independence Site is bordered by existing storm drains that will not be altered by the Project. The proposed storm drain network for the site connects to the existing 48-inch RCP storm drain in the northeast corner of the project site, known as model node ID-PR-54 (POC2 on the civil site plans provided by DES). Survey information identifies the invert at the point of connection to be -2.07 feet NGVD. All invert elevations along the proposed Independence Site storm drain network are calculated from this invert the pipe slopes from the civil site plans.

Existing storm drain pipes are either reinforced concrete or vitrified clay pipe, with Manning's n-values of 0.0133 and 0.0143, respectively. All of the proposed pipes are PVC with a Manning's n of 0.011 based on recommendations from the City.

Nodes are used in the model whenever two links join. The model provides an option to select the type of inlet and outlet losses associated with each node. The storm drain model network includes nodes with manholes and nodes without manholes. The manholes were defined at nodes using inputs of ground surface and invert elevations and circular shape with a diameter of 3.0 feet. The model calculates the inlet and outlet losses at these typical manhole nodes. Outlet losses are calculated using a standard minor loss coefficient. The outlet shape was defined as "sharp edged" with a head loss coefficient of K_m=0.50.

Nodes that join links but do not include a manhole (e.g. when a small 4-inch pipe joins a larger storm drain pipe) were modeled to reflect a smooth hydraulic condition at the node. This was accomplished by setting the outlet shape to "No CRS changes (1)" which tells the model to exclude losses at the node.

Storage nodes were defined for the two subgrade reservoirs, below the permeable parking, at the Constitution Site. Orifices (with overflow weirs) were defined at the outlets of the oversized pipes at the Independence Site and the subsurface storage reservoirs at the Constitution Site.

MOUSE provides three options to describe flow approximations within the model: dynamic wave approach; diffusive wave approach; kinematic wave approach. The dynamic wave approach was utilized for this analysis. This approach uses the full momentum equation and is appropriate for this system which has low slopes and resistant forces (DHI, 2003).

3.1.2 Boundary conditions

The boundary conditions for the storm drain network models include inflows at the nodes within the Constitution and Independence Sites, inflows from adjacent subwatersheds of the Chrysler Pump Station watershed to the network, and a starting tailwater elevation at the design point for each of the sites.

3.1.2.1 Hydrologic Inputs

The initial boundary conditions for the storm drain network models are time variable inflows at the nodes. Runoff hydrographs were developed for the total inflow at each node with contributing flow based on the total site peak flow rate. A rectangular hydrograph with a flow-duration equal to the time of concentration was used to evaluate peak flows within the system. The inflows for the Constitution and Independence Sites were estimated as discussed in Section 2, while a separate analysis was conducted for the Chrysler Pump Station watershed peak flow rates.

A hydrologic analysis of the Chrysler Pump Station watershed was conducted to estimate peak flow rates of the larger watershed that contributes flow to the Chrysler Pump Station. The 258 acre watershed was subdivided into nine subwatersheds to estimate the 10-year flows entering the Chrysler Drive storm drain at each main lateral input. The Rational Method was used to estimate the peak flow rates. A 60 minute time of concentration (T_c), based on a minimum design pipe velocity of 2 feet per second, was used for the watershed to estimate the 10-year rainfall intensity of 0.65 inches per hour. The composite runoff coefficients for the two project sites were used with values estimated for the remaining watershed areas. A typical C-value of 0.80 (business park) was used for the majority of the watershed. The total 10-year peak flow to the Chrysler Pump Station was estimated to be approximately 130 cfs using the Rational Method. The hydrologic calculations, pump curves, and watershed boundaries for the Chrysler Pump Station watershed are presented in Appendix D-1.

3.1.2.2 Tailwater Analysis

The tailwater at the Chrysler Pump Station was estimated for use in the hydraulic model boundary condition inputs. The pump curve for the two pumps at the Chrysler Pump Station provided by the manufacturer, Cascade Pump Company, was used to estimate the tailwater. The pump curves indicate that the pump station can lift the 10-year flow (130 cfs) with approximately 7.75 feet of head, with both

pumps operating. Based on guidance from the City, a mean higher high water (MHHW) of 4.35 feet NGVD for San Francisco Bay at San Francisquito Creek (just south of the project site) was used as the discharge tailwater. The tailwater in the pump station was calculated to be at elevation -3.4 feet NGVD. This tailwater elevation was then used as the downstream boundary condition for the Constitution Site storm drain model.

An additional storm drain network model was developed to estimate the tailwater at the Independence Site design point. The network includes the storm drain pipes along Chrysler Drive using pipe data from storm drain maps provided by the City and detailed survey information collected at the Constitution and Independence Sites. The downstream tailwater condition was set at -3.4 feet NGVD based on the Chrysler Pump Station analysis. The input flows from each major storm drain junction were estimated from the subwatersheds of the larger Chrysler Pump Station watershed. The model results indicated that the tailwater at the Independence Site design point is 1.43 feet NGVD for the 10-year peak flow. This tailwater elevation was used as the downstream boundary condition for the modeling of the Independence Site storm drain network.

The time of concentration for the proposed conditions at the Constitution and Independence Sites is considerably shorter (25 and 30 minutes) than the 1-hour time of concentration for the larger Chrysler Pump Station watershed. Rather than develop a complex model routing each of the subwatersheds through the Chrysler Drive storm drain and pump station, the tailwater analysis for the Chrysler Pump Station and Chrysler Drive storm drain was based on the 10-year peak flow rate reflecting the 1-hour time of concentration to be conservative. This approach provided a worst-case scenario for modeling of the 10-year event within the storm drain networks of the Constitution and Independence Sites by reflecting the coincidence of a 10-year, 25 and 30 minute peak flow at the project sites with the full 10-year, 1-hour peak flow for the larger watershed. For the 100-year event, this 130 cfs scenario was also more conservative than applying a triangular hydrograph peaking at 195 cfs for the 100-year, 1-hour event for the Chrysler Pump Station watershed which would have resulted in a flow rate of 81 to 98 cfs for the watershed.

3.1.3 Model Iterations

An iterative approach for the storm drain modeling was conducted for each site. The models were first run with the input hydrographs developed in the initial peak flow analysis for the two project sites. The pipe flow velocities calculated in the model were output and used to update the peak flow analysis. This step provided a check of the initial estimate of the time of concentration and peak flow rate for each site. The results of the iterative calculation indicated that the initial and updated peak flow estimates were similar and thus the results of the second iteration could be used for the hydraulic analysis of the storm drain networks. The updated time of concentration and peak flow rate estimates for each site were then used to develop the input hydrographs used in the storm drain network model.

The proposed conditions model networks were then revised to include storage and flow control elements necessary to attenuate design condition peak flows to match existing condition flow rates. Storage elements included oversized pipes with outlet orifice controls and overflow weirs at the Independence Site and storage nodes for the subsurface storage reservoirs beneath the parking lots at the Constitution Site.

The proposed condition models were then run and adjustments made to the pipes, storage nodes, and flow control elements to determine sizing appropriate to attenuate the peak flow rates to existing conditions (or lower) for each site for the 10-year and 100-year events. The proposed condition design peak flow rate was evaluated at the design point for each site. A summary of the model runs conducted for this analysis is presented in Table 4.

Table 4. Summary of Pipe Network Model Runs

Site	Design Condition	Design Flow
Constitution	Existing	Q10
Constitution	Existing	Q100
Constitution	Proposed	Q10
Constitution	Proposed	Q100
Independence	Existing	Q10
Independence	Existing	Q100
Independence	Proposed	Q10
Independence	Proposed	Q100

3.1.4 Model Outputs

MOUSE Pipe Flow outputs a series of tables chronicling the important model inputs as well as associated hydraulic conditions. The model uses the Saint Venant equations to compute unsteady flow in pipes and Manning's equation is used to compute head losses in pipes. Manning's roughness coefficients are described in Section 3.1.1.

The model input data and output data are summarized in tabular format in Appendix D-2. The modeling output includes calculated water surface elevations at each node, and flow rates and velocities in each link. The input data includes node identifiers, ground surface elevation, link identifiers and node connections, invert elevations, pipe lengths, and slopes. A profile for each pipe system showing the pipe diameter, ground surface elevation, node identification, flow rate, flow velocity, hydraulic grade line (HGL) in each pipe segment is also included in Appendix D-2. The energy grade line (EGL) needs to be calculated by hand, from the hydraulic grade line and velocity head, since the model does not have this as an output option.

3.2 SUMMARY

The MOUSE model was used to evaluate the hydraulic design of the storm drain network for the Project. The results of the modeling indicate the storm drain system is adequately sized to meet the City's criteria for storm drain design for the 10-year event. The 10-year water levels in the system do not exceed the one foot freeboard requirement and at no point is the energy grade line above the ground elevation. Additionally, the model was used to size and evaluate the on-site detention facilities and outlet controls to restrict the peak flow from the site to equal to or less than existing conditions for the 10-year and 100-year storm events.

4. RESULTS AND FINDINGS

The redevelopment of the Constitution and Independence Sites will change not only the types of facilities and land uses at the two sites but will also change the hydrology of the two sites. The modifications to the types and distribution of land cover types (e.g. paving, landscaping, and buildings) and revisions to the site grading modify the way stormwater surface runoff is generated at the sites and delivered to the City's storm drain system. These changes and their impacts on stormwater runoff generated at each site and the delivery of stormwater to the City storm drain system is discussed in the following sections.

The total area evaluated for the two sites was the same for existing and proposed conditions to allow for comparison of the impacts of the redevelopment of the two sites. In general, the Constitution Site design layout will result in a reduction in the total impervious area at the site while the Independence Site will increase the total impervious area, as compared to existing conditions. This change to the land uses at the sites will result in a decrease in the runoff coefficient for the Constitution Site and an increase in the runoff coefficient for the Independence Site.

The calculated rainfall intensity factor (I) is will increase due to increased efficiency of the grading and stormwater collection system under proposed conditions. As shown in Section 2.3.2, the rainfall intensity factor is inversely proportional to the time of concentration. A decrease in the time of concentration directly results in an increase in the rainfall intensity factor. The estimated time of concentration and rainfall intensities for each site are shown in Table 5.

Table 5. Summary of Time of Concentration and Rainfall Intensity Estimates

	T_c (min)	I_{10} (in/hr)	I_{100} (in/hr)
Constitution Site			
Existing Conditions	30	0.94	1.40
Proposed Conditions	25	1.04	1.54
Independence Site			
Existing Conditions	52	0.70	1.05
Proposed Conditions	30	0.94	1.40

The results of the initial peak flow analysis indicated that the Project would result in an increase in peak stormwater flow rate from both the Constitution Site and the Independence Site, for both the 10-year and 100-year storms. The Project will therefore implement stormwater detention and flow control measures to mitigate this increase and reduce the peak flow rate from each site to be equal to or less than existing conditions.

The increased peak flows are attenuated for the 10-year and 100-year events to less than the existing condition flows using stormwater detention measures. The estimated peak flows are summarized in Table 6.

Table 6. Summary of Peak Flow Estimates

	Q_{10} Existing (cfs)	Q_{10} Proposed w/o Attenuation (cfs)	Q_{10} Proposed w/ Attenuation (cfs)	Q_{100} Existing (cfs)	Q_{100} Proposed w/o Attenuation (cfs)	Q_{100} Proposed w/ Attenuation (cfs)
Constitution Site	7.2	7.3	6.7	10.7	10.8	9.6
Independence Site	3.9	5.3	2.5	5.8	7.8	5.1

Runoff volumes were estimated using synthetic triangular hydrographs based on the time of concentration and the estimated peak flow rates for existing and proposed conditions at each site. Using guidance from Redwood City the hydrograph duration was set at three times the time of concentration with the estimated peak flow occurring at the time of concentration. The results of the runoff volume estimates are presented in Table 7. Due to the decreased time of concentration, estimated runoff volumes for the proposed conditions are lower than the estimates for the existing conditions at both sites.

Table 7. Summary of Runoff Volume Estimates

	10-year Existing Conditions (ft^3)	10-year Proposed Conditions (ft^3)	100-year Existing Conditions (ft^3)	100-year Proposed Conditions (ft^3)
Constitution Site	19,440	16,425	28,890	24,300
Independence Site	18,252	14,310	27,144	21,060

In order to evaluate the impacts of the proposed design at each site, the sites were evaluated individually and will be discussed separately here. The two sites are not contiguous and runoff from each site will reach the design point independently of the runoff from the other site. The two sites do both deliver runoff to the storm drain system at Chrysler Drive and ultimately the Chrysler Pump Station. This relationship was incorporated into the tailwater analysis and modeling as discussed in Section 3.1.2.

4.1 CONSTITUTION SITE

There will be an increase of approximately 62,000 square feet in the pervious and landscaped area in the proposed design for the Constitution Site, which includes approximately 23,400 square feet of permeable paving. This will result in decrease in the runoff coefficient from 0.81 to 0.74.

A portion of the runoff from the off-site area and Caltrans right of way will be directed to the on-site storm drain system and a very small on-site area will direct flow off-site (1,300 square feet). The total off-site area that will contribute flow to the design point for the Constitution Site is approximately 29,500 square feet. The runoff for this area was included in the peak flow estimate for the Constitution Site as the travel times and pipe flow estimates include this runoff and the flow reaches the design point for this system. The total site area contributing flow to the design point is approximately 414, 000 square feet.

Modifications to the site grading, including overland flow lengths and slopes, will reduce the time of concentration from approximately 30 minutes to 25 minutes, which represents a decrease of approximately 17%. As a result of the decreased time of concentration, the calculated rainfall intensity for the site will increase for both the 10-year and 100-year events. This will result in an increase in the peak runoff, from 7.2 cfs to 7.3 cfs for the 10-year event and 10.7 cfs to 10.8 cfs for the 100-year event. This represents changes of approximately 1% for both the 10-year and 100-year events. The stormwater detention facilities must attenuate the 0.1 cfs increase in peak flow for the 10-year runoff at the Constitution Site.

The off-site area will remain relatively unchanged in land use from existing conditions. The proposed grading results in a smaller area to be included in the off-site runoff estimate. The peak runoff from this area will be approximately 0.5 cfs for the 10-year event and 0.8 cfs for the 100-year event.

The minor increase in the peak flow from the Constitution Site will be attenuated using subsurface detention within the storage reservoirs located beneath the permeable paving at the two surface parking lots. This water will be stored on-site temporarily before being released to the City’s storm drain system following the peak runoff event.

4.2 INDEPENDENCE SITE

At the Independence Site, there will be an increase of approximately 21,700 square feet in the impervious area and an equivalent decrease in the total pervious area. The total site area contributing flow to the design point will be approximately 308,815 square feet. The runoff coefficient will increase from 0.78 to 0.79 from existing to proposed conditions. The time of concentration will decrease from approximately 50 minutes to 30 minutes between the existing and proposed conditions, representing a decrease of approximately 40%. The small increase to the runoff coefficient and significant decrease to the time of concentration will result in an overall increase to the estimated peak runoff from the site, from 3.9 cfs to 5.3 cfs for the 10-year event and 5.8 cfs to 7.8 cfs for the 100-year event. This represents changes of

approximately 36% and 34% for the 10-year and 100-year events, respectively. The stormwater detention facilities must attenuate the 1.4 cfs increase in peak flow for the 10-year runoff at the Independence Site.

