Water Quality Management Plan

For:

San Antonio Water Company

WQMP _____

APN 1044-091-22
400 E. 20th Street
Upland, CA 91784

Prepared for:
CEDG Architects
401 E. Columbia Ave.
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Erik Peterson

Prepared by:
Land Development Design Company, LLC
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Ontario, CA 91761
(909) 930-1466
Kevin Richer

Submittal Date: November 12, 2025

Revision Date: _____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for San Antonio Water Company by Land Development Design Company, LLC. The WQMP is intended to comply with the requirements of the San Bernardino County and the NPDES Area-wide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

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Project Data			
Permit/Application Number(s):	TBD	Grading Permit Number(s):	GPA 24-0004
Tract/Parcel Map Number(s):	Portion of Lot 281 & 282 MB 11/6	Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 1044-091-22

Owner's Signature			
Owner Name: San Antonio Water			
Title			
Company	San Antonio Water Company		
Address	139 N Euclid Ave, Upland, CA 91786		
Email			
Telephone #	(909) 982-4107		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):	TBD	Grading Permit Number(s):	GPA 24-0004
Tract/Parcel Map Number(s):	Portion of Lot 281 & 282 MB 11/6	Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 1044-091-22

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Kevin J. Richer	
Title	Project Engineer
Company	Land Development Design Company, LLC
Address	2313 E. Philadelphia St. Ste. F / Ontario, CA 91761
Email	kevin.richer@lddc.net
Telephone #	(909) 930-1466
Signature	
Date	11/12/2025

PE Stamp Below



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Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	San Antonio Water Company				
Project Owner Contact Name:	San Antonio Water Company				
Mailing Address:	139 N Euclid Ave, Upland, CA 91786	E-mail Address:		Telephone:	(909) 982-4107
Permit/Application Number(s):	TBD		Tract/Parcel Map Number(s):	APN 1044-091-22	
Additional Information/ Comments:					
Description of Project:	The project proposes to develop a portion of 4.92 acre site located at 400 E. 20th Street, Upland. The site is bounded to the north by the right-of-way 20th Street and single family tract homes further to the north; to the west by single family tact homes; to the south by the 210 Freeway right-of-way; and to the east by an undeveloped lot. The site is currently partially developed with a water tank and equipment pad located towards the west boundary. The site is primarily pervious with dirt and rock cover. The site has no landscape or natural vegetation. There is a small paved turn-around near the entrance to the lot. The site currently sheet flows from northeast towards southwest. There is a 3' to 6' high slope along the south boundary of the project adjacent to the freeway right-of-way. There is a natural ravine near the southwest corner that discharges into an existing ditch along the northerly freeway right-of-way The project proposes to develop the majority of the site with a office building and maintenance building along with access drives and parking areas. The westerly third of the site will remain undisturbed around the existing water tank and equipment pad. There will be a large landscape area in front of the office building along with landscape buffers along the north, east and south boundaries. The pervious area for this scope of project is higher than normal. The site is divided into 2 drainage areas. DA1 covers the northeasterly quadrant of the site where drainage sheets to a landscaped infiltration basin located to the north of the proposed office building. The office building roof drains are also directed to said infiltration basin. The pervious area for DA1 is approximately 60%. The infiltration basin is designed such that an overflow will discharge at the westerly end of the basin into the undisturbed area. DA2 covers the southerly maintenance building and the easterly drive and parking lot. This area sheets towards curbs and gutters that flow westerly towards a series of catch basin inlets connected to a proposed storm drain. The storm drain will convey flows towards a proposed underground infiltration system located west of the paved area near the south boundary. The access manhole will have a grated manhole cover to allow the system flows to bubble out onto the surface when the system is full. This will only occur during large storms. The infiltration rate is high and will allow smaller storms to be contained within the system and infiltrate rapidly. The overflows will drain towards the existing ravine in the southwest corner of the site. The pervious area for DA2 is approximately 62%. This is due to the large undisturbed area being considered part of the project. These drainage patterns mimic the existing condition and overflows do not exceed pre-developed flow rates Street improvements along 20th Street are existing.				

Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	N/A

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more
☐ Hillside developments of 5,000 ft^2 or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft^2 of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☐ Parking lots of 5,000 ft^2 or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft^2 or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.

2 Project Area (ft2):	214,321	**3** Number of Dwelling Units:	n/a	**4** SIC Code:	4941

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

6 Does Project include roads? Yes ☐ No ☒ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

The maintenance of the proposed development is the responsibility of the owner. There is no homeowner or property owner's association set up for this proposed development. All of the BMPs are the responsibility of the owner to maintain.

Owner information:
San Antonio Water Company
139 N Euclid Ave
Upland, CA 91786
(909) 982-4107
Contact
email

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Wild Birds and animal wastes, garbage.
Nutrients - Phosphorous	E ☒	N ☐	Fertilizers, food waste, garbage.
Nutrients - Nitrogen	E ☒	N ☐	Fertilizers, food waste, garbage.
Noxious Aquatic Plants	E ☒	N ☐	Landscape areas.
Sediment	E ☒	N ☐	Driveways, rooftops and sidewalks.
Metals	E ☒	N ☐	Car and truck use.
Oil and Grease	E ☒	N ☐	Car and truck use.
Trash/Debris	E ☒	N ☐	Poorly managed trash containers and parking lot.
Pesticides / Herbicides	E ☒	N ☐	Landscape use.
Organic Compounds	E ☒	N ☐	Landscape use and fertilizers.
Other: Oxygen Demanding Compounds	E ☒	N ☐	Landscape areas.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

1 Project Types that Qualify for Water Quality Credits: *Select all that apply*

☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]

2 Total Credit 0% *(Total all credit percentages up to a maximum allowable credit of 50 percent)*

Description of Water Quality Credit Eligibility (if applicable)	n/a

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34°08'08"N	Longitude 117°38'43"W	Thomas Bros Map page 572 C5

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 Does the site have more than one drainage area (DA): Yes☐ No☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*

DA 1 ⟶ OUTLET 1
DA 2 ⟶ OUTLET 2

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA 1 to Outlet 1	Storm water runoff is directed towards a proposed landscape infiltration basin located north of the proposed office building. The drainage area consists of the northeast quadrant of the site which is primarily landscape and the proposed office building. The overflow from this basin will discharge at the west end of the basin and sheet into the undisturbed area, continuing southwest in the same manner as the pre-developed flows.
DA 2 to Outlet 2	Storm water runoff is directed southerly towards curb and gutters in the south paved driveway access adjacent to the maintenance building. The westerly drive and southerly area will be collected in a series of catch basin inlets that convey flows in a proposed storm drain pipe towards a proposed underground infiltration system located just westerly of the paved areas. The access manhole will have a grated manhole cover to allow the system flows to bubble out onto the surface when the system is full. This will only occur during large storms. The infiltration rate is high and will allow smaller storms to be contained within the system and infiltrate rapidly. The overflows will drain towards the existing ravine in the southwest corner of the site.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	45,206	169,115		
2 Existing site impervious area (ft^2)	19,485	65,084		
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412map.pdf*	II	II		
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	B	B		
5 Longest flowpath length (ft)	668			
6 Longest flowpath slope (ft/ft)	0.004			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Dirt	Dirt		
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	Poor	Poor		

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://sbcounty.permitrack.com/WAP See 'Drainage Facilities" link at this website*	City of Fontana Storm Drain of Poplar Ave., San Sevaine Channel, Santa Ana River Reach 3, Prado Dam, Santa Ana River Reach 2, Santa Ana River Reach 1, Pacific Ocean
Applicable TMDLs *Refer to Local Implementation Plan*	San Sevaine Channel – None Santa Ana River Reach 3 – Bacterial Indicator Prado Dam – None Santa Ana River Reach 2 – None Santa Ana River Reach 1 – None Pacific Ocean – None
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	San Sevaine Channel – None Santa Ana River Reach 3 - Copper/Lead/Bacterial Indicator Prado Dam – pH Santa Ana River Reach 2 - None Santa Ana River Reach 1 – None Pacific Ocean - None
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	n/a
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	Santa Ana River
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No, project drains to an adequate sump, Prado Dam and Santa Ana River, per TGD 3.4.
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The owner shall familiarize himself with the contents of the WQMP and furnish copies of city and county BMP factsheets to all future tenants through lease agreements.
N2	Activity Restrictions	☒	☐	Tenants shall not be allowed to discharge chemicals, chemical residues, wastewater or other prohibited discharges (sediment, trash, fertilizers, pesticides, heavy metals, petroleum products or pollutants), to the outside, paved areas of the site. Pesticide application shall be done by a certified applicator.
N3	Landscape Management BMPs	☒	☐	Landscape crews shall inspect the irrigation system and shall report all drainage problems to the owner. At a minimum, owner shall ensure landscape management BMPs are implemented, including application of fertilizers/pesticides by licensed persons.
N4	BMP Maintenance	☒	☐	All site, source and treatment control BMPs outlined in this WQMP shall be maintained as outlined in Section 5 of this WQMP..
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Medical Waste Storage is not a project feature.
N6	Local Water Quality Ordinances	☒	☐	The owner shall ensure that all business activities at the site comply with the County of San Bernardino stormwater ordinance through the implementation of BMP through this WQMP.
N7	Spill Contingency Plan	☒	☐	Hazardous waste such as oils, lubricants, etc. will have a spill contingency plan developed by the operator. Absorbent materials shall be kept onsite to apply to oil/grease leaks in the parking lot. A spill cleanup and disposal process shall be created and all applicable employees shall be trained accordingly.
N8	Underground Storage Tank Compliance	☐	☒	Underground storage tanks are not a project feature.
N9	Hazardous Materials Disclosure Compliance	☒	☐	The operator will complete the Hazardous Waste Compliance based on storage of oils, lubricants, etc.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	Building will be fitted with fire sprinklers, including areas of hazardous waste storage.
N11	Litter/Debris Control Program	☒	☐	A program shall be implemented to pick up litter of the site weekly. The trash enclosure is to be swept and cleaned on a daily basis. Trash enclosures are designed to divert all flows around the enclosure. Enclosure is designed with a roof cover. All dumpsters will have lids installed and will be inspected to ensure that the dumpsters remain covered and leak-proof. The owner shall ensure tenants contract with a refuse company to have the dumpsters emptied on a weekly basis, at a minimum.
N12	Employee Training	☒	☐	Owner shall utilize the attached County brochures for employee training on stormwater best management practices. Training to occur within the first three months of hire, and annually thereafter.
N13	Housekeeping of Loading Docks	☐	☒	Docks are not a project design feature.
N14	Catch Basin Inspection Program	☒	☐	The on-site catch basins shall be inspected monthly during the rainy season (October-May) and before and after each storm to ensure proper operation. The owner shall contract with a qualified landscape contractor to inspect and clean out accumulation of trash, litter and sediment and check for evidence of illegal dumping of waste materials into on-site drains.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Parking lots shall be vacuum swept weekly to prevent sediment, garden waste, and trash, or other pollutants from entering on-site drains and public storm channels. Vacuum sweeping will be done by a landscape contractor or other contractor provided by the owner.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	No measures required.
N17	Comply with all other applicable NPDES permits	☒	☐	NPDES General Construction Activities Permit to be complied with by filing a notice of intent and SWPPP with the state and obtaining a WDID Discharge Permit Number prior to commencement of construction activities, covered under the permit. Industrial Gneral Permit will be applied for by the owner/operator.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	A painted message "No Dumping-Drains to Ocean" shall be placed on each catch basin. The message shall be inspected annually & repainted as necessary.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☒	☐	Storage materials for construction/maintenance projects stored in covered enclosures.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Stormwater flows are designed to flow around waste areas. Trash enclosures shall be paved and have permanent roof or awning. All dumpster shall have working lids which shall be kept closed at all times.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Implement landscape plans consistent with county water conservation ordinances, which shall include provision of weather-based controllers, rain shutoff devices, drip irrigation heads and recessed finish grade of all landscaped areas.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Landscape is to be depressed 1-2".
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Rip-rap proposed to prevent erosion at overflow locations in southwest and southeast corners.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	Covered dock areas are not a design feature of this project.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	Maintenance bays are not located inside the maintenance building and have internal drains that are directed through a clarifier that are on the sanitary sewer system.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Vehicle washing is not conducted inside the maintenance building in a truck wash bay. All wash waters are collected in a drain and directed through a clarifier prior to discharge into sanitary sewer
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	Outdoor processing is not a project feature.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Equipment washing is not a project feature.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	Fueling is not a project feature.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	Hillsides are not a project feature.
S14	Wash water control for food preparation areas	☐	☒	Food preparation is not a project feature.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	Community car wash racks are not a project feature.

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventative LID Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Impervious cover for the proposed development is less than typical projects of this size. West portion of site is base paved to reduce impervious area.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: The proposed development includes one underground infiltration systems and one infiltration basin to utilize the site's natural infiltration capacity.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: The existing drainage pattern has been mimicked in the site design, directing storm flows to an infiltration basin north of the proposed building for DA1. DA1 will sheet south and west to an underground infiltration system near the southwest corner.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: On-site storm flows on the site are directed to the proposed on-site underground storage infiltration systems to be mitigated before possible overflow discharges from the site. Roof drains at office building will discharge to landscape along north side of building and be directed to infiltration basin in landscape area.
Protect existing vegetation and sensitive areas: Yes ☒ No ☐ Explanation: The existing site contains no vegetation or sensitive areas. The proposed development will increase vegetation of the site with proposed landscaping.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: The disturbed area will be stabilized with pavement, base paving and landscaping.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: The proposed underground infiltration system is to be excavated only. Compaction of native soils within the system's limits is prohibited. Compaction of system during installation must be in conformance with manufacturer's specifications. The infiltration basin will also be marked out for no compaction.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: North parking lot drains to a vegetated infiltration basin.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Landscape areas to be staked off to prevent compaction of these areas.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.
Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1

- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 45,206	**2** Imperviousness after applying preventative site design practices (Imp%): 43%	**3** Runoff Coefficient (Rc): 0.30 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.658 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.97 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 2,152 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

1 Project area DA 2 (ft^2): 169,115	**2** Imperviousness after applying preventative site design practices (Imp%): 38%	**3** Runoff Coefficient (Rc): 0.27 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.658 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.97 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 7,245 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a fu5,344nction of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of HCOC Assessment

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☒

Go to: http://sbcounty.permitrack.com/WAP

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)*

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** *Form 4.2-3 Item 12*	**2** *Form 4.2-4 Item 13*	**3** *Form 4.2-5 Item 10*
Post-developed	**4** *Form 4.2-3 Item 13*	**5** *Form 4.2-4 Item 14*	**6** *Form 4.2-5 Item 14*
Difference	**7** *Item 4 – Item 1*	**8** *Item 2 – Item 5*	**9** *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** % *Item 7 / Item 1*	**11** % *Item 8 / Item 2*	**12** % *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3):
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), S_o = *Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) V_{fps} = *(1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) T_t = *Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) T_c = *Item 5 + Item 11*								

13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*

14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*

15 Additional time of concentration needed to meet HCOC requirement (min): $T_{C\text{-}HCOC}$ = *(Item 13 * 0.95) – Item 14*

Form 4.2-5 HCOC Assessment for Peak Runoff

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet HCOC Requirement (cfs): $Q_{p\text{-}HCOC}$ = *(Item 14 * 0.95) – Item 10*		

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.
The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.
Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.
If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.
If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2).
Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment.

Form 4.3-1 Infiltration BMP Feasibility

Feasibility Criterion – Complete evaluation for each DA on the Project Site

1 Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒

Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒

(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

3 Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒

See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

7 Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒

If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.

8 Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒

If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.

9 All answers to Item 1 through Item 6 are "No": Yes ☒ No ☐

Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA 1	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3): $V_{retention}$ *=Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): $V_{retention}$ *=Sum of Item 12 for all BMPs*			
14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA1)

15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) *$V_{retention}$ = Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft^3): *$V_{retention}$ =Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft^3): *$V_{retention}$ = Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrels/cisterns: Yes ☐ No ☒ *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) *$V_{retention}$ = Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): *$V_{retention}$ =Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.
If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)
If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 2,052 (DA 1), 7,245 (DA 2)

V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 BMP Type: Infiltration	DA 2 BMP Type: Infiltration	DA/DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	15.62	15.62	
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D4*	3	3	
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	5.21	5.21	
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48 hr. max 5.41 hrs	48 hr. max 16.12 hrs	
6 Maximum ponding depth (ft) *BMP design*	20.84	20.84	
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	2.35	7	
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	1,755	1,425	
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	
10 Amended soil porosity	n/a	n/a	
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	n/a	n/a	
12 Gravel porosity	n/a	n/a	
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	2,286	1,856	
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	4,124	5,651	

16 Total Retention Volume from LID Infiltration BMPs: 6,408 (DA 1), 7,530 (DA 2)

(Sum of Items 14 and 15 for all infiltration BMP included in plan)

17 Fraction of DCV achieved with infiltration BMP: 318% (DA 1), 103.99% (DA 2)

Retention% = Item 16 / Form 4.2-1 Item 7

18 Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.
Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): 0 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16*			
BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			
9 Total Retention Volume (ft^3) from Harvest and Use BMP *Sum of Item 8 for all harvest and use BMP included in plan*			
10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest and use BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.*			

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 0 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*	List pollutants of concern *Copy from Form 2.3-1.*	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-6 Volume Based Biotreatment – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) b_w *= (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) SA_{top} *= (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 2,152 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 6,410 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  *Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs

1 Volume reduction needed for HCOC performance criteria (ft^3): 0
*(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*

2 On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): 0 *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*

3 Remaining volume for HCOC volume capture (ft^3): 0 *Item 1 – Item 2*

4 Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): 0 *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
N1 Education of Property Owners, Tenants, and Occupants on Stormwater BMPs	Owner	The owner shall familiarize himself with the contents of the WQMP and the County & City Ordinance and brochures and furnish copies of city and county BMP factsheets to all future tenants through lease agreements.	Educational materials will be kept onsite for reference.
N2 Activity Restrictions	Owner	Tenants shall not be allowed to discharge chemicals, chemical residues, wastewater or other prohibited discharges listed in the City and County Ordinances, to the outside, paved areas of the site. Owner shall inspect property regularly and resolve violations as needed.	Daily
N3 Landscape Management BMPs	Owner	Landscape crews shall inspect the irrigation system after each landscape procedure and shall report all drainage problems to the owner.	Be inspected bi-weekly after each landscape procedure.
N11 Litter/Debris Control Program	Owner	A program shall be implemented to pick up litter of the site weekly.	Weekly inspection and cleanup of the site.
N12 Employee Training	Owner	Owner shall utilize the attached County brochures for employee training on stormwater runoff best management practices.	Employee shall be trained upon hire and annually thereafter. Brochures from employee training will be kept on site for reference.
N14 Catch Basin Inspection Program SC-44 Drainage System Maintenance MP-52 Drain Inlet	Owner	The on-site catch basins shall be inspected monthly during the rainy season (October-May) and before and after each storm to ensure proper operation. Catch basins to be cleaned when capacity is reduced by 25%. The owner shall contract with a qualified landscape contractor to inspect and clean out accumulation of trash, litter and sediment and check for evidence of illegal dumping of waste materials into on-site drains.	Shall be inspected monthly during the rainy season (October-May) and before and after each storm to ensure proper operation.

N15 Vacuum Sweeping of Private Streets and Parking Lots SC-43 Parking/Storage Area Maintenance	Owner	Parking lots shall be swept utilizing a vacuum sweeper weekly to prevent sediment, garden waste, and trash, or other pollutants from entering on-site drains and public storm channels. Vacuum sweeping will be done by a landscape contractor or other contractor provided by the owner.	Weekly
S1 Storm Drain Stencil SD-13 Storm Drain Systems Signs	Owner	A painted message "No Dumping-Drains to Ocean" shall be placed on each catch basin. The message shall be inspected for legibility annually & repainted as necessary.	Shall be inspected for legibility annually and repainted as necessary.
S3 Trash and Waste Storage Areas SD-32 Trash Enclosures	Owner	Trash enclosure to be inspected for debris and leaking roof. Pick up debris and sweep daily. Repairs to be made upon inspection.	Inspect and repair weekly at minimum. Clean daily.
S4 Efficient Irrigation Systems and Landscape Design	Owner	Implement landscape plans consistent with county water conservation resolutions, which shall include provision of weather-based controllers, rain shutoff devices, drip irrigation heads and recessed finish grade of all landscape areas. Inspect irrigation system for leaks. Observe landscape and adjust watering for plant's needs.	Be inspected bi-weekly after each landscape procedure.
S5 Finish Grade of Landscape	Owner	Landscape to be inspected for depression of 1-2".	Be inspected bi-weekly after each landscape procedure.
S6 Protect Slopes and Channels	Owner	Rip-rap pads to be kept clean of debris and sedimentations.	At the beginning of the wet season and as necessary
Underground Infiltration System	Owner	Observe drawdown time for a storm after completion or following maintenance of the facility, to confirm that the drawdown time (48 hours) has been obtained.	Quarterly and after storm events
MP-51 Vortex Separator	Owner	The Owner shall enter into a contract with a qualified contractor to inspect and maintain the Hydrodynamic Separator unit.	Inspection and Maintenance to be performed quarterly during the first year, and bi-annually thereafter.

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

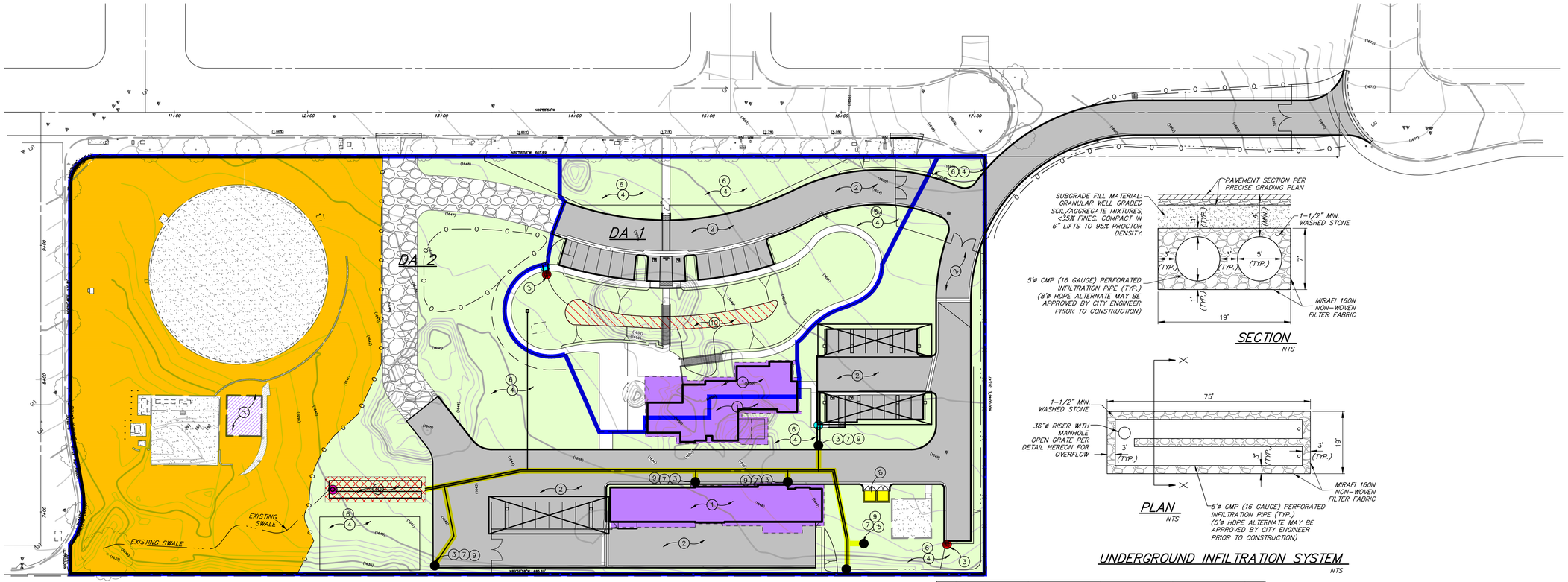
6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements

6.1
Site Plan & Drainage Plan



LEGEND

- LANDSCAPE
- AC PAVEMENT
- CONCRETE/SIDEWALK
- BUILDING
- TRASH ENCLOSURE
- UNDISTURBED PERVIOUS AREA
- UNDERGROUND STORAGE INFILTRATION SYSTEM
- INFILTRATION BASIN
- PERVIOUS GRAVEL ROAD
- DRAINAGE AREA BOUNDARY
- PROP. STORM DRAIN
- DRAINAGE FLOW
- ROOF DRAIN
- PROP. RIP-RAP PAD
- PROP. MANHOLE
- PROP. CATCH BASIN W/ FOSSIL FILTER
- PROP. UNDERWALK DRAIN

BMP LEGEND

(1)	SC-42	BUILDING REPAIR AND CONSTRUCTION
(2)	SC-43	PARKING/STORAGE AREA MAINTENANCE
(3)	SC-44	DRAINAGE MAINTENANCE
(4)	SC-73	LANDSCAPE MAINTENANCE
(5)	SD-11	ROOF RUNOFF CONTROLS
(6)	SD-12	EFFICIENT IRRIGATION
(7)	SD-13	STORM DRAIN SIGNAGE
(8)	SD-32	TRASH ENCLOSURES
(9)	MP-52	DRAIN INSERT
(10)	TC-10	INFILTRATION TRENCH

SC-10	NON-STORMWATER DISCHARGES
SC-11	SPILL PROTECTION, CONTROL AND CLEANUP
SC-41	BUILDING & GROUND MAINTENANCE
SC-60	HOUSEKEEPING PRACTICES
SC-10	SITE DESIGN & LANDSCAPE PLANNING

AREAS

DA 1
TOTAL AREA 45,206 SF
IMPERVIOUS AREA: 19,485 SF
PERVIOUS AREA: 25,721 SF

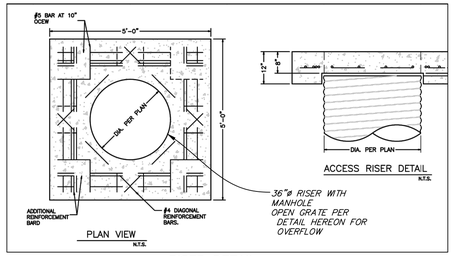
DA 2
TOTAL AREA 169,115 SF
IMPERVIOUS AREA: 65,084 SF
PERVIOUS AREA: 104,031 SF

STORAGE VOLUME		
AREA	DCV REQ'D	VOL. PROV.
DA 1	2,152 CF	6,410 CF
DA 2	7,245 CF	7,507 CF

SECTION
NTS

PLAN
NTS

UNDERGROUND INFILTRATION SYSTEM
NTS



PLAN VIEW
N.T.S.

RISER DETAIL
NTS

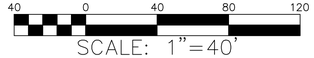


Type M Flat Grate
Approx. 140 sq. in. open area

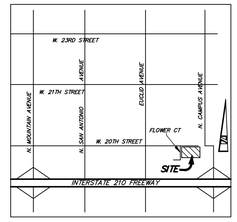
BY TRENCH DRAIN SUPPLY
MODEL NO 1588 OR EQUAL

MANHOLE COVER OPEN GRATE
NTS





SCALE: 1"=40'



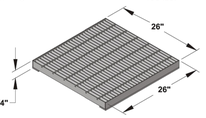
VICINITY MAP
N.T.S.

2424 CAST IRON GRATE

PARKWAY 112 lbs.

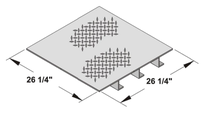
2424 STEEL GRATES

PARKWAY 48 lbs.
TRAFFIC 103 lbs.

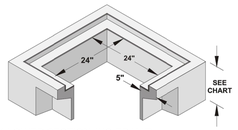


2424 STEEL COVER

PARKWAY 81 lbs.
TRAFFIC 114 lbs.

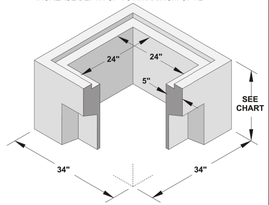


2424 TOP SECTION (*WITH GALVANIZED FRAME*)

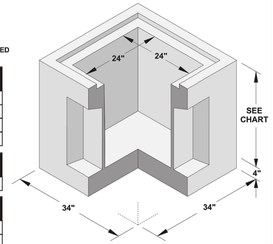


2424 LOWER SECTION (*NO FRAME*)

NOTE: USE 12", 18", 24" LOWERS TO INCREASE DEPTH UP TO A MAXIMUM OF 72"



2424 BOTTOM SECTION (*WITH OR WITHOUT FRAME*)



NOTES:
1. GRATES AND COVERS AVAILABLE PAINTED BLACK OR GALVANIZED
2. "ADA" GRATES AVAILABLE IN PARKWAY & TRAFFIC .
3. "HEEL PROOF" GRATES AVAILABLE IN PARKWAY ONLY
4. A TOP SECTION WITH FRAME MUST BE USED IF BOLT DOWN REQUIRED

TOP SECTION	HT.	LBS	KNOCK-OUTS
2424 T6	6"	270	NONE
2424 T12	12"	495	(4) 6" x 11"
2424 T18	18"	745	(4) 9" x 12"
2424 T24	24"	870	(4) 14" x 14"

EXTENSION SECTION	HT.	LBS	KNOCK-OUTS
2424 E6	6"	270	NONE

LOWER SECTION	HT.	LBS	KNOCK-OUTS
2424 L12	12"	495	(4) 6" x 11"
2424 L18	18"	745	(4) 9" x 12"
2424 L24	24"	870	(4) 14" x 14"

BOTTOM SECTION	HT.	LBS	KNOCK-OUTS
2424 B30	30"	1595	(4) 18" x 18"
2424 B36	36"	1905	(4) 18" x 18"

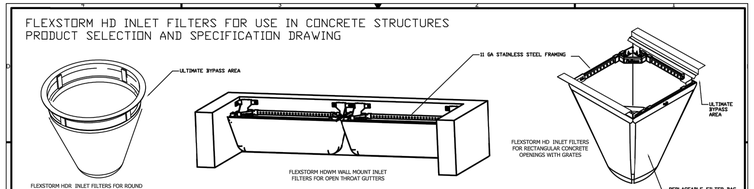
24" x 24" CATCH BASIN

DWG. ISSUE DATE 11-23-99 | REV. ISSUE DATE 02-28-00

BROOKS PRODUCTS
2424 CB

24"x24" CATCH BASIN
NTS

FLEXSTORM HD INLET FILTERS FOR USE IN CONCRETE STRUCTURES
PRODUCT SELECTION AND SPECIFICATION DRAWING



FLEXSTORM HDR Round Concrete Openings with Grates	
Drop Thru Opening Size Dia	Flexstorm Frame P/N
Small: 10.0" - 18.0"	62SHDR
Medium: 18.1" - 24.0"	62MHDR
Large: 24.1" - 36.0"	62LHDR

FLEXSTORM HDWM (Wall Mount) For Open Throat Curb Inlets - Mounted to Wall Beneath Curb Opening	
Curb Opening Size	Flexstorm Frame P/N
Up to 4' curb openings (1 Filter and Mounting Hardware)	62HDWM1
Between 4' and 8' curb openings (2 Filters and Mounting Hardware)	62HDWM2
Between 8' and 12' curb openings (3 Filters and Mounting Hardware)	62HDWM3
Between 12' and 16' curb openings (4 Filters and Mounting Hardware)	62HDWM4

FLEXSTORM HD For Rectangular/Square Concrete Openings with Grates	
Clear Drop Thru Opening Size *(not grate or seat size)*	Flexstorm Frame P/N
Small: 12" x 12" up to 16" x 16" (or 64" max perimeter)	62SHD
Medium: 18" x 18" up to 24" x 24" (or 96" max perimeter)	62MHD
Large: 26" x 26" up to 30" x 30" (or 120" max perimeter)	62LHD
XL: 32" x 32" up to 48" x 48" (or 192" max perimeter) typ 2 pc set	62XLHD

CREATE YOUR ADS FLEXSTORM PART NUMBER BY COMBINING FRAME P/N AND BAG P/N
1. IDENTIFY YOUR FLEXSTORM FRAME PART NUMBER FROM TABLES ABOVE
2. SELECT YOUR BAG PART NUMBER BASED ON APPLICATION NEEDS

FLEXSTORM FILTER BAGS	(22" depth) STD Bag P/N	(12" depth) Short Bag P/N	Clean Water Flow Rate (GPM/SqFt)	Min A.O.S. (US Sieve)
FX: Standard Woven Bag	FX	FX-S	200	40
FX+: Woven w/ MyCelx	FXP	FXP-S	200	40
FXO: Woven w/ Oil Boom	FXO	FXO-S	200	40
PC: Post Construction Bag	PC	PC-S	137	140
PC+: PC Bag w/ MyCelx	PCP	PCP-S	137	140
LL: Litter and Leaf Bag	LL	LL-S	High	3.5
IL: IDOT Non-Woven Bag	IL	IL-S	145	70

3. CREATE YOUR FINAL PART NUMBER TO INCLUDE ON YOUR SPECIFICATION PLANS

Frame P/N from Step 1. | Filter Bag P/N from Step 2.