The decrease in time of concentration is the result of modifications to travel paths for runoff under proposed conditions, allowing runoff to leave the site more efficiently. Due to the configuration of site features, there are few long flow paths where runoff travels over pervious material and many of the flow paths are short, such as at the fire access road, the pool deck area, and the frontage area along Independence Drive.

The peak flow will be attenuated on-site using oversized storm drain lines with orifice outlet controls to detain the excess runoff and limit the flow rate to the City storm drain system. This water will be stored on-site temporarily before being released to the City's storm drain system following the peak runoff event.

4.3 PEAK FLOW ATTENUATION

The City's policy of no net increase in storm water runoff requires the use of on-site storage facilities to detain a portion of the runoff from the project site. Additionally, a volume equivalent to the runoff from the on-site sidewalks must be captured using on-site storage facilities. These detention facilities will include oversized storm drains and underground reservoirs at Independence and Constitution Sites, respectively.

4.3.1 Constitution Site

The peak flow rates leaving the site will be 6.7 and 9.6 cfs for the 10-year and 100-year events, respectively, using the subsurface storage reservoir with a single outlet orifice control at the west parking lot within the Constitution site. The attenuated peak flows are lower than existing conditions for both the 10-year and 100-year runoff events. The total volume required to mitigate the peak flow from this site and account for the on-site sidewalks is 400 cubic feet. A four inch diameter orifice is used to restrict the flow exiting the subsurface reservoir. The total storage volume of the reservoir is approximately 4,000 cubic feet which is larger than that required for peak flow mitigation and will include additional outlets that do not use an orifice control to restrict the flows to the City storm drain system.

4.3.2 Independence Site

The peak flow rates leaving the site will be 2.5 and 5.1 cfs for the 10-year and 100-year events, respectively, using oversized pipes at several locations within the Independence site. The attenuated peak flows are lower than existing conditions for both the 10-year and 100-year runoff events. A total of four oversized pipe systems will be used to attenuate the peak flow at this site. The systems use 21-, 24, and 30-inch diameter pipes. The total length of the oversized pipes is approximately 1,871 feet and the total

storage capacity of the four systems is 6,335 cubic feet. The oversized pipe systems are summarized in Table 8.

Table 8. Summary of Oversized Pipe Detention Systems

System ID	Location	Start Node(s)	End Node	Pipe Diameter (in)	Pipe Length (ft)	Storage Capacity (ft^3)
1	Between Office & Garage	ID-PR-08	ID-PR-07.13	24	439	1,379
2	Between Garage & ClubSport	ID-PR-31	ID-PR-16.31	30	360	1,767
3	Between Garage & ClubSport	ID-PR-22	ID-PR-17.25	30	244	1,198
4	Pool Deck, Chrysler Frontage	ID-PR-41, ID-PR-33	ID-PR-51.50	21	828	1,992
	Total				1,871	6,335

The outflow of the oversized pipe system is controlled using an orifice structure, located in a manhole at the outlet of each system. The structures are located just upstream of the junction with the 18-inch storm main along Independence Drive and the media filter vault near the northeast corner of the site. The outlet structures include an orifice plate to restrict flows up to the 100-year flow rate and an overflow weir to bypass flows in excess of this rate or in the event of a clogged orifice without surcharging the system. The orifice diameters range from 3.0 to 4.5 inches and the length of each overflow weir is 2 feet. The systems were sized such that their combined detention results in a reduced peak flow at the design point, located at the intersection of the existing 18-inch and 48-inch mains at the corner of Independence Drive and Chrysler Drive. A summary of the outlet control features and estimated water surface elevations, and peak flow rates for the 10-year and 100-year events is shown in Table 9, below.

Table 9. Summary of Outlet Control Features

ID	Node	Pipe	Ground Surface Elev. (ft)	Orifice Diameter (in)	Weir Length (ft)	Weir Crest Elev. (ft)	Q10 Water Surface Elev. (ft)	Q10 Attenuated Flow Rate (cfs)	Q100 Water Surface Elev. (ft)	Q100 Attenuated Flow Rate (cfs)
Independence Site										
System 1	ID-PR-07.13	P13-07	6.2	4.0	2.0	4.8	2.82	0.47	4.90	1.04
System 2	ID-PR-16.31	P31.1-16	5.5	3.0	2.0	4.0	2.28	0.30	2.82	0.36
System 3	ID-PR-17.25	P25-17	5.6	4.5	2.0	4.5	2.65	0.56	4.75	1.42
System 4	ID-PR-51.50	P49-50	7.5	4.0	2.0	4.0	0.16	0.00*	3.36	0.59
Unrestricted Flows	-	-	-	-	-	-	-	1.20	-	1.69
Design Point	ID-PR-52	-	-	-	-	-	-	**2.50**		**5.10**
Constitution Site										
System 1		P05-07	6.15	4	-		-0.27	0.84	-0.27	0.86
Unrestricted Flows	-	-	-	-	-	-	-	-		8.78
Design Point			5.00				-3.4	**6.7**		**9.60**

** There is no flow from System 4 with the 10-yr flow rate because the whole flow from that portion of the system is stored in the pipes below the tailwater elevation. There is a flap gate modeled between the System 4 orifice and the point of connection to prevent backflow into this portion of the system.*

4.4 STORMDRAIN PERFORMANCE

The City requirements are for top of curb to be at least 12 inches above the 10-year water level. The hydraulic model results for the proposed storm drain systems at the Constitution and Independence Sites are presented in Appendix D-2. The model results indicate that the City's freeboard requirement is met at all manholes and nodes for the 10-year flow.

4.5 FLOODING POTENTIAL

The City also has specific requirements regarding building elevations related to the FEMA Base Flood Elevation and the 100-year flow.

4.5.1 Base Flood Elevation

The FEMA Zone AE Base Flood Elevation is referenced at Elevation 7 feet NGVD in the vicinity of the project sites. The City's requirements are for building finished floor elevations to be at least 6 inches above the Base Flood Elevation.

The Constitution Site is adjacent to San Francisco Bay and is entirely within the FEMA designated Special Flood Hazard Zone AE. At the Constitution Site, the finished floor elevations for the Garages will be at elevation 7.6 feet NGVD, 0.6 feet above the Base Flood Elevation. The Garages at the Constitution Site are stand alone buildings with no structural connection to the adjacent office buildings. The finished floor elevations for the two office buildings on the Constitution Site will be at 8.1 feet NGVD, 1.1 feet above the Base Flood Elevation. All buildings at the Constitution Site meet the City's requirements for finished floor elevations relative to the Base Flood Elevation.

The Independence Site is on higher ground, further from San Francisco Bay with only the eastern most portion of the site currently within the FEMA designated Special Flood Hazard Zone AE. The finished floor elevations of the Office Building, Garage, ClubSport, and Hotels at the Independence site will all be set at elevation 8.1 feet NGVD, 1.1 feet above the Base Flood Elevation. All buildings at the Independence Site meet the City's requirements for finished floor elevations relative to the Base Flood Elevation.

4.5.2 100-Year Flood

The project sites are located in an area is bounded by elevated roads to the north, east and west and slopes towards San Francisco Bay. The Bayfront Expressway prevents direct overland release to the Bay, and the area is essentially a bathtub. The project vicinity is drained via the Chrysler Pump Station and a number of small drainage culverts under the Bayfront Expressway. Peak flows from the proposed sites during the 100-year event will be attenuated to below existing conditions. As a result of the extensive subsurface storage employed at the Independence and Constitution Sites, the peak flow rates from the

project sites are estimated to be reduced by about 1.8 cfs or 10.9% below the existing conditions. Based on the peak flow mitigation measures, the proposed projects are expected to decrease flood conditions at the project sites and at adjacent properties.

The estimated 100-year peak flow for the Chrysler Pump Station watershed is approximately 195 cfs using the Rational Method. However, the Rational Method provides an estimate of peak flow rates which does not directly translate to runoff volumes. Assuming an SCS Curve Number of 95 for commercial and business areas on Type D soils, the runoff volume for the 100-year, 1-hour rainfall event for the Chrysler Pump Station watershed would be about 11.6 acre-feet using the SCS Curve Number Method. The Chrysler Pump Station has a maximum pumping capacity of about 143 cfs, and can pump the 11.6 acre-feet runoff volume in about 59 minutes. The Chrysler Pump Station has adequate capacity to match peak flow rates generated by 100-year storms with durations longer than about two hours.

The proposed finished floor elevations are 0.6 to 1.1 feet above the FEMA Base Flood Elevation. Approximately 133 acres of the 258-acre Chrysler Pump Station watershed are within the designated Special Flood Hazard Zone AE. Assuming that existing buildings are above the FEMA Base Flood Elevation, about 77 acres within the Special Flood Hazard Zone, comprised of parking lots, streets, and landscaped areas, may be subject to flooding. The 11.6 acre-feet of runoff volume would result in ponding of up to 0.15 feet deep over the 77 acres of parking lots, streets, and landscaped areas within the FEMA Special Flood Hazard Zone AE, assuming that the Chrysler Pump Station was not functioning during the event.

These approaches indicate that the 100-year flow would not enter the proposed buildings at the Independence and Chrysler sites.

4.6 SUMMARY

The results of this analysis indicate that the Project will mitigate increases in the 10-year and 100-year peak flow rates from the both the Constitution Drive and Independence Sites. The increase in peak flow rate is primarily caused by increased efficiency in the delivery of stormwater runoff to the storm drainage system, resulting in shorter times of concentration as compared to existing conditions. Through the use of subsurface detention facilities, the increases in the peak flow rates are mitigated to be lower than the existing conditions peak flow rates at each site. The proposed storm drain system meets the City's design criteria related to freeboard at all manholes and catch basins and the Project meets the City requirement for no net increase in stormwater runoff. In addition, the proposed Project meets the City's requirements for finished floor elevations related to the FEMA Base Flood Elevation and 100-year flood flows will not enter buildings at the project sites.

5. TREATMENT MEASURES

5.1 WATER QUALITY

The City requires that all areas contributing runoff to the City storm drain system be self-treating or receive water quality treatment before runoff enters the City storm drain system. The Project incorporates stormwater treatment measures to remove pollutants from stormwater runoff before entering the City storm drain system and eventually flowing into San Francisco Bay. The stormwater treatment measures were selected and sized based on guidelines presented in the San Mateo County *C.3 Stormwater Technical Guidance*, pursuant to the requirements of the *RHPR.*

5.1.1 NPDES Requirements

The requirements set forth in Provision C.3 of the San Mateo countywide NPDES Permit (No. CAS0029921, Order No. R2-2003-0023) served as the basis for the stormwater treatment guidance and measures used in this analysis. Provision C.3.c includes thresholds defining how new and redevelopment projects must comply with Provision C.3.

A new Municipal Regional Stormwater Permit was issued on October 14, 2009. This new permit includes new Low Impact Development requirements (C.3.c.1) for stormwater treatment. This requirement relies on treating, storing, detaining, and infiltrating runoff close to the source using landscape and other natural measures, which would affect the planned use of media filters at the Project. However, Provision C.3.c.ii of the new permit specifically exempts any private development projects which receive final discretionary approval for the project before the required implementation date of December 11, 2011 from the requirements of Provision C.3.c.i (LID). The Menlo Gateway Project anticipates receiving final discretionary approval in 2010 and thus the new Provision C.3.c.i will not apply to this project. Additionally, the City's NPDES Checklist for the Project has been completed and is presented in Appendix F.

5.2 TREATMENT MEASURES

The primary surface stormwater treatment measures included in the design of each site are flow-through planters and vegetated swales. Tree well filters will be used to treat runoff from the perimeter sidewalks that flow directly toward the public streets. Permeable paving, with a sub-drain system, will also be included at the parking stalls of the Constitution Site. The existing soil conditions and the proximity of the site to San Francisco Bay prevent the use of treatment measures that rely on direct subsurface infiltration for water quality treatment.

Subsurface mechanical stormwater treatment measures will be used to treat areas that cannot be treated using surface treatment measures. Subsurface media filtration units include storm filter vaults, manhole

storm filters and catch basin filters. Areas requiring mechanical treatment include building roofs, the pool deck area, and small areas that cannot direct runoff to surface treatment areas because of constraints due to grading, physical space, and intended land use at the project sites.

A portion of each site is considered to be self-treating. Self-treating areas are those in which the entire area is landscaped or have comparatively minimal impervious surfaces. The volleyball and bocce courts at the Constitution Site were evaluated as landscape features and are considered self-treating. Self-treating areas with some impervious surfaces include those in which runoff from a pathway or small impervious area is directed to and flows across the landscaped or grassed area before entering the storm drain system.

A summary of the areas treated by surface stormwater treatment measures and subsurface mechanical stormwater treatment measures is presented in Table 10. Additionally, the water quality treatment measure used at each of the subwatersheds for the Constitution and Independence Sites are summarized in Appendix E.

Table 10. Summary of Water Quality Treatment Areas

	Constitution Site		**Independence Site**	
Description	**Area (ft^2)**	**% of Total**	**Area (ft^2)**	**% of Total**
Total Site Area	385,854	100%	308,815	100%
Total Impervious Area	225,612	58%	230,256	75%
Total Pervious Area	160,242	42%	71,372	23%
Total Open Water Area	0	0%	7,187	2%
Self-Treating Areas	115,571	30%	87,567	28.5%
Area Contributing to Surface Treatment Measures	245,799	64%	49,123	16%
Area Contributing to Mechanical Treatment Measures	24,484	6%	164,938	54.5%
Open Water (No Treatment Required)	0	0%	7,187	2%
Total Area Receiving Treatment	385,854	100%	308,815	100%

5.2.1 Design Criteria

The stormwater treatment measures were preliminarily sized using the simplified sizing approach in which the required treatment area is equal to 4% of the contributing impervious area (SMCWPPP, 2007). This approach was also used to confirm that adequate space is available for surface treatment as well as provide an estimate of areas that will require alternative treatment measures.

*Treatment Area = Impervious Area (to be treated) * 0.04*

For the Final Hydrology Report, more detailed analyses were performed to confirm that each treatment measure was adequately sized to provide water quality treatment as required by the City's NPDES permit. In addition, detailed hydraulic analysis was performed to confirm that overflow bypass structures for the flow-through planters and vegetated swales will be adequately sized to pass the 100-year design flow rate.