SPECIFICATIONS FOR STANDARD BAGS BY NOMINAL BAG / FRAME SIZE						
Nominal Bag Size *Matched to Frame Size*	Solids Storage (CuFt)	Filtered Flow Rate at 50% Max (CFS) FX (Woven)	PC (Post Constr)	IL (NonWoven)	* PC Oil Retention (Oz.)	**PC+ Oil Retention (Oz)	**FX+ Oil Retention (Oz)
Small	1.6	1.2	0.8	0.9	79	168	89
Medium	2.1	1.7	1.2	1.3	115	204	89
Large	3.8	2.7	1.8	1.9	173	262	89
XL	4.2	3.6	2.4	2.6	230	319	178
Filtration Efficiency		82%	NA	Large scale 3rd party testing per ASTM D 7351 using 7% concentration USDA Sandy Loam			
TSS (total suspended solids rem)		NA	99%	Large Scale testing at 90 GPM using US Silica OK-110 sand at 1750 mg/L measuring TSS per SM 2540D.			
TPH (tot petroleum hydrocarbons)		NA	96%	Large Scale testing at 90 GPM with used motor oil at 243 mg/L measuring per EPA Method 1664A.			

* PC filter bag at 50% max adsorption capacity
** PC filter bag at 50% capacity and MyCelx skimmer at 100% capacity

NOTES:
1. ALL HD FRAMING IS CONSTRUCTED OF 304 STAINLESS STEEL FOR 25 YEAR LIFE RATING
2. TOTAL BYPASS CAPACITY: BYPASS CAPACITY WILL VARY WITH EACH SIZE DRAINAGE STRUCTURE. FLEXSTORM DESIGNS FRAMING BYPASS TO MEET OR EXCEED THE DESIGN FLOW OF THE PARTICULAR DRAINAGE STRUCTURE
3. UPON ORDERING CONFIRMATION OF THE DOT CALLOUT, PRECAST MAKE AND MODEL, OR DETAILED DIMENSIONAL FORMS MUST BE PROVIDED TO CONFIGURE AND ASSEMBLE YOUR CUSTOMIZED FLEXSTORM INLET FILTER; PART NUMBER ALONE IS NOT SUFFICIENT

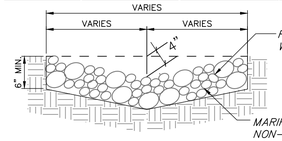
GENERAL INSTALLATION INSTRUCTIONS:
1. REMOVE GRATE
2. DROP FLEXSTORM INLET FILTER ONTO LOAD BEARING LIP OF INLET STRUCTURE
3. REPLACE GRATE



ALL PRODUCTS MANUFACTURED BY INLET & PIPE PROTECTION, INC DISTRIBUTED BY ADS
WWW.INLETFILTERS.COM
(866) 287-8655 PH
(630) 355-3477 FX
INFO@INLETFILTERS.COM

SIZE C | DWG NO FLEXSTORM_HD | REV
SCALE | SHEET 1 OF 1

FLEXSTORM INLET FILTER
NTS



RIP RAP PAD
NTS

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. RICHER
No. 43714
Exp. 3/31/2027
CIVIL
STATE OF CALIFORNIA

LAND DEVELOPMENT DESIGN COMPANY, LLC
2313 E. Philadelphia St., Ste. F
Ontario, CA 91761
(909) 930-1468 • FAX (909) 930-1468
PLANNING • CIVIL • SURVEYING

BENCHMARK

REVISIONS:

PREPARED UNDER THE SUPERVISION OF:
KEVIN J. RICHER
R.C.E.43714 LIC. EXP. 3/31/2027 DATE

APPROVED BY:
DATE

WQMP EXHIBIT

SITE:
SAN ANTONIO WATER
400 E. 20TH STREET
UPLAND, CA 91784

PREPARED FOR:
ERICK PETERSON
401 E. COLUMBIA AVE.
POMONA, CA 91767

DATE: 11/12/2025
DRAWN BY: RAS
DESIGNED BY: KJR
CHECKED BY:
JOB NO. 6773
SCALE 1"=40'
SHEET 1 OF 1 SHEETS

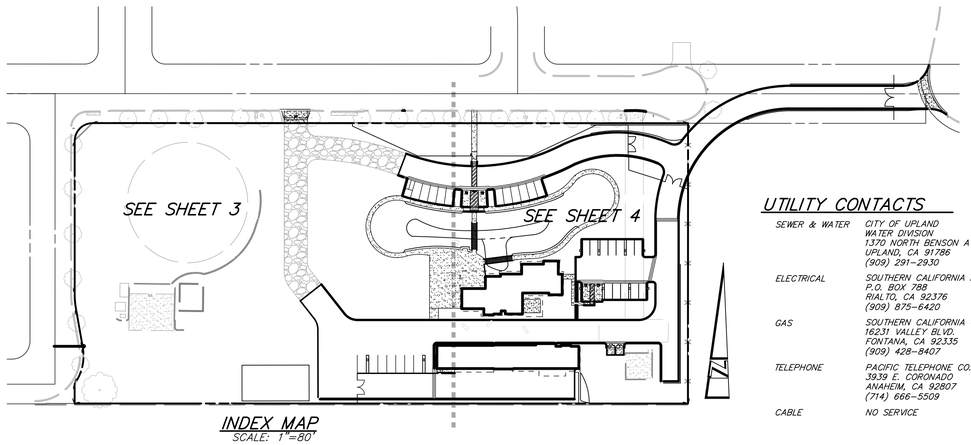
PRECISE GRADING PLAN
FOR
400 E. 20TH STREET

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH CHAPTER 15.52 OF THE UPLAND MUNICIPAL CODE AND ANY SPECIAL REQUIREMENTS OF THE PERMIT. A COPY OF THE APPROVED GRADING PLAN SHALL BE RETAINED ON THE JOB SITE WHILE WORK IS IN PROGRESS. WHEN REFERENCED ON THE PLANS, A COPY OF CITY OF UPLAND STANDARD PLANS SHALL ALSO BE RETAINED ON THE SITE.
2. GRADING SHALL NOT BE STARTED WITHOUT FIRST NOTIFYING THE CITY OF UPLAND PUBLIC WORKS INSPECTOR AT (909) 291-2963. A PRE-GRADING MEETING ON THE SITE IS REQUIRED BEFORE START OF GRADING WITH THE FOLLOWING PEOPLE PRESENT: OWNER, GRADING CONTRACTOR, DESIGN CIVIL ENGINEER, SOILS ENGINEER, ENGINEERING GEOLOGIST, AND CITY INSPECTOR. THE REQUIRED INSPECTIONS FOR GRADING WILL BE EXPLAINED AT THIS MEETING.
3. ISSUANCE OF A GRADING PERMIT DOES NOT ELIMINATE THE NEED FOR PERMITS FROM OTHER AGENCIES WITH REGULATORY RESPONSIBILITIES FOR CONSTRUCTION ACTIVITIES ASSOCIATED WITH THE WORK AUTHORIZED ON THIS PLAN.
4. THE GRADING PERMIT AND AN APPROVED COPY OF THE GRADING PLAN SHALL BE ON THE PERMITTED SITE WHILE WORK IS IN PROGRESS.
5. PRELIMINARY SOIL AND GEOLOGY REPORTS AND ALL SUBSEQUENT REPORTS ARE CONSIDERED A PART OF THE APPROVED GRADING PLAN.
6. THE SOILS ENGINEER AND ENGINEERING GEOLOGIST SHALL PERFORM SUFFICIENT INSPECTIONS AND BE AVAILABLE DURING GRADING AND CONSTRUCTION TO VERIFY COMPLIANCE WITH THE PLANS, SPECIFICATIONS AND THE CODE WITHIN THEIR PURVIEW.
7. THE CIVIL ENGINEER SHALL BE AVAILABLE DURING GRADING TO VERIFY COMPLIANCE WITH THE PLANS, SPECIFICATIONS, CODE AND ANY SPECIAL CONDITIONS OF THE PERMIT WITHIN THEIR PURVIEW.
8. AREAS TO RECEIVE FILL SHALL BE PROPERLY PREPARED AND APPROVED IN WRITING BY THE SOIL ENGINEER BEFORE PLACING FILL.
9. FILLS SHALL BE BENCHED INTO COMPETENT MATERIAL AS REQUIRED BY THE SOILS ENGINEER.
10. ALL EXISTING FILLS SHALL BE APPROVED BY THE SOILS ENGINEER OR REMOVED BEFORE PLACING ADDITIONAL FILLS.
11. FILLS SHALL BE COMPACTED THROUGHOUT TO A MINIMUM OF 90% RELATIVE COMPACTION. AGGREGATE BASE FOR ASPHALTIC AREAS SHALL BE COMPACTED TO A MINIMUM OF 95% RELATIVE COMPACTION. MAXIMUM DENSITY SHALL BE IN ACCORDANCE WITH CALIFORNIA BUILDING CODE (LATEST EDITION).
12. CUT AND FILL SLOPES SHALL BE NO STEEPER THAN 2-FOOT HORIZONTAL TO 1-FOOT VERTICAL (2:1) EXCEPT WHERE SPECIFICALLY APPROVED OTHERWISE.
13. ALL CUT SLOPES SHALL BE INVESTIGATED BOTH DURING AND AFTER GRADING BY THE ENGINEERING GEOLOGIST TO DETERMINE IF ANY SLOPE STABILITY PROBLEM EXISTS. SHOULD EXCAVATION DISCLOSE ANY GEOLOGICAL HAZARDS OR POTENTIAL GEOLOGICAL HAZARDS, THE ENGINEERING GEOLOGIST SHALL SUBMIT RECOMMENDED TREATMENT TO THE CITY INSPECTOR FOR APPROVAL.
14. ALL TRENCH BACKFILLS SHALL BE TESTED AND APPROVED BY THE SOILS ENGINEER PER THE GRADING CODE.
15. ANY EXISTING IRRIGATION LINES AND CISTERNS SHALL BE REMOVED AND/OR CRUSHED IN PLACE AND APPROVED BY THE CITY INSPECTOR AND SOILS ENGINEER.
16. ANY EXISTING WATER WELLS SHALL BE ABANDONED IN COMPLIANCE WITH THE SPECIFICATIONS APPROVED BY SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC HEALTH.
17. ANY EXISTING CESSPOOLS AND SEPTIC TANKS SHALL BE ABANDONED IN COMPLIANCE WITH THE CALIFORNIA PLUMBING CODE TO THE APPROVAL OF THE BUILDING OFFICIAL. A SEPARATE PERMIT MUST BE OBTAINED FROM THE CITY BUILDING DEPARTMENT.
18. THE CITY INSPECTOR, BEFORE EXCAVATION, SHALL APPROVE STOCK PILING OF EXCESS MATERIAL.
19. EXPORT SOIL MUST BE TRANSPORTED TO A LEGAL DUMP OR TO A PERMITTED SITE APPROVED BY THE CITY INSPECTOR.
20. THE PERMITTEE SHALL SUBMIT A HAUL ROUTE PLAN TO THE CITY ENGINEER WHEN EARTH AND/OR DEBRIS IS TRANSPORTED TO OR FROM A PERMITTED SITE ON PUBLIC ROADWAYS.
21. THE PERMITTEE IS RESPONSIBLE FOR DUST CONTROL MEASURES.
22. THE PERMITTEE SHALL GIVE REASONABLE NOTICE TO THE OWNER OF THE ADJOINING LANDS AND BUILDINGS BEFORE BEGINNING EXCAVATIONS, WHICH MAY AFFECT THE LATERAL, AND SUBADJACENT SUPPORT OF THE ADJOINING PROPERTY. THE NOTICE SHALL STATE THE INTENDED DEPTH OF EXCAVATION AND WHEN THE EXCAVATION WILL COMMENCE. THE PERMITTEE OR HIS AGENT SHALL BE RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER GRADING ACTIVITIES.
23. SLOPES EXCEEDING 5 FEET IN HEIGHT SHALL BE PLANTED WITH AN APPROVED PLANT MATERIAL. IN ADDITIONAL, SLOPES EXCEEDING 15 FEET IN HEIGHT SHALL BE PROVIDED WITH AN APPROVED IRRIGATION SYSTEM UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
24. SANITARY FACILITIES SHALL BE MAINTAINED ON THE SITE.
25. THE LOCATION AND PROTECTION OF ALL UTILITIES IS THE RESPONSIBILITY OF THE PERMITTEE.
26. ALL WATER VALVES AND SEWER MANHOLES SHALL REMAIN ACCESSIBLE AND FREE OF DEBRIS THROUGHOUT ALL PHASES OF THE PROJECT.
27. INSTALL 3/4" PLYWOOD FALSE BOTTOMS IN ALL SEWER MANHOLES WITHIN THE CONSTRUCTION AREA. (CHECKED DAILY BY INSPECTOR.)
28. PROVIDE TRAP AT FIRST MANHOLE DOWNSTREAM OF PROPOSED IMPROVEMENTS. (CHECKED DAILY BY INSPECTOR.)
29. APPROVED PROTECTIVE MEASURES AND TEMPORARY DRAINAGE PROVISIONS SHALL BE USED TO PROTECT ADJOINING PROPERTIES DURING GRADING.
30. GRADING OPERATIONS, INCLUDING MAINTENANCE OF EQUIPMENT, SHALL BE CONDUCTED BETWEEN THE HOURS OF 7 A.M. AND 3:30 P.M. MONDAY TROUGH FRIDAY. NO WORK SHALL BE ALLOWED ON WEEKENDS.
    A) ALL CONSTRUCTION VEHICLES OR EQUIPMENT, FIXED OR MOBILE, OPERATED WITHIN 1,000 FEET OF A DWELLING SHALL BE EQUIPPED WITH PROPERLY OPERATION AND MAINTAINED MUFFLERS.
    B) ALL OPERATIONS SHALL COMPLY WITH CITY OF UPLAND NOISE ORDINANCE (CHAPTER 4.5, UNNECESSARY NOISE.)
    C) STOCKPILING AND/OR VEHICLE STAGING AREAS SHALL BE LOCATED AS FAR AS PRACTICABLE FROM DWELLINGS AND WITHIN THE LIMITS OF GRADING PERMIT.
31. GRADING AND EXCAVATION SHALL BE HALTED DURING PERIODS OF HIGH WINDS. ACCORDING TO AQMD MEASURE F-4, HIGH WINDS ARE DEFINED AS 30 MPH OR GREATER. THIS LEVEL OCCURS ONLY UNDER EXTREME CONDITIONS, SUCH AS SANTA ANA WIND CONDITIONS. USE A WATER TRUCK FOR DUST CONTROL.
32. THE CIVIL ENGINEER, AS A CONDITION OF ROUGH GRADE APPROVAL, SHALL PROVIDE A BLUE TOP WITH ACCOMPANYING WITNESS STAKE, SET AT THE CENTER OF EACH PAD REFLECTING THE PAD ELEVATION FOR PRECISE PERMITS AND A BLUE TOP WITH WITNESS STAKE SET AT THE DRAINAGE SWALE HIGH POINT REFLECTING THE HIGH POINT ELEVATION FOR ROUGH GRADING PERMITS.
33. THE ENGINEERING GEOLOGIST SHALL PERFORM PERIODIC INSPECTIONS AND SUBMIT A COMPLETE REPORT AND MAP UPON COMPLETION OF THE ROUGH GRADING.
34. THE GRADING CONTRACTOR SHALL SUBMIT A STATEMENT OF COMPLIANCE TO THE APPROVED GRADING PLAN BEFORE FINAL APPROVAL.
35. IN THE EVENT THAT SOIL CONTAMINATION IS DISCOVERED DURING EXCAVATION OR REMOVAL OF AN EXISTING TANK IS NECESSARY, WORK SHALL BE STOPPED UNTIL A SITE ASSESSMENT AND MITIGATION PLAN HAS BEEN PREPARED, SUBMITTED AND APPROVED BY COUNTY OF SAN BERNARDINO DEPARTMENT OF ENVIRONMENTAL HEALTH.
36. THE DEVELOPER SHALL BE RESPONSIBLE FOR SUBMITTING TO THE CITY PROOF THAT A NOTICE OF INTENT (NOI) FOR THE GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY HAS BEEN FILED WITH AND APPROVED BY THE STATE WATER RESOURCES CONTROL BOARD. CONSTRUCTION SHALL NOT COMMENCE WITHOUT THIS APPROVAL. THE DEVELOPER SHALL BE RESPONSIBLE TO COMPLY WITH THE GENERAL CONSTRUCTION ACTIVITY STORM WATER PERMIT BY IMPLEMENTING THEIR STORM WATER POLLUTION PREVENTION PLAN FOR THE DURATION OF THE PROJECT. INDICATE WDID NUMBER ON PLANS.

LEGAL DESCRIPTION

PORTION LOT 282 ONTARIO COLONY LANDS TOGETHER WITH PORTION OF THE WEST 21.48 FEET OF LOT 281
BEGINNING AT A POINT 33.00 FEET SOUTHERLY OF CENTERLINE OF 20TH STREET SHOWN AS NORTH 89°50'00" WEST AND 21.48 FEET EASTERLY OF EAST LINE OF LOT 282;
THENCE SOUTH 313.86 FEET;
THENCE WEST 685.2 FEET TO A POINT PARALLEL WITH AND 32 FEET EASTERLY OF WESTERLY LINE OF SAID LOT 282;
THENCE NORTH 00°00'44" EAST 22.03 FEET TO BEGINNING OF A NON-TANGENT CURVE CONCAVE NORTHWESTERLY WITH RADIAL BEARING OF NORTH 54°44'11" WEST;
THENCE ALONG SAID CURVE 42.65 FEET WITH RADIUS OF 54 FEET THRU ANGLE OF 45°15'05";
THENCE TO A TANGENT BEARING NORTH 09°59'26" WEST 43.73 FEET TO BEGINNING OF TANGENT CURVE CONCAVE EASTERLY;
THENCE ALONG SAID CURVE 17.10 FEET WITH RADIAL OF 98 FEET THROUGH AN ANGLE OF 10°00'00";
THENCE NORTH 00°00'44" EAST PARALLEL WITH AND 32 FEET EASTERLY OF WEST LINE OF SAID LOT 282 171.20 FEET TO BEGINNING OF TANGENT CURVE CONCAVE SOUTHEASTERLY;
THENCE ALONG SAID CURVE 31.36 FEET WITH RADIUS OF 20 FT THRU AN ANGLE OF 89°50'39" TO A POINT ON A LINE PARALLEL AND DISTANT 33 FEET SOUTHERLY FROM CENTERLINE OF SAID 20TH STREET;
THENCE SOUTH 89°59'00" EAST ALONG SAID PARALLEL LINE A DISTANCE OF 665.69 FEET TO POINT OF BEGINNING.



INDEX MAP
SCALE: 1"=80'

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND APPROXIMATE LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES OR STRUCTURES EXCEPT AS SHOWN ON THESE PLANS. THE ENGINEER ASSUMES NO LIABILITY AS TO THE EXACT LOCATION OF SAID LINES NOR FOR UTILITIES OR IRRIGATION LINES WHOSE LOCATIONS ARE NOT SHOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING ALL UTILITY AND IRRIGATION COMPANIES PRIOR TO WORK ON EXCAVATION TO DETERMINE EXACT LOCATION OF ALL LINES AFFECTING THIS WORK, WHETHER OR NOT SHOWN HEREON, AND FOR ANY DAMAGE OR PROTECTION OF THESE LINES. THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT (USA) PHONE 1-800-277-2600 TWO WORKING DAYS PRIOR TO DIGGING. NO CONSTRUCTION PERMIT ISSUED BY THE PUBLIC WORKS DEPARTMENT, SHALL BE VALID INVOLVING UNDERGROUND FACILITIES, UNLESS THE APPLICANT HAS AN INQUIRY IDENTIFICATION NUMBER ISSUED BY USA.

CONTRACTOR'S RESPONSIBILITY FOR SAFETY

IN SUBMITTING A BID FOR THIS WORK THE CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSED OF CONSTRUCTION OF THIS PROJECT; INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER, THE ENGINEER AND THE CITY OF UPLAND AND ITS AGENTS OR REPRESENTATIVES HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER, THE ENGINEER, AND THE CITY OF UPLAND AND ITS AGENTS OR REPRESENTATIVES.

THE CONTRACTORS AND SUB-CONTRACTORS PERFORMING WORK SHOWN ON OR RELATED TO THESE PLANS SHALL CONDUCT THEIR OPERATIONS SO THAT EMPLOYEES ARE PROVIDED A SAFE PLACE TO WORK AND THE PUBLIC IS PROTECTED. ALL CONTRACTORS AND SUB-CONTRACTORS SHALL COMPLY WITH THE "OCCUPATIONAL SAFETY AND HEALTH REGULATIONS" OF THE U.S. DEPARTMENT OF LABOR AND WITH "CONSTRUCTION SAFETY ORDERS." THE CIVIL ENGINEER SHALL NOT BE RESPONSIBLE IN ANY WAY FOR THE CONTRACTOR OR SUB-CONTRACTORS COMPLIANCE WITH SAID REGULATIONS AND ORDERS.

SURVEY MONUMENT NOTE

SURVEY MONUMENTS THAT EXIST AS SHOWN ON RECORDED MAPS, HIGHWAY MAPS OR POINTS THAT PROVIDE SURVEY CONTROL WITHIN THE CONSTRUCTION AREA, SHALL BE LOCATED AND REFERENCED OUT BY A LICENSED LAND SURVEYOR OR REGISTERED CIVIL ENGINEER (AUTHORIZED TO PRACTICE LAND SURVEYING), AND CORNER RECORDS SHALL BE FILED WITH THE COUNTY SURVEYOR PRIOR TO THE START OF CONSTRUCTION. THESE CORNER RECORDS SHALL DESCRIBE THE MONUMENTS FOUND WITH TIE DISTANCES TO REFERENCE POINTS FOR RESETTING OF THE SURVEY MONUMENT. WHEN CONSTRUCTION IS COMPLETED, MONUMENTS SHALL BE SET AND CORNER RECORDS SHALL BE FILED WITH THE COUNTY SURVEYOR SHOWING THE NEW MONUMENTS.

STATEMENT OF CITY ENGINEER FOR TEMPORARY DRAINAGE AND EROSION CONTROL

BY MY APPROVAL I HEREBY ACCEPT THIS GRADING PLAN AND TEMPORARY EROSION CONTROL PLAN AS MEETING THE PREREQUISITE FOR ISSUANCE OF A GRADING PERMIT AND FOR RECORD PURPOSES.

THIS GRADING PLAN AND THE TEMPORARY EROSION CONTROL PLAN WAS PREPARED UNDER THE DIRECTION OF A FULLY QUALIFIED PROFESSIONAL WHO HAS STATED THAT THE PLAN CONFORMS WITH ALL THE APPLICABLE REQUIREMENTS OF THE CITY. THE DESIGN, ELEVATIONS, DETAILS AND FEATURES OF THE ONSITE GRADING HAVE NOT BEEN REVIEWED BY THE CITY, EXCEPT AS THEY RELATE TO PUBLIC IMPROVEMENTS WITHIN THE ADJACENT RIGHT OF WAYS AND EASEMENTS.

STATEMENT OF CITY ENGINEER

BY MY APPROVAL I HEREBY ACCEPT THIS GRADING PLAN AND TEMPORARY EROSION CONTROL PLAN AS MEETING THE PREREQUISITE FOR ISSUANCE OF A GRADING PERMIT AND FOR RECORD PURPOSES. THIS GRADING PLAN AND THE TEMPORARY EROSION CONTROL PLAN WAS PREPARED UNDER THE DIRECTION OF A FULLY QUALIFIED PROFESSIONAL WHO HAS STATED THAT THE PLAN CONFORMS WITH ALL APPLICABLE REQUIREMENTS OF THE CITY. THE DESIGN, ELEVATIONS, DETAILS AND FEATURES OF THE ONSITE GRADING HAVE NOT BEEN REVIEWED BY THE CITY, EXCEPT AS THEY RELATE TO PUBLIC IMPROVEMENTS WITHIN ADJACENT RIGHT OF WAYS AND EASEMENTS.

DIGALERT
DIAL TOLL FREE 811 AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

BASIS OF BEARING

THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF TWENTIETH STREET AS SHOWN ON TRACT NO. 11355 M.B. 158 PAGES 65-66 AS RECORDED IN THE COUNTY OF SAN BERNARDINO'S RECORDER'S OFFICE.

SAID BEARING: NORTH 89°58'58" WEST

CONSTRUCTION NOTES

		QUANTITY
1	CONSTRUCT 3" AC OVER 3" CLASS II A.B. AC PAVEMENT PER GREENBOOK (B-AR-4000). SOILS ENGINEER TO VERIFY R-VALUE AND PAVEMENT SECTION AFTER GRADING.	11,512 S.F.
2	CONSTRUCT 6" CONCRETE CURB PER CITY UPLAND STD. NO. CU-R-2 TYPE "D."	1,585 L.F.
3	CONSTRUCT 6" CURB & GUTTER PER CITY OF UPLAND STD. NO. CU-R-2 TYPE "A."	1272 L.F.
4	CONSTRUCT 4' WIDE CONCRETE GUTTER PER DETAIL ON SHEET 2.	-----
5	CONSTRUCT 6" THICK CONCRETE PAVEMENT.	1222 S.F.
6	CONSTRUCT 4" THICK CONCRETE SIDEWALK PER CITY OF UPLAND STD. NO. CU-P-3. (PRIVATE)	6,953 S.F.
7	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL ON SHEET 2.	190 L.F.
8	CONSTRUCT 24" CONCRETE CHANNEL PER DETAIL ON SHEET 2.	36 L.F.
9	OMIT 3' CURB PER DETAIL ON SHEET 2.	6 L.F.
10	CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLAN PER SEPARATE PERMIT.	1 EA.
11	PAINT PARKING STRIPING PER ARCHITECTURAL PLANS PER SEPARATE PERMIT.	----
12	CONSTRUCT ADA RAMP PER DETAIL ON SHEET 2.	1 EA.
13	CONSTRUCT ADA PARKING PER DETAIL 1 ON SHEET 2.	2 EA.
14	CONSTRUCT ADA PARKING PER DETAIL 2 ON SHEET 2.	2 EA.
15	CONSTRUCT TRUNCATED DOME PER DETAIL ON SHEET 2.	75 S.F.
16	CONSTRUCT RIP-RAP PAD PER DETAIL ON SHEET 2.	30 S.F.
17	CONSTRUCT UNDERWALK DRAIN PER DETAIL ON SHEET 2.	2 EA.
18	CONSTRUCT UNDERGROUND INFILTRATION SYSTEM PER DETAIL ON SHEET 2.	1 EA.
19	INSTALL 12"ø HDPE (PRIVATE STORM DRAIN).	226 L.F.
20	INSTALL 18"ø HDPE (PRIVATE STORM DRAIN).	381 L.F.
21	INSTALL 18"X18"X12" TEE. (PRIVATE STORM DRAIN)	5 EA.
22	INSTALL 18"ø-90° ELBOW. (PRIVATE STORM DRAIN)	1 EA.
23	CONSTRUCT CANOPY PER ARCHITECTURAL PLAN AND SEPARATE PERMIT.	3 EA.
24	INSTALL 18"ø-11.25° ELBOW. (PRIVATE STORM DRAIN)	3 EA.
25	INSTALL 12"ø-45° ELBOW. (PRIVATE STORM DRAIN)	1 EA.
26	CONSTRUCT 24"X24" BROOKS BOX. INSTALL FLEXSTORM INLET FILTER MODEL NO. 62HD24PCP AND STENCIL PER DETAILS ON SHEET 2.	6 EA.
27	CONSTRUCT 18" CONCRETE PARKING ISALAND LANDING PER CITY OF UPLAND STD. NO. CU-L-5.	206 L.F.
28	CONSTRUCT INFILTRATION BASIN PER ARCHITECTURAL PLAN AND PERMIT.	1 EA.
29	CONSTRUCT WROUGHT IRON FENCE PER ARCHITECTURAL PLAN.	338 L.F.
30	CONSTRUCT 6'-0" BLOCK WALL PER ARCHITECTURAL PLAN PER SEPARATE PERMIT.	248 L.F.
31	CONSTRUCT 6'-0" MAX RETAINING WALL PER ARCHITECTURAL PLAN AND SEPARATE PLAN AND PERMIT.	510 L.F.
32	CONSTRUCT BRIDGE PER SEPARATE PLAN AND PERMIT.	2 EA.
33	CONSTRUCT FULL DEPTH AC PER DETAIL ON SHEET 2.	118 L.F.
34	CONSTRUCT 8" CURB & GUTTER PER CITY OF UPLAND STD. NO. CU-R-2 TYPE "A."	31 L.F.
35	CONSTRUCT DRIVEWAY PER CITY OF UPLAND STD. NO. CU-P-4 TYPE "A". (W=26'; X=3')	1 EA.
36	CONSTRUCT DRIVEWAY PER CITY OF UPLAND STD. NO. CU-P-4 TYPE "B". (W=26'; R=30')	1 EA.
37	CONSTRUCT GRAVEL ROAD PER ARCHITECTURAL PLAN.	827 S.F.
38	CONSTRUCT 0" TO 6" TRANSITION CONCRETE CURB PER DETAIL ON SHEET 2.	2 EA.