Stormwater treatment measures may be sized using flow-based criteria or volume-based criteria. Flow-based treatment measures remove pollutants through adsorption and/or filtering of moving runoff and sizes are based on peak flow rates for a given design water quality event. Vegetation within these treatment measures removes pollutants through absorption of the stormwater runoff. Volume-based treatment measures rely on detention of stormwater followed by settling of pollutants and/or removal by processes associated with infiltration. The majority of the treatment measures used in the Project will be flow-based treatment measures sized according to requirements of the NPDES stormwater permit. The NPDES permit specifies three options to hydraulically size flow-based treatment measures. The recommended approach uses a rainfall intensity of 0.2 inches per hour to estimate the water quality runoff flow rate for the treatment measures (SMCWPPP, 2007). The volume based approach was used to size the storage reservoirs beneath the permeable paving parking stalls for water quality treatment. The NPDES permit specifies two methods for sizing volume-based measures. The recommended approach uses an annual runoff volume required to achieve 80 percent or more capture of stormwater pollutants (SMCWPPP, 2007). This approach was used for sizing the storage reservoirs for treatment of runoff that enters from the permeable paving.

Each stormwater treatment measure was designed with the capacity to treat runoff from a storm with a rainfall intensity of 0.2 inches per hour. The Rational Method was used to estimate the treatment flow rate from the contributing area of each treatment measure. The stormwater treatment measures are designed to bypass overflows in excess of the water quality design treatment flow directly to the City's storm drain system.

All of the planned treatment measures will require regular maintenance to maintain their designed level of water quality treatment. The City requires a maintenance agreement to ensure that the treatment measures will successfully perform over the lifetime of the Project.

5.2.2 Flow-Through Planters

Flow-through planters are located adjacent to the office buildings and parking garages at the Constitution Site and adjacent to the garage at the Independence Site to treat the runoff from the roofs of these structures. A total of four planter box systems are located on the Constitution Drive and one planter box system is located at the Independence Site. Within each planter box system, the total runoff from the roof of each structure will be split to deliver water to 8-11 individual planter boxes. The average size of an individual planter box is approximately 250 square feet. The systems are designed both to treat the design water quality treatment flow rate and to pass the 100-year peak flow rate without overtopping the wall of

the planter box. The five flow-through planter systems and their contributing areas are summarized in Table 11.

Table 11. Flow-Through Planter Summary

Contributing Subwatershed	Description	Contributing Area (ft^2)	Composite C	Planter Surface Area (ft^2)	No. Planter Boxes
Constitution Site					
CD51	Garage A	37,297	0.88	2,324	10
CD57	Office Building 1	36,364	0.87	2,454	8
CD61	Office Building 2	36,364	0.87	2,454	8
CD67	Garage B	52,855	0.88	2,312	10
Independence Site					
ID67	Garage	50,145	0.88	2,045	11

Each planter box consists of a concrete box structure with a 12-inch gravel layer overlain by an 18-inch layer of sandy loam and topped with a 6-inch layer of planting soil. The concrete structure will be waterproofed to protect the building foundations. A 4-inch diameter perforated pipe underdrain, with a clean out, will be placed within the gravel layer to deliver treated runoff to the City storm drain system. The gravel layer shall be open-graded crushed rock with a minimum diameter of 0.5 inches. The sandy loam shall be engineered to have a minimum infiltration rate of 5 inches per hour (in/hr). Each planter will have a vertical riser pipe to bypass flows in excess of the design treatment flow rate. The overflow outlet is set 6 inches above the planting surface and 12 inches below the top of the wall to provide a reservoir for ponding resulting from small, frequent runoff events without bypassing water quality treatment. The planting palette will be selected for viability in well-drained soils as well as tolerance for periods of ponding and inundation.

The treatment capacity of each flow through planter system was estimated using flow-based design criteria based on the 5 in/hr minimum infiltration rate and the treatment system area. Additionally, the capacity of each individual planter boxed was evaluated as they are not equally sized and will operate independently within each treatment system. A summary of the design criteria and calculations for each flow-through planter system is presented in Appendix E-1.

The overflow bypass outlet was sized to pass runoff events larger than the water quality treatment flow rate with the assumption that the soil is saturated and the water quality storage volume is full at the time of the event. The Rational Method was used to estimate the peak flow rate from the contributing area for each flow-through planter system. The overflow bypass outlet for each planter box was sized to pass the maximum 100-year peak flow rate to an individual planter, approximately 0.33 cfs. A rating curve was developed to size the outlet structure with the outlet initially discharging under weir controlled flow and then orifice controlled flow conditions. A riser pipe with a diameter of 4 inches will allow runoff from the

100-year event to pass without overflowing the planter box. The elevation of the top of the planter boxes is 8.6 feet at both sites and the planter boxes will pass the 100-year peak flow with a minimum freeboard of three inches. The design calculations for the overflow bypass structure and rating curve are presented in Appendix E-1.

5.2.3 Vegetated Swales

Vegetated swales will be used to treat runoff from the surface parking lots at the Constitution Site and to treat roof runoff from the garage and office building at the Independence Site. Surface runoff flows overland across the parking lots to the three swales at the Constitution Site. The majority of the runoff directed to the two swales at the Independence Site will be delivered via pipe from the buildings in addition to some surface runoff from the fire access road. The swales at the Independence site are each two swales that drain towards a single outlet located between them.

The swales were designed in accordance with the San Mateo County *C.3 Stormwater Technical Guidance* using flow-based sizing. The design criteria used to size the swales is summarized below in Table 12.

Table 12. Vegetated Swale Design Criteria

Treatment depth (maximum)	0.33	ft
Manning's n (bunch grasses)	0.25	
Retention time (minimum)	8	min
Treatment depth	4	in
Treatment width (maximum)	10	ft
Longitudinal slope	0.005 - 0.04	ft/ft
Planting soil infiltration rate (range)	5 - 10	in/hr
Flow velocity (maximum)	4	ft/sec
Design rainfall intensity	**0.2**	in/hr

Due to the low infiltration capacity of the native soils at the project sites (hydrologic group D); a 6-inch perforated pipe underdrain contained in a gravel trench is required for each of the swales to provide proper drainage. A layer of filter fabric will be placed around the gravel trench to prevent the migration of fines into the rock trench. The rock trench shall be 18 inches wide by 12 inches deep with a minimum slope of 0.5%. The underdrain pipe will be connected to the swale outlet structure. The swale outlet structure will be a standard 2 feet by 2 feet drop inlet with the rim of the inlet set slightly above the swale invert to allow for accumulation of sediment which will also increase percolation through the planting soil layer.

The swales are designed with trapezoidal cross-sections with a bottom width of 3 feet and side slopes of 4:1. The longitudinal slope is 0.5% maximum and the lengths vary from 100 to 160 feet. The water

quality treatment flow rate for the swales ranges from 0.06 cfs to 0.09 cfs as shown below in Table 13. With a maximum treatment flow depth of 4 inches, the flow velocity is 0.14 feet per second assuming a manning's n of 0.25 for bunch grasses. This results in retention times ranging from approximately 12 to 19 minutes and a maximum water quality treatment capacity of 0.14 cfs, indicating that the vegetated swales will provide adequate residence times and treatment capacities to treat the water quality treatment flow rate (see Table 13).

The swales are also designed with flood flow capacity sufficient to pass the 100-year peak flow rate. Assuming a Manning's n value of 0.15 and a flow depth of 8 inches, the swales have a flood flow capacity of approximately 1.5 cfs, while the maximum 100-year peak flow rate for a single swale is approximately 1.3 cfs. The maximum depth of the swales ranges from 1.0 to 1.5 feet, providing at least 0.2 to 0.7 feet of freeboard during a 100-year flow. The drop inlet structure has sufficient flow capacity to pass the 100-year peak flow rate at each of the swales with a maximum head of 0.20 feet. A summary of the vegetated swale design flows is presented in the Table 13 and a detailed summary is presented in Appendix E-2.

Table 13. Vegetated Swale Design Summary

Swale ID	Location	Contributing Subwatersheds	Contributing Area (ft^2)	Composite C	Swale Length (ft)	Treatment Flow Rate (cfs)	100-year Flow Rate (cfs)
CD-VS1	West parking lot	CD84, 86	27,569	0.71	100	0.09	1.26
CD-VS2	West parking lot	CD88, 89	27,482	0.73	100	0.09	1.29
CD-VS3	East parking lot	CD121, 122, 126	24,802	0.67	100	0.08	1.07
ID-VS1a	Office- west	ID54, 55	19,129	0.78	105	0.07	0.96
ID-VS1b	Office-east	ID54, 55	18,863	0.78	125	0.07	0.95
ID-VS2a	Garage-west	ID61, 66	17,013	0.80	160	0.06	0.88
ID-VS2b	Garage-east	ID61, 66	16,967	0.80	115	0.06	0.87

5.2.4 Tree Well Filters

Tree well filters will be used to treat runoff from the perimeter sidewalks that would otherwise flow directly to the street at each site. As discussed in Section 2.2.2.1, the tree wells will capture and treat runoff from both the on-site and off-site sidewalks and are designed to treat an area equivalent to the total on-site sidewalk area for each site. Each tree-well filter is approximately 4.5 feet wide by 10 feet long with a total of 39 units at the Constitution Site and 29 units at the Independence Site. Each tree well filter will hold a single tree of a species (*Platanus acerfiolia* "Columbia") approved by the City. The tree well will contain a 12-inch gravel layer overlain by a 36-inch layer of engineered filter media and native soil surrounding the filter media. A root barrier will be placed between the native soil and gravel layer. A 3-

inch layer of mulch will be placed on top of the filter media. The low infiltration rates of the native soil require the use of a sub-drain system; therefore a 4-inch perforated pipe will be placed within the gravel layer and connected to the City storm drain system.

To capture additional runoff, a small grated trench drain will be located in the sidewalk between adjacent tree wells in a number of locations. This is necessary to provide sufficient treatment for the total on-site sidewalk area at each site. The total on-site sidewalk area for each site and area of sidewalk receiving treatment of runoff is summarized in Table 14.

Table 14. Summary of Treated Sidewalk Area

Perimeter Sidewalk	Constitution Site	Independence Site
Off-site Area (ft^2)	13,364	12,073
On-site Area (ft^2)	5,543	5,073
Total Area (ft^2)	18,907	17,146
Total Treated Sidewalk Area		
Off-site Area (ft^2)	2,905	2,890
On-site Area (ft^2)	3,185	2,250
	6,090	5,140
Excess sidewalk area treated (ft^2)	547	67

The treatment capacity of the tree wells was estimated for the maximum contributing area for a single tree well. The maximum contributing area for a single 45 square feet tree well will be approximately 300 square feet. The tree wells will be approximately 30% of the size of the contributing area and thus are well in excess of the typical 4% ratio used for initial sizing. Using a runoff coefficient of 0.9 for the sidewalks and a rainfall intensity of 0.2 in/hr yields a design treatment flow rate of 0.0008 cfs or 0.35 gallons per minute (gpm). The filter media shall be designed to achieve an infiltration rate of 5 in/hr. The design criteria and calculations for tree well sizing are summarized in Appendix E-3.

5.2.5 Media Filters

Mechanical stormwater treatment measures are required to treat runoff from areas that cannot be directed to a surface treatment measure. Media filters will be used at several locations at the Independence Site due to limited space for surface treatment measures. Manufactured cartridge media filter systems will be used in two configurations at the Independence site and a single configuration at the Constitution Site. The configurations include catch-basin filter systems and manhole or vault filter systems. The catch-basin filters are used to treat small drainage areas while the manhole and vault systems treat runoff from large portions of the project site. Each media filter system will use a swirl concentrator for pretreatment.

The media filter systems are Filter Type C as defined in the San Mateo County *C.3 Stormwater Technical Guidance.* These systems use a series of vertical cartridges in which runoff travels horizontally through the filter, is collected in a center tube and travels downward to an under-drain that is connected to the City storm drain system. The Project will use Contech StormFilter cartridges which have a minimum treatment capacity of 5 gallons per minute (gpm) or 0.011 cfs (Contech, 2007). These cartridges will be used in each of the media filter configurations planned for the Project. The StormFilter cartridge configurations to be used at the Independence Site will include the Precast StormFilter and the CatchBasin StormFilter. The CatchBasin StormFilter system will be used at the Constitution Site.

The Precast StormFilter system will be used in concrete manholes or vaults and consists of an inlet pipe, energy dissipator, filtration bay with filter cartridges, overflow or bypass, and outlet pipe. The overflow bypass may be online or offline depending on the size of the system. An internal overflow bypass will be capable of passing flows of 1.0 to 2.0 cfs. There will be two vault systems and one manhole system at the Independence Site. The manhole will utilize and internal bypass while the two vaults will require an offline bypass. There are three StormFilter cartridges available with varying treatment capacities based on the available hydraulic drop within the filtration bay with treatment capacities ranging from 5.0 to 11.25 gpm per unit. The systems are sized to using a design treatment flow rate resulting from the design rainfall intensity of 0.2 in/hr. The total number of units required was estimated using a cartridge treatment capacity of 7.5 gpm. The bypass flow rate was estimated using the 100-year peak runoff for the contributing area for each system. The vaults will be approximately 6 feet by 12 feet and 8 feet by 16 feet for Vaults 1 and 2, respectively, while the manhole will be 48 inches in diameter. The design flow rates and sizing for each of the three Precast StormFilter systems are summarized in Table 15.

Table 15. Summary of PreCast StormFilter Media Filter Systems

Precast StormFilter	No. Contributing Subwatersheds	Contributing Area (ft^2)	Composite C	Treatment Flow Rate (cfs)	Treatment Flow Rate (gpm)	100-year Bypass Flow Rate (cfs)	No. Cartridges
Vault 1 (ID-SFV-1)	7	46,770	0.89	0.19	86	1.47	11
Vault 2 (ID-SFV-2)	36	82,209	0.74	0.28	126	2.15	17
Manhole 1 (ID-SFMH-1)	1	9,489	0.88	0.04	17	0.30	2

The CatchBasin StormFilter system consists of an inlet pipe, filter cartridges, overflow weir, and outlet pipe. These systems will be installed flush with the finished grade and in coordination with typical catch basins. These systems can treat flows up to 0.20 cfs with an internal overflow capacity of 1.0 cfs and contain up to four cartridges (Contech, 2007).

The systems are sized to using a design treatment flow rate resulting from the design rainfall intensity of 0.2 in/hr. The total number of units required was estimated using a cartridge treatment capacity of 7.5 gpm. The bypass flow rate was estimated using the 100-year peak runoff for the contributing area for each

system. A total of 6 units will be used at the Constitution Site and 7 units at the Independence Site. The design flow rates and sizing for each of the CatchBasin StormFilter systems are summarized in Table 16.