REMOVAL NOTES

		QUANTITY
1	REMOVE EXISTING PAVEMENT.	6,428 S.F.
2	REMOVE EXISTING WALL.	355 L.F.
3	REMOVE EXISTING C.L. FENCE.	332 L.F.
4	REMOVE EXISTING METAL TOOL BOX.	1 EA.
5	REMOVE PILE OF ROCKS.	320 S.F.
6	REMOVE EXISTING DRIVEWAY APPROACH	1 EA.
7	REMOVE EXISTING CURB & GUTTER.	91 L.F.
8	REMOVE EXISTING TREE.	2 EA.
9	REMOVE EXISTING UTILITY POLE BY OTHERS.	1 EA.

UTILITY CONTACTS

SEWER & WATER	CITY OF UPLAND WATER DIVISION 1370 NORTH BENSON AVENUE UPLAND, CA 91786 (909) 291-2930
ELECTRICAL	SOUTHERN CALIFORNIA EDISON P.O. BOX 788 RIALTO, CA 92376 (909) 875-6420
GAS	SOUTHERN CALIFORNIA GAS CO. 16231 VALLEY BLVD. FONTANA, CA 92335 (909) 428-8407
TELEPHONE	PACIFIC TELEPHONE CO. 3939 E. CORONADO ANAHEIM, CA 92807 (714) 666-5509
CABLE	NO SERVICE

OWNER

SAN ANTONIO WATER
400 E. 20TH STREET
POMONA, CA 91784

CONTRACTOR

CEDC INC.
ERIK PETERSON
401 E. COLUMBIA AVE.
POMONA, CA 91767
(909) 625-3916

24 HOUR CONTACT

ERIK PETERSON
401 E. COLUMBIA AVE.
POMONA, CA 91767
(909) 625-3916

SOIL ENGINEER

THIS GRADING PLAN HAS BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN CONFORMANCE WITH THE RECOMMENDATIONS AS OUTLINED IN THE FOLLOWING SOILS REPORT FOR THIS PROJECT.

PROJECT NO: 24036-F/BMP
DATE: AUGUST 28, 2024
FIRM NAME: SOILS SOUTHWEST, INC
MALAY K. GUPTA
897 VIA LATA, SUITE N
COLTON, CA 92324
(909) 370-0474

MALAY K. GUPTA
RCE 3178 EXP. 12/31/26

DATE:

REGISTERED PROFESSIONAL ENGINEER
MALAY K. GUPTA
No.31708
Exp. 12/31/2026
CIVIL
STATE OF CALIFORNIA

DECLARATION OF ENGINEER OF RECORDS

I HEREBY DECLARE THAT IN MY PROFESSIONAL OPINION, THE DESIGN OF THE IMPROVEMENTS AS SHOWN ON THESE PLANS COMPLIES WITH THE CURRENT PROFESSIONAL ENGINEER STANDARDS AND PRACTICES. AS THE ENGINEER IN RESPONSIBLE CHARGE OF THE DESIGN OF THESE IMPROVEMENTS, I ACCEPTED FULL RESPONSIBILITY FOR SUCH DESIGN. I UNDERSTAND AND ACKNOWLEDGE THAT THE PLAN CHECK OF THESE PLANS COMPLY WITH THE CITY OF UPLAND IS A REVIEW FOR THE LIMITED PURPOSE OF ENSURING THAT THESE PLANS COMPLY WITH THE CITY STANDARDS AND OTHER APPLICABLE CODES AND ORDINANCES. THE PLAN REVIEW PROCESS IS NOT A DETERMINATION OF THE TECHNICAL ADEQUACY OF THE DESIGN OF THE IMPROVEMENTS. SUCH PLAN CHECK DOES NOT THEREFORE RELIEVE ME OF MY DESIGN RESPONSIBILITY.

AS THE ENGINEER OF RECORD, I AGREE TO DEFEND AND INDEMNITY THE CITY OF UPLAND, ITS OFFICERS, ITS AGENT, AND ITS EMPLOYEES FROM ANY AND LIABILITY, CLAIMS, DAMAGES, OR INJURIES TO ANY PERSON OR PROPERTY ARISING FROM NEGLIGENT ACTS, ERRORS OR OMISSIONS OF THE ENGINEER OF RECORD, HIS EMPLOYEES, HIS AGENT OR HIS CONSULTANTS.

SIGNATURE: KEVIN J. RICHER
RCE 43714 EXP. 3/31/27
DATE: 7/30/26

DESIGN PROFESSIONAL'S STATEMENT

THIS GRADING PLAN WAS PREPARED UNDER MY DIRECTION AND IS IN ACCORDANCE CALIFORNIA BUILDING CODE (LATEST EDITION) AND CHAPTER 15.52 OF THE UPLAND AND MUNICIPAL CODE. THE SITE GRADING AND ALL APPLICABLE DETAILS CONFORM TO THE PROVISIONS OF SERIES CU-E OF THE STANDARD DRAWINGS OF THE CITY OF UPLAND, WITH SERIES ED-E OF THE ENGINEERING DIRECTIVES, AND WITH ANY CITY OF UPLAND CONDITIONS OF APPROVAL CONCERNING GRADING. IN MY OPINION, ADEQUATE PROVISIONS HAVE BEEN MADE FOR THE DRAINAGE OF SURFACE WATERS FROM EACH BUILDING SITE.

LAND DEVELOPMENT DESIGN COMPANY, LLC
FIRM NAME

KEVIN J. RICHER — 43714 — 03/31/27
SIGNATURE — RCE # — EXP.

PROJECT MANAGER
TITLE
7/30/26
DATE

GRADING QUANTITIES

ITEM	CUT (C.Y.) A	FILL (C.Y.) B
1. RAW VOLUME	4,381	3,252
2. OVEREXCAVATION (3.0' AVG. UNDER PADS)	1,326	1,326
3. TOTAL (1A+2A)	5,707	4,578
4. SHRINKAGE (10% 3A) (SUBTOTAL)	574	-----
5. SPOILS	697	-----
6. CUT AVAILABLE (3A-4A+5A)	5,830	-----
7. FILL REQUIRED (1B+2B)	---	4,578

TOTAL EXPORT: 1,252 CY

ACREAGE

GROSS AREA: 222,084S.F. (5.10 ACRES)

DISTURBED AREA

164,800S.F. (3.78 ACRES)

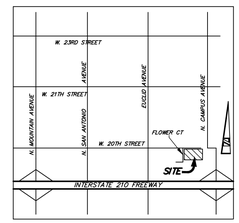
ASSESSOR'S PARCEL NUMBER

1044-091-22-0000

ESTIMATED START DATE:
ESTIMATED COMPLETION DATE:

SHEET INDEX

TITLE SHEET	SHEET 1
DETAILS	SHEET 2
PRECISE GRADING PLAN	SHEET 3
PRECISE GRADING PLAN	SHEET 4
EROSION CONTROL PLAN	SHEET 5
HORIZONTAL CONTROL PLAN	SHEET 6
UTILITY PLAN	SHEET 7



VICINITY MAP
N.T.S.

LEGEND

BW	BACK OF WALK		
EG	EXISTING GRADE	Ⓓ	EXISTING STORM DRAIN
FG	FINISH GRADE	Ⓢ	EXISTING SEWER DRAIN
FS	FINISH SURFACE	Ⓣ	EXISTING TELECOMM MANHOLE
TC	TOP OF CURB		
FL	FLOW LINE		
EP	EDGE OF PAVEMENT	●	FOUND MONUMENT AS NOTED
FF	FINISH FLOOR	♿	EXISTING HANDICAP SIGN
PAD	PAD GRADE		
TW	TOP OF WALL		
TF	TOP OF FOOTING		EXISTING 3'ø PALM TREE
HP	HIGH POINT		
L.S.	LANDSCAPE		EXISTING TREE
LP	LOW POINT		
CF	CURB FACE		EXISTING LIGHT
TG	TOP OF GRATE		EXISTING STREET LIGHT
WI	WROUGHT IRON		
TRW	TOP OF RETAINING WALL		EXISTING TRAFFIC SIGNAL
EDF	EXTRA DEPTH FOOTING		EXISTING GUY-WIRE
SCO	SEWER CLEANOUT		
INV	INVERT OF PIPE		EXISTING CONTOUR
GB	GRADE BREAK		
	TOP OF SLOPE		FINISH CONTOURS
2%	RATE OF SLOPE		
	TOE OF SLOPE		DAYLIGHT LINE
— S —	EXISTING SEWER		
— W —	EXISTING WATER		EXIST. CONCRETE
— E —	EXISTING ELEC.		
— G —	EXISTING GAS		REMOVAL
— T —	EXISTING COMM.		
— x —	EXISTING CHAIN-LINK FENCE		CONCRETE
— □ —	EXISTING WROUGHT IRON FENCE		
	EXISTING FIRE HYDRANT		ASPHALT PAVING
	EXISTING FDC		
	EXISTING POWER POLE		
WV	EXISTING WATER VALVE		
GM	EXISTING GAS METER		
WM	EXISTING WATER METER		
PB	EXISTING PULL BOX		
ICV	EXISTING ICV		

BENCHMARK NO.
LOCATION:

REVISIONS

MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD

PREPARED BY:
LAND DEVELOPMENT DESIGN COMPANY, LLC
425 E. Arrow Highway, #364
Glendora, CA 91740
(909) 930-1466
PLANNING • CIVIL • SURVEYING
KEVIN J. RICHER — 7/30/26
RCE: 43714 LIC. EXP. 03/31/27 — DATE

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. RICHER
No. 43714
CIVIL
STATE OF CALIFORNIA

DRAWN BY: RAS
DESIGNED BY: KJR
CHECKED BY: KJR
RECOMMENDED BY:

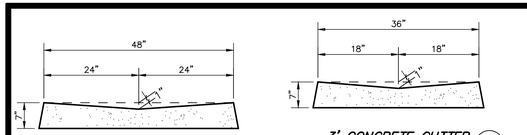
APPROVED BY:
R.C.E. EXP. DATE DATE
RECOMMENDED BY: ENGINEERING STAFF
RECOMMENDED BY: LAND DEVELOPMENT TRANSPORTATION

CITY OF UPLAND GPA-24-0004 DPR-24-0008

PRECISE GRADING PLAN
TITLE SHEET
400 E. 20TH STREET
UPLAND, CA 91784

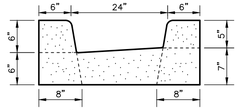
PROJECT NO. SP
SHEET 1 OF 7 SHEETS
DRAWING NO. GP 26-02

PLAN NO.
PROJECT NO.

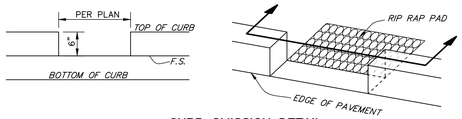


4' CONCRETE GUTTER (4)
NTS

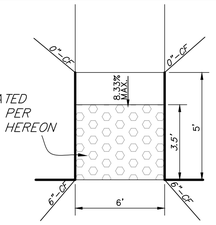
3' CONCRETE GUTTER (7)
NTS



18" CONC. CHANNEL (8)
NTS

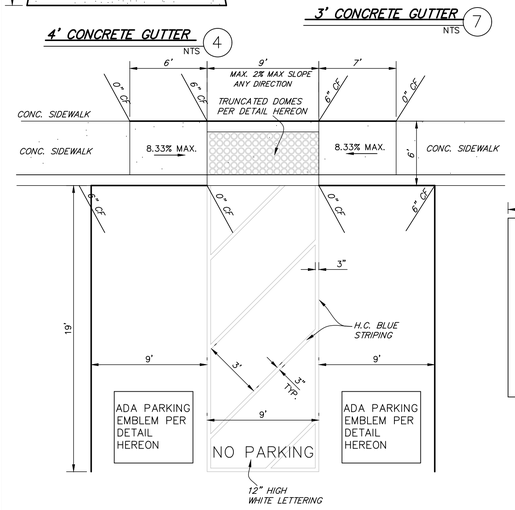


CURB OMISSION DETAIL (9)
NTS

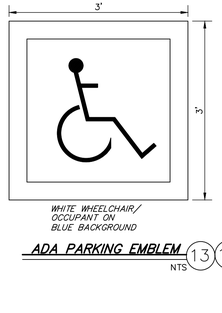


TRUNCATED DOMES PER DETAIL HEREON

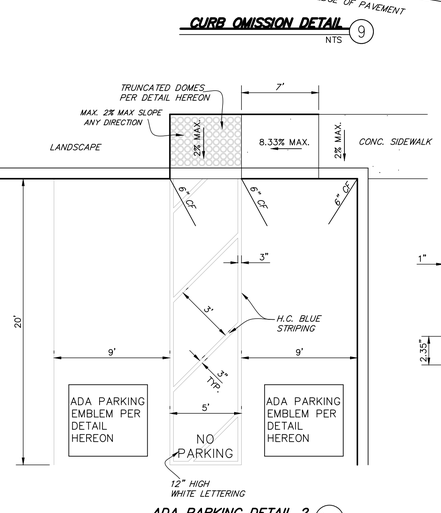
H.C. RAMP DETAIL (12)
NTS



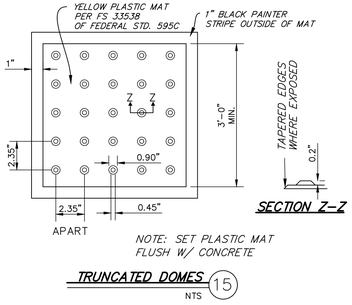
ADA PARKING DETAIL 1 (13)
NTS



ADA PARKING EMBLEM (13)(14)
NTS



ADA PARKING DETAIL 2 (14)
NTS



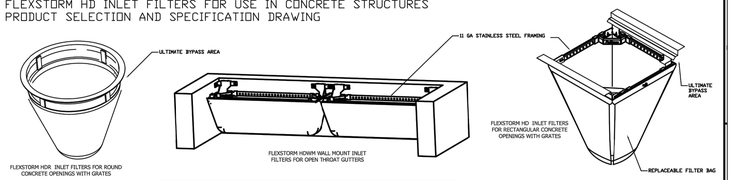
NOTE: SET PLASTIC MAT FLUSH W/ CONCRETE

TRUNCATED DOMES (15)
NTS



STENCIL (26)(27)
NTS

FLEXSTORM HD INLET FILTERS FOR USE IN CONCRETE STRUCTURES
PRODUCT SELECTION AND SPECIFICATION DRAWING



FLEXSTORM HDR Round Concrete Openings with Grates	
Drop Thru Opening Size Dia	Flexstorm Frame P/N
Small: 10.0" - 18.0"	62SHDR
Medium: 18.1" - 24.0"	62MHDR
Large: 24.1" - 36.0"	62LHDR

FLEXSTORM HDWM (Wall Mount) For Open Throat Curb Inlets - Mounted to Wall Beneath Curb Opening	
Curb Opening Size	Flexstorm Frame P/N
Up to 4' curb openings (1 Filter and Mounting Hardware)	62HDWM1
Between 4' and 8' curb openings (2 Filters and Mounting Hardware)	62HDWM2
Between 8' and 12' curb openings (3 Filters and Mounting Hardware)	62HDWM3
Between 12' and 16' curb openings (4 Filters and Mounting Hardware)	62HDWM4

FLEXSTORM HD For Rectangular/Square Concrete Openings with Grates	
Clear Drop Thru Opening Size *(not grate or seat size)*	Flexstorm Frame P/N
Small: 12" x 12" up to 16" x 16" (or 64" max perimeter)	62SHD
Medium: 18" x 18" up to 24" x 24" (or 96" max perimeter)	62MHD
Large: 26" x 26" up to 30" x 30" (or 120" max perimeter)	62LHD
XL: 32" x 32" up to 48" x 48" (or 192" max perimeter) typ 2 pc set	62XLHD

CREATE YOUR ADS FLEXSTORM PART NUMBER BY COMBINING FRAME P/N AND BAG P/N
1. IDENTIFY YOUR FLEXSTORM FRAME PART NUMBER FROM TABLES ABOVE
2. SELECT YOUR BAG PART NUMBER BASED ON APPLICATION NEEDS

FLEXSTORM FILTER BAGS	(22" depth) STD Bag P/N	(12" depth) Short Bag P/N	Clean Water Flow Rate (GPM/SqFt)	Min A.O.S. (US Sieve)
FX: Standard Woven Bag	FX	FX-S	200	40
FX+: Woven w/ MyCelx	FXP	FXP-S	200	40
FXO: Woven w/ Oil Boom	FXO	FXO-S	200	40
PC: Post Construction Bag	PC	PC-S	137	140
PC+: PC Bag w/ MyCelx	PCP	PCP-S	137	140
LL: Litter and Leaf Bag	LL	LL-S	High	3.5
IL: IDOT Non-Woven Bag	IL	IL-S	145	70

3. CREATE YOUR FINAL PART NUMBER TO INCLUDE ON YOUR SPECIFICATION PLANS

Frame P/N from Step 1. | Filter Bag P/N from Step 2.

SPECIFICATIONS FOR STANDARD BAGS BY NOMINAL BAG / FRAME SIZE

Nominal Bag Size *Matched to Frame Size*	Solids Storage (CuFt)	Filtered Flow Rate at 50% Max (CFS) FX (Woven)	PC (Post Constr)	IL (NonWoven)	*PC+ Oil Retention (Oz.)	**FX+ Oil Retention (Oz)
Small	1.6	1.2	0.8	0.9	79	168
Medium	2.1	1.7	1.2	1.3	115	204
Large	3.8	2.7	1.8	1.9	173	262
XL	4.2	3.6	2.4	2.6	230	319
Filtration Efficiency		82%	NA	Large scale 3rd party testing per ASTM D 7351 using 7% concentration USDA Sandy Loam		89
TSS (total suspended solids rem)		NA	99%	Large Scale testing at 90 GPM using US Silica OK-110 sand at 1750 mg/L measuring TSS per SM 2540D.		178
TPH (tot petroleum hydrocarbons)		NA	96%	Large Scale testing at 90 GPM with used motor oil at 243 mg/L measuring per EPA Method 1664A.		

* PC filter bag at 50% max adsorption capacity
** FX filter bag at 50% capacity and MyCelx skimmer at 100% capacity

NOTES:
1. ALL HD FRAMING IS CONSTRUCTED OF 304 STAINLESS STEEL FOR 25 YEAR LIFE RATING
2. TOTAL BYPASS CAPACITY: BYPASS CAPACITY WILL VARY WITH EACH SIZE DRAINAGE STRUCTURE. FLEXSTORM DESIGNS FRAMING BYPASS TO MEET OR EXCEED THE DESIGN FLOW OF THE PARTICULAR DRAINAGE STRUCTURE
3. UPON ORDERING CONFIRMATION IF THE DOT CALLOUT, PRECAST MAKE AND MODEL, OR DETAILED DIMENSIONAL FORMS MUST BE PROVIDED TO CONFIGURE AND ASSEMBLE YOUR CUSTOMIZED FLEXSTORM INLET FILTER; PART NUMBER ALONE IS NOT SUFFICIENT

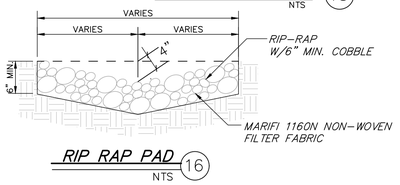
GENERAL INSTALLATION INSTRUCTIONS:
1. REMOVE GRATE
2. DROP FLEXSTORM INLET FILTER ONTO LOAD BEARING LIP OF INLET STRUCTURE
3. REPLACE GRATE



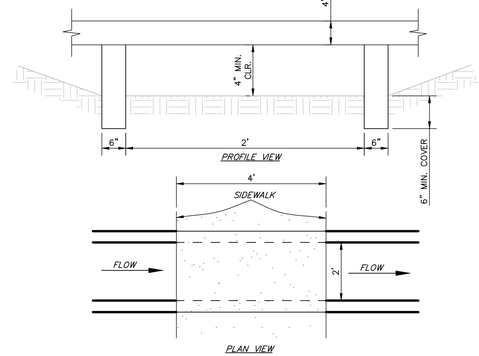
ALL PRODUCTS MANUFACTURED BY INLET & PIPE PROTECTION, INC
DISTRIBUTED BY ADS
WWW.INLETFILTERS.COM
(866) 287-8655 PH
(630) 355-3477 FX
INFO@INLETFILTERS.COM

SIZE	DWG NO	REV
C	FLEXSTORM_HD	
SCALE	SHEET 1 OF 1	

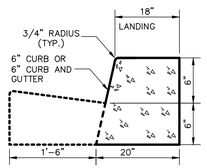
FLEXSTORM INLET FILTER (26)(27)
NTS



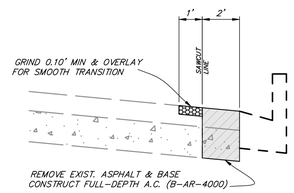
RIP RAP PAD (16)
NTS



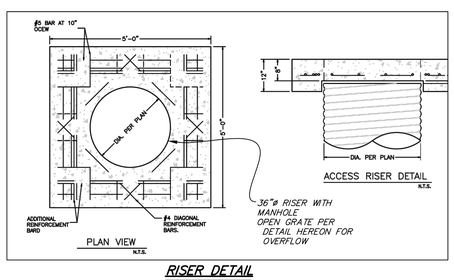
UNDERWALK DRAIN (17)
NTS



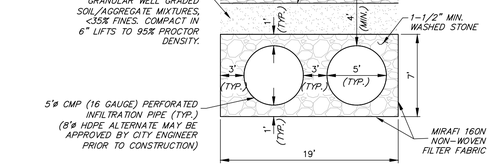
18" CONC. PARKING ISLAND LANDING (27)
NTS



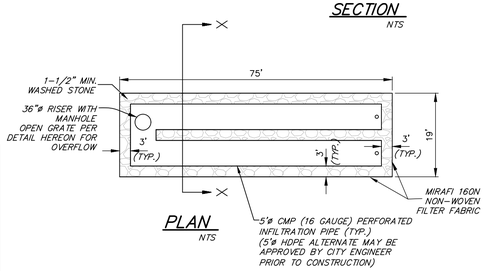
A.C. REMOVAL & REPLACEMENT (33)
NTS



RISER DETAIL
NTS



SECTION
NTS



PLAN
NTS

UNDERGROUND INFILTRATION SYSTEM (18)
NTS

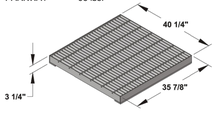


Type M Flat Grate
Approx. 140 sq. in. open area

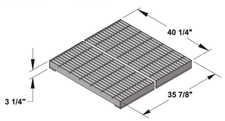
BY TRENCH DRAIN SUPPLY MODEL NO 1588 OR EQUAL

MANHOLE COVER OPEN GRATE
NTS

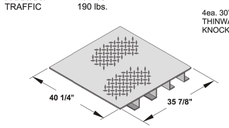
3636 STEEL GRATES - 1 Pc.
PARKWAY 93 lbs.



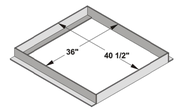
3636 STEEL GRATES - 2 Pc.
TRAFFIC 341 lbs.



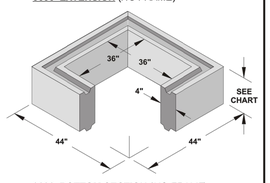
3636 STEEL COVER - 1 Pc.
PARKWAY 152 lbs.
TRAFFIC 190 lbs.



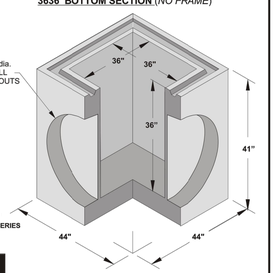
3636 FRAME ONLY



3636 EXTENSION (*NO FRAME*)



3636 BOTTOM SECTION (*NO FRAME*)



NOTES:
1. GRATES AND COVERS AVAILABLE PAINTED BLACK OR GALVANIZED
2. "ADA" OR "HEEL-PROOF" GRATES ARE NOT AVAILABLE FOR THIS SERIES
3. BOLT DOWN GRATES AND COVERS ARE AVAILABLE

EXTENSION SECTION	HT.	LBS	KNOCK-OUTS
3636 E6	6"	525	NONE
3636 E12	12"	1050	NONE

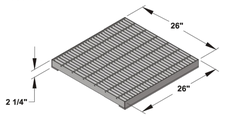
BOTTOM SECTION	HT.	LBS	KNOCK-OUTS
3636 B36	36"	2,230	(4) 30" DIA.

36" x 36" CATCH BASIN
ORIG DWG DATE 11-23-99 | REV DWG DATE 02-18-00
BROOKS PRODUCTS 3636 CB

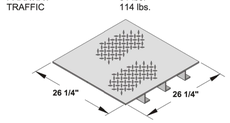
36"X36" BOX DETAIL (27)

2424 CAST IRON GRATE
PARKWAY 112 lbs.

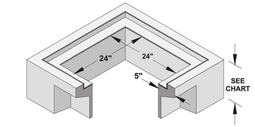
2424 STEEL GRATES
PARKWAY 48 lbs.
TRAFFIC 103 lbs.



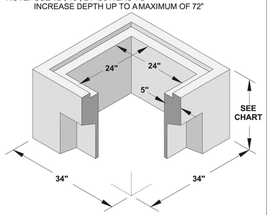
2424 STEEL COVER
PARKWAY 81 lbs.
TRAFFIC 114 lbs.



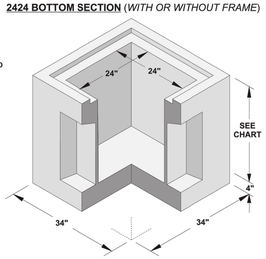
2424 TOP SECTION (*WITH GALVANIZED FRAME*)



2424 LOWER SECTION (*NO FRAME*)
NOTE: USE 12", 18", 24" LOWERS TO INCREASE DEPTH UP TO A MAXIMUM OF 72"



2424 BOTTOM SECTION (*WITH OR WITHOUT FRAME*)



NOTES:
1. GRATES AND COVERS AVAILABLE PAINTED BLACK OR GALVANIZED
2. "ADA" GRATES AVAILABLE IN PARKWAY & TRAFFIC .
3. "HEEL PROOF" GRATES AVAILABLE IN PARKWAY ONLY
4. A TOP SECTION WITH FRAME MUST BE USED IF BOLT DOWN REQUIRED

TOP SECTION	HT.	LBS	KNOCK-OUTS
2424 T6	6"	270	NONE
2424 T12	12"	495	(4) 6" x 11"
2424 T18	18"	745	(4) 9" x 12"
2424 T24	24"	870	(4) 14" x 14"

EXTENSION SECTION	HT.	LBS	KNOCK-OUTS
2424 E6	6"	270	NONE

LOWER SECTION	HT.	LBS	KNOCK-OUTS
2424 L12	12"	495	(4) 6" x 11"
2424 L18	18"	745	(4) 9" x 12"
2424 L24	24"	870	(4) 14" x 14"

BOTTOM SECTION	HT.	LBS	KNOCK-OUTS
2424 B30	30"	1595	(4) 18" x 18"
2424 B36	36"	1905	(4) 18" x 18"

24" x 24" CATCH BASIN
ORIG DWG DATE 11-23-99 | REV DWG DATE 02-28-00
BROOKS PRODUCTS 2424 CB

24"x24" CATCH BASIN (26)
NTS

7-05

DIGALERT
DIAL TOLL FREE 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

BENCHMARK NO.
LOCATION:

REVISIONS

MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD

PREPARED BY:
LAND DEVELOPMENT DESIGN COMPANY, LLC
425 E. Arrow Highway, #364
Glendora, CA 91740
(909) 930-1466
PLANNING • CIVIL • SURVEYING
KEVIN J. RICHER RCE: 43714 LIC. EXP. 03/31/27
7/30/26 DATE

REGISTERED PROFESSIONAL ENGINEER KEVIN J. RICHER No. 43714 CIVIL STATE OF CALIFORNIA

DRAWN BY: RAS
DESIGNED BY: KJR
CHECKED BY: KJR
RECOMMENDED BY:

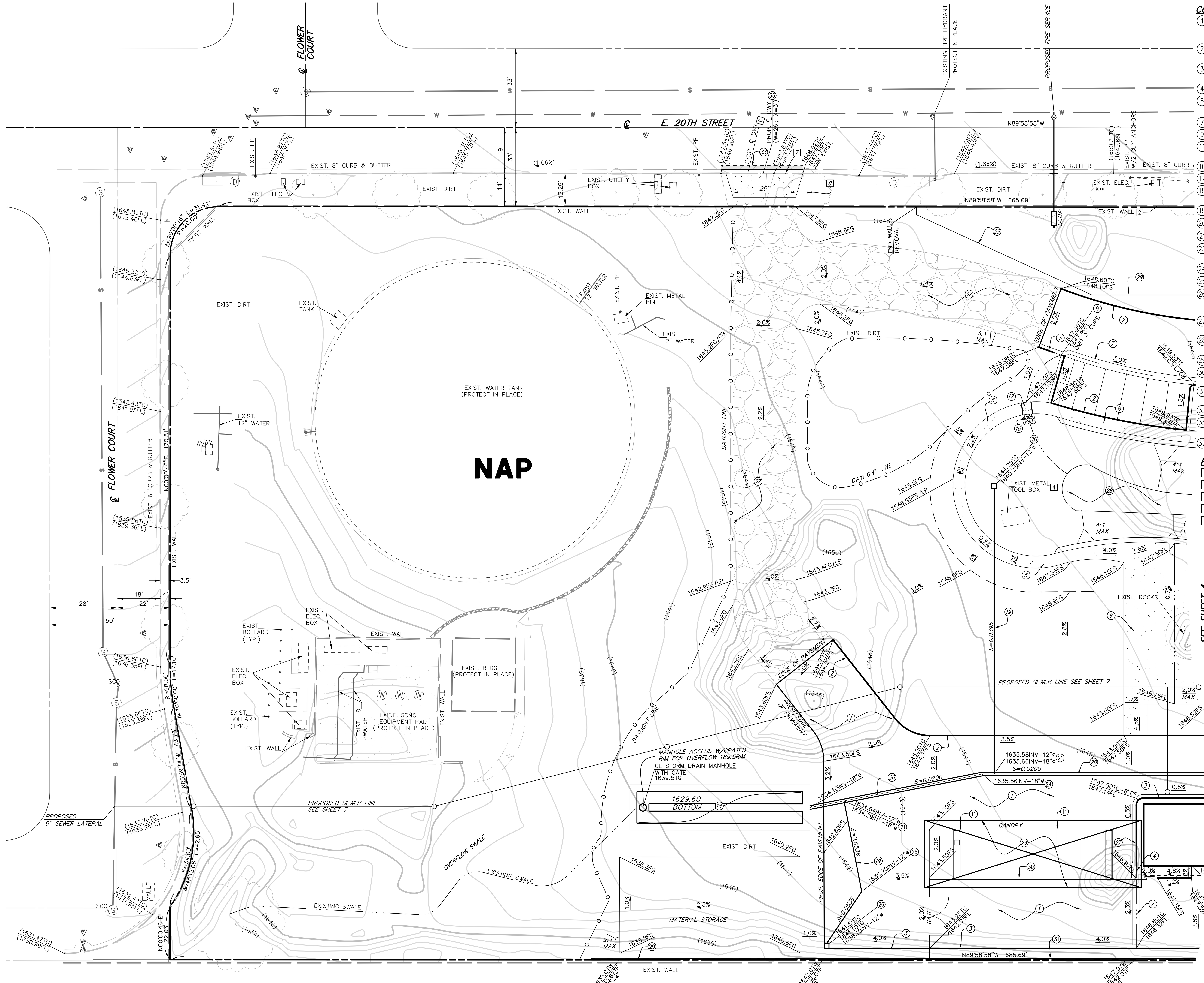
APPROVED BY: DATE
R.C.E. EXP. DATE
RECOMMENDED BY: ENGINEERING STAFF
RECOMMENDED BY: LAND DEVELOPMENT TRANSPORTATION

CITY OF UPLAND
PRECISE GRADING PLAN DETAILS
400 E. 20TH STREET
UPLAND, CA 91784

PROJECT NO. SP
SHEET 2 OF 7 SHEETS
DRAWING NO. GP 26-02

6773

PROJECT NO. PLAN NO.