Table 16. Summary of CatchBasin StormFilter Media Filter Systems

Filter ID	Contributing Subwatersheds	Contributing Area (ft^2)	Composite C	Treatment Flow rate (cfs)	Treatment Flow rate (gpm)	100-year Bypass Flow rate (cfs)	No. Cartridges
Constitution Site							
CD-CBF1	CD52	591	0.90	0.002	0.90	0.019	1
CD-CBF2	CD53, 54, 55A, 55B, 56A, 56B	10,563	0.74	0.036	16.20	0.276	3
CD-CBF3	CD59	3,367	0.79	0.012	5.40	0.094	1
CD-CBF4	CD64	1,442	0.73	0.005	2.25	0.037	1
CD-CBF5	CD65A, 65B, 66A, 66B	7,931	0.79	0.029	13.05	0.221	2
CD-CBF6	CD68	591	0.90	0.002	0.90	0.019	1
Independence Site							
ID-CBF-1	ID50	1,066	0.90	0.004	1.80	0.034	1
ID-CBF-2	ID57	2,558	0.89	0.010	4.50	0.080	1
ID-CBF-3	ID59	4,182	0.88	0.017	7.65	0.130	2
ID-CBF-4	ID74	406	0.90	0.002	0.90	0.013	1
ID-CBF-5	ID73	1,287	0.90	0.005	2.25	0.041	1
ID-CBF-6	ID79A	3,741	0.54	0.009	4.05	0.071	1
ID-CBF-7	ID80A	5,270	0.90	0.022	9.90	0.168	2

A summary of the sizing calculations and engineering and data for the StormFilter cartridges is included in Appendix E-4.

5.2.6 Permeable Paving & Subsurface Storage

Permeable paving will be used in the parking stalls of the two surface parking lots at the Constitution Drive Site. The permeable paving reduces the surface water runoff from the parking stalls, while providing a finished surface that permits vehicular and pedestrian traffic loading. This system will also provide water quality treatment of the runoff and the underground storage of surface runoff within the subgrade layer. The paving will be porous asphalt which is an open graded asphalt concrete layer placed over an open-graded aggregate base with a sub-drain system. The sub-drain is required due to the poor infiltration capacity of the underlying native soils. The sub-drain will be connected to the City storm drain system.

The 3-inch porous asphalt surface course will overlay a 2 inch layer of filter course material. An 18-inch open graded aggregate base layer will serve as the storage reservoir. Filter fabric shall be placed between the aggregate and native soils to prevent migration of fines into the rock layer. The aggregate base layer will have approximately 35% void space available for water storage. The 6-inch perforated pipe sub-drain will be located 6 inches above the bottom of the aggregate layer to increase the residence time in the reservoir and increase the opportunity for subsurface infiltration, though limited by the nature of the underlying soils.

In addition to the storage required to attenuate the peak flows, the storage reservoir was sized to have sufficient capacity to contain the water quality volume required to treat runoff from the surface parking lots. The reservoir was sized conservatively to provide added treatment and storage as only a portion of the runoff from the parking lots will reach the storage reservoir, while the remainder flows overland to the vegetated swales.

The surface area of the permeable paving and the storage capacity for each system are summarized in Table 17, with additional calculations presented in Appendix E-5.

Table 17. Summary of Permeable Paving and Subsurface Storage

Constitution Site	Permeable Paving Area (ft^2)	Reservoir Volume (ft^3)	Total Storage Volume (ft^3)	Storage Volume Below Sub-drain (ft^3)	Water Quality Volume (ft^3)
West parking lot	19,240	28,860	10,100	3,400	2,200
East parking lot	4,120	6,180	2,200	700	700
Total	**23,360**	**35,040**	**14,016**	**4,100**	**2,900**

5.2.7 Self-Treating Areas

The design of the site plan for the Project utilized site design measures to limit the total impervious area at each site to the extent possible. This approach aids to reduce the size of the treatment facilities necessary at the sites by limiting the amount of stormwater runoff that requires treatment. Such measures primarily include the use of vegetated areas, self-treating area at the two sites. Vegetation and landscaping were used to the maximum extent possible, given the specific spatial and land use requirements of the two sites, to reduce impervious surfaces. Individual subwatersheds that are entirely landscaped area were considered to be self-treating with runoff from the subwatershed flowing directly to the City storm drain system. Additionally, subwatersheds with some impervious surfaces including those in which runoff from a pathway or small impervious area is directed to and flows across the landscaped or grassed area before entering the storm drain system were considered self-treating. The volleyball and bocce courts at the Constitution site were evaluated as landscape features and are also considered self-treating. A total of

115,571 square feet, or 30% of the site, was evaluated as self-treating at the Constitution Site. The Independence site includes 87,567 square feet of self-treating area which is approximately 28.5% of the site area. The pools and open water areas of the Independence site will not contribute any runoff to the storm drain systems and thus will not require any water quality treatment. A tabulation of each individual self-treating subwatershed is presented in Appendix E.

5.3 SUMMARY

The five stormwater quality treatment measures, in addition to the self-treating areas, utilized in the Project will effectively treat all of the runoff generated by the water quality design storm for both the Constitution and Independence Sites. Proper maintenance of these systems, including the self-treating areas, will insure that pollutants are adequately removed from stormwater generated by the Project prior to entering the City storm drain system and subsequently flowing to San Francisco Bay. In addition to site design and source control measures these treatment measures meet the requirement set forth by the City to meet the requirements of the NPDES permit for stormwater quality treatment.

6. REFERENCES

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7. LIST OF PREPARERS

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Scott Stoller, P.E., Hydrologist
Barry Tanaka, Hydrologist

8. FIGURES

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Figure 2. Project Location within Menlo Park Storm Drain System
Figure 3. Project Location within Flood Hazard Zones
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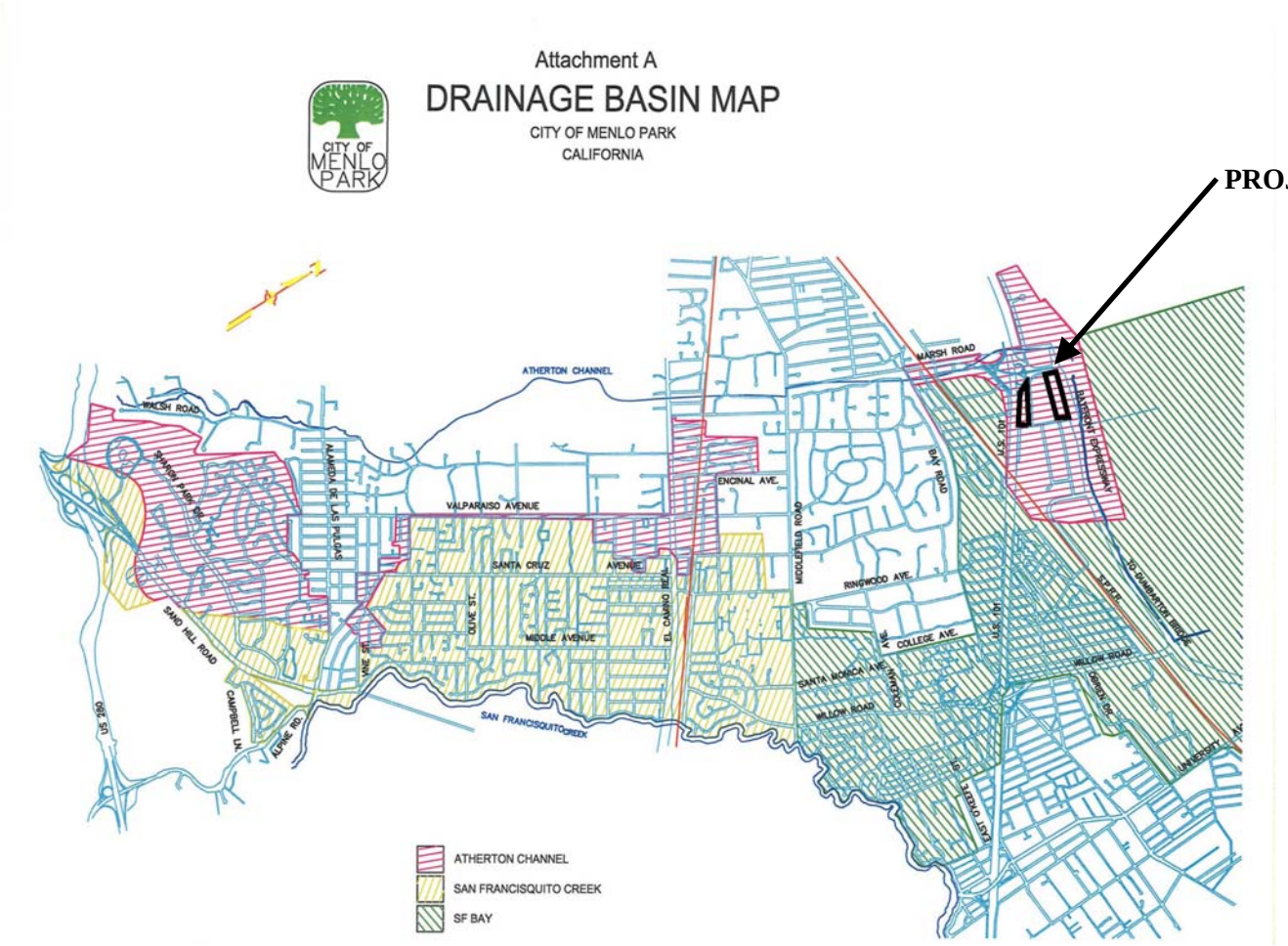
Figure 5. Independence Site Aerial Photograph
Figure 6. Constitution Site - Existing Conditions Land Use and Drainage
Figure 7. Independence Site - Existing Conditions Land Use and Drainage
Figure 8. Perimeter Sidewalk Runoff Typical Detail
Figure 9. Constitution Site – Proposed Conditions Land Use and Drainage
Figure 10. Independence Site - Proposed Conditions Land Use and Drainage
Figure 11. Constitution Site - Existing Conditions - Storm Drain Network Model
Figure 12. Independence Site - Existing Conditions - Storm Drain Network Model
Figure 13. Constitution Site - Proposed Conditions - Storm Drain Network Model
Figure 14. Constitution Site - Proposed Conditions - Storm Drain Network Model



Source: City of Menlo Park. *Requirements for the Preparation of Hydrology Reports* (2006)

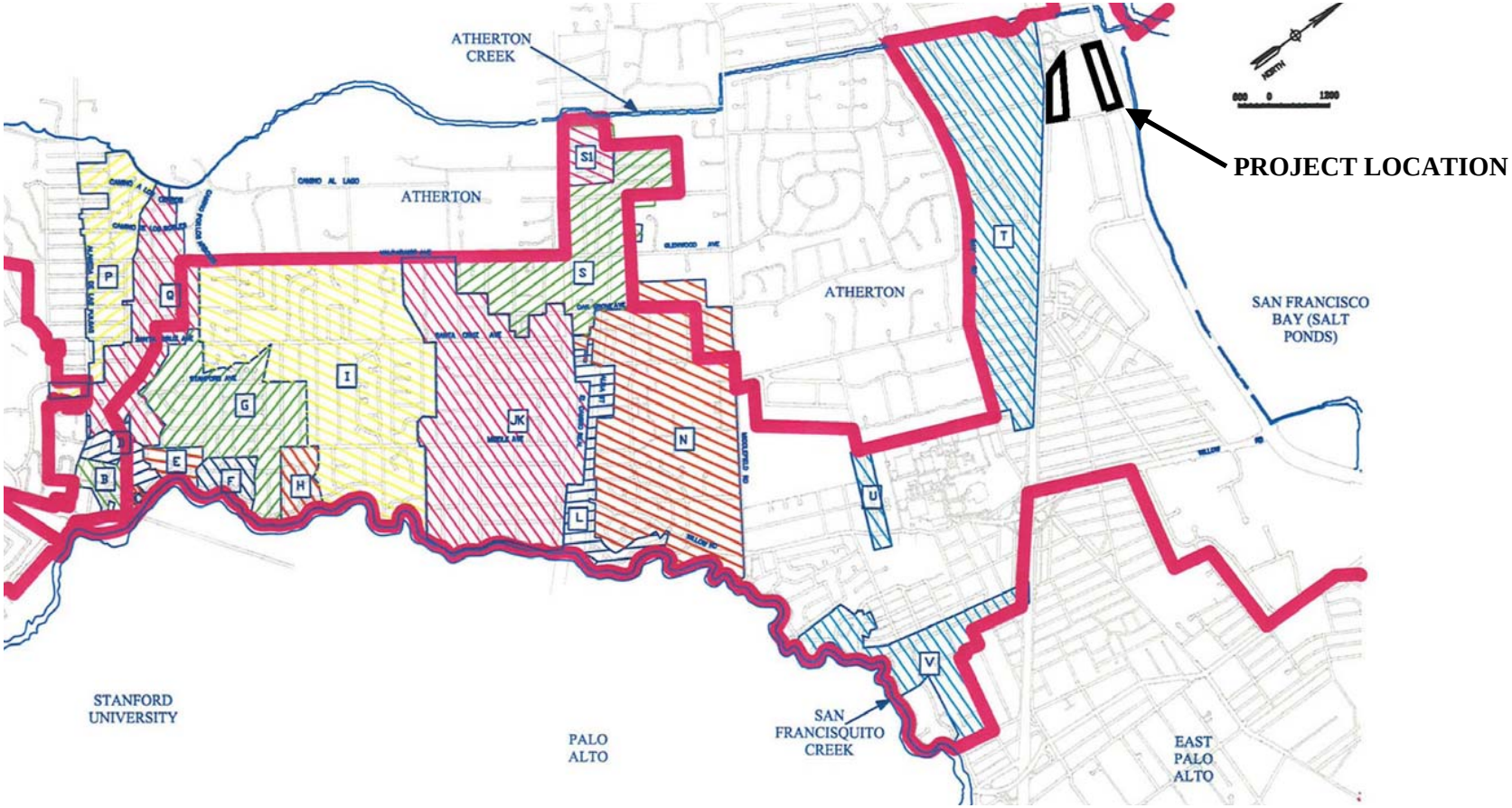
figure 1

Menlo Gateway Project - Hydrology Report

Project Location within Menlo Park Drainage Basins

PWA Ref# 1894

PWA



Note:
The shaded areas shown on this figure represent locations where hydrograph modification may be required. The Menlo Gateway Project is not located within an area subject to hydrograph modification.