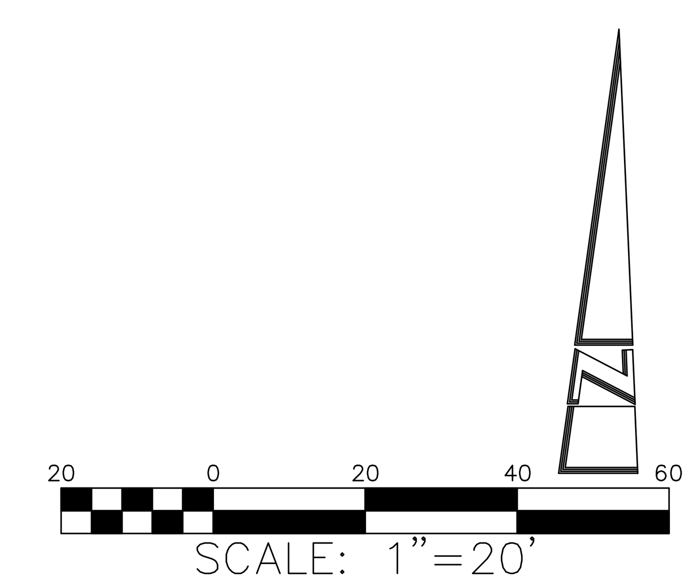


CONSTRUCTION NOTES

1. CONSTRUCT 3" AC OVER 3" CLASS II A.B. AC PAVEMENT PER GREENBOOK (B-AR-4000). SOILS ENGINEER TO VERIFY R-VALUE AND PAVEMENT SECTION AFTER GRADING.
2. CONSTRUCT 6" CONCRETE CURB PER CITY UPLAND STD. NO. CU-R-2 TYPE "D."
3. CONSTRUCT 6" CURB & GUTTER PER CITY OF UPLAND STD. NO. CU-R-2 TYPE "A."
4. CONSTRUCT 4' WIDE CONCRETE GUTTER PER DETAIL ON SHEET 2.
6. CONSTRUCT 4" THICK CONCRETE SIDEWALK PER CITY OF UPLAND STD. NO. CU-P-3. (PRIVATE)
7. CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL ON SHEET 2.
9. OMIT 3' CURB PER DETAIL ON SHEET 2.
11. PAINT PARKING STRIPING PER ARCHITECTURAL PLANS PER SEPARATE PERMIT.
16. CONSTRUCT RIP-RAP PAD PER DETAIL ON SHEET 2.
17. CONSTRUCT UNDERWALK DRAIN PER DETAIL ON SHEET 2.
18. CONSTRUCT UNDERGROUND INFILTRATION SYSTEM PER DETAIL ON SHEET 2.
19. INSTALL 12"ø HDPE (PRIVATE STORM DRAIN).
20. INSTALL 18"ø HDPE (PRIVATE STORM DRAIN).
21. INSTALL 18"X18"X12" TEE. (PRIVATE STORM DRAIN)
23. CONSTRUCT CANOPY PER ARCHITECTURAL PLAN AND SEPARATE PERMIT.
24. INSTALL 18"ø-11.25° ELBOW. (PRIVATE STORM DRAIN)
25. INSTALL 12"ø-45° ELBOW. (PRIVATE STORM DRAIN)
26. CONSTRUCT 24"X24" BROOKS BOX. INSTALL FLEXSTORM INLET FILTER MODEL NO. 62HD24PCP AND STENCIL PER DETAILS ON SHEET 2.
27. CONSTRUCT 18" CONCRETE PARKING ISALAND LANDING PER CITY OF UPLAND STD. NO. CU-L-5.
28. CONSTRUCT INFILTRATION BASIN PER ARCHITECTURAL PLAN AND PERMIT.
29. CONSTRUCT WROUGHT IRON FENCE PER ARCHITECTURAL PLAN.
30. CONSTRUCT 6'-0" BLOCK WALL PER ARCHITECTURAL PLAN PER SEPARATE PERMIT.
31. CONSTRUCT 6'-0" MAX RETAINING WALL PER ARCHITECTURAL PLAN AND SEPARATE PLAN AND PERMIT.
33. CONSTRUCT FULL DEPTH AC PER DETAIL ON SHEET 2.
35. CONSTRUCT DRIVEWAY PER CITY OF UPLAND STD. NO. CU-P-4 TYPE "A". (W=26'; X=3")
37. CONSTRUCT GRAVEL ROAD PER ARCHITECTURAL PLAN.

REMOVAL NOTES

2. REMOVE EXISTING WALL.
4. REMOVE EXISTING METAL TOOL BOX.
6. REMOVE EXISTING DRIVEWAY APPROACH
7. REMOVE EXISTING CURB & GUTTER.
8. REMOVE EXISTING TREE.



6773

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BENCHMARK NO.
LOCATION:

REVISIONS

MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD

PREPARED BY:
LAND DEVELOPMENT DESIGN COMPANY, LLC
425 E. Arrow Highway, #364
Glendora, CA 91740
(909) 930-1466
PLANNING • CIVIL • SURVEYING
KEVIN J. RICHER
RCE: 43714 LIC. EXP. 03/31/27
7/30/26
DATE

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. RICHER
No. 43714
CIVIL
STATE OF CALIFORNIA

DRAWN BY: RAS
DESIGNED BY: KJR
CHECKED BY: KJR
RECOMMENDED BY:

APPROVED BY:
DATE
R.C.E. EXP. DATE
RECOMMENDED BY: RECOMMENDED BY:
ENGINEERING STAFF LAND DEVELOPMENT TRANSPORTATION

CITY OF UPLAND

PRECISE GRADING PLAN

400 E. 20TH STREET
UPLAND, CA 91784

PROJECT NO. SP
SHEET 3 OF 7 SHEETS
DRAWING NO. GP 26-02

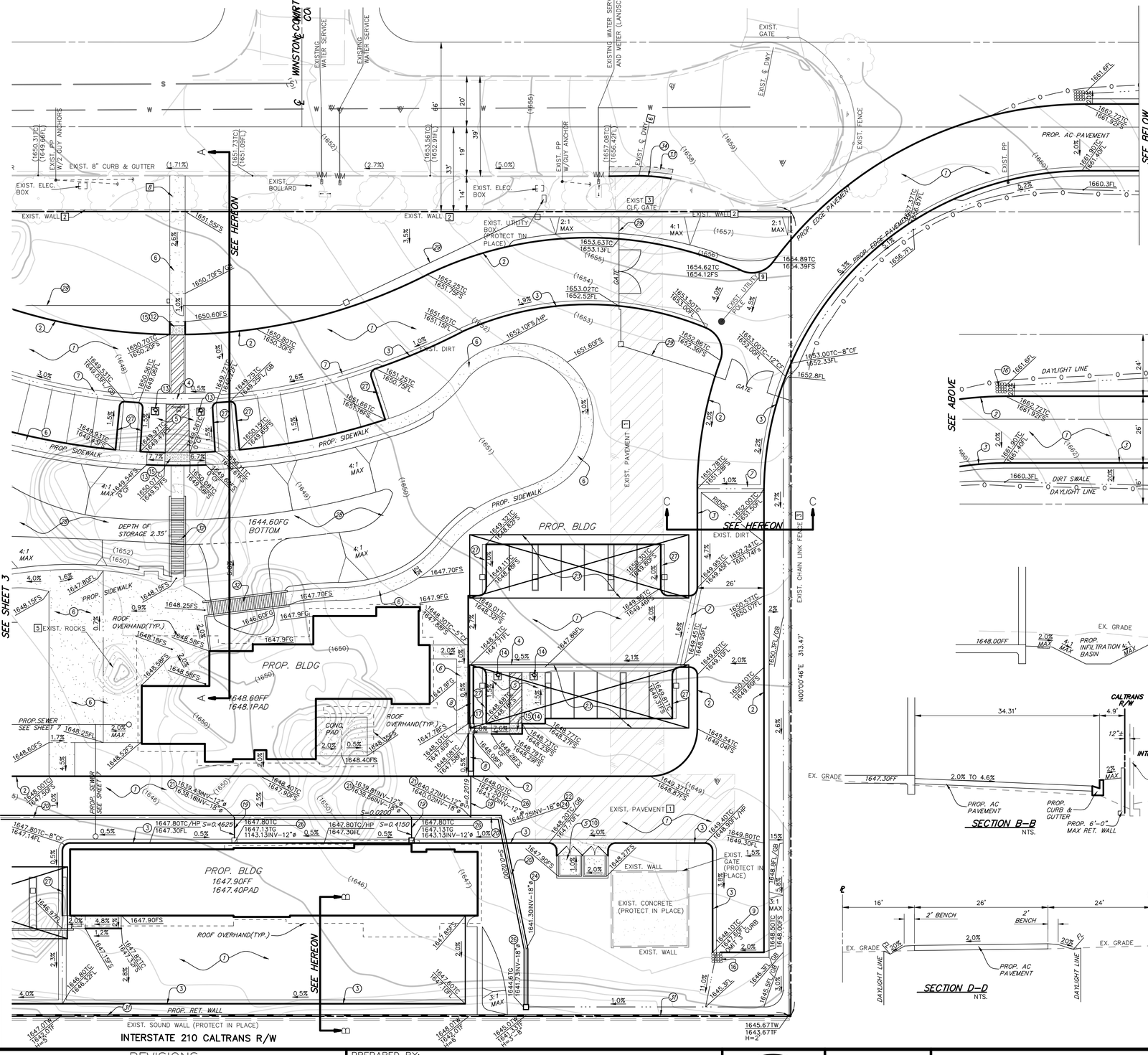
PLAN NO.
PROJECT NO.

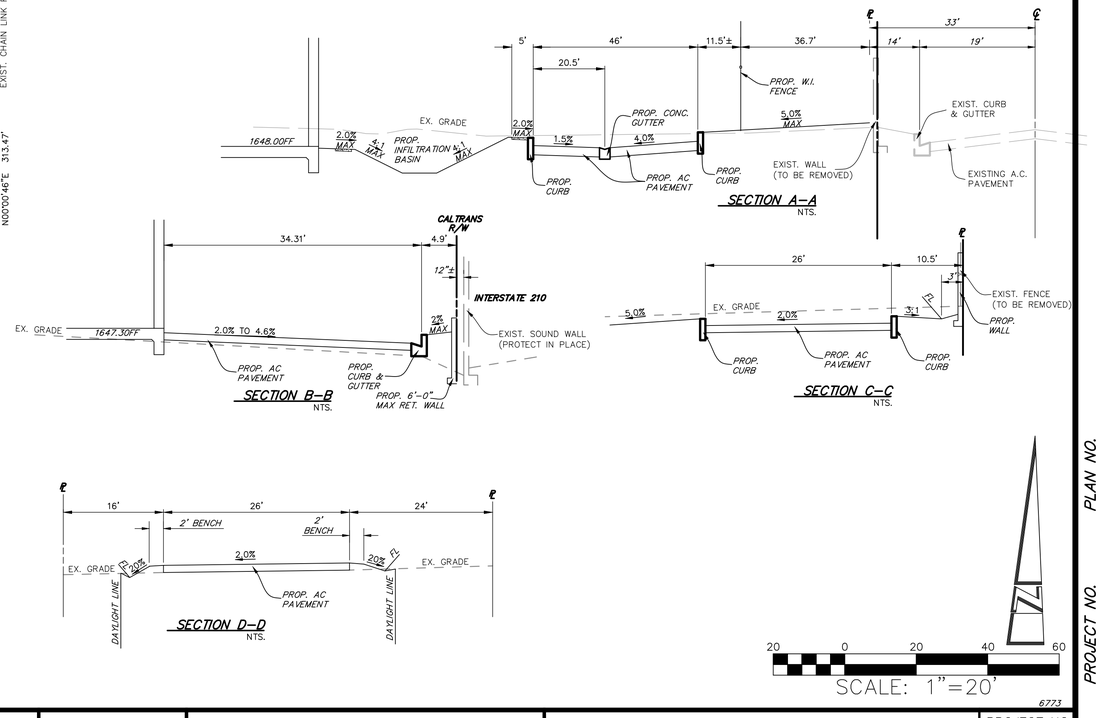
CONSTRUCTION NOTES

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2. CONSTRUCT 6" CONCRETE CURB PER CITY UPLAND STD. NO. CU-R-2 TYPE "D."
3. CONSTRUCT 6" CURB & GUTTER PER CITY OF UPLAND STD. NO. CU-R-2 TYPE "A."
4. CONSTRUCT 4' WIDE CONCRETE GUTTER PER DETAIL ON SHEET 2.
5. CONSTRUCT 6" THICK CONCRETE PAVEMENT.
6. CONSTRUCT 4" THICK CONCRETE SIDEWALK PER CITY OF UPLAND STD. NO. CU-P-3. (PRIVATE)
7. CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL ON SHEET 2.
8. CONSTRUCT 24" CONCRETE CHANNEL PER DETAIL ON SHEET 2.
9. OMIT 3' CURB PER DETAIL ON SHEET 2.
10. CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLAN PER SEPARATE PERMIT.
11. PAINT PARKING STRIPING PER ARCHITECTURAL PLANS PER SEPARATE PERMIT.
12. CONSTRUCT ADA RAMP PER DETAIL ON SHEET 2.
13. CONSTRUCT ADA PARKING PER DETAIL ON SHEET 2.
14. CONSTRUCT ADA PARKING PER DETAIL 1 ON SHEET 2.
15. CONSTRUCT TRUNCATED DOME PER DETAIL 2 ON SHEET 2.
16. CONSTRUCT RIP-RAP PAD PER DETAIL ON SHEET 2.
17. CONSTRUCT UNDERWALK DRAIN PER DETAIL ON SHEET 2.
18. CONSTRUCT UNDERGROUND INFILTRATION SYSTEM PER DETAIL ON SHEET 2.
19. INSTALL 12"ø HDPE (PRIVATE STORM DRAIN).
20. INSTALL 18"ø HDPE (PRIVATE STORM DRAIN).
21. INSTALL 18"X18"X12" TEE. (PRIVATE STORM DRAIN)
22. INSTALL 18"ø-90° ELBOW. (PRIVATE STORM DRAIN)
23. CONSTRUCT CANOPY PER ARCHITECTURAL PLAN AND SEPARATE PERMIT.
24. INSTALL 18"ø-11.25° ELBOW. (PRIVATE STORM DRAIN)
25. INSTALL 12"ø-45° ELBOW. (PRIVATE STORM DRAIN)
26. CONSTRUCT 24"X24" BROOKS BOX. INSTALL FLEXSTORM INLET FILTER MODEL NO. 62HD24PCP AND STENCIL PER DETAILS ON SHEET 2.
27. CONSTRUCT 18" CONCRETE PARKING ISALAND LANDING PER CITY OF UPLAND STD. NO. CU-L-5.
28. CONSTRUCT INFILTRATION BASIN PER ARCHITECTURAL PLAN AND PERMIT.
29. CONSTRUCT WROUGHT IRON FENCE PER ARCHITECTURAL PLAN.
30. CONSTRUCT 6'-0" BLOCK WALL PER ARCHITECTURAL PLAN PER SEPARATE PERMIT.
31. CONSTRUCT 6'-0" MAX RETAINING WALL PER ARCHITECTURAL PLAN AND SEPARATE PLAN AND PERMIT.
32. CONSTRUCT BRIDGE PER SEPARATE PLAN AND PERMIT.
33. CONSTRUCT FULL DEPTH AC PER DETAIL ON SHEET 2.
34. CONSTRUCT 8" CURB & GUTTER PER CITY OF UPLAND STD. NO. CU-R-2 TYPE "A."
36. CONSTRUCT DRIVEWAY PER CITY OF UPLAND STD. NO. CU-P-4 TYPE "B". (W=26'; R=30')
37. CONSTRUCT GRAVEL ROAD PER ARCHITECTURAL PLAN.
38. CONSTRUCT 0" TO 6" TRANSITION CONCRETE CURB PER DETAIL ON SHEET 2.

REMOVAL NOTES

1. REMOVE EXISTING PAVEMENT.
2. REMOVE EXISTING WALL.
3. REMOVE EXISTING C.L. FENCE.
4. REMOVE EXISTING METAL TOOL BOX.
5. REMOVE PILE OF ROCKS.
6. REMOVE EXISTING DRIVEWAY APPROACH
8. REMOVE EXISTING TREE.
9. REMOVE EXISTING UTILITY POLE BY OTHERS.





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BENCHMARK NO.
LOCATION:

REVISIONS

MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD

PREPARED BY:
LAND DEVELOPMENT DESIGN COMPANY, LLC
425 E. Arrow Highway, #364
Glendora, CA 91740
(909) 930-1466
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KEVIN J. RICHER
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DATE

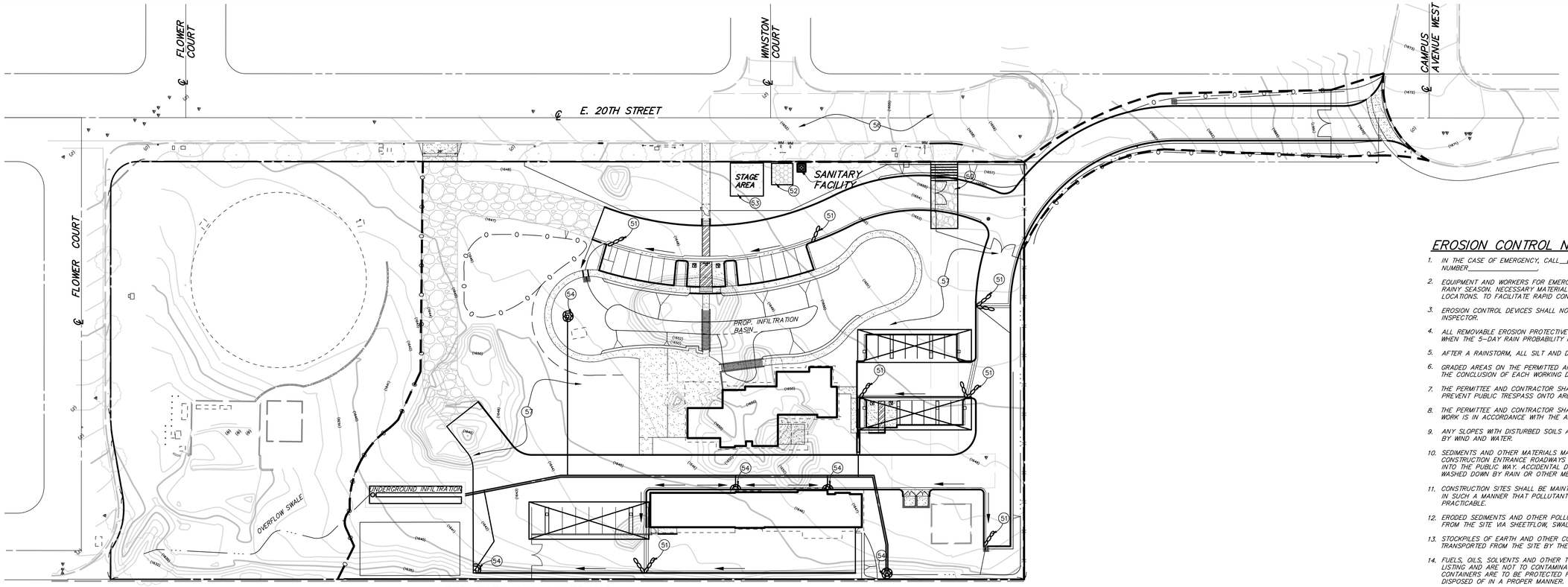
REGISTERED PROFESSIONAL ENGINEER
KEVIN J. RICHER
No. 43714
CIVIL
STATE OF CALIFORNIA

DRAWN BY: RAS
DESIGNED BY: KJR
CHECKED BY: KJR
RECOMMENDED BY:

APPROVED BY:
R.C.E. EXP. DATE DATE
RECOMMENDED BY: ENGINEERING STAFF
RECOMMENDED BY: LAND DEVELOPMENT TRANSPORTATION

CITY OF UPLAND
PRECISE GRADING PLAN
400 E. 20TH STREET
UPLAND, CA 91784

PROJECT NO. SP
SHEET 4 OF 7 SHEETS
DRAWING NO. GP 26-02



SPECIAL NOTE FROM PRIVATE ENGINEER TO CONTRACTOR:

QUALIFIED SWPPP PRACTITIONER (QSP) AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, QSP WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JON SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT LIMITED TO NORMAL WORKING HOURS AND QSP FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONAL HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF DESIGN PROFESSIONAL.

EROSION CONTROL NOTES

1. IN THE CASE OF EMERGENCY, CALL ERIK PETERSON AT WORK NUMBER (909) 625-3916 OR HOME NUMBER_____.
2. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. NECESSARY MATERIALS SHALL BE AVAILABLE ON SITE AND STOCKPILED AT CONVENIENT LOCATIONS. TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS IMMINENT.
3. EROSION CONTROL DEVICES SHALL NOT BE MOVED OR MODIFIED WITHOUT THE APPROVAL OF THE CITY INSPECTOR.
4. ALL REMOVABLE EROSION PROTECTIVE DEVICES SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE 5-DAY RAIN PROBABILITY FORECAST EXCEEDS 40%.
5. AFTER A RAINSTORM, ALL SILT AND DEBRIS SHALL BE REMOVED FROM STREETS, CHECK BERMS AND BASINS.
6. GRADED AREAS ON THE PERMITTED AREA PERIMETER MUST DRAIN AWAY FROM THE FACE OF SLOPES AT THE CONCLUSION OF EACH WORKING DAY. DRAINAGE IS TO BE DIRECTED TOWARD DESILTING FACILITIES.
7. THE PERMITTEE AND CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATER CREATES A HAZARDOUS CONDITION.
8. THE PERMITTEE AND CONTRACTOR SHALL INSPECT THE EROSION CONTROL WORK AND ENSURE THAT THE WORK IS IN ACCORDANCE WITH THE APPROVED PLANS.
9. ANY SLOPES WITH DISTURBED SOILS ARE DENUDED VEGETATION MUST BE STABILIZED TO INHIBIT EROSION BY WIND AND WATER.
10. SEDIMENTS AND OTHER MATERIALS MAY NOT BE TRACED FROM THE SITE BY VEHICLE TRAFFIC. THE CONSTRUCTION ENTRANCE ROADWAYS MUST BE STABILIZED TO INHIBIT SEDIMENTS FROM BEING DEPOSITED INTO THE PUBLIC WAY. ACCIDENTAL DEPOSITIONS MUST BE SWEPT UP IMMEDIATELY AND MAY NOT BE WASHED DOWN BY RAIN OR OTHER MEANS.
11. CONSTRUCTION SITES SHALL BE MAINTAINED BY IMPLEMENTATION OF BEST MANAGEMENT PRACTICES (BMP) IN SUCH A MANNER THAT POLLUTANTS ARE NOT DISCHARGED FROM THE SITE TO THE MAXIMUM EXTENT PRACTICABLE.
12. ERODED SEDIMENTS AND OTHER POLLUTANTS MUST BE RETAINED ON SITE AND MAY NOT BE TRANSPORTED FROM THE SITE VIA SHEETFLOW, SWALES, AREA DRAINS, NATURAL DRAINAGE OR WIND.
13. STOCKPILES OF EARTH AND OTHER CONSTRUCTION RELATED MATERIALS MUST BE PROTECTED FROM BEING TRANSPORTED FROM THE SITE BY THE FORCES OF WIND AND WATER.
14. FUELS, OILS, SOLVENTS AND OTHER TOXIC MATERIALS MUST BE STORED IN ACCORDANCE WITH THEIR LISTING AND ARE NOT TO CONTAMINATE THE SOIL AND SURFACE WATERS. ALL APPROVED STORAGE CONTAINERS ARE TO BE PROTECTED FROM THE WEATHER. SPILLS MUST BE CLEANED UP IMMEDIATELY AND DISPOSED OF IN A PROPER MANNER. SPILLS MAY NOT BE WASHED INTO THE DRAINAGE SYSTEM.
15. EXCESS OR WASTE CONCRETE MAY NOT BE WASHED INTO THE PUBLIC RIGHT-OF-WAY OR ANY OTHER DRAINAGE SYSTEM. PROVISIONS SHALL BE MADE TO RETAIN CONCRETE WASTES ON SITE UNTIL THEY CAN BE DISPOSED OF AS A SOLID WASTE.
16. ALL NON-STORMWATER DISCHARGES, UNLESS EXPECTED OR AUTHORIZED BY AN NPDES PERMIT, REQUIRE PRIOR APPROVAL BY THE STATE WATER RESOURCES CONTROL BOARD.
17. TRASH AND CONSTRUCTION RELATED SOLID WASTES MUST BE DEPOSITED INTO A COVERED RECEPTACLE TO PREVENT CONTAMINATION OF RAINWATER AND DISPERSAL BY WIND.

EROSION CONTROL NOTES

		QUANTITY
50	CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE PER DETAIL HEREON AND PER TC-1 OF THE CALIFORNIA STORMWATER BMP HANDBOOK.	1 EA.
51	CONSTRUCT GRAVEL BAG VELOCITY REDUCER PER DETAIL HEREON.	10 EA.
52	CONSTRUCT CONCRETE TRUCK WASHOUT PER DETAIL HEREON.	1 EA.
53	CONSTRUCT STAGING AREA PER DETAIL HEREON.	1 EA.
54	CONSTRUCT CATCH BASIN CHECK DAM PER DETAIL HEREON AND PER SE-10 OF THE CALIFORNIA STORMWATER BMP HANDBOOK.	5 EA.
55	CONSTRUCT SILT FENCE PER DETAIL HEREON AND PER SE-1 OF THE CALIFORNIA STORMWATER BMP HANDBOOK.	1,460 L.F.
56	CONDUCT STREET SWEEPING AS NEEDED PER SE-7 OF THE CALIFORNIA STORMWATER BMP HANDBOOK.	----
57	APPLY WIND EROSION CONTROL AS NEEDED PER WE-1 OF THE CALIFORNIA STORMWATER BMP HANDBOOK.	----

LEGEND:

- STABILIZED CONSTRUCTION ENTRANCE PER DETAIL HEREON
- CEMENT TRUCK WASH AREA PER DETAIL HEREON.
- CONSTRUCTION STAGING AREA PER DETAIL HEREON.
- PROPOSED SILT FENCE
- PROPOSED GRAVEL BAGS
- DRAINAGE FLOW

DESIGN PROFESSIONAL'S STATEMENT TEMPORARY DRAINAGE AND EROSION CONTROL

THIS DRAINAGE AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION. BERMS, SWALES, SANDBAGS AND OTHER TEMPORARY DRAINAGE FACILITIES SHOWN HERE ARE TO BE INSTALLED AND MAINTAINED DURING THE CONSTRUCTION PHASE OF THE PROJECT.

IN MY OPINION, ADEQUATE PROVISIONS HAVE BEEN MADE TO PROVIDE DRAINAGE OF SURFACE WATER FROM THE SITE WITHOUT CAUSING FLOODING OR SEDIMENTATION PROBLEMS ON PUBLIC RIGHTS-OF-WAY OR SURROUNDING PRIVATE PROPERTY.

LAND DEVELOPMENT DESIGN COMPANY, LLC
FIRM NAME

KEVIN J. RICHER RCE 43714 EXP. 03/31/27

PROJECT MANAGER
TITLE

7/30/26
DATE

40 0 40 80 120
SCALE: 1"=40'

24 HOURS CONTACT

WDID# 8

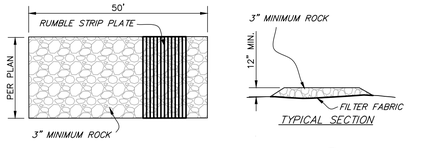
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PLAN NO.

PROJECT NO.

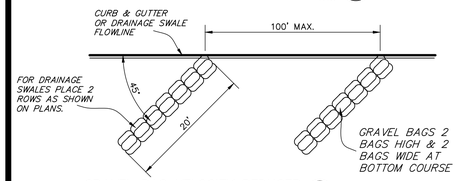
STABILIZED CONSTRUCTION ENTRANCE DETAIL (50)

NTS



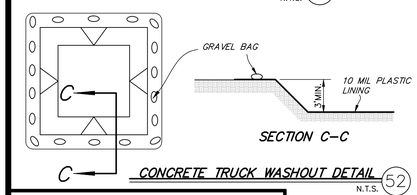
GRAVEL BAG VELOCITY REDUCER (51)

N.T.S.



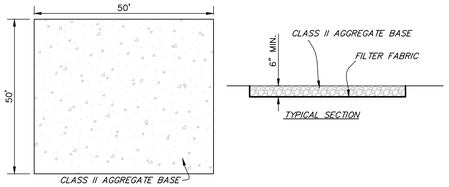
CONCRETE TRUCK WASHOUT DETAIL (52)

N.T.S.



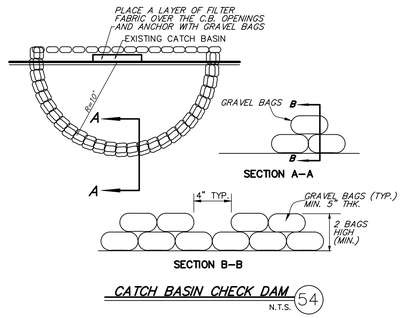
CONSTRUCTION STAGING AREA DETAIL (53)

N.T.S.



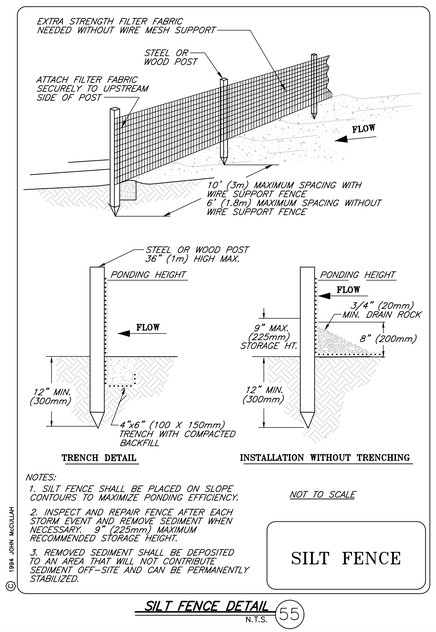
CATCH BASIN CHECK DAM (54)

N.T.S.



SILT FENCE DETAIL (55)

N.T.S.



DIGALERT
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RECOMMENDED BY:

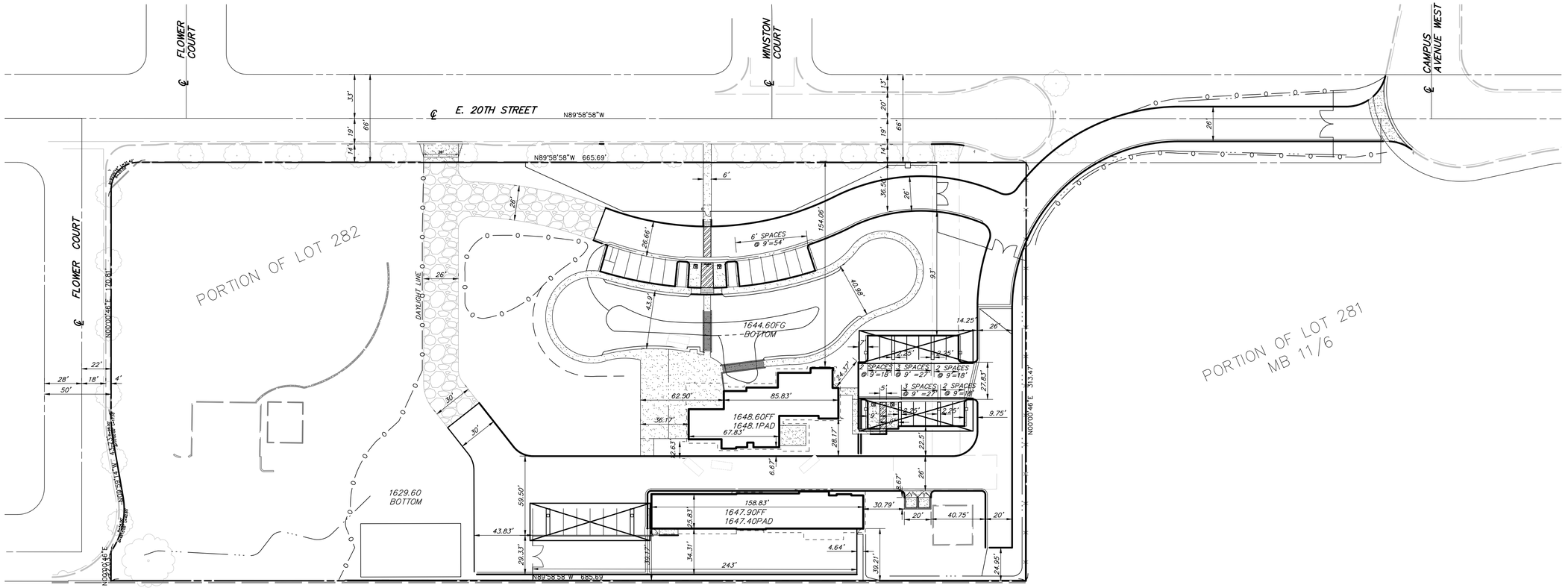
APPROVED BY:
R.C.E. EXP. DATE DATE
RECOMMENDED BY: ENGINEERING STAFF
RECOMMENDED BY: LAND DEVELOPMENT TRANSPORTATION

CITY OF UPLAND

EROSION CONTROL PLAN

400 E. 20TH STREET
UPLAND, CA 91784

PROJECT NO. SP
SHEET 5 OF 7 SHEETS
DRAWING NO. GP 26-02



40 0 40 80 120

SCALE: 1"=40'

6773

PLAN NO.

PROJECT NO.

DIGALERT

DIAL TOLL FREE 811 AT LEAST TWO DAYS BEFORE YOU DIG

UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

BENCHMARK NO.

LOCATION:

REVISIONS

MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD

PREPARED BY:

LAND DEVELOPMENT DESIGN COMPANY, LLC

425 E. Arrow Highway, #364
Glendora, CA 91740
(909) 930-1466

PLANNING • CIVIL • SURVEYING

KEVIN J. RICHER
RCE: 43714 LIC. EXP. 03/31/27

7/30/26
DATE

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. RICHER
No. 43714
CIVIL
STATE OF CALIFORNIA

DRAWN BY: RAS

DESIGNED BY: KJR

CHECKED BY: KJR

RECOMMENDED BY:

APPROVED BY:

R.C.E. EXP. DATE DATE

RECOMMENDED BY: ENGINEERING STAFF

RECOMMENDED BY: LAND DEVELOPMENT TRANSPORTATION

CITY OF UPLAND

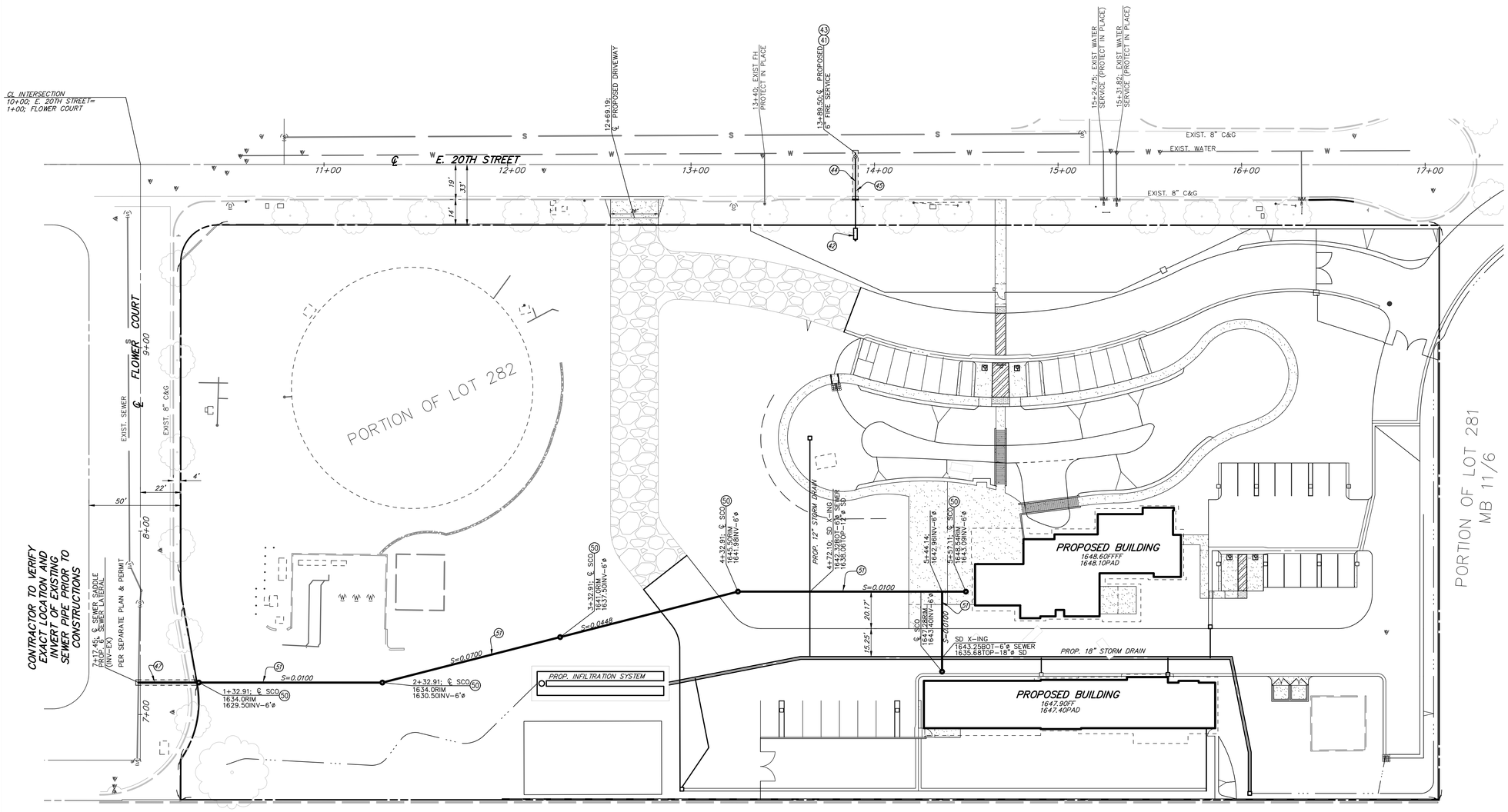
HORIZONTAL CONTROL PLAN

400 E. 20TH STREET
UPLAND, CA 91784

PROJECT NO. SP

SHEET 6 OF 7 SHEETS

DRAWING NO. GP 26-02



CONSTRUCTION IN THE PUBLIC RIGHT-OF-WAY REQUIRES A SEPARATE ENCROACHMENT PERMIT

CONTRACTOR TO NOTIFY AFFECTED WATER USERS A MINIMUM OF 72 HOURS PRIOR TO SHUT DOWN OF WATER SERVICE IF APPLICABLE

CONSTRUCTION NOTES

		QUANTITIES
(41)	CONSTRUCT 12"x8"TAPPING SLEEVE WITH 8" GATE VALVE PER CITY OF UPLAND STANDARD DRAWING W-6.	1 EA.
(42)	CONSTRUCT 8" ABOVE GROUND FIRE SERVICE WITH 8" DOUBLE CHECK DETECTOR CHECK VALVE ASSEMBLY WITH 4 WAY FIRE DEPARTMENT CONNECTION PER CITY UPLAND STANDARD W-17.	1 EA.
(43)	INSTALL 8" GATE VALVE AND VALVE BOX PER CITY OF UPLAND STANDARDS W-07 & W-09.	1 EA.
(44)	CONSTRUCT 8" CLM&C WATER PIPE.	41 L.F.
(45)	SAWCUT, REMOVE, AND REPLACE AC/BASE PER CITY OF UPLAND STANDARD CU-Z-3. TRENCH, BACKFILL AND PAVEMENT REPLACEMENT PER CITY OF UPLAND STANDARD W-23.	76 S.F.

CONSTRUCTION NOTES: PRIVATE SEWER

		QUANTITIES
(50)	CONSTRUCT SEWER CLEANOUT PER CITY OF UPLAND STANDARD CU-Z-4.	5 EA.
(51)	CONSTRUCT 6" PVC SDR35 SEWER PIPE.	1,858 L.F.

WATER & SEWER GENERAL NOTES

1. ALL WORK AND MATERIAL SHALL CONFORM TO THE HIGHER STANDARD IN EITHER "STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF WATER MAINS AND APPURTENANCES, APRIL 2011" ON FILE AT THE PUBLIC WORKS DEPARTMENT, CITY OF UPLAND, OR "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION," LATEST ISSUE AND AMENDMENTS, KNOWN AS THE "GREEN BOOK."
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR LOCATING AND PROTECTING FROM DAMAGE ALL EXISTING FACILITIES AND IMPROVEMENTS WHETHER OR NOT SHOWN ON THESE PLANS. THE FACILITIES AND IMPROVEMENTS ARE BELIEVED TO BE CORRECTLY SHOWN BUT THE CONTRACTOR IS REQUIRED TO SATISFY HIMSELF AS TO THE COMPLETENESS AND ACCURACY OF THE LOCATIONS.
3. SAN ANTONIO WATER COMPANY, 139 N. EUCLID AVENUE, UPLAND, (909) 982-4107, MAY HAVE WATER LINES IN THIS AREA. CONTACT THEM FOR LOCATION, SIZE, AND DEPTH OF LINES, AND OTHER PERTINENT INFORMATION.
4. QUANTITIES SHOWN ON THE PLANS ARE ESTIMATED. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO THE ACCURACY OF QUANTITIES BEFORE BIDDING ON ANY ITEM.
5. THE CONTRACTOR SHALL OBTAIN A PERMIT FROM THE STATE OF CALIFORNIA, DEPARTMENT OF INDUSTRIAL RELATIONS, DIVISION OF INDUSTRIAL SAFETY, BEFORE STARTING THE EXCAVATION OF ANY TRENCH FIVE FEET OR MORE IN DEPTH. SHORING, BRACING, SLOPING AND ALL OTHER PROVISIONS FOR WORKER PROTECTION SHALL CONFORM TO THE PROVISIONS CONTAINED IN ARTICLE 6 OF THE STATE OF CALIFORNIA, DEPARTMENT OF INDUSTRIAL RELATIONS CONSTRUCTION SAFETY ORDERS, EFFECTIVE AUGUST 8, 1965, AND AS AMENDED JULY 27, 1973. IF VARIATION FROM THESE STANDARDS IS DESIRED, A DETAILED PLAN SHALL BE PREPARED BY A REGISTERED CIVIL ENGINEER AND SUBMITTED TO THE PUBLIC WORKS DIRECTOR FOR APPROVAL.
6. ALL WATER AND SEWER MAINS SHALL MEET THE STATE OF CALIFORNIA, DEPARTMENT OF HEALTH REQUIREMENTS FOR THE SEPARATION BETWEEN WATER MAINS AND SANITARY SEWER.
7. THE CONTRACTOR IS REQUIRED TO REPAIR THE EXISTING PAVEMENT WHICH IS REMOVED OR DAMAGED BY HIS OPERATIONS IN ACCORDANCE WITH STANDARD DRAWING ORDINANCE NO. 1841 AND CU-Z-3 UNLESS ARRANGEMENTS ARE MADE WHICH COORDINATE STREET PAVING IN A MANNER ACCEPTABLE TO AND APPROVED BY THE PUBLIC WORKS DIRECTOR.
8. BEFORE CONNECTING TO THE CITY WATER SYSTEM, THE DEVELOPER MUST MEET THE REQUIREMENTS OF SECTION 13.12.130 OF THE UPLAND MUNICIPAL CODE RELATING TO THE TRANSFER OF WATER STOCK TO THE CITY OF UPLAND.
9. SERVICE LATERALS ARE TO BE PLACED AT THE CENTER THIRD OF THE LOT UNLESS OTHERWISE APPROVED BY THE CITY OF UPLAND.
10. SERVICE LATERALS ARE TO BE INSTALLED PER STANDARD DRAWING W.01 OR W.03, ON FILE AT THE CITY OF UPLAND WATER DEPARTMENT.
11. FIRE HYDRANTS SHALL BE INSTALLED PER STANDARD DRAWING W.05 ON FILE AT THE CITY OF UPLAND WATER DEPARTMENT.
12. CONNECTIONS TO EXISTING WATER MAINS SHALL BE BY "HOT TAP."
13. MINIMUM COVER OF WATER LINES SHALL BE AS FOLLOWS:

DIAMETER OF PIPE	MINIMUM COVER
2"	24"
4"	30"
6"	36"
8"	42"
10"	48"
12"	48"
14"	52"

14. SADDLE CONNECTIONS ARE NOT PERMITTED TO THE SEWER MAIN. NEW CONNECTIONS REQUIRE A "TEE" OR "WYE" SECTION TO BE PLACED.
15. ACCESS TO WATER VALVES SHALL BE MAINTAINED DURING ALL PHASES OF THE PROJECT. VALVE BOXES TO REMAIN FREE AND CLEAR OF DEBRIS.
16. SEPARATION BETWEEN WATER INSTALLATIONS AND OTHER UTILITIES SHALL BE MAINTAINED (PER WATER DIVISION STD. W.25).
17. PROVIDE TRAP AT FIRST MANHOLE DOWNSTREAM OF PROPOSED IMPROVEMENTS. (CHECKED DAILY BY INSPECTOR)
18. PROVIDE 3/4" PLYWOOD FALSE BOTTOMS FOR MANHOLES, BOTH NEW AND OLD, DURING CONSTRUCTION. (CHECKED DAILY BY INSPECTOR)
19. PROVIDE CLEANOUTS FOR EACH SEWER LATERAL 6 INCHES BACK OF SIDEWALK, ADJUST TO FINISH GRADE IN BOX MARKED SEWER.
20. REFERENCE PLANS USED: SS 9813C, WATER ATLAS-P3

30 0 30 60 90
SCALE: 1"=30'

6773

PLAN NO. 7

PROJECT NO.

DIGALERT
DIAL TOLL FREE
811
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

BENCHMARK NO.
LOCATION:

REVISIONS

MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD

PREPARED BY:
LAND DEVELOPMENT DESIGN COMPANY, LLC
425 E. Arrow Highway, #364
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REGISTERED PROFESSIONAL ENGINEER
KEVIN J. RICHER
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STATE OF CALIFORNIA

DRAWN BY: RAS
DESIGNED BY: KJR
CHECKED BY: KJR
RECOMMENDED BY:

APPROVED BY:
R.C.E. EXP. DATE DATE

RECOMMENDED BY: ENGINEERING STAFF
RECOMMENDED BY: LAND DEVELOPMENT TRANSPORTATION

CITY OF UPLAND

UTILITY PLAN

400 E. 20TH STREET
UPLAND, CA 91784

PROJECT NO. SP
SHEET 7 OF 7 SHEETS
DRAWING NO. GP 26-02

6.2
Electronic Data Submittal

6.3
Post Construction

RECORDING REQUESTED BY:
City of Upland, California
Department of Public Works

AND WHEN RECORDED MAIL TO:
City of Upland
City Clerk's Office
460 N. Euclid Avenue
Upland, CA 91785

SPACE ABOVE THIS LINE FOR RECORDER'S USE

COVENANT AND AGREEMENT REGARDING WATER QUALITY MANAGEMENT PLAN AND STORMWATER BEST MANAGEMENT PRACTICES TRANSFER, ACCESS AND MAINTENANCE

THIS PAGE ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING INFORMATION (Additional Recording Fees Apply)

Covenant and Agreement Regarding Water Quality Management Plan and Storm water Best Management Practices Transfer, Access and Maintenance

OWNER NAME: San Antonio Water Company

LEASE HOLDER NAME: N/A

PROPERTY ADDRESS: 400 E. 20th Street, Upland CA 91784

PROJECT CASE NO.: DPR-20-0008

APN: 1044-091-22

THIS AGREEMENT is made and entered into in

_____ ,California, this _____ day of

_____ , by and between

San Antonio Water Comapny , herein after

referred to as "Owner/Lease Holder" and the CITY OF UPLAND, a municipal corporation, located in the County of San Bernardino, State of California hereinafter referred to as "CITY";

WHEREAS, the Owner owns real property ("Property") in the City of Upland, County of San Bernardino, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of initial approval of development project known as

DPR-24-0008 within the Property described herein, the City required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff; and

WHEREAS, the Owner/Lease Holder has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, on file with the City, hereinafter referred to as "WQMP", to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff; and

WHEREAS, said WQMP has been certified by the Owner/lease Holder, and reviewed and approved by the City; and

WHEREAS, said BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all maintenance or replacement, therefore, the sole responsibility of the Owner/Lease Holder in accordance with the terms of this Agreement; and

WHEREAS, the Owner/Lease Holder is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs.

NOW THEREFORE, it is mutually stipulated and agreed as follows:

1. Owner/Lease Holder shall comply with the WQMP.

2. All maintenance or replacement of BMPs proposed as part of the WQMP are the sole responsibility of the Owner/Lease Holder in accordance with the terms of this Agreement.

3. Owner/Lease Holder hereby provides the City of Upland's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the City's Public Works Director, no advance notice, for the purpose of inspection, sampling, testing of the Device, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner/lease holder's expense as provided in paragraph 5 below. City shall make every effort at all times to minimize or avoid interference with Owner/Lease Holder's use of the Property. Denial of access to any premises or facility that contain WQMP features is a breach of this Agreement and may also be a violation of the City's storm water drainage management regulations. If there is a reasonable cause to believe that an illicit discharge or breach of this Agreement is occurring on the premises then the authorized enforcement agency may seek issuance of a search warrant from any court of competent jurisdiction in addition to other enforcement actions. Owner/Lease Holder recognizes that the City may perform inspections of BMPs. Owner/Lease Holder or Owner's successors or assigns shall pay the City for all costs incurred by the City for inspections, sampling, testing of BMPs within thirty (30) calendar days of the City's invoice.

4. Owner/Lease Holder shall use its best efforts diligently to maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner/Lease Holder and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the City, the Owner/Lease Holder shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination.

5. In the event Owner/Lease Holder, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) days of being given written notice by the City, the City is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner/Lease Holder or Owner's successors or assigns, including administrative costs, attorneys' fees and interest thereon at the maximum rate authorized by the Civil Code from the date of the notice of expense until paid in full. Owner/Lease Holder or Owner's successors or assigns shall pay the City within thirty (30) calendar days of the City invoice.

5. (a) To compensate the City for expenses incurred by the City to perform the aforementioned maintenance in event that Owner/Lease Holder, its successors or assigns, fails to satisfactorily perform the necessary maintenance, which causes the City to perform it instead, Owner/Lease Holder, its successors or assigns, is required to make a minimum cash deposit of $10,000 with the City prior to issuance of permit(s) for precise or final grading. In such event that causes the City to use Owner deposit to cover for maintenance expenses, upon notice by the City, Lease Holder, Owner, its heirs, successors, executors, administrators and assigns, shall replenish the cash deposit to meet the said minimum deposit requirement within thirty (30) calendar days of the City notice.

5. (b) Depending on the maintenance expense, including administrative costs, estimated or incurred by the City to perform the necessary maintenance contemplated by this Agreement, the City may require Owner/Lease Holder to post additional security in form of bond(s) to make the combination of minimum cash deposit and security bonds to be at least of one hundred fifty percent (150%) of the maintenance expense. The additional bond(s) security period is for a time period determined by the City to guarantee the performance of the obligations stated herein. Should Owner/Lease Holder fails to perform the obligations under the Agreement, the City can, in the case of a cash bond, act for Owner/Lease Holder, using the proceeds from it, or in the case of a surety bond, require the surety(ies) to perform the obligations of this Agreement.

5. (c) The City agrees, from time to time, within ten (10) City business days after request of Owner/Lease Holder, to execute and send to Owner/Lease Holder, or Owner's designee, an estoppel certificate requested by Owner/Lease Holder, stating that this Agreement is in full force and effect, and that Owner/Lease Holder is not in default hereunder with regard to any maintenance or payment obligations (or specifying in detail the nature of Owner/Lease Holder's default). Owner/Lease Holder shall pay all costs and expenses incurred by the City in its investigation of whether to issue an estoppel certificate within thirty (30) calendar days after receipt of the City invoice and prior to the City's issuance of such certificate. Where the City cannot issue an estoppel certificate, Owner/Lease Holder shall pay the City within thirty (30) calendar days of receipt of the City's invoice in association with its investigation of whether to issue an estoppel certificate.

6. Owner/Lease Holder shall not change any BMPs identified in the WQMP without an amendment to this Agreement approved by authorized representatives of both the City and the Owner/Lease Holder.

7. The City and Owner/Lease Holder shall comply with all applicable laws, ordinances, rules, regulations, court orders and government agency orders now or hereinafter in effect in carrying out the terms of this Agreement. If a provision of this Agreement is terminated or held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall remain in full effect.

8. This agreement shall be recorded in the Office of the Recorder of San Bernardino County, California, at the expense of the Owner/Lease Holder and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

9. In event of legal action occasioned by any default or action of the Owner/Lease Holder, or its successors or assigns, then the Owner/Lease Holder and its successors or assigns agree(s) to pay all costs incurred by the City in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

10. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

11. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also the Lease Holder, the Owner's heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner/Lease Holder shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner/Lease Holder shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

12. Time is of the essence in the performance of this Agreement.

13. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

IF TO CITY:

Director of Public Works

City of Upland

460 N. Euclid Avenue

Upland, CA 91786

IF TO OWNER:

San Antonio Water Company

139 N Euclid Avenue

Upland, CA 91786

IF TO LEASE HOLDER:

N/A

IN WITNESS THEREOF, the parties hereto have affixed their signatures as of the date first written above.

LEASE HOLDER:

N/A

Company/Trust

Signature | Title

Print Name | Date

OWNER:

San Antonio Water Company

Company/Trust

Signature | Title

Print Name | Date

NOTARIES ON FOLLOWING PAGE(S)

Notary acknowledgement is required for recordation (attach appropriate acknowledgement).

ACKNOWLEDGEMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
)
COUNTY OF _____)

On _____ before me, _____,
Notary Public, personally appeared _____,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____ (Seal)

ACKNOWLEDGEMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
)
COUNTY OF _____)

On _____ before me, _____,
Notary Public, personally appeared _____,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____ (Seal)

IN WITNESS WHEREOF, the undersigned have executed this Agreement on the date first hereinabove written.