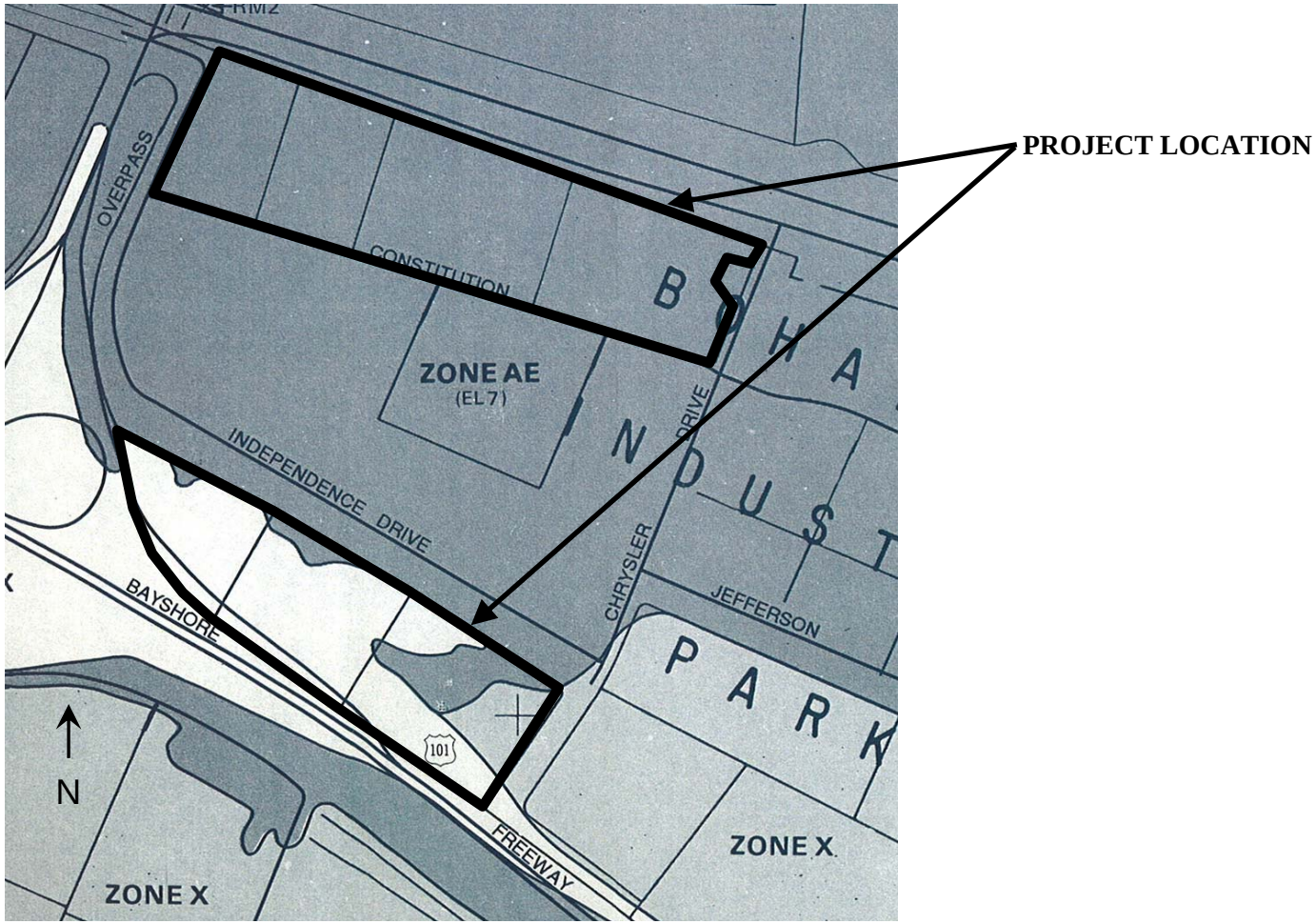
Source: City of Menlo Park. *Requirements for the Preparation of Hydrology Reports* (2006) Attachment B

figure 2
Menlo Gateway Project - Hydrology Report

Project Location within Menlo Park Storm Drain System

PWA Ref# 1894

PWA



Notes:
1. All of the Constitution Site and a portion of the Independence Site are located within Flood Hazard Zone AE, (elevation 7.0 feet NGVD 1929).
2. A portion of the Independence Site is located within Flood Hazard Zone X.

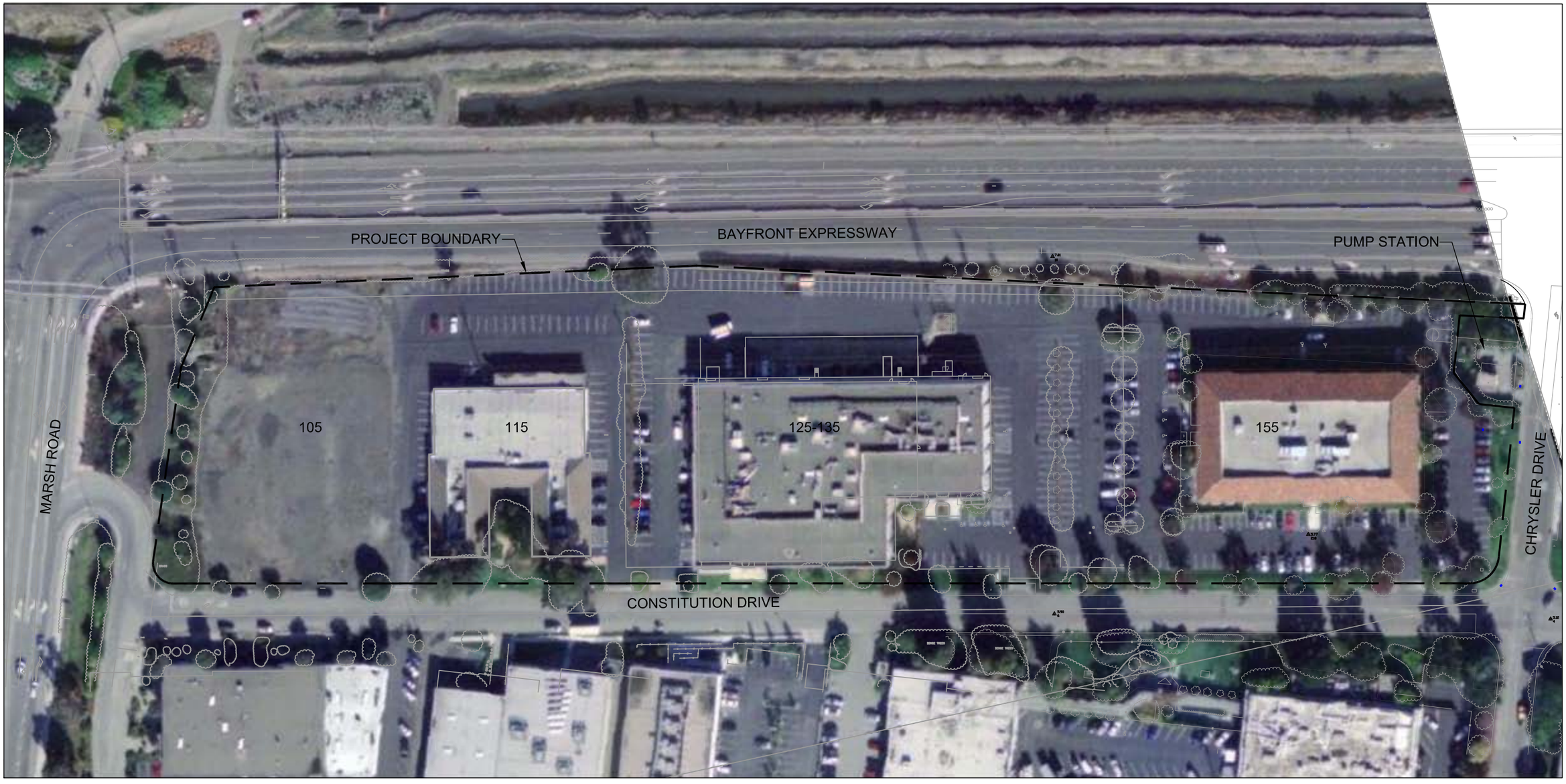
Source: FEMA Flood Insurance Rate Map. City of Menlo Park, California, San Mateo County. Panel 4 of 13. 1999.

figure 3
Menlo Gateway Project - Hydrology Report

Project Location within Flood Hazard Zones

PWA Ref# 1894

PWA



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SCALE (FEET)

Menlo Gateway Project - Hydrology Report *figure* 4

Constitution Site
Aerial Photograph

PWA

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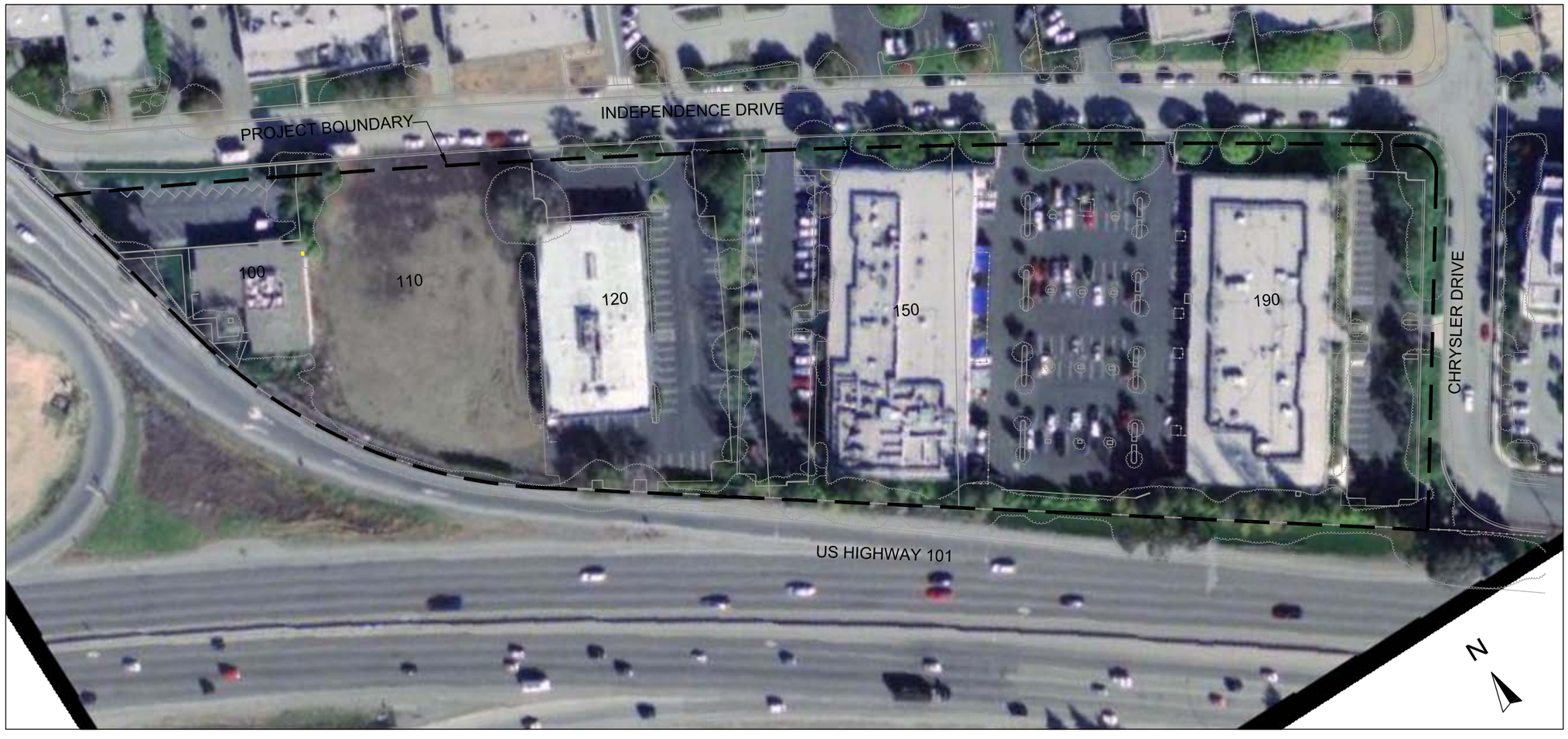

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SCALE (FEET)

Menlo Gateway Project - Hydrology Report *figure* **5**

Independence Site
Aerial Photograph

PWA

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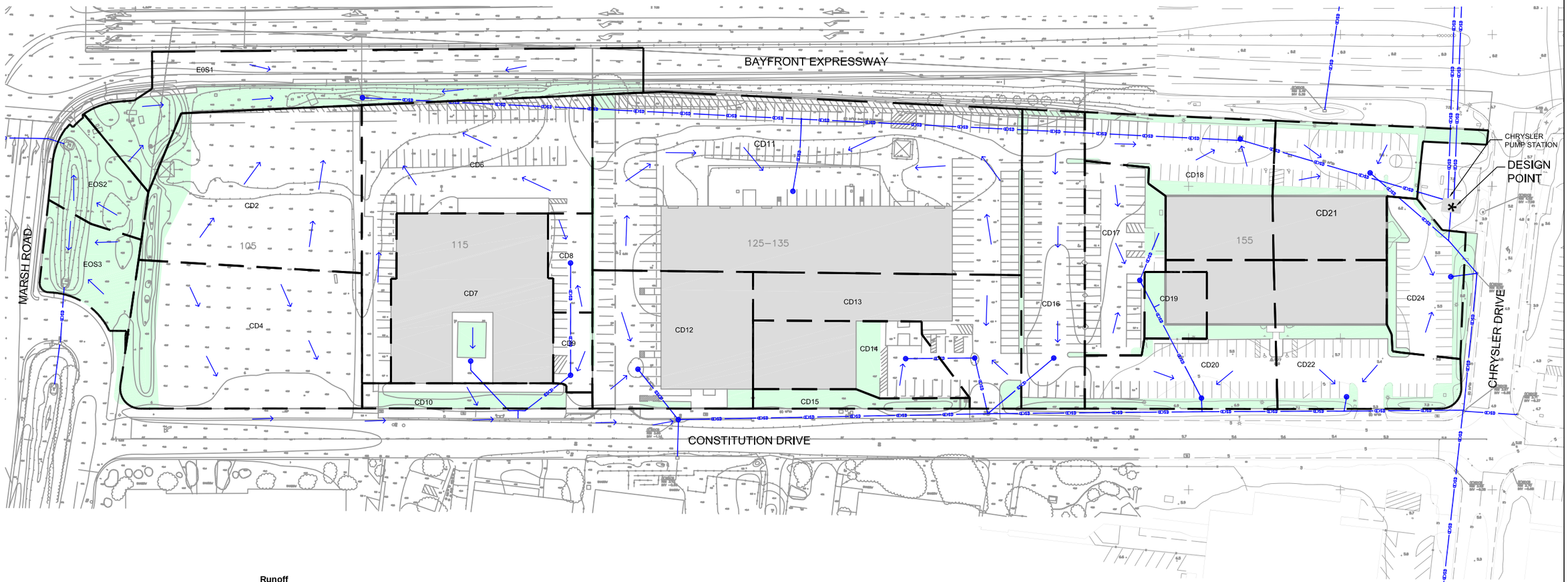

Subwatershed ID	Total Area (ft^2)	Total Area (ac)	Runoff Coefficient C
ON-SITE			
CD2	31,873.4	0.732	0.57
CD4	32,467.4	0.745	0.57
CD6	30,782.2	0.707	0.90
CD7	26,291.5	0.604	0.88
CD8	4,157.2	0.095	0.88
CD9	2,979.2	0.068	0.88
CD10	5,489.2	0.126	0.68
CD11	72,758.5	1.670	0.89
CD12	21,621.5	0.496	0.88
CD13	19,005.5	0.436	0.88
CD14	13,271.5	0.305	0.85
CD15	3,228.9	0.074	0.50
CD16	18,434.2	0.423	0.86
CD17	12,958.2	0.297	0.85
CD18	19,493.5	0.448	0.84
CD19	4,077.2	0.094	0.71
CD20	17,853.5	0.410	0.84
CD21	18,426.5	0.423	0.83
CD22	20,125.5	0.462	0.82
CD24	10,559.2	0.242	0.79
TOTAL	**385,854.0**	**8.86**	**0.81**
OFF-SITE			
EOS1	30,319.0	0.696	0.71
EOS2	7,319.0	0.168	0.50
EOS3	8,050.0	0.185	0.50
Total	45,688.0	1.049	0.64

Subwatershed IDs CD1, CD3, CD5, CD23 were not used.

LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- VACANT
- WATERSHED BOUNDARY
- CD68 WATERSHED ID
- (E)SD (E) STORM DRAIN
- FLOW PATH

N

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SCALE (FEET)

Menlo Gateway Project - Hydrology Report *figure 6*

Constitution Site - Existing Conditions Land Use and Drainage

PWA

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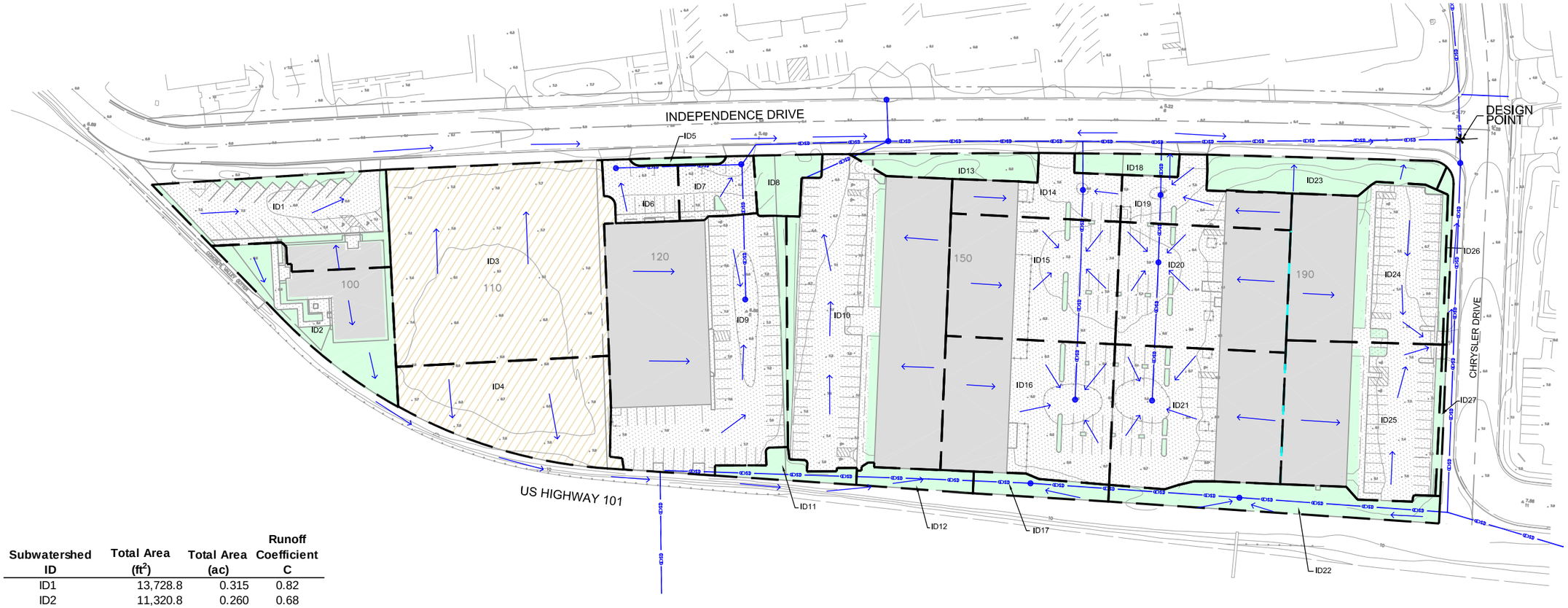

Subwatershed ID	Total Area (ft^2)	Total Area (ac)	Runoff Coefficient C
ID1	13,728.8	0.315	0.82
ID2	11,320.8	0.260	0.68
ID3	34,940.0	0.802	0.58
ID4	15,010.0	0.345	0.58
ID5	538.4	0.012	0.50
ID6	3,426.4	0.079	0.50
ID7	3,554.7	0.082	0.89
ID8	2,666.4	0.061	0.50
ID9	36,357.8	0.835	0.88
ID10	38,392.8	0.881	0.87
ID11	1,958.4	0.045	0.50
ID12	1,958.4	0.045	0.50
ID13	3,456.4	0.079	0.50
ID14	6,289.8	0.144	0.90
ID15	17,081.8	0.392	0.90
ID16	18,988.8	0.436	0.89
ID17	2,195.4	0.050	0.50
ID18	1,821.4	0.042	0.50
ID19	6,497.8	0.149	0.90
ID20	17,196.8	0.395	0.90
ID21	19,117.8	0.439	0.89
ID22	6,519.4	0.150	0.50
ID23	6,216.4	0.143	0.50
ID24	19,618.8	0.450	0.85
ID25	19,331.8	0.444	0.86
ID26	341.4	0.008	0.50
ID27	288.4	0.007	0.50
TOTAL	**308,815.0**	**7.09**	**0.78**

N

0 25 50 100
SCALE (FEET)

LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- VACANT
- WATERSHED BOUNDARY
- ID68 WATERSHED ID
- (E) STORM DRAIN
- FLOW PATH

Menlo Gateway Project - Hydrology Report *figure 7*

Independence Site - Existing Conditions Land Use and Drainage

PWA

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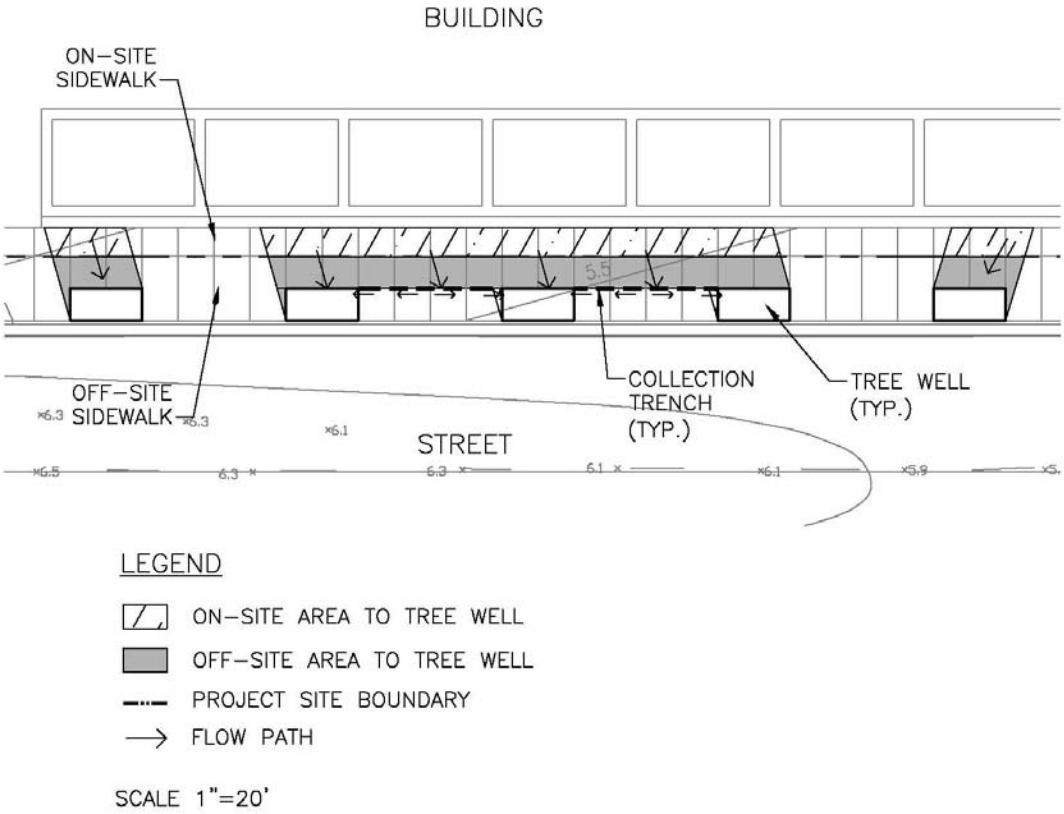

figure ***8***

Menlo Gateway Project – Hydrology Report

Perimeter Sidewalk Runoff Typical Detail

PWA Ref# 1894

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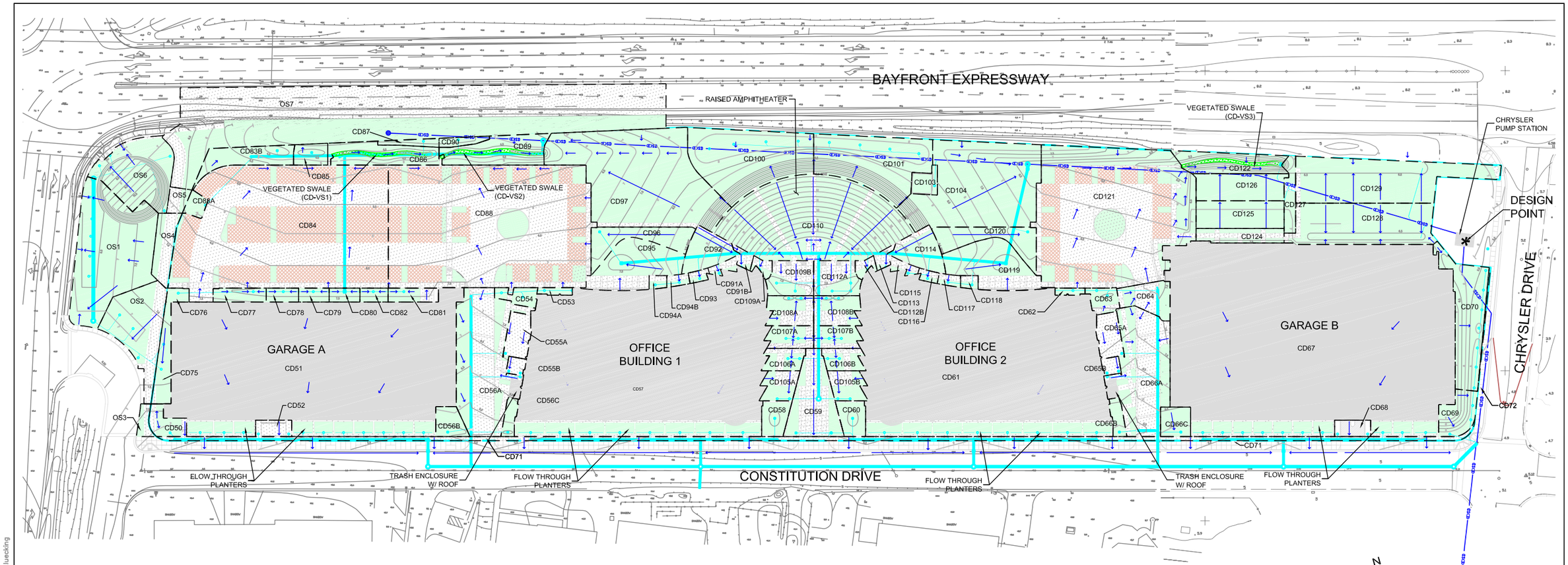

Subwatershed ID	Total Area (ft^2)	Total Area (ac)	Runoff Coefficient C
ON-SITE			
CD50	851.5	0.020	0.63
CD51	37,297.2	0.856	0.88
CD52	591.0	0.014	0.90
CD53	251.3	0.006	0.51
CD54	630.7	0.014	0.54
CD55A	1,020.5	0.023	0.90
CD55B	299.7	0.007	0.90
CD56A	7,540.8	0.173	0.77
CD56B	819.5	0.019	0.50
CD56C	449.2	0.010	0.50
CD57	36,363.5	0.835	0.87
CD58	922.1	0.021	0.53
CD59	3,367.1	0.077	0.79
CD60	922.1	0.021	0.53
CD61	36,363.5	0.835	0.87
CD62	204.5	0.005	0.50
CD63	696.3	0.016	0.58
CD64	1,442.2	0.033	0.73
CD65A	1,022.8	0.023	0.90
CD65B	299.7	0.007	0.90
CD66A	6,145.1	0.141	0.79
CD66B	462.9	0.011	0.50
CD66C	885.9	0.020	0.50
CD67	52,854.7	1.213	0.88
CD68	591.0	0.014	0.90
CD69	1,382.0	0.032	0.50
CD70	3,883.7	0.089	0.50
CD71	5,371.3	0.123	0.90
CD72	99.5	0.002	0.90
CD75	1,297.5	0.030	0.53
CD76	308.5	0.007	0.50
CD77	735.2	0.017	0.50
CD78	451.6	0.010	0.50
CD79	424.1	0.010	0.50
CD80	427.3	0.010	0.50
CD81	700.4	0.016	0.61
CD82	391.9	0.009	0.50
CD83A	427.5	0.010	0.50
CD83B	1,810.0	0.042	0.50

Subwatershed ID	Total Area (ft^2)	Total Area (ac)	Runoff Coefficient C
ON-SITE			
CD84	25,282.7	0.580	0.73
CD85	713.6	0.016	0.50
CD86	2,285.9	0.052	0.50
CD87	377.3	0.009	0.50
CD88	24,805.2	0.569	0.75
CD89	2,676.4	0.061	0.50
CD90	386.2	0.009	0.50
CD91A	305.0	0.007	0.80
CD91B	275.8	0.006	0.83
CD92	1,560.7	0.036	0.57
CD93	212.7	0.005	0.73
CD94A	250.0	0.006	0.71
CD94B	227.2	0.005	0.69
CD95	3,466.5	0.080	0.61
CD96	2,109.1	0.048	0.50
CD97	12,709.9	0.292	0.51
CD100	6,773.7	0.156	0.50
CD101	5,687.4	0.131	0.50
CD103	600.8	0.014	0.90
CD104	9,785.2	0.225	0.50
CD105A	976.3	0.022	0.64
CD105B	976.3	0.022	0.64
CD106A	856.2	0.020	0.65
CD106B	856.2	0.020	0.65
CD107A	1,024.8	0.024	0.65
CD107B	1,024.8	0.024	0.65
CD108A	1,365.3	0.031	0.68
CD108B	1,365.3	0.031	0.68
CD109A	282.1	0.006	0.74
CD109B	1,556.4	0.036	0.75
CD110	12,674.1	0.291	0.55
CD112A	1,556	0.036	0.75
CD112B	282	0.006	0.74
CD113	276	0.006	0.83
CD114	1,561	0.036	0.57
CD115	305	0.007	0.80
CD116	213	0.005	0.73
CD117	250	0.006	0.71
CD118	227	0.005	0.69

Subwatershed ID	Total Area (ft^2)	Total Area (ac)	Runoff Coefficient C
ON-SITE			
CD119	3,467	0.080	0.61
CD120	2,109	0.048	0.50
CD121	20,237	0.465	0.71
CD122	2,162	0.050	0.50
CD124	1,248	0.029	0.68
CD125	2,434	0.056	0.50
CD126	2,403	0.055	0.50
CD127	851	0.020	0.53
CD128	5,775	0.133	0.52
CD129	7,045	0.162	0.51
TOTAL	**385,854.0**	**8.86**	**0.74**

Subwatershed IDs CD73, CD74, CD98, CD99, CD102, and CD111, CD123 were not used.