CITY:

CITY OF UPLAND

_____
Bill Velto, Mayor

ATTEST:

_____
Keri Johnson, City Clerk

APPROVED:

_____
Stephen Deitsch, City Attorney

EXHIBIT A
(Legal Description)

PORTION LOT 282 ONTARIO COLONY LANDS TOGETHER WITH PORTION OF THE WEST 21.48 FEET OF LOT 281;

BEGINNING AT A POINT 33.00 FEET SOUTHERLY OF CENTERLINE OF 20TH STREET SHOWN AS NORTH 89°50'00" WEST AND 21.48 FEET EASTERLY OF EAST LINE OF LOT 282;

THENCE SOUTH 313.86 FEET;

THENCE WEST 685.2 FEET TO A POINT PARALLEL WITH AND 32 FEET EASTERLY OF WESTERLY LINE OF SAID LOT 282;

THENCE NORTH 00°OO'44" EAST 22.03 FEET TO BEGINNING OF A NON-TANGENT CURVE CONCAVE NORTHWESTERLY WITH RADIAL BEARING OF NORTH 54°44'11" WEST;

THENCE ALONG SAID CURVE 42.65 FEET WITH RADIUS OF 54 FEET THRU ANGLE OF 45°15'05";

THENCE TO A TANGENT BEARING NORTH 09°59'26" WEST 43.73 FEET TO BEGINNING OF TANGENT CURVE CONCAVE EASTERLYLY;

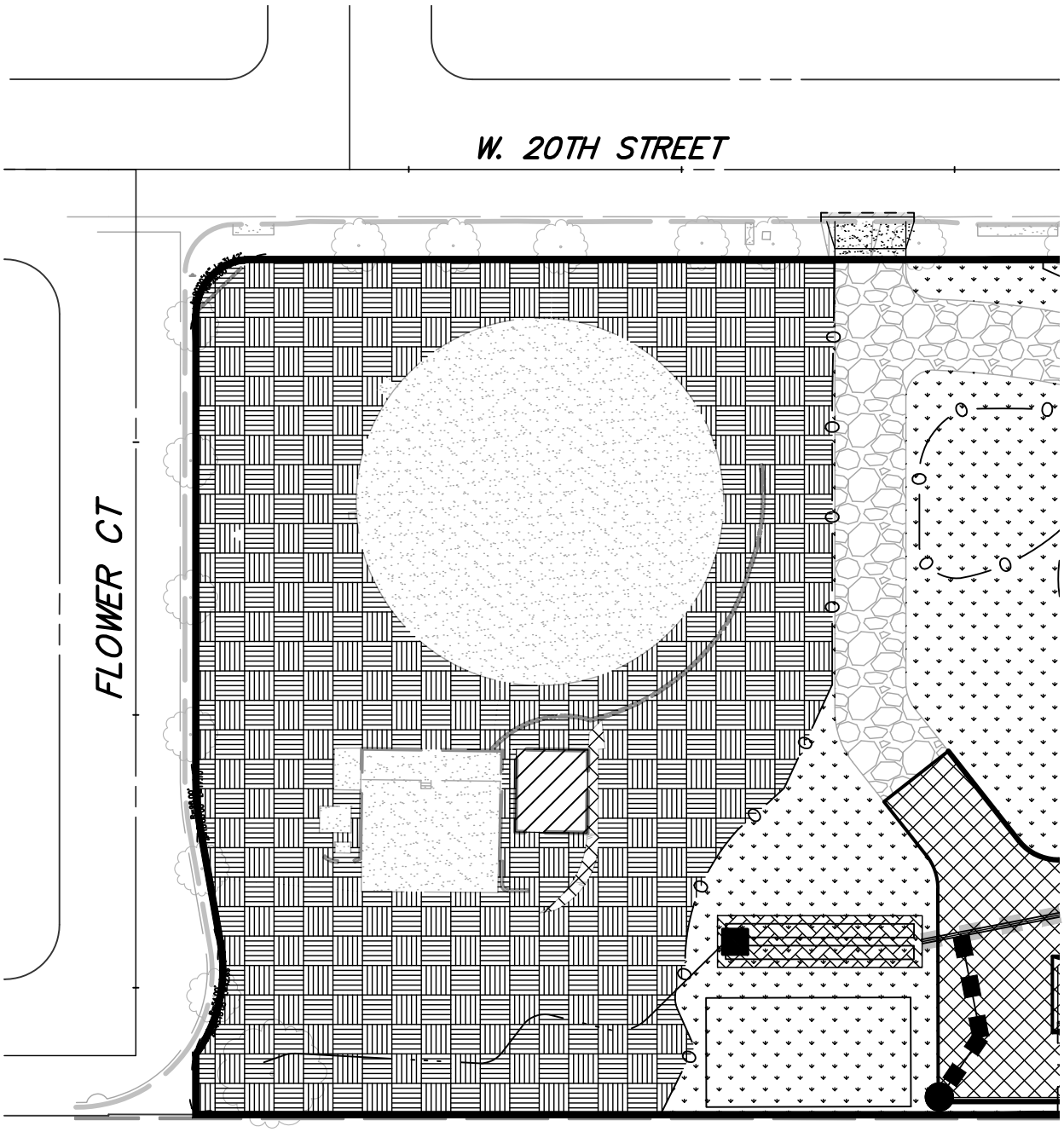
THENCE ALONG SAID CURVE 17.10 FEET WITH RADIAL OF 98 FEET THROUGH AN ANGLE OF 10°00'00";

THENCE NORTH 00°00'44" EAST PARALLEL WITH AND 32 FEET EASTERLY OF WEST LINE OF SAID LOT 282 171.20 FEET TO BEGINNING OF TANGENT CURVE CONCAVE SOUTHEASTERLY;

THENCE ALONG SAID CURVE 31.36 FEET WITH RADIUS OF 20 FT THRU AN ANGLE OF 89°50'39" TO A POINT ON A LINE PARALLEL AND DISTANT 33 FEET SOUTHERLY FROM CENTERLINE OF SAID 20TH STREET;

THENCE SOUTH 89°59'00" EAST ALONG SAID PARALLEL LINE A DISTANCE OF 665.69 FEET TO **POINT OF BEGINNING.**

EXHIBIT "B"
(Map/Illustration)
PAGE 1 OF 3



NOTE:

SEE LEGEND ON SHEET 2

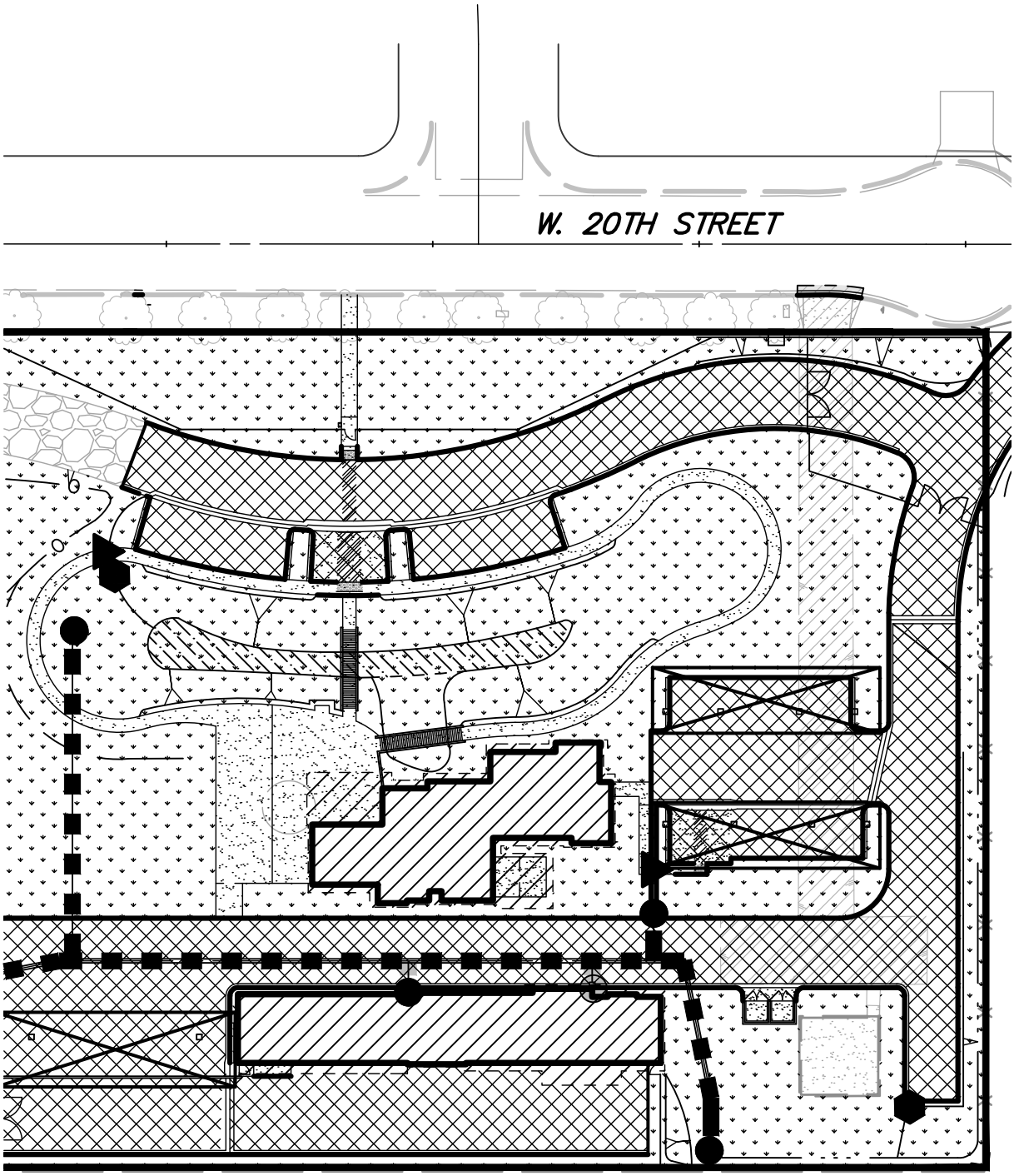
SITE:

SAN ANTONIO WATER
400 E. 20TH STREET
UPLAND, CA 91784

N

SCALE: 1"=60'

EXHIBIT "B"
(Map/Illustration)
PAGE 2 OF 3

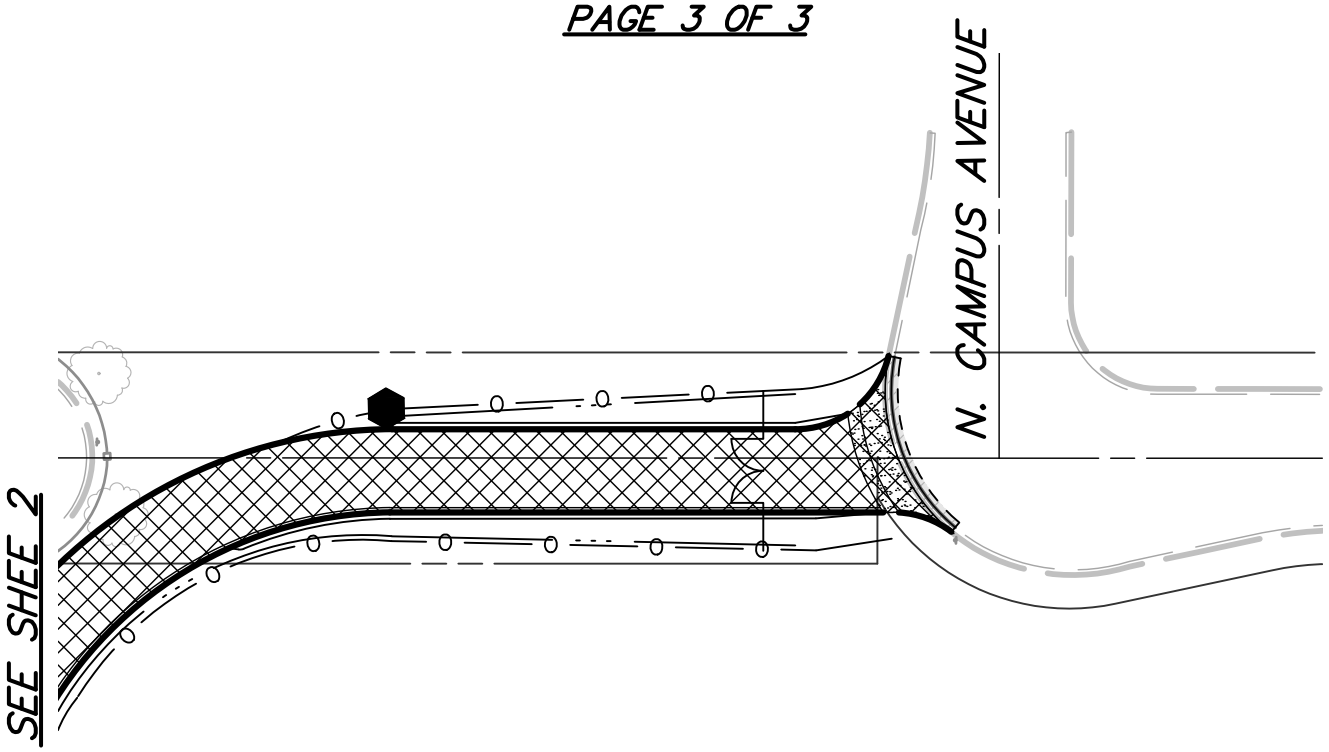


NOTE:

SEE LEGEND ON SHEET 2

SCALE: 1"=60'

EXHIBIT "B"
(Map/Illustration)
PAGE 3 OF 3



LEGEND

- LANDSCAPE
- AC PAVEMENT
- CONCRETE/SIDEWALK
- BUILDING
- TRASH ENCLOSURE
- UNDISTURBED PERVIOUS AREA
- UNDERGROUND STORAGE INFILTRATION SYSTEM
- INFILTRATION BASIN
- PERVIOUS GRAVEL ROAD

- DRAINAGE AREA BOUNDARY
- PROP. STORM DRAIN
- DRAINAGE FLOW
- PROP. UNDERWALK DRAIN
- PROP. RIP-RAP PAD
- PROP. MANHOLE
- PROP. CATCH BASIN W/ FOSSIL FILTER

N

SCALE: 1"=60'

6.4
Other Supporting Documentation

BASIN VOLUME CALCULATION

SURFACE AREA =1,755 SF
INFILTRATION RATE =5.21 IN/HR
TIME = 3 HOURS
PONDING DEPTH = 2.35 FT

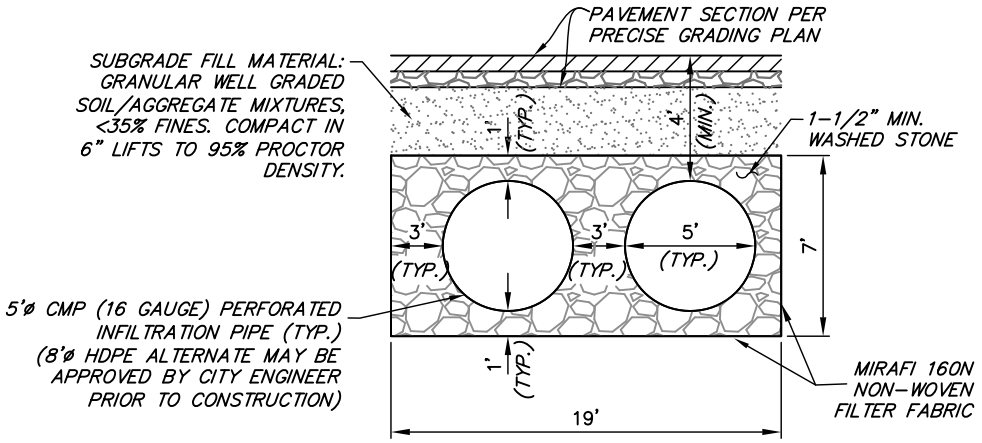
STORAGE VOLUME=1,755 SF X 2.35 FT =4,124 CF

INFILTRATION VOLUME FOR 3 HOURS

DEPTH (INCHES) = 5.21 IN/HR X 3 HR = 1.3025 FT

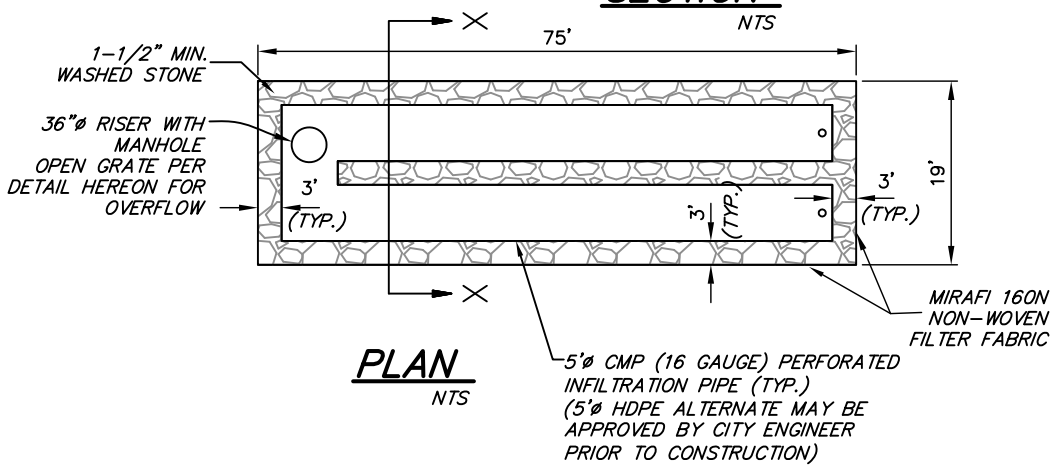
$V_{INFILTRATION}$ =1755 S.F. X 1.3025 FT =2,286 CF

TOTAL STORAGE = 4,124 +2,286 = 6,410 CF



SECTION

NTS



PLAN

NTS

UNDERGROUND INFILTRATION SYSTEM

NTS

V_{TRENCH} = (7 LF)(19 LF)(75 LF) = 9,975 CF

$V_{PIPES} = \frac{\pi (5\ LF)^2}{4} (141\ LF) = 2,769\ CF$

V_{GRAVEL} = (40%)(9,975−2,769) = 2,882 CF

STORAGE = 2,769+2,882 = 5,651 CF

INFILTRATION VOLUME FOR 3 HOURS

SURFACE AREA = 1425 SF
INFILTRATION RATE =5.21 IN/HR
TIME = 3 HOURS

$DEPTH\ (INCHES) = \frac{5.21\ IN/HR \times 3\ HR}{12\ IN/FOOT} = 1.3025\ FT$

$V_{INFILTRATION}$ =1425 S.F. X 1.3025 FT =1,856 CF

TOTAL STORAGE = 5651 +1,856 = 7,507 CF

NOAA Atlas 14, Volume 6, Version 2
Location name: Upland, California, USA*
Latitude: 34.136°, Longitude: -117.646°
Elevation: 1649 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.128 (0.107-0.155)	0.161 (0.134-0.196)	0.205 (0.170-0.249)	0.239 (0.197-0.294)	0.287 (0.228-0.364)	0.322 (0.251-0.419)	0.358 (0.272-0.477)	0.395 (0.291-0.542)	0.444 (0.314-0.636)	0.482 (0.328-0.715)
10-min	0.183 (0.153-0.222)	0.231 (0.192-0.280)	0.293 (0.243-0.357)	0.343 (0.282-0.421)	0.411 (0.326-0.522)	0.462 (0.359-0.600)	0.514 (0.389-0.684)	0.566 (0.417-0.777)	0.637 (0.449-0.912)	0.691 (0.470-1.03)
15-min	0.222 (0.185-0.269)	0.279 (0.233-0.339)	0.354 (0.294-0.431)	0.415 (0.342-0.510)	0.497 (0.395-0.631)	0.559 (0.434-0.726)	0.621 (0.471-0.827)	0.685 (0.504-0.939)	0.770 (0.543-1.10)	0.836 (0.569-1.24)
30-min	0.329 (0.274-0.399)	0.415 (0.346-0.504)	0.527 (0.437-0.641)	0.617 (0.508-0.757)	0.738 (0.587-0.938)	0.830 (0.646-1.08)	0.923 (0.700-1.23)	1.02 (0.750-1.40)	1.14 (0.808-1.64)	1.24 (0.846-1.84)
60-min	0.522 (0.435-0.633)	0.658 (0.548-0.799)	0.835 (0.693-1.02)	0.978 (0.805-1.20)	1.17 (0.930-1.49)	1.32 (1.02-1.71)	1.46 (1.11-1.95)	1.61 (1.19-2.21)	1.82 (1.28-2.60)	1.97 (1.34-2.92)
2-hr	0.792 (0.660-0.959)	1.00 (0.834-1.22)	1.27 (1.05-1.54)	1.48 (1.22-1.82)	1.76 (1.40-2.23)	1.96 (1.52-2.55)	2.16 (1.64-2.88)	2.36 (1.74-3.24)	2.62 (1.85-3.76)	2.82 (1.92-4.18)
3-hr	0.999 (0.833-1.21)	1.27 (1.05-1.54)	1.60 (1.33-1.95)	1.87 (1.54-2.29)	2.21 (1.76-2.81)	2.46 (1.91-3.20)	2.71 (2.05-3.61)	2.95 (2.18-4.05)	3.27 (2.31-4.68)	3.50 (2.38-5.20)
6-hr	1.43 (1.19-1.74)	1.82 (1.52-2.21)	2.31 (1.92-2.81)	2.69 (2.21-3.30)	3.19 (2.53-4.05)	3.55 (2.76-4.61)	3.91 (2.96-5.20)	4.26 (3.14-5.84)	4.72 (3.33-6.75)	5.05 (3.44-7.50)
12-hr	1.88 (1.57-2.28)	2.40 (2.00-2.91)	3.07 (2.54-3.73)	3.60 (2.96-4.42)	4.30 (3.42-5.47)	4.83 (3.76-6.28)	5.36 (4.06-7.14)	5.89 (4.34-8.08)	6.59 (4.65-9.44)	7.12 (4.85-10.6)
24-hr	2.77 (2.45-3.19)	3.58 (3.17-4.13)	4.65 (4.10-5.38)	5.52 (4.83-6.44)	6.71 (5.68-8.09)	7.63 (6.33-9.39)	8.57 (6.94-10.8)	9.54 (7.52-12.4)	10.9 (8.22-14.7)	11.9 (8.70-16.6)
2-day	3.45 (3.05-3.97)	4.61 (4.07-5.32)	6.15 (5.42-7.11)	7.43 (6.50-8.66)	9.19 (7.78-11.1)	10.6 (8.77-13.0)	12.0 (9.72-15.1)	13.5 (10.6-17.5)	15.5 (11.8-21.0)	17.2 (12.6-24.0)
3-day	3.70 (3.28-4.26)	5.06 (4.48-5.84)	6.89 (6.08-7.97)	8.41 (7.35-9.80)	10.5 (8.90-12.7)	12.2 (10.1-15.0)	13.9 (11.2-17.5)	15.7 (12.4-20.3)	18.2 (13.8-24.5)	20.2 (14.8-28.2)
4-day	3.99 (3.53-4.60)	5.54 (4.90-6.39)	7.61 (6.71-8.81)	9.35 (8.18-10.9)	11.8 (9.96-14.2)	13.7 (11.3-16.8)	15.7 (12.7-19.7)	17.8 (14.0-23.0)	20.7 (15.6-27.9)	23.0 (16.8-32.1)
7-day	4.51 (4.00-5.20)	6.33 (5.60-7.31)	8.81 (7.77-10.2)	10.9 (9.54-12.7)	13.9 (11.7-16.7)	16.2 (13.4-19.9)	18.7 (15.1-23.6)	21.3 (16.8-27.6)	25.1 (18.9-33.8)	28.1 (20.5-39.2)
10-day	4.87 (4.31-5.61)	6.86 (6.07-7.92)	9.60 (8.46-11.1)	11.9 (10.4-13.9)	15.2 (12.9-18.3)	17.8 (14.8-22.0)	20.6 (16.7-26.0)	23.6 (18.6-30.6)	27.9 (21.1-37.6)	31.3 (22.9-43.7)
20-day	5.86 (5.19-6.75)	8.34 (7.37-9.62)	11.7 (10.4-13.6)	14.6 (12.8-17.1)	18.7 (15.9-22.6)	22.0 (18.3-27.1)	25.5 (20.7-32.2)	29.3 (23.1-37.9)	34.6 (26.2-46.7)	38.9 (28.5-54.4)
30-day	6.86 (6.08-7.91)	9.74 (8.61-11.2)	13.7 (12.1-15.8)	17.0 (14.9-19.8)	21.7 (18.4-26.2)	25.6 (21.2-31.4)	29.6 (24.0-37.3)	33.9 (26.7-43.9)	40.0 (30.3-54.0)	45.0 (32.9-62.8)
45-day	8.21 (7.27-9.46)	11.5 (10.2-13.3)	16.0 (14.1-18.5)	19.7 (17.3-23.0)	25.1 (21.2-30.2)	29.4 (24.3-36.1)	33.9 (27.4-42.7)	38.7 (30.5-50.1)	45.4 (34.4-61.3)	50.9 (37.2-71.1)
60-day	9.62 (8.52-11.1)	13.2 (11.7-15.3)	18.1 (16.0-21.0)	22.2 (19.5-25.9)	28.0 (23.7-33.8)	32.6 (27.1-40.2)	37.5 (30.4-47.2)	42.6 (33.6-55.2)	49.9 (37.7-67.3)	55.7 (40.7-77.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

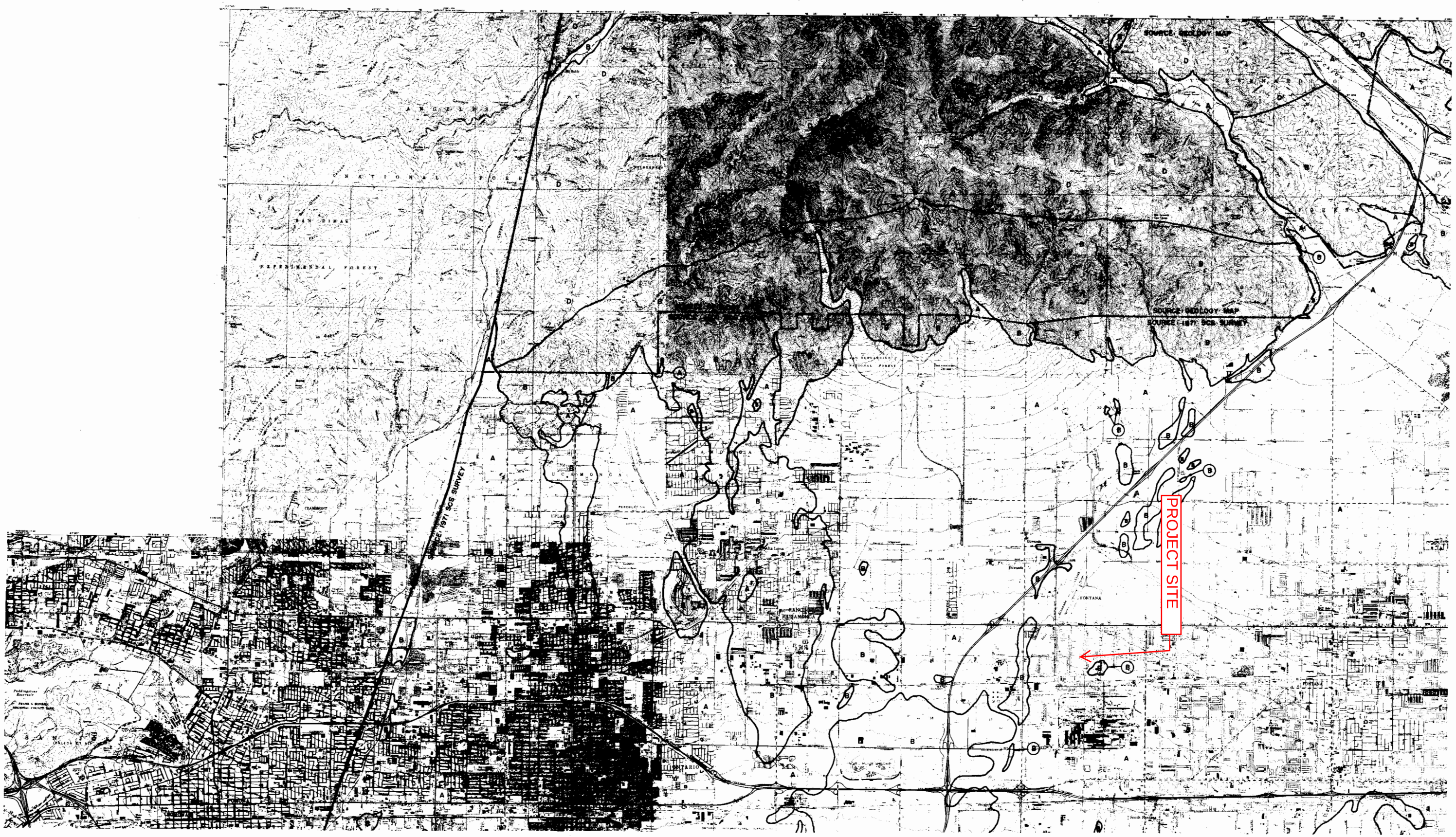
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, S_A = Lp			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, S_B = Lp			2.50
Combined Safety Factor, S_{TOT}= S_A x S_B					3.00
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					12.71
Design Infiltration Rate, in/hr, K_{DESIGN} = S_{TOT} × K_M					4.23

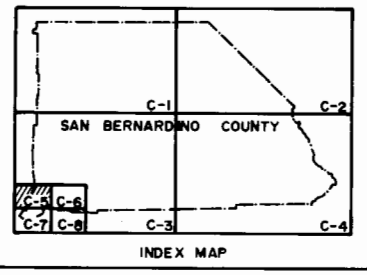
Supporting Data

Briefly describe infiltration test and provide reference to test forms:

See Section 6.4 of the project WQMP for project Geotechnical Engineering Investigation by Soils Southwest

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.





INDEX MAP

LEGEND

SOIL GROUP BOUNDARY

A SOIL GROUP DESIGNATION

BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

SCALE REDUCED BY 1/2

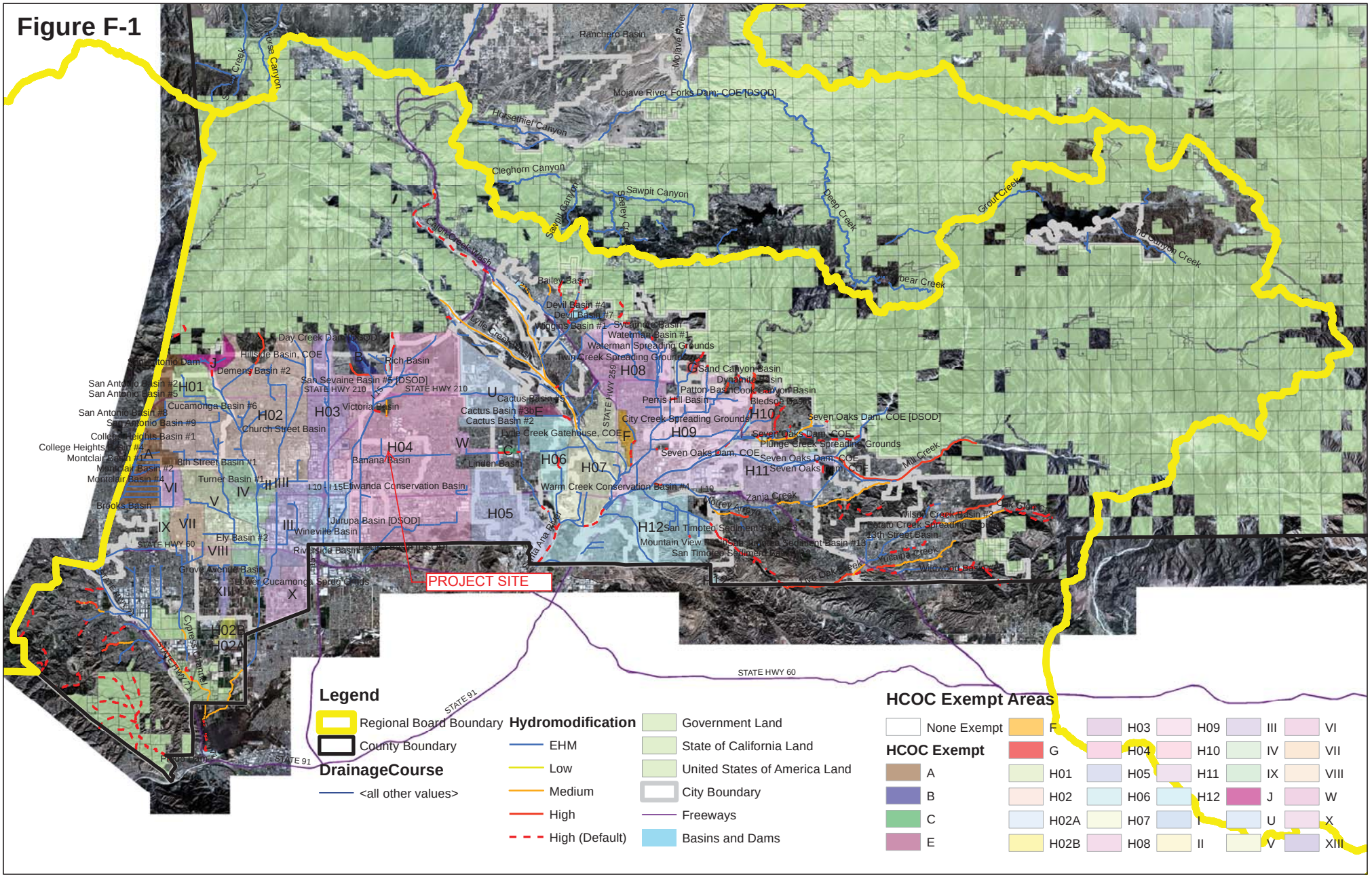
SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-A AREA

FIGURE C-13

Figure F-1


Ranchero Basin
Mojave River
Mojave River Forks Dam, COE [DSOD]
Horsethief Canyon
Cleghorn Canyon
Sawpit Canyon
Sawmill Canyon
Deep Creek
Grout Creek
Bear Creek
Bailey Basin
Devil Basin #4
Devil Basin #7
Wiggins Basin #1
Sycamore Basin
Waterman Basin #1
Waterman Spreading Grounds
Twin Creek Spreading Grounds
Day Creek Dam [DSOD]
Hillside Basin, COE
Rich Basin
Demens Basin #2
San Sevaine Basin #5 [DSOD]
STATE HWY 210
San Antonio Basin #2
San Antonio Basin #5
Cucamonga Basin #6
San Antonio Basin #8
San Antonio Basin #9
College Heights Basin #1
College Heights Basin #4
Montclair Basin #1A
Montclair Basin #2
Montclair Basin #4
8th Street Basin #1
Turner Basin #1
Brooks Basin
Church Street Basin
Victoria Basin
Banana Basin
Linden Basin
Cactus Basin #3
Cactus Basin #2
Lytle Creek Gatehouse, COE
Lytle Creek Wash
Sand Canyon Basin
Dynamite Basin
Patton Basin
Cook Canyon Basin
Bledsoe Basin
Perris Hill Basin
City Creek Spreading Grounds
STATE HWY 259
Seven Oaks Dam, COE [DSOD]
Seven Oaks Dam, COE
Plunge Creek Spreading Grounds
Mill Creek
Warm Creek Conservation Basin #4
Zanja Creek
Oak Glen Creek
Wilson Creek Basin #3
Yucaipa Creek
Wildwood Basin
Ely Basin #2
Wineville Basin
Jurupa Basin [DSOD]
Riverside Basin
Grove Avenue Basin
Lower Cucamonga Spreading Grounds
Santa Ana River
San Timoteo Sediment Basin #3
San Timoteo Sediment Basin #13
Mountain View Basin
PROJECT SITE
STATE HWY 60
STATE 91
Cypress Channel
H01
H02
H02A
H02B
H03
H04
H05
H06
H07
H08
H09
H10
H11
H12
A
B
C
E
F
G
J
U
W
I
II
III
IV
V
VI
VII
VIII
IX
X
XIII
Legend
Regional Board Boundary
County Boundary
DrainageCourse
<all other values>
Hydromodification
EHM
Low
Medium
High
High (Default)
Government Land
State of California Land
United States of America Land
City Boundary
Freeways
Basins and Dams
HCOC Exempt Areas
None Exempt
HCOC Exempt
A
B
C
E
F
G
H01
H02
H02A
H02B
H03
H04
H05
H06
H07
H08
H09
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H11
H12
I
II
III
IV
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VII
VIII
IX
J
U
W
X
XIII

SOILS SOUTHWEST, INC.