OFF-SITE			
OS1	8,699	0.200	0.50
OS2	4,047	0.093	0.64
OS3	383	0.009	0.72
OS4	1,349	0.031	0.76
OS5	476	0.011	0.76
OS6	4,362	0.100	0.51
OS7	27,259	0.626	0.75
Total	46574.300	1.069	0.67

N

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SCALE (FEET)

LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- OPEN WATER
- PERMEABLE PAVING (w/ SUBDRAIN)
- WATERSHED BOUNDARY
- CD68 WATERSHED ID
- (E) STORM DRAIN
- (N) STORM DRAIN

Menlo Gateway Project - Hydrology Report *figure* ***9***

Constitution Site - Proposed Conditions Land Use and Drainage

PWA

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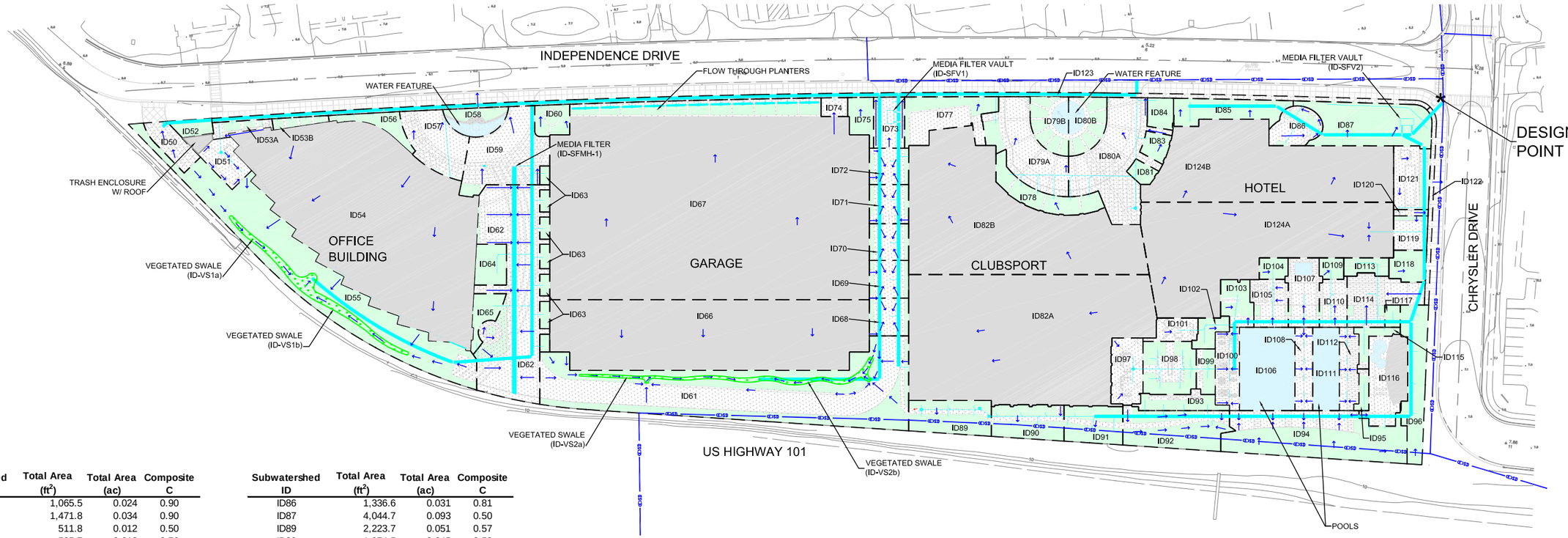

Subwatershed ID	Total Area (ft^2)	Total Area (ac)	Composite C
ID50	1,065.5	0.024	0.90
ID51	1,471.8	0.034	0.90
ID52	511.8	0.012	0.50
ID53A	585.7	0.013	0.76
ID53B	414.7	0.010	0.59
ID54	26,449.5	0.607	0.90
ID55	11,542.1	0.265	0.51
ID56	875.4	0.020	0.50
ID57	2,557.6	0.059	0.89
ID58	1,181.1	0.027	0.35
ID59	4,181.9	0.096	0.88
ID60	863.9	0.020	0.54
ID61	16,264.4	0.373	0.70
ID62	9,489.0	0.218	0.88
ID63	1,251.8	0.029	0.50
ID64	1,038.2	0.024	0.50
ID65	838.4	0.019	0.50
ID66	17,716.4	0.407	0.90
ID67	50,145.4	1.151	0.88
ID68	1,205.0	0.028	0.83
ID69	1,204.5	0.028	0.83
ID70	1,170.2	0.027	0.82
ID71	1,249.1	0.029	0.83
ID72	1,161.0	0.027	0.83
ID73	1,287.2	0.030	0.90
ID74	406.3	0.009	0.90
ID75	804.2	0.018	0.50
ID77	2,676.2	0.061	0.73
ID78	1,836.6	0.042	0.52
ID79A	3,741.2	0.086	0.54
ID79B	1,589.5	0.036	0.49
ID80A	5,270.4	0.121	0.90
ID80B	1,581.1	0.036	0.50
ID81	385.5	0.009	0.50
ID82A	23,407.0	0.537	0.90
ID82B	17,372.7	0.399	0.90
ID83	550.6	0.013	0.50
ID84	639.9	0.015	0.50
ID85	2,008.1	0.046	0.50

Subwatershed ID	Total Area (ft^2)	Total Area (ac)	Composite C
ID86	1,336.6	0.031	0.81
ID87	4,044.7	0.093	0.50
ID89	2,223.7	0.051	0.57
ID90	1,974.5	0.045	0.58
ID91	1,765.3	0.041	0.56
ID92	3,220.4	0.074	0.59
ID93	1,120.3	0.026	0.64
ID94	6,463.4	0.148	0.62
ID95	367.4	0.008	0.61
ID96	2,613.5	0.060	0.50
ID97	1,683.9	0.039	0.90
ID98	2,235.7	0.051	0.64
ID99	681.5	0.016	0.65
ID100	1,519.3	0.035	0.90
ID101	814.3	0.019	0.90
ID102	654.2	0.015	0.54
ID103	1,127.9	0.026	0.58
ID104	495.4	0.011	0.53
ID105	1,400.7	0.032	0.88
ID106	3,750.0	0.086	0.00
ID107	1,786.0	0.041	0.81
ID108	1,200.0	0.028	0.50
ID109	419.6	0.010	0.54
ID110	1,078.2	0.025	0.89
ID111	1,800.0	0.041	0.00
ID112	1,257.0	0.029	0.90
ID113	623.0	0.014	0.52
ID114	2,409.4	0.055	0.89
ID115	582.6	0.013	0.58
ID116	2,707.6	0.062	0.65
ID117	277.8	0.006	0.50
ID118	891.6	0.020	0.50
ID119	943.2	0.022	0.86
ID120	176.7	0.004	0.50
ID121	1,838.5	0.042	0.83
ID122	709.7	0.016	0.90
ID123	4,363.3	0.100	0.90
ID124A	15,392.8	0.353	0.90
ID124B	12,874.4	0.296	0.90
TOTAL	**308,815.0**	**7.09**	**0.79**

Subwatershed IDs ID76 and ID78 were not used.

LEGEND:

- LANDSCAPING
- BUILDING
- PAVING
- OPEN WATER
- WATERSHED BOUNDARY
- ID68 WATERSHED ID
- (E) STORM DRAIN
- (N) STORM DRAIN
- FLOW PATH
- CATCH BASIN/ INLET

N

0 25 50 100
SCALE (FEET)

Menlo Gateway Project - Hydrology Report *figure* ***10***

Independence Site - Proposed Conditions Land Use and Drainage

PWA

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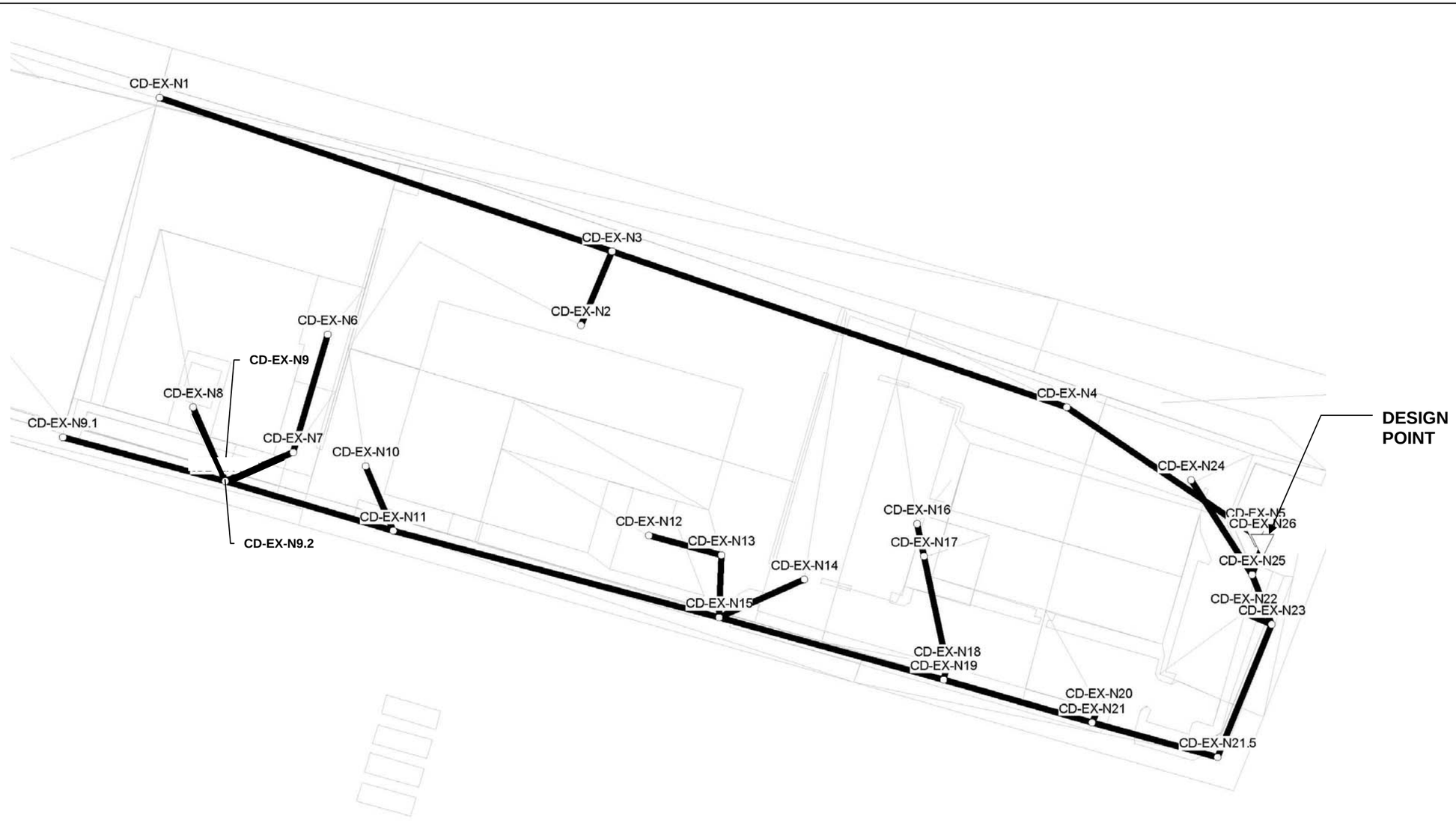


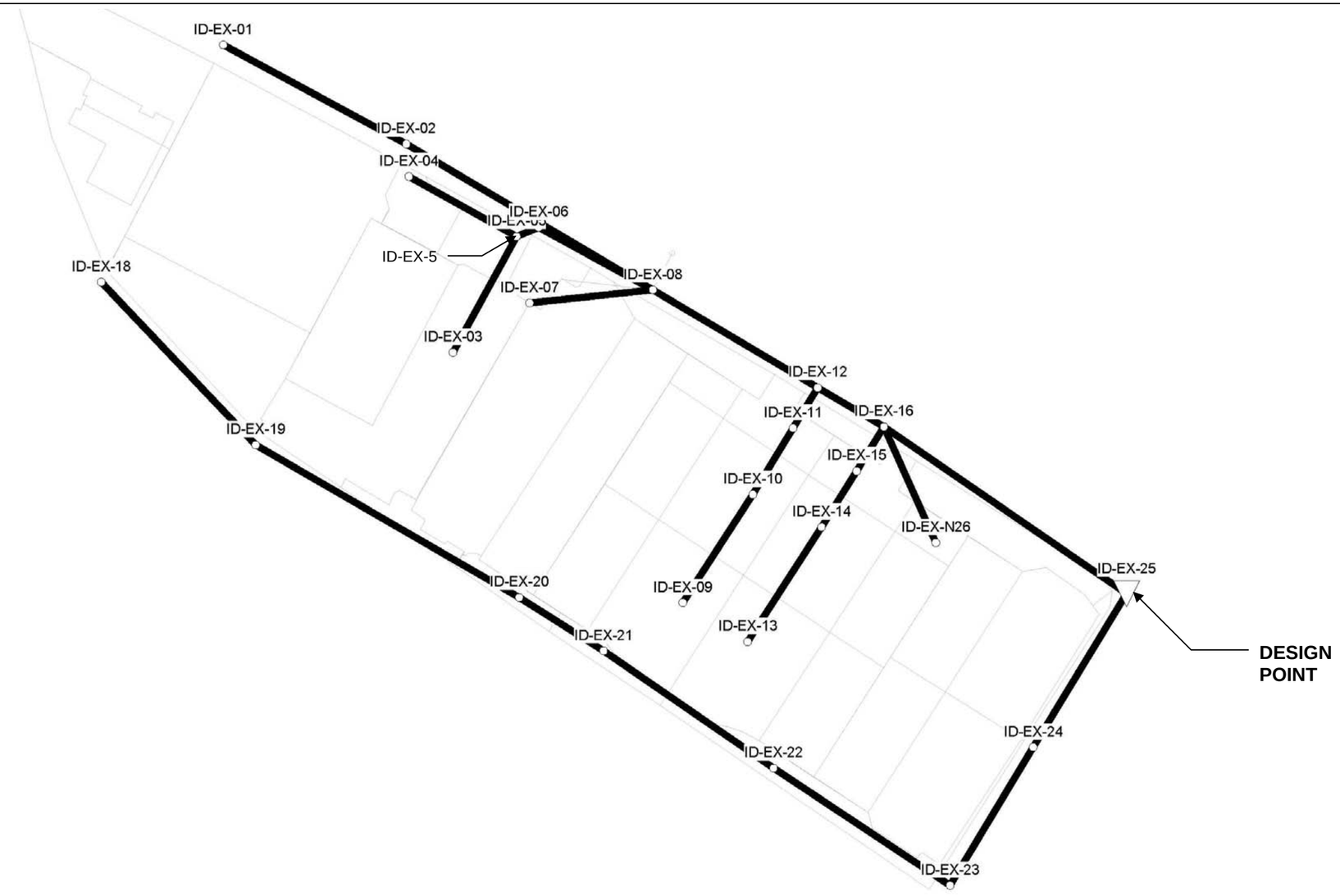
Source:
MOUSE Pipe Flow Model
Not to Scale