SOILS, MATERIALS AND ENVIRONMENTAL ENGINEERING CONSULTANTS

897 VIA LATA, SUITE N • COLTON, CA 92324 • (909) 370-0474 • (909) 370-0481 • FAX (909) 370-3156

Report of Geotechnical Evaluations and
Soils Infiltration Testing for WQMP-BMP Stormwater Disposal Design

Planned New San Antonio Water District Headquarters Office and Maintenance Facility
400 E. 20th Street
Upland, CA
APN: 1044-091-22

Project No. 24036-F/BMP

August 28, 2024

Prepared for:

CEDG, Inc.
c/o Mr. Erik Peterson
401 E. Columbia Avenue
Pomona, CA 91767

soilssouthwest@aol.com
Established 1984

SOILS SOUTHWEST, INC.

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August 28, 2024

Project No.24001-F/BMP

CEDG, Inc.
401 E. Columbia Avenue
Pomona, CA 91767

Attention: Mr. Erik Peterson

Subject: Report of Geotechnical Evaluations and
Soils Infiltration Rates for WQMP-BMP Stormwater Disposal Design
Planned New San Antonio Water District Headquarters Office and Maintenance Facility
400 E. 20th Street
Upland, CA
APN: 1044-091-22

Reference: Preliminary Site Plan Provided by Addressee

Dear Mr. Peterson,

Presented herewith is the report of (i) Geotechnical Evaluations and (ii) Soils Infiltration Rates for WQMP-BMP Stormwater Disposal Design proposed for the planned new administrative office and maintenance structures, parking, along with shallow depth basin and underground infiltration disposal systems to be located 400 East 20th Street, Upland, California. In absence of detailed development plans review, the opinions and recommendations included should be considered as "preliminary". Revised and/or updated recommendations may be warranted following precise grading and development plans review.

Based on the referenced site plan, it is understood that the subject development will primarily include two new near grade structures including one maintenance shop and one administrative office structure. Construction of wood and stucco, concrete tilt-up or concrete framed, or concrete block construction with concrete slabs-on-grade is assumed. Supplemental construction is to include on-site driveways and parking and paving for auto/heavy-duty truck traffic , along with the installation of a couple WQMP-BMP stormwater disposal systems to complete the project. Moderate site preparations and grading should be expected. For estimation purposes, the anticipated structural loadings of 80 kips and 8 klf are assumed for isolated column and conventional wall spread foundations, respectively.

Based on the test explorations and laboratory testing completed at this time, it is our opinion that the soils encountered primarily consist of upper 3 feet of variegating layers of gravels and silty fine to medium coarse gravel sand mixtures with high concentrations of rocks, cobbles, and occasional small boulders to the refusal depth of 3 feet explored. Descriptions of the soils encountered are provided in the attached Log of Borings.

No shallow-depth groundwater or impermeable layers were encountered. Historical and shallow-depth groundwater is reported at approximately 267 feet below grade as measured at the nearest water well, 01N07W28N002S. Based on such, and as described in the Special Publication SP117, published by the State of California Department of Conservation, Division of Mines and Geology, it is our opinion that the site is considered non-susceptible to seismically induced soils liquefaction thereby requiring no special geotechnical design recommendations other than those as recommended herein.

Based on review of the available USGS (California Geologic Survey) publication, it is understood that the site is not situated within an A-P Special Studies Zone where a known seismic fault passes through the site or its adjacent. Supplemental information is provided in Appendix C.

Following review of the online FEMA National Flood Hazard Layer Mapping, it is understood that the project site is classified as a Zone X, Area of Minimal Flood Hazard.

Based on the evaluations completed at this time, it is our opinion that from a geotechnical viewpoint, the site should be considered suitable for the proposed development provided that the recommendations and opinions included are considered in design and construction.

Final grading and detailed development plan review is suggested to verify the applicability of the certain assumptions as used in preparing this report.

This report has been substantiated by subsurface explorations and mathematical analysis made in accordance with the generally accepted engineering principles, including those field and laboratory testing considered necessary in the circumstances.

We offer no other warranty, expressed or implied.

Respectfully submitted,
Soils Southwest, Inc.

Malay Gupta, RCE 31708



John Flippin
Project Coordinator

1.0 Introduction

1.1 Purpose and Scope of Work

This report presents the results of (i) Geotechnical Evaluations and (ii) Soils Infiltration Testing for WQMP-BMP Stormwater Disposal System Design for the new administrative office and maintenance structures, parking, along with shallow depth and underground infiltration design systems to be located 400 East 20th Street, Upland, California. In absence of precise grading and/or detailed development plans, the recommendations and opinions included may require updating and revisions recommendations following detailed development plans review.

The soils encountered as described herein are based on visual observations made during test explorations, supplemented by the necessary laboratory testing completed at this time. Being beyond scope of work, no geologic investigations or Phase I Environmental Site Assessment (ESA) are included. Reports of such will be supplied upon request.

The recommendations contained reflect our best estimate of the soils' conditions as encountered during field explorations as conducted for the site. It is not to be considered as a warranty of the soils' conditions for other areas or for the depth beyond the explorations advanced at this time.

The recommendations supplied should be considered valid and applicable following review of the final grading and development plans when supplied and when the following conditions are observed:

i. Pre-grade meeting with the contractor, public agency, and the geotechnical engineer,
ii. Excavated bottom inspections and verifications by the geotechnical engineer prior to backfill placement,
iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Plumbing trenches backfill placement prior to concrete slab-on-grade placement,
vi. On and off-site utility trenches backfill testing and verifications, and
vii. Consultations as required during construction or upon your request.

1.2 Site Description

The rectangular shaped subject parcel of 4.92 acres is currently a water district yard facility in operation . In general, the site is bounded by East 20th Street to the north, by Interstate 210 Freeway on the south, by vacant undeveloped property on the east, and by Flower Court on the west. Following review of the available site drawings, overall vertical relief within the property is unknown, however, based on site reconnaissance, sheet flow from incidental rainfall is estimated to flow towards the south and southwest. Other than an existing reservoir tank, pump station, and numerous soil, rock, and asphalt debris stockpiles in the center portion of the property, along with a satellite tower at the southeast corner, presence of no other significant features were noted.

1.3 Proposed Development

No precise grading and/or detailed development plans are available for review; however, it is understood that the subject development will primarily include two (2) structures near existing grade to accommodate, among others, a maintenance building and an administrative office. Use of wood and stucco framed, concrete block, or metal framed construction with concrete slabs-on-grade is assumed. Supplemental construction is anticipated to include on-site driveways, parking and paving, along with the installation of two (2) WQMP-BMP stormwater disposal systems. Considering existing offsite paving, curb-gutter, and drive approaches, off-site street improvements is not anticipated at this time.

Moderate site preparations and grading are anticipated as described in the following sections.

1.4 Subsurface Investigation

The geotechnical evaluations include subsurface explorations, soil sampling, necessary laboratory testing, engineering analyses, and preparation of this report. Being beyond scope of work, no geologic investigations or Phase I Environmental Site Assessments are included. Reports on such will be supplied on request.

In general, our scope of work included the following: review of the referenced site plan supplied along with three (6) test borings (B-1 to B-6) explored by using a Hollow-Stem Auger (HSA) drill rig advanced to the refusal depth of 3 feet below grade along with four (4) infiltration test borings to maximum depths between 3 and 8 feet (P-1 and P-4) as requested for WQMP-BMP Stormwater Disposal Design. During explorations, the soils encountered were continuously logged, bulked, and undisturbed samples were procured and recorded. Collected samples were subsequently transferred to our laboratory for necessary geotechnical testing.

Descriptions of the soils encountered are provided on the attached Log of Borings. Approximate test locations are shown on the attached Plate A.

- Laboratory testing conducted on the selected bulk and undisturbed samples were programmed according to the project requirements. The laboratory testing included determinations of:
    - Moisture Density Determination (ASTM D2216),
    - Maximum Dry Density and Optimum Moisture Content (ASTM D1557),
    - Soils' Peak and Residual Shear Strengths (ASTM D3080),
    - Soils' Consolidation Characteristics (ASTM D2435),
    - Soils' Sieve Analyses (ASTM D422),
    - Soils' R-value (ASTM D2844), and
    - Soils' Sand Equivalent, SE (ASTM D2419).

- Based on the field investigation and laboratory testing completed the necessary engineering analyses and evaluations were made on which to base our preliminary recommendations for foundation design, slab-on-grade, site preparations and grading, utility trenches backfill, and

- Preparation of this report for initial use by the project design professionals.

The recommendations supplied should be considered "tentative" and may require revisions and/or upgrading following final grading and detailed development plans review.

2.0 Geotechnical Evaluations

2.1 Site Soils Description

The soils encountered primarily consist of upper 3 feet of variegating layers of gravels and silty fine to medium coarse gravel sand mixtures with high concentrations of rocks, cobbles, and occasional small boulders to the refusal depth of 3 feet explored. Descriptions of the soils encountered are provided in the attached Log of Borings.

Based on review of the USDA Natural Resources Conservation Service: Web Soil Survey for the subject area, it is our understanding that the soil classification within the structural pad areas is identified as being SpC-Soboba stony loamy sand, 2 to 9 percent slopes with the upper 60 inches consisting of stony loamy stand and very stony sands below existing grade, whereas the soils within the planned underground infiltration disposal system at the southwest portion of the property being classified as HaC-Hanford coarse sandy loam, 2 to 9 percent slopes consisting of sandy loam and fine sandy loam up to five (5) feet below existing grade. Following review of the Geological Map of the Mount Baldy Quadrangle (2002), the project site is designated as consisting of Qg alluvial gravel and sand of stream channels.

Based on review of the available USGS (California Geologic Survey) publications, it is understood that the site is not situated within an A-P Special Studies Zone where seismic fault passes through the site or its adjacent.

No groundwater or impermeable soils were encountered within the refusal depth of 3 feet explored. According to California Department of Water Resources, the historical groundwater level is at a depth of approximately 267 feet which is in excess of 50 feet below grade as measured at the nearest water well (01N07W28N002S) . Based on such and as described in the Special Publication SP117, published by the State of California Department of Conservation, Division of Mines and Geology, it is our opinion that the site is considered non-susceptible to seismically induced soils liquefaction.

Laboratory shear tests conducted on the upper soils remolded to 90% indicate "moderate" shear strengths under increased moisture conditions. Results of the laboratory shear tests are provided on Plate B.

Consolidation tests conducted on remolded samples indicate "slight" potential for compressibility along with slight to moderate hydro-collapse potential under anticipated static structural loadings with potential for "tolerable" settlements to footings and concrete slabs-on-grade. Areas of slight to moderate compressibility and/or hydro collapsible potential may require further excavation and/or compaction effort. Results of the laboratory determined soils consolidation potential are shown in Appendix B.

Fine to medium coarse to coarse sands with traces of silts along with rocks and cobbles encountered are considered "low" in expansion potential requiring no special construction requirements other than those as recommended herein. Supplemental soil expansion testing, however, is recommended following mass grading completion to provide supplemental/revised foundation recommendations, if warranted.

2.2 Subsurface Variations

During site preparations and grading, buried irrigation, debris, organic and others may be encountered. In addition, variations in soil strata, their continuity and orientations may be expected. Due to the deposition characteristics of the soils encountered, care should be exercised in interpolating or extrapolating the subsurface soils conditions existing in between and beyond the test explorations conducted.

2.3 Excavatibility

It is our opinion that the grading required for the project may be accomplished by using conventional heavy-duty construction equipment. No blasting or jackhammering should be warranted. However, considering the presence of high concentration of cobbles and boulders, it is suggested to use rocks no greater than 6-8 inches in compacted fills, but directly beneath footings and slabs should be avoided.

2.4 Soil Corrosivity

Reference Soil Sample B-1 @ 0-3 feet below grade

1. Chloride concentration equal to 29 mg/Kg does not exceed 10,000 ppm is non-corrosive to ferrous metals,
2. pH equal to 7.93 units exceeding 4.0 units is non-corrosive to buried metals,
3. Sulfate concentration equal to 82 mg/Kg does not exceed 2000 ppm is non-corrosive to concrete, and

4. Resistivity equal to 3,640 ohms/cm is "moderately" corrosive to buried metals.

Soil chemical test results are included in Appendix B.

It is suggested that following mass grading completions, soils corrosivity potential evaluations should be made to determine, at a minimum, concentrations of pH, sulfate, chloride, and resistivity. Further corrective recommendations should be provided by Corrosion Engineer.

2.5 Groundwater

No groundwater or bedrock was encountered within the refusal depth of 3 feet explored. However, following review of the available recorded groundwater well data as shown in the table below, historical groundwater was measured at approximately 267 feet below the existing well grade. The following table describes the historical and the current groundwater level as recorded in the nearest well as listed by the local reporting agency.

GROUNDWATER TABLE	
Reporting Agency	California Department of Water Resources Marcelo Montagna 2008 Maps http://wdl.water.ca.gov/waterdatalibrary/
Well Number	01N/07W-28N002S Cucamonga-1000547
Well Monitoring Agency	Chino Basin
Well Location: Township/Range/Section	T01N-R07W-Section 28
Well Elevation:	1675
Current Depth to Water (Measured in feet)	469
Current Date Water was Measured	March 26,2024
Depth to Water (Measured in feet) (Shallowest)	267
Date Water was Measured (Shallowest)	December 15,1983

Fluctuations in groundwater levels, however, can occur due to seasonal variations in the amount of rainfall, runoff, altered natural drainage paths, and other factors not evident at the time the test borings completed. Accordingly, for the planned development, it is our opinion that provisions should be maintained to dispose incidental surface runoff away from the individual structural pads, once constructed.

3.1 Faulting and Seismicity

Based on the information published by the USGS (currently known as California Geologic Survey) Department of Conservation, State of California, it is understood that the site is not situated within an A-P Special Study Zone where earthquake fault(s) runs through or adjacent to the subject site. In the absence of shallow (less than 50 feet) depth groundwater, the site is considered non-susceptible to soils liquefaction in the event of a strong motion earthquake. However, the site being within Southern California where potentials for seismically induced structural hazards could not be ignored, it is our opinion that implementation of the current CBC seismic design parameters in structural design as described herein may reduce the potential for seismically induced structural distress to some "acceptable" tolerable limits.

Seismically induced site-specific potential hazards are discussed in the following sections.

3.2 Direct or Primary Seismic Hazards

Surface ground rupture along with active fault zones and ground shaking represent primary or direct seismic hazards to structures. There are no known active or potentially active faults that pass through or towards the subject site and the site is not situated within an A-P Special Studies Zone. According to the current 2022 CBC, the site is considered situated within Seismic Zone 4. As a result, it is likely that during the life expectancy of the structures built, moderate to severe ground shaking may have some adverse effects to the structures built.

3.3 Induced or Secondary Seismic Hazards

In addition to ground shaking, effects of seismic activity may include surface rupture, flooding, landsliding, lateral spreading, settlements, and subsidence. Potential effects of such are as described below.

3.3.1 Liquefaction

Liquefaction is caused by build-up of excess hydrostatic pressure in saturated cohesionless soils due to cyclic stress generated by ground shaking during an earthquake. The significant factors on which liquefaction potential of a soil deposit depends, among others include, soil type, relative soil density, intensity of earthquake, duration of ground shaking, and depth of ground water.

No groundwater was encountered within the refusal depth of 3 feet explored. In absence of historically reported groundwater within 50 feet below grade, and based on review the Special Publication SP117, published by the State of California Department of Conservation, Division of Mines and Geology, it is our opinion that the site is considered non-susceptible to seismically induced soils liquefaction thereby requiring no special geotechnical design recommendations other than those as recommended herein.

3.3.2 Shallow Depth Ground Rupture

The site is not situated within an A-P Special Studies Zone. Based on review of the existing geologic information, no major fault is noted to cross through or extend towards the site. The potential for surface rupture resulting from nearby fault movement is not known for certainty; however, in our opinion it is considered "remote" due to the distance of the site to the recorded nearby earthquake fault.

3.3.3 Flooding

Flooding hazards include tsunamis (seismic sea waves), Seiches, or failure of manmade reservoirs, tanks, and aqueducts. The potential for these hazards is considered "remote" considering the inland site location and in absence of nearby known bodies of water. Based on review of the FEMA National Flood Hazard Layer FIRMette map, it is our understanding that the subject area is delineated as Zone X, Area of Minimal Flood Hazard on its eastern half while the western half is delineated as being in an area with "Reduced Flood Risk due to Levee as shown in the attached Appendix C.

3.3.4 Landslides

Seismically induced landslides and other slope failures are common occurrences during or soon after an earthquake. Considering the site and its adjacent being relatively flat, it is our opinion that potential for seismically induced landslides should be considered "remote".

3.3.5 Lateral Spreading

Seismically induced lateral spreading involves lateral movement of soils due to ground shaking. Lateral spreading is demonstrated by near vertical cracks with predominantly horizontal movement of the soil mass involved. The topography of the site being near level, it is our opinion that the potential for seismically induced lateral spreading should be considered "remote".

3.3.6 Seismically Induced Settlement

Considering the proximity of the earthquake fault as described, it is our opinion that potential for some total and differential settlements due to ground shaking may be anticipated as described herein.

3.4 Seismic Design Parameters

The design spectrum was developed based on the 2022 CBC. Site Coordinates of 34.135692°N, -117.645040°W were used to establish the seismic parameters presented below.

3.4.1 Seismic Design Coefficients

The site is situated at approximately 1.3 miles from the Cucamonga Fault capable of generating an earthquake magnitude, M of 6.7 and Peak Horizontal Ground Acceleration, PGA of 0.753g at 10% probability of exceedance in 50-year return period.

For foundation and structural design use of the following seismic parameters are suggested as based on the current 2022 CBC:

Recommended values are based upon the online review of ASCE 7-22 Hazard Tool coefficient parameters. The following presents the seismic design parameters evaluated based on the available publications published by California Geological Survey (CGS), 2022 CBC, and ASCE Standard 7-16.

TABLE 3.4.1 A1: Seismic Design Parameters

Seismic Source Type

Based on California Geological Survey-Probabilistic Seismic Hazard Assessment Peak Horizontal Ground Acceleration (PGA) having a 10% probability of exceedance in a 50-year period is described as below:

Seismic Source Type / Appendix C	
Nearest Maximum Fault Magnitude	M ≥ 6.7
Peak Horizontal Ground Acceleration (PGA)	0.753g

In design, vertical acceleration may be assumed to about 1/3 to 2/3 of the estimated horizontal ground accelerations (PGA) described.

It should be noted that lateral force requirement in design should be intended to resist total structural collapse due to the described PGA of 0.753g or greater. However, during the lifetime use of the structure built, it is our opinion that some structural damage may be anticipated requiring structural repairs and/or replacement. Use of flexible lifeline connections are suggested.

TABLE 3.4.1 A2: Seismic Design Coefficients

CBC Chapter 16	2022 ASCE 7-16 Standard Seismic Design Parameters	Recommended Values
1613A.5.2	Site Class	D
1613.5.1	The mapped spectral accelerations at short period	S_s
1613.5.1	The mapped spectral accelerations at 1.0-second period	S_1
1613A5.3(1)	Seismic Coefficient, S_s	1.766g
1613A5.3(2)	Seismic Coefficient, S_1	0.658g
1613A5.3(1)	Site Class D / Seismic Coefficient, F_a	1g
1613A5.3(2)	Site Class D / Seismic Coefficient, F_v	n/a
16A-37 Equation	Spectral Response Accelerations, $S_{Ms} = F_a S_s$	1.766g
16A-38 Equation	Spectral Response Accelerations, $S_{M1} = F_v S_1$	n/a
16A-39 Equation	Design Spectral Response Accelerations, $S_{Ds} = 2/3 \times S_{Ms}$	1.177g
16A-40 Equation	Design Spectral Response Accelerations, $S_{D1} = 2/3 \times S_{Ms}$	n/a

4.0 Evaluations and Recommendations

4.1 General Evaluations

Based on field explorations, laboratory testing, and subsequent engineering analyses, the following tentative conclusions and recommendations are presented for initial study:

(I) From a geotechnical viewpoint, the site is considered grossly stable for the proposed development, provided that the recommendations supplied herein are incorporated in design and construction. Foundation design should reflect considerations of the seismically induced PGA as described.

(II) Based on the dry, silty, gravelly, variable consistency nature of the upper soils existing as encountered, it is our opinion that for structural support the load bearing soils should be reworked in the form of subexcavations, followed by scarification, moisturization, and their replacement as engineered fills compacted to minimum 90%. In the event that new fill soils are required over the current grade surface such should be placed on the original grades when prepared as described.

(III) The subexcavation depths during mass grading as described in the following section should be considered as "minimum". During grading, localized deeper subexcavations may be required within areas underlain by buried debris, utilities, localized fills or soft soils and others. It will be the responsibility of the grading contractor to inform the project geotechnical engineer of the presence of such prior to further site preparations and grading.

(IV) In order to minimize potential for differential settlements, it is recommended that structural footings should be established exclusively into engineered fills of local soils compacted to the minimum as recommended in this report. Construction of footings and slabs straddling over cut and fill transition conditions shall be avoided.

(V) Structural design consideration should include probability for "moderate" peak ground acceleration from relatively active nearby earthquake faults. Implementing the seismic design parameters and procedures as outlined in the current CBC and as described earlier, however, may minimize the adverse effects for the structures proposed.

(VI) Although no groundwater was encountered, provisions should be maintained during construction to divert incidental rainfall away from the structural pads constructed.

(VII) It is our opinion that, if site preparations and grading are performed as recommended and as per the generally accepted construction practices and current CBC, the proposed development will not adversely affect the stability of the site or its adjacent.

4.1.1 Recommendations for Site Preparations and Grading for Structural Support

In absence of detailed development plans review, the planned structural pad grades are assumed at/or near the existing grade surface. For adequate structural support, it is our opinion that moderate site preparations and grading should be included in the form of subexcavations of the near grade dry, silty, gravelly, variable consistency soils and their replacement as engineered fills compacted to minimum 90%.

In general, site preparations and grading should include subexcavations of the near surface soils to about:

(i) minimum 5 feet below the current grade surface or
(ii) to the depth as required to expose the underlying moist and dense natural subgrades or
(iii) to the depth as required to maintain a 24-inch-thick compacted fill mat blanket below foundation bottoms, whichever is greater.

The site preparations and grading described should encompass, at a minimum, the proposed structural footprint areas and minimum 5 feet beyond or as suggested by the geotechnical engineer during grading. No cut and fill transition conditions should be allowed.

Within areas requiring fill soils, if any, such may be placed following sufficient subexcavations to expose the underlying dense subgrades as approved by the project geotechnical engineer. During grading, the engineered fills placed should be compacted to near Optimum Moisture and with minimum 90% compaction of soils' Maximum Dry Density as determined by ASTM D1557.

The subexcavation depths described should be considered as "preliminary". Localized additional subexcavations may be required within areas underlain by undocumented old fills, buried utilities and abandoned sewer and/or buried septic systems. It is recommended that the excavated subgrades should be verified and approved by the geotechnical engineer prior to structural fill soil placement. Supplemental recommendations may be warranted following detailed development plans review.

Mass grading required for the project is recommended to encompass, at a minimum, the entire individual structural pads and beyond.

For reference, supplemental general mass grading recommendations are included Section 5 of this report.

4.2 Structural Fill Material Requirements

The local and/or imported fills, if required, should be gravelly sand, free of organics, roots, debris, and rocks larger than 6 to 8-inch in diameter.

Although no significant variations in soil conditions are anticipated, actual soils conditions may vary during grading. It will be the contractor's responsibility to notify Soils Southwest, Inc. about such variations for revised/updated geotechnical recommendations.

Non-expansive in nature, the on-site soils free of organic, debris, and rocks larger than 8-inch in load bearing structural backfills placed should be compacted to minimum 90% of the soils' Maximum Dry Density as determined by ASTM D1557 test method. Import soils, if required, should be non-expansive, gravelly sand and meeting the following criteria:

Liquid Limit	<35
Plasticity Index	<15
Expansion Index	<20

4.2.1 Structural Fill Soils Placement

Within the areas of structural loadings, it is our opinion that the near grade soils should be subexcavated to minimum 5 feet depth. For adequate structural bearing, it is our opinion that the excavated soils may be placed in 6 to 8-inch lifts with near Optimum Moisture Conditions compacted to minimum 90%. No structural fills should be placed during unfavorable weather conditions.

4.2.2 Cut and Fill Transition Conditions Pad Preparations (if applicable)

Use of cut and fill transition conditions should be avoided to minimize potential for differential settlements to footings and concrete slabs-on-grade. Within cut and fill transition areas, if it becomes essential, it is suggested that following the necessary cut, the entire structural pad should be prepared so as to establish a uniform bearing compacted fill mat prepared in conformance to the general guidelines as described below.

Pad Preparation Guidelines for Cut and Fill Transition Condition Areas

Fill Depth Required for Finish Grade (Within low-lying areas)	Overexcavation Depth below Finish Grade (Within cut areas)
Up to 5 feet	Equal Depth
5 to 10 feet	5 feet
Greater than 10 feet	One-half the maximum thickness of fills placed on the "fill" portion (20 feet maximum)

Cut portions should be overexcavated beyond the structural perimeter lines for a horizontal distance equal to the depth of overexcavation or to a minimum distance of 5 feet, whichever is greater. Actual subexcavation depths should be determined by the geotechnical engineer during grading.

4.3 Structural Foundation Design Parameters

In the absence of detailed development plans review, it is assumed that for load bearing support conventional continuous wall foundations and isolated spread footings will be used bearing directly on the engineered graded fills placed as described earlier in this report.

It is assumed that the subject development will include concrete tilt-up or concrete framed, concrete block construction with concrete slabs-on-grade and concrete footings in the form of isolated pier foundations or continuous wall foundations. Use of load bearing concrete wall and/or isolated spread footings are assumed to be used underlain by at least 30-inch-thick engineered fill mat of local soils compacted to minimum 90% as recommended earlier.

Structural foundations, in the form of exterior load bearing wall foundations and isolated pier foundations, may be considered in design based on the following equations:

Continuous Wall Footing: $q_{allowable} = 2000 + 350d + 250b$
Isolated Square Footing: $q_{allowable} = 2400 + 350d + 100b$, where

$q_{allowable}$ = allowable soil vertical bearing capacity, in psf
d = footing depth, minimum 30-inch,
b = footing width, minimum 24-inch.

The above soil bearing capacities may be increased for each additional depth in footing and width in excess of the minimum recommended. Under static loading conditions, with a Factor of Safety, FS = 3.0, the total maximum vertical bearing capacity is recommended not to exceed 3500 psf for continuous wall footings and isolated square footings. If normal code requirements are applied, the above capacities may further be increased by an additional 1/3 for short duration of loading which includes the effect of wind and seismic forces. The load bearing footings should be reinforced with minimum 2-#5 near the near the top and 2-#5 rebar near bottom of continuous wall footings. For isolated foundations reinforcing requirements shall be determined by the project structural engineer. Actual foundation dimensions (b & d) and reinforcement requirements should be provided by the project structural engineer based on anticipated structural dead loadings, soil bearing capacity, and Peak Ground Acceleration (PGA) described.

The footing depths described should be measured vertically from the lowest adjacent outside grade and not from the finished pad grade or from finished floor surface. Footing depths and dimensions shall be verified by the geotechnical engineer prior to footing-forming, rebar, and concrete placement. It will be the contractor's responsibility to arrange such verifications by the geotechnical engineer.

Based on the laboratory determined soils' consolidation characteristics, settlements to properly designed and constructed foundations supported exclusively into engineered fills of site soils or its equivalent or better, and carrying maximum assumed structural loadings, are expected to be within "tolerable" limits.

Under static loading conditions, over a 40-foot-span, the estimated total and differential settlements should be about 1 and 1/2-inch, respectively, provided the foundations being supported by engineered fills of local soils compacted to minimum 90% as described. Most of the elastic deformations, however, are expected to occur during construction.

4.4 Concrete Slabs-on-Grade

No concrete slabs, sidewalks and flatworks should be placed bearing directly on the surface soils currently existing. The prepared subgrades to receive footings should be adequate for concrete slab-on-grade placement. The following is provided for reference only.

Building Pad Warehouse/ Truck Traffic:

1. Suggested 5-inch-thick (net) slab thickness,
2. 2500 psi concrete with water/cement ratio of 0.64 maximum,
3. #4 rebar @ 18-inch o/c using chairs or as required by the project structural engineer,
4. Within moisture sensitive areas, it is suggested to use 10-mil-thick commercially available StegoWrap, Visqueen or other approved coverings,
5. Two (2) inches of sand with SE>30 over the installed Stego Wrap System,
6. Saw cuts requirements shall be as per the structural engineer.

Driveways:

1. 6-inch-thick net slab,
2. 2500 psi concrete with water/cement ratio of 0.64 maximum,
3. Over native grade compacted to a maximum of 95%.

Flatwork:

1. 3 ½-inch-thick net concrete,
2. 2500 psi concrete with water/cement ratio of 0.64 maximum,
3. Over native grade compacted to a minimum 90%,
4. Tooled joints per the structural engineer.

It is recommended that, prior to concrete pours, utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with sandy gravelly soils, mechanically compacted to the minimum compaction requirements as described.

Within moisture sensitive areas, concrete slabs should be underlain by 2-inch of compacted clean sands, followed by 10-mil-thick vapor barrier, such as commercially available StegoWrap, Visqueen or other approved coverings, overlying an additional 2-inch-thick layer of sands. Sands used should have a Sand Equivalent, SE of 30 or greater.

Subgrades to receive concrete foundations and slab-on-grade should be "'dampened" as would be expected in any such concrete placement. Use of low-slump concrete is recommended. In addition, it is recommended that utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with gravelly sandy soils mechanically compacted to minimum 90%. Concrete construction joint requirements should be determined by the project structural engineer.

No concrete should be placed during extreme weather conditions, such as during high outside temperature and/or during high Santa Ana wind conditions. Use of excess water on finished grade is not recommended to prevent post-placement concrete "warping".

4.4.1 Concrete Curing and Crack Control

The recommendations presented in this report are intended to reduce potentials for cracking of concrete slabs-on-grade due to concrete curing or settlement. However, even when the following recommendations have been implemented, foundations, stucco walls and concrete slabs-on-grade may display some minor cracking due to minor soil movement and/or concrete shrinkage.

The occurrence of concrete cracking may also be reduced and/or controlled by limiting the slump of the concrete used, proper concrete placement, and curing along with using crack control joints at reasonable intervals where re-entrant slab corners occur. For standard crack control, maximum expansion/construction joint spacing is recommended not to exceed 24 to 30 x the concrete thickness. Shorter distance between joint spacing would provide greater crack control. Joints at curves and angle points are suggested as determined by the project structural engineer.

To minimize potentials for "warping", subgrades to receive concrete shall be free of excess water. Concrete placements during adverse weather conditions should not be allowed.

4.5 Resistance to Lateral Loads

Resistance to foundation lateral displacement can be achieved by friction acting at the base of foundation and by passive earth pressures. A coefficient friction of 0.40 may be assumed with normal dead load forces for footing established on engineered compacted fills of local soils.

An allowable passive lateral earth resistance of 300 psf per foot of depth may be assumed for the sides of foundations poured against compacted fills. The maximum lateral passive earth pressure is recommended not to exceed 3000 lbs.

For design, active lateral pressures from local soils when used as backfills may be estimated from the following equivalent fluid density:

CONDITIONS	EQUIVALENT FLUID DENITY, pcf	
	Level Backfill	2:1 Backfill Sloping Upwards
Active	40	55
At Rest	55	70
Seismic	75% of active earth pressures	75% of active earth pressures

4.6 Shrinkage and Subsidence

It is our opinion that during grading the upper soils may be subjected to a volume change. Assuming a 90% relative compaction for structural fills and assuming an overexcavation and recompaction depth as described earlier, such volume change due to shrinkage may be on the order of 7% to 10%. Further volume change may be expected due to supplemental shrinkage during preparation of subgrade soils. For estimation purpose, such may be approximated to about 2-inch when conventional construction equipment is used.

4.7 Construction Considerations

4.7.1 Unsupported Excavation

Gravelly sandy site soils encountered are considered highly susceptible to caving. Temporary excavations up to 4 feet in depth may be made without rigorous lateral support. Excavated surface should be "'wetted" during construction to minimize potential surface soil raveling. No surcharge loading should be allowed within an imaginary 1:1 line drawn upward from the toe of the temporary excavations.

4.7.2 Supported Excavations

If vertical excavations exceeding 4 feet in depth become warranted, such should be achieved using shoring to support sidewalls.

4.8 Soil Caving

Considering the gravelly sandy site soils encountered as described, it is our opinion that some caving may be expected during deep excavations. Temporary excavations in excess of 5 feet should be made at a slope ratio of 2 to 1 (h:v) or flatter, or as per the construction guidelines as provided by Cal-Osha.

4.9 Site Preparations for Driveways/Parking/Paving

Assuming concrete paving for use by conventional traffic, it is suggested that prior to concrete placement, the subgrades to receive paving should be subexcavated to minimum 18 inches, followed by the local excavated soils replacement in 6 to 8-inch-thick lifts, compacted to minimum 95%. Use of vibratory sheepsfoot roller is suggested during grading.

4.10 Pavement Thickness Design

Alternative I - Rigid Concrete Paving

Rigid paving, if selected, should be at least 6-inch-thick concrete placed directly over the local sandy gravelly soils compacted to minimum 95%. Alternatively, 5-inch thick concrete can be considered over 4-inch class II base material compacted to 95%. Actual paving thickness and reinforcement requirements should be supplied by the project structural engineer using soils' Subgrade Reaction Modulus, kcf of 350.

Rigid concrete driveways should have thickened edges to prevent potential for lateral sliding under auto and truck traffic loading.

Alternative II - Asphalt Paving

Flexural asphalt paving, if selected, based on the estimated Traffic Indices (TIs) as described and a laboratory determined soils' R-value of 75 and laboratory determined soils' Sand Equivalent, SE of 46.76, the following flexible (a.c.) pavement sections are provided for initial use:

Service Vehicle	Traffic Index, TIs	Pavement Type	Paving Thickness (inch)
Auto/ Truck Traffic	7	a.c. over Class II base or CMB	3.0 over 3.0 5.0 over native
	10	"	5.0 over 3.0

Within paving areas, subgrade soils should be subexcavated to minimum 18 inches, moisture conditioned to near Optimum Moisture Content, followed by the excavated soils replacement as engineered fills compacted to at least 95% of the soils' maximum Dry Density as determined by the method ASTM D1557. Class II base or CMB used to receive asphalt concretes should be placed directly over the prepared subgrades and compacted to minimum 95%. Use of thicker/deepened paving edges are recommended to minimize potential for edge movement and paving distress.

The pavement evaluations are based on estimated Traffic Index (TI) as shown and on the soils' R-value as described. It is recommended that following mass grading completion, representative site soils should be laboratory tested to determine soils' R-value and to provide updated paving thickness.

4.11 Retaining Wall (if planned)

It is unknown if any retaining structure will be associated with development proposed. It is our opinion that retaining foundations should be designed based on a soils vertical bearing capacity of 1800 psf, along with the lateral active pressures as described below:

Slope of Retained Material (h:v)	Equivalent Fluid Density, pcf	
	Clean Sand	Local Soil
level	30	35
2:1	42	55

During a local Magnitude 6.7 earthquake along the Cucamonga fault zone, additional lateral pressures will occur along the back of the retaining walls. The seismic-induced lateral soil pressure may be computed using a triangular pressure distribution with the maximum value at the top of the wall> The maximum lateral pressure of (20 pcf) H where H is the height of the retained soils above the wall footing should be used in the final design of retaining wall.

Sliding resistance value and passive fluid pressure values may be increased by 1/3 during short-erm wind and seismic loading conditions.

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. All walls shall be waterproofed and protected from hydrostatic pressure by a reliable permanent subdrain system.

The design parameters do not include any hydrostatic pressure build-up. Consequently, installation of "'French-drain" behind retaining walls is recommended to minimize water pressure build-up behind retaining walls. Use of impervious material is preferred within upper the 18 inches of the backfills placed.

Backfills behind retaining wall should be compacted to a minimum 90% of the soils' Maximum Dry Density as determined by the ASTM D15571 test method. Flooding and/or jetting behind wall should not be permitted.

Walls adjacent to traffic areas should be designed to resist a uniform lateral pressure of 100 psf, which is a result of an assumed 300 psf surcharge behind the walls due to normal traffic. If the traffic is kept back 10 feet from the wall, the traffic surcharge may be neglected.

4.12 Utility Trenches Backfill

Utility trenches backfills at depth in excess of 2 feet should be placed in thin lifts and compacted to the minimum requirements described. As an alternative, clean granular sand may be used having Sand Equivalent, SE of minimum 30. Jetting is not recommended in lieu of mechanical compaction. Trench excavations should conform to the requirements and safety as specified by Cal-Osha.

4.13 Seasonal Limitations

No fill shall be placed, spread or rolled during unfavorable weather conditions. Where the work is interrupted by heavy rains, fill operations shall not be resumed until moisture conditions are considered favorable by the geotechnical engineer.

4.14 Planters

To minimize potential differential settlement to foundations, planters requiring heavy irrigation should be restricted from using adjacent to footings. In the event that such becomes unavoidable, planter boxes with sealed bottoms should be considered.

4.15 Landscape Maintenance

Only the amount of irrigation necessary to sustain plant life should be provided. Pad drainage should be directed towards streets and to other approved areas away from foundations. Slope areas should be planted with draught resistant vegetation. Over watering landscape areas could adversely affect the proposed site development during its lifetime use.

4.16 Observations and Testing During Site Preparations and Grading

Recommendations provided assume that structural footings and slabs-on-grade be established exclusively into compacted fills. Excavated footings should be inspected, verified, and certified by the geotechnical engineer prior to steel and concrete placement to ensure their sufficient embedment and proper bearing as recommended. Structural backfills discussed should be placed under direct observation and testing by Soils Southwest, Inc. Excess soils generated from footing excavations should be removed from pad areas.

In general, geotechnical inspections should include, at a minimum, the following:

- Subexcavation depth during grading,
- Fill compaction testing,
- Retaining wall backfill compaction (if planned),
- Excavated foundation depth,
- Paving subgrade verification, and
- Utility trenches backfill compaction.

4.17 Plan Review

No precise grading or detailed development plans are prepared and none such are available for review. Prior to the actual mass grading, grading and foundation plans should be available to ensure applicability of the assumptions made in preparing this report. If during construction, conditions are observed different from those as presented, revised and/or supplemental recommendations will be required.

4.18 Pre-Construction Meeting

It is recommended that no clearing of the site or any grading operations be performed without the presence of a representative of this office. An on-site pre-grading meeting should be arranged between the geotechnical engineer and the grading contractor prior to the start of construction. Two days' advance notice for such meeting is required.

5.0 Earth Work/General Grading Recommendations

It is our opinion that the soils encountered primarily consist upper 3 feet of variegating layers of gravels and gravel silty fine to medium coarse sand mixtures with concentrations of rocks, cobbles, and occasional small boulders to the refusal depth of 3 feet explored. Descriptions of the soils encountered are provided in the attached Log of Borings.

Prior to grading commencement, it is suggested that all debris and loose stockpiles should be cleared and disposed off-site to the satisfaction of the geotechnical engineer. In general, site preparations and grading for the project should include, at a minimum, the following:

Structural Backfill

Local soils free of organics, debris, and rocks smaller than 6-inch in overall diameter should be considered suitable for reuse as structural backfill. Loose soils, formwork, and debris should be removed prior to backfilling retaining walls. Local soils backfill should be placed and compacted in accordance with the recommendations provided below. Where space limitations do not allow conventional backfilling operations, special backfill materials, and procedures may be required. Pea gravel or other select backfill can be used within limited space areas. Additional recommendations on such will be provided during construction.

Percentage Compaction During Mass Grading

With the presence of fine to coarse gravelly sandy soils with trace silts, isolated cobbles and rocks existing as described and assuming moderately high dead loads and seismic peak ground acceleration described, it is our opinion that structural fills placed should be compacted to the minimum 90% compaction requirements described. During grading, use of vibratory sheepsfoot roller is recommended.

Site Drainage

Adequate positive drainage should be maintained away from the structural pad in order to prevent water from ponding and to reduce potential percolation into backfill. A desirable slope for surface drainage is 2% in landscape areas and 1% in paved areas. Planters and landscaped areas adjacent to building perimeter should be adequately designed to minimize water filtration into subsoils. Considerations should be given to the use of closed planter bottoms, concrete slabs, and perimeter subdrains where applicable.

Utility Trenches

Buried utility conduits should be bedded and backfilled around the conduit in accordance with the project specifications. Buried utilities in excess of 2 feet should be backfilled with local gravelly sandy soils and compacted to at least 90%. Remaining near surface backfills should be compacted to 95%.

General Grading Recommendations:

Recommended general specifications for surface preparation to receive compacted engineered fills for structural support and utility trench backfill and others are presented below:

1. Areas to be graded, backfilled or paved, shall be grubbed, stripped, and cleaned of all buried and undetected debris, structures, concrete, vegetation and other deleterious materials prior to grading.

2. During grading, the estimated subexcavation depths within building pad areas and 5 feet beyond should be minimum 5 feet below the current grade surface.

3. Where compacted fill is used to provide vertical support for foundations, all loose, soft, and other incompetent soils should be removed to full depth as approved by the geotechnical engineer.

4. Compaction for structural fills shall be determined relative to the Maximum Dry Density as determined by ASTM D1557 compaction methods. All in-situ field density of compacted fill shall be determined by the ASTM D1556 standard methods or by other approved procedures.

5. All new imported soils, if required, shall be clean, granular, and non-expansive material requiring prior approval by the geotechnical engineer.

6. During grading, fill soils shall be placed as thin layers, thickness of which following compaction shall not exceed 6 inches.

7. In accordance with the CBC: rock sizes greater than 12 inches (305 mm) and up to 24 inches (610 mm) in maximum dimension shall be three feet (914 mm) or more below grade, measured vertically. Rock sizes greater than 24 inches (610 mm) in maximum dimension shall be 10 feet (3048 mm) or more below grade, measured vertically.

8. No jetting and/or water tampering be considered for backfill compaction for utility trenches without prior approval of the geotechnical engineer. For such backfill, hand tampering with fill layers of 8 to 12 inches in thickness or as approved by the geotechnical engineer is recommended.

9. Any and all utility trenches at depth as well as cesspool and abandoned septic tank within building pad area and beyond, should either be completely excavated and removed from the site or should be backfilled with gravel, slurry or by other material, as approved by the geotechnical engineer.

10. Any and all import soils if required during grading should be equivalent to the site soils or better. The geotechnical engineer prior to their use should approve such.

11. Any and all grading required for pavement, sidewalks or other facilities to be used by general public, should be constructed under direct observation of the geotechnical engineer or as required by the local public agencies.

12. A site meeting should be held between the grading contractor and the geotechnical engineer prior to actual site preparations and grading. Two days advance notice will be required for such meeting.

6.0 WQMP-BMP Infiltration Rates Using Porchet Method for Stormwater Disposal Design

In general, four (4) infiltration tests were planned at the depth and locations as suggested by the project design engineer. Considering the excessively gravely sands and concentrations of rocks, cobbles, and occasional small boulders, infiltration testing was limited to the depths of 3 and 5 feet below existing surface grade (BSG) at the southwest where 8-foot testing was planned. Planned testing (P-3 and P-4) at depths 3 to 4 feet within the area of the planned basin/swale could not be performed due to resistance at 1 and 1.5 feet due to concentrations of rocks, cobbles, and small boulders. The tests were performed using the standardized "falling-head" test converted using the Porchet method. Test locations and test data are shown in the attached Appendix D.

Method of infiltration rate as per the guidelines in accordance with Table 1, Infiltration Basin Option 2 of Appendix A of the Riverside County-Low Impact Development (LID) BMP Design Handbook as well as per the Appendices Section VII.3.8.2, Appendix VII: Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations of the San Bernardino County Technical Guidance Document for Water Quality Management Plans Handbook.

Approximate test locations are shown on the attached Plate 1. The test results should be considered tentative given the potential for changes to site finish grades or changes in soil conditions as exposed during site preparations and grading.

The soils encountered within the proposed chamber consist, in general, of dry gravels and fine to medium coarse poorly graded silty sands overlying variegating layers of gravels and silty fine to medium coarse sands with rocks and cobbles to the depth explored of 3 and 5 feet as described (test borings P-1 to P-2). Descriptions of the soils encountered are provided in the attached Log of Borings.

Based on the field infiltration testing completed, it is our opinion that for the infiltration system design proposed at about 3 and 5 feet below grade, the observed soils infiltration rates are 19.79 inches/hour and 15.62 inches/hour for test locations P-1 and P-2, respectively.

For design, it is suggested that use of an appropriate factor of safety as determined by the design engineer should be considered to the observed rate to account for long-term saturation, inconsistencies in subsoil conditions, potential for silting, and lack of maintenance. The observed soils' percolation rates are provided in Section 6.3 of this report.

6.1 METHODOLOGY AND TEST PROCEDURES

EQUIPMENT SET-UP (POST EXCAVATION) PROCEDURES:

Following test boring completion, each of the test holes were fitted with perforated PVC pipes backfilled with 2-inch-thick crushed rock at the bottom to minimize potentials for scouring and caving. For testing, each test hole was initially filled using water supplied by water jugs.

Prior to actual testing, to determine test intervals, as per the Section 2.3 for deep percolation testing of the referenced handbook guideline, two consecutive readings were performed to determine if 6 or more inches of water seeped in 25 minutes. Since 6 inches or more of water seeped away in less than 25 minutes for all test locations, P-1 and P-2 , subsequent percolation testing was performed at 10-minute time intervals for at least minimum one hour or until the rates were uniform. Testing included water placement at about and 3 feet below existing grade surface (inlet depth of 24 inches above infiltration system bottom).

The final 10-minute recorded percolation test rates were converted into an Infiltration Rate (I_t) for inches per hour using the "Porchet Method" equation as described in the Reference 2, Riverside County Low Impact Development BMP Design Handbook, as well as per the Appendices Section VII.3.8.2, Appendix

VII: Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations on the San Bernardino County Technical Guidance Document for Water Quality Management Plans Handbook.

6.2 INFILTRATION TEST RESULTS

Based on the soils infiltration testing completed at the test locations and at the test depth as described, the observed soils' percolation rates are 19.79 inches/hour and 15.62 inches/hour for test locations P-1 and P-2, respectively.

Calculations to convert the percolation test rate to infiltration test rates in accordance with Section 2.3 of the County Handbook are presented in Table I and II below. For design, it is suggested that an appropriate Factor of Safety as selected by the design engineer should be considered to the observed field percolation rate described.

6.2.1 SUMMARY & CONVERSION CALCULATIONS

TABLE I

For WQMP-BMP design, based on the soils infiltration testing completed and, on the calculations as described, the following infiltration rates may be considered. Actual field test data are attached.

Observed Infiltration Rate for Design

Test Location (8-9-24)	Test Depth Below Grade, feet	Porchet Method Observed Rate, inch/hour
P-1	3	19.79
P-2	5	15.62
P-3	n/a	n/a
P-4	n/a	n/a

Note: n/a: due to shallow boring resistance to near surface concentrations of rocks, cobbles, and small boulders, infiltration tests could not be performed at the required depths.

TABLE II
Conversion Table (Porchet Method)

Test No.	Depth Test Hole, inches	Time Interval, minutes	Initial Depth, inches	Final Depth, inches	Initial Water Height, inches	Final Water Height, inches	Change in Height/ Time	Average Head Height/Time
	Dt	ΔT	D_O	D_f	$H_o=D_t-D_o$	$H_f=D_t-D_f$	$\Delta H= H_f-H_O$	$H_{avg} = (H_o+H_f)/2$
P-1	36	10	12	35.5	24.0	0.5	23.50	12.25
P-2	60	10	36	56.5	24.0	3.5	20.50	13.75

	Infiltration Rate (It)=ΔH60r/Δt(r+2Havg)		
	A	B	C
Test No.	ΔH60r	Δt(r+2Havg)	A/B=in/hr
P-1	5640	285	19.79
P-2	4920	315	15.62

Use of a safety factor should be considered to account for long-term saturation, inconsistencies in subsoil conditions along with the potential for silting of percolating soils.

The infiltration rate described is based on the in-situ testing completed at the locations as suggested by the project civil engineer. In the event that the final chamber location and depth vary considerably from those described herein, supplemental soils infiltration testing may be warranted.

It should be noted that over prolonged use and lack of maintenance the detention/infiltration basins or deep chambers constructed based on the suggested design rate may experience much lower infiltration rate due to the accumulation of silts, fines, soils, and others. Regular maintenance of the chambers in the form of removal of debris, oil, and fines are strongly recommended. A maintenance record of such is suggested for future use.

Suggested Requirements for Standard Stormwater BMP installation (where applicable)
The invert of stormwater infiltration should be set at least 10 feet above the groundwater elevation and should not be placed on steep slopes to create conditions for slopes instability.

When adequately installed, it is our opinion that the Stormwater infiltration systems installed should not increase the potential for static or seismic settlement of structures.

Stormwater infiltration installed should not place an increased surcharge on structures or foundations on or its adjacent. The pore water pressure should not increase the soils retained by retaining structures.

The invert of stormwater infiltration should be set back at least 15 feet and outside a 1:1 plan drawn up from the bottom of adjacent foundations.

Stormwater infiltration should not be located near utility lines where the introduction of stormwater could cause damage to utilities or settlement of trench backfill.

Stormwater infiltration systems should not be allowed within 100 feet of any potable groundwater production well.

Once installed, regular maintenance of the detention systems is recommended.

7.0 Closure

The conclusions and recommendations presented are based upon the findings and observations as made during subsurface test excavations and subsequent laboratory testing and engineering evaluations as currently used in the Geotechnical industry. The recommendations supplied should be considered "preliminary" since they are based on soil samples only. If during construction, the subsoil conditions appear different from those as disclosed during field investigation this office should be notified to consider any possible need for modification by the geotechnical recommendations as provided in this report.

Recommendations provided are based on the assumptions that structural footings will be established exclusively into compacted fill. No footings and/or slabs should be allowed straddling over cut and fill transition interface.

Site grading observations and testing must be performed by a representative of this office. Further, it is recommended that excavated footings should be verified and approved by geotechnical engineer prior to steel and concrete placement to ensure that foundations are founded into satisfactory soils and excavations are free of loose and disturbed materials.

A pre-grading meeting between grading contractor and geotechnical engineer is recommended prior to construction preferably at the site, to discuss the grading procedures to be implemented and other requirements described in this report to be fulfilled.

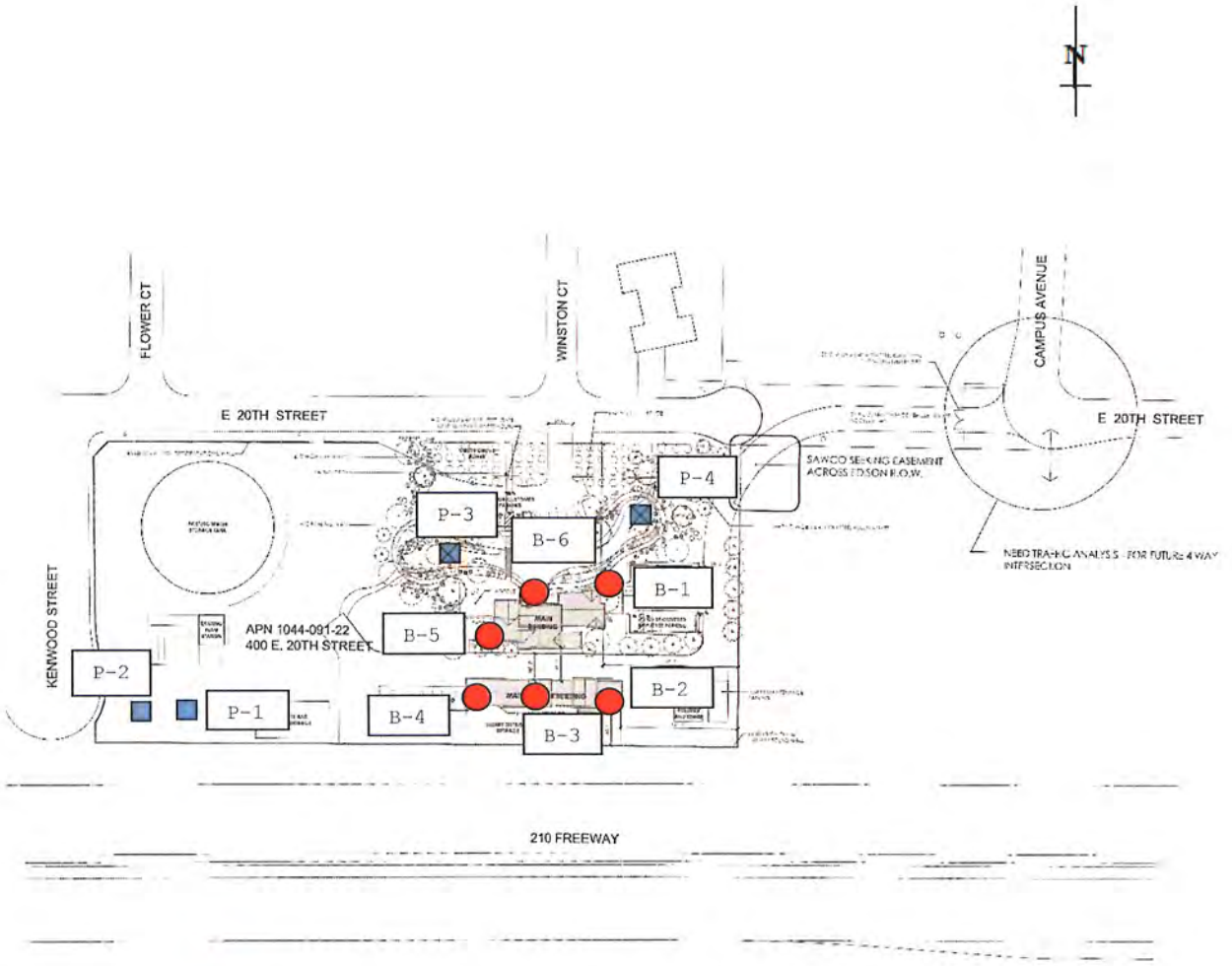
This report has been prepared exclusively for the use of the addressee for the project referenced in the context. It shall not be transferred or be used by other parties without written consent by Soils Southwest, Inc.

Should the project be delayed beyond one year after the date of this report, the recommendations presented shall be reviewed to consider any possible change in site conditions.

The recommendations presented are on the assumption that the necessary geotechnical observations and testing during construction will be performed by a representative of this office. The field observations are considered a continuation of the geotechnical investigation performed.

If another firm is retained for geotechnical observations and testing, our professional liability and responsibility shall be limited to the extent that Soils Southwest, Inc. would not be the geotechnical engineer of record. Use of the geotechnical recommendations by others will relieve Soils Southwest, Inc. of any liability that may arise during the lifetime use of the structure constructed.

PLOT PLAN AND TEST LOCATIONS
400 E. 20th Street, Upland
APN: 1044-091-22
Not to Scale



Legend:

- B-1 Approximate Location of Test Borings for Geotechnical Evaluations
- P-1 Approximate Location of Test Pit for BMP Soils' Infiltration
- P-3 Approximate location of Test Pit for BMP Soils Infiltration that could not be performed as planned due to surface concentrations of rocks, cobbles, and small boulders.

List of Appendices

Appendix A - Log of Borings

Appendix B - Laboratory Test Results

Table I: In-Situ Moisture-Density (ASTM D2216 and D2937)

Table II: Max. Density/Optimum Moisture Content (ASTM D1557)

Table III: Direct Shear (ASTM D3080)

Table IV: Consolidation (ASTM D2435)

Table V: Sand Equivalent, SE (ASTM D2419)

Table VI: Sieve Analysis (ASTM D422)

Table VII: Soils' Chemical Analyses Test Results

Table VIII: Soils' Density Correlation to SPT Blow Counts

APPENDIX C – Supplemental Seismic Design Parameters &
FEMA National Flood Hazard Layer Map

APPENDIX D - Field Infiltration Test Data Porchet Method Calculation Summary

LOG OF BORINGS

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-1

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GP			disturbed surface soils, gravels, scattered debris
					GM-SM			GRAVELS consisting of rocks and cobbles - (Max Dry Density = 133 pcf @ 8.0 %
							5	GRAVEL/SAND mixture-tannish light brown, silty, fine to medium coarse, pebbles, rock fragments, rocks, cobbles, dry
							10	- Abandoned at +/- 3.0 ft. due to resistance (concentrations of rocks and cobbles) - no bedrock - no groundwater
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

Bulk/Grab sample

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LOG OF BORING B-2

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GP			gravels GRAVEL- rocks cobbles, small boulders, with very little yellow tan silty dry sand - Abandoned test boring @ 1.5 feet due to resistance (concentrations of rocks and cobbles - no bedrock - no groundwater

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

Soils Southwest, Inc.
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Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-3

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GM-SM			gravels, scattered weeds and debris GRAVEL/SAND mixture-with gravely and slightly silty, fine to medium coarse, rock fragments, rocks, and cobbles, dry - Abandoned Test boring @ 2.0 ft. due to resistance (concentrations of rocks and cobbles) - no bedrock - no groundwater

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

Soils Southwest, Inc.
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Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-4

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GM-SM			disturbed surface gravels and soils
								GRAVEL/SAND mixture-light tan silty, fine to medium coarse, rock fragments, rocks,cobbles occasional small boulders, dry
							5	- Abandoned test boring @ 0.5 ft. due to resistance (concentrations of rocks, cobbles, small boulders) - no bedrock - no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location

Planned Headquarter Facility
400 East 20th Street
Upland, California

Plate #

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-5

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GM-SM			disturbed surface gravels and soils with rocks and cobbles
								GRAVEL/SAND mixture-tan to light brown, slightly silty, fine to medium coarse, rock fragments, rocks, and cobbles, dry
							5	- Abandoned test boring