figure 11
Menlo Gateway Project – Hydrology Report

Constitution Site – Existing Conditions – Storm Drain Network Model

PWA Ref#: 1894

PWA



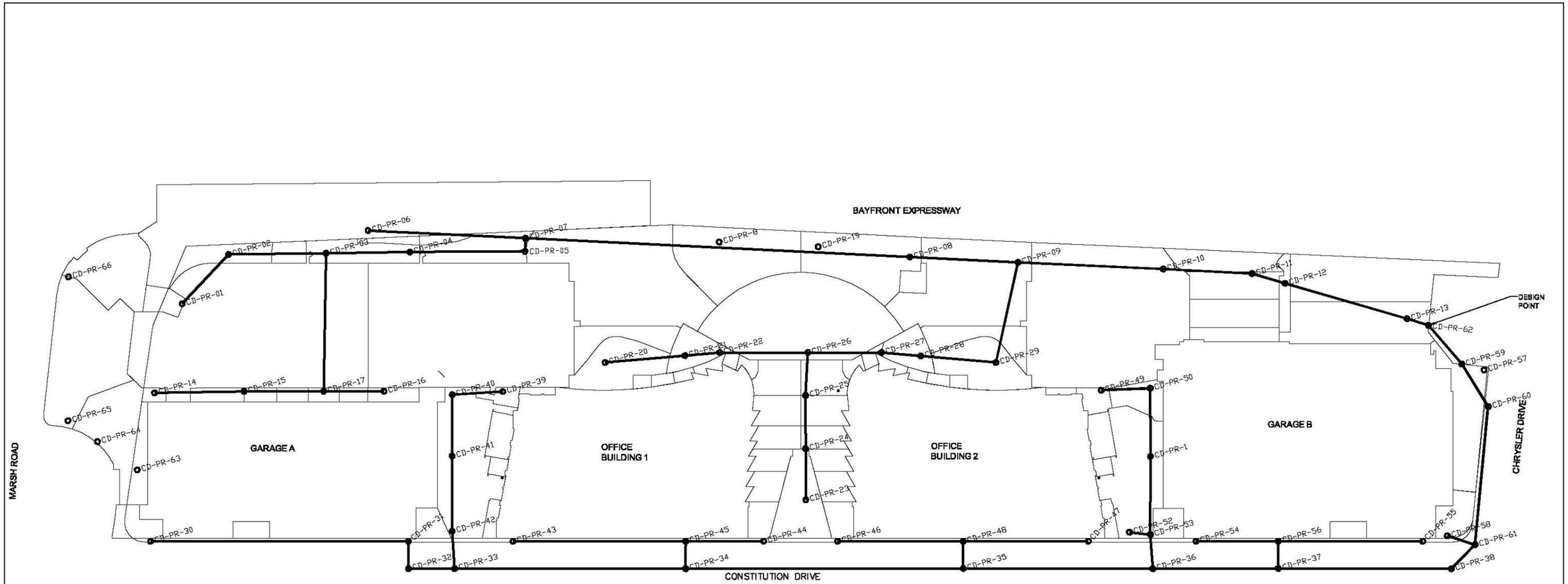
Source: MOUSE Pipe Flow Model
Not to Scale

figure 12
Menlo Gateway Project – Hydrology Report

Independence Site – Existing Conditions – Storm Drain Network Model

PWA Ref#: 1894

PWA



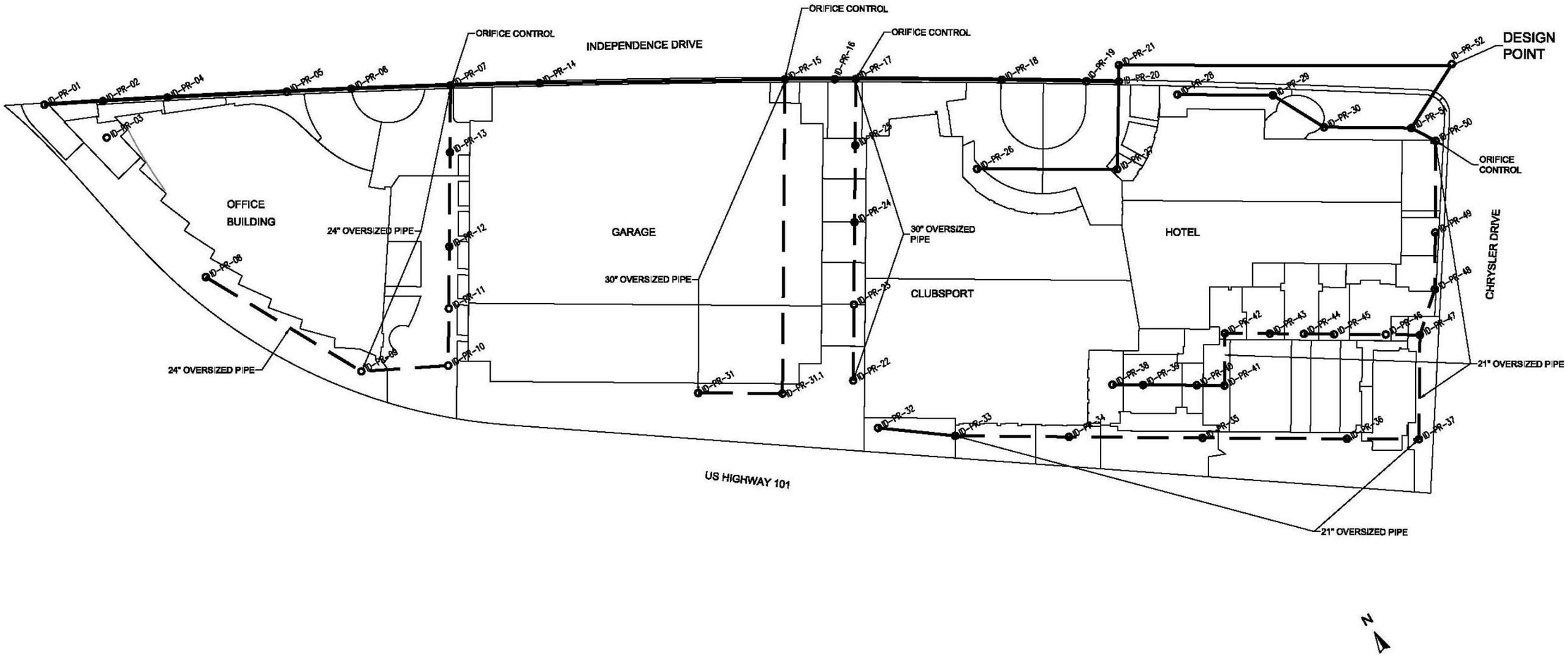
Source:
MOUSE Pipe Flow Model
Not to Scale

figure 13
Menlo Gateway Project – Hydrology Report

Constitution Site – Proposed Conditions – Storm Drain Network Model

PWA Ref#: 1894

PWA



Source:
MOUSE Pipe Flow Model
Not to Scale

figure 14
Menlo Gateway Project – Hydrology Report

Independence Site – Proposed Conditions – Storm Drain Network Model

PWA Ref#: 1894

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Appendix C.3: Memorandum from PWA to Lisa Ekers and Virginia Parks, City of Menlo Park (January 2010)

PWA
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M E M O R A N D U M

Date:	January 8, 2010
To:	Lisa Ekers and Virginia Parks, City of Menlo Park
CC:	Jennifer Renk (Luce Forward), Sue Chan and Phil Erickson (Community Design and Architecture), and Chris Boyle (DES Architects and Engineers)
From:	Philip Luecking, P.E. and Mark Lindley, P.E.
PWA Project:	Menlo Gateway Project (#1894.00)
Subject:	**Response to December 22, 2009 Comments on Hydrology Report**

INTRODUCTION

This memorandum shall accompany the Final Hydrology Report (Report) for the Menlo Gateway Project (Project), prepared by Philip Williams and Associates (PWA), and dated December 21, 2009. The intent of this memorandum is to address comments from the City of Menlo Park (City) related to the analyses and methodology used in the preparation of the Final Hydrology Report that were received on December 22, 2009, subsequent to the submittal of the report. The City has indicated that a formal response to the comments would be acceptable in lieu of revising and resubmitting the Report as the comments can be adequately addressed at this phase in the project approval process without further analyses.

PWA submitted a memorandum to the City (dated December 2, 2009) that provided a response to initial comments on the Draft Final Hydrology Report provided by BKF on behalf of the City, dated October 26, 2009. The City forwarded two additional comments from BKF via email correspondence on December 22, 2009. The City has indicated that PWA's responses adequately addressed the comments in the October 26th document and the subsequent December 22, 2009 comments (L. Ekers and V. Parks email correspondence to M. Lindley 12/23/2009). The responses to the December 22, 2009 comments are presented in this memorandum.

COMMENTS

The City forwarded two additional comments from BKF via email correspondence on December 22, 2009. These two comments will be addressed in this memorandum and are as follows:

1. Their response to the beginning HGL elevation uses the outfall elevation and the pump curve information to come up with a beginning HGL. The solution is -3.4' beginning HGL based on a total head of 7.75', The question is, does this 7.75' of total dynamic head include any losses through a force main in addition to the losses through the pump? No mention or calculation is provided of how far the water is pumped in the force main or whether the pump station simply acts as a lift station?

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2. They state two pumps can handle the full 130 cfs encountered at the Chrysler Pump Station. The City should confirm that both pump are set to operate simultaneously when the water level in the wet well is at an elevation of -3.4.

RESPONSE TO COMMENT 1

PWA requested detailed information from the City on the Chrysler Pump Station in early November 2009 as well as direction on the tailwater computation. We anticipated that the City would provide information such an engineering report for the pump station including a pump curve, pump set up (with on/off switch elevations), outlet configuration and piping, and total performance of the system. In response, the City did provided two points on the curve and direction to utilize the mean higher high water (MHHW) at San Francisco Bay with the pump curve to compute the tailwater. It was not clearly expressed in the information provided if the pump curve included any losses through the discharge pipe under Bayfront Expressway. We proceeded with our analyses based on the City's direction with the assumption that the pump curve did include the losses. Subsequent to submittal of the Report, the City indicated that the pump curve likely does not include the pipe losses.

The Chrysler Pump Station essentially acts as a lift station to pump stormwater under the Bayfront Expressway into a slough channel connected to San Francisco Bay. Assuming two 54-inch discharge pipes with one bend, the additional head loss would be approximately 0.6 to 0.8 feet to pump the 10-year peak discharge into the receiving slough. In order to fully evaluate the losses due to the discharge pipes and the impact on the hydraulic analyses presented in the Report, detailed information on the pump station and discharge pipe configurations would be required and the hydraulic modeling would need to be revised with likely little change to the reported results.

The analyses presented in the Report represent a conservative estimate to compute the tailwater through the Chrysler Pump Station. The 10-year 1-hour peak flow rate for the entire Chrysler Pump Station watershed was combined with higher intensity 10-year 25-minute to 30-minute flow rates for the Constitution and Independence Sites. By combining these peak flows, the scenario modeled is greater than the 10-year event. If a less conservative assumption was utilized and a triangular hydrograph was applied to the Chrysler Pump Station watershed peak flow rate, the tailwater would have been computed at approximately 65 cfs (as compared to 130 cfs), and the resulting tailwater would have been substantially lower. Based on information provided by the City, the tailwater at 65 cfs would be between -5 and -6 feet NGVD, which is 1.6 to 2.6 feet lower than the estimated tailwater using the conservative approach included in the Final Hydrology Report. Thus, the conservative approach should more than account for the estimated 0.6 to 0.8 feet of additional head loss through the discharge pipes under the Bayfront Expressway.

Using the conservative assumptions in the Final Hydrology Report, the Project will over-mitigate the 10-year and 100-year peak flows and meet all of the City's storm drain freeboard requirements. The minimum freeboard shown in our storm drain modeling is estimated at approximately 2.4 feet between the storm drain inlet and 10-year water level not accounting for the curb height. Therefore the project would have sufficient additional freeboard to account for additional losses through the discharge pipes.

It is important to note that these analyses were conducted and are being submitted at the EIR level to demonstrate that the proposed project can meet the City's requirements in order to obtain approval from the Planning Commission. This discussion was presented to the City for consideration in lieu of revising the Report as submitted on December 21, 2009. Ms. Ekers and Ms. Parks provided their approval of the above discussion of our use of a conservative estimate of the tailwater and have indicated that further analysis is not required (email correspondence to M. Lindley 1/6/2010 and 12/23/2009).

RESPONSE TO COMMENT 2

The City provided additional information regarding the pump station settings subsequent to the December 22, 2009 comments that effectively respond to Comment 2. The City indicated that the Chrysler Pump Station is set to turn on the first pump when the water level in the wet well reaches elevation (-) 6 feet NGVD with the second pump starting when the water level reaches elevation (-) 5 feet NGVD. Therefore the two pumps will be operating simultaneously when the water level in the wet well is at elevation of (-) 3.4 feet NGVD (the computed tailwater used in our analyses).

CONCLUSION

The project is currently at an EIR design level for evaluation by City staff for recommendations to the Planning Commission. The analyses presented in the Final Hydrology Report and the above discussions indicate that the Project will meet the City's requirements for stormwater management related to water quality treatment, peak discharge mitigation, and stormdrain performance. The proposed project would improve water quality treatment and significantly decrease peak discharge rates during 10-year and 100-year storm events, thus improving stormdrain performance in the vicinity of the project site.

The results at this stage of the project design development allow for refinements of the proposed design elements to optimize stormwater management at the project site. Such refinements could include revisions to the orifice control structures or stormwater detention facilities to fine tune the on-site storage to further mitigate smaller, more frequent storm events (i.e. further decreasing discharge during a 10-year event). We anticipate that discussions of this nature will occur subsequent to the Planning Commission approval as the design advances towards construction documents. The project team looks forward to working with the City to optimize the stormwater management benefits provided by the proposed Menlo Gateway Project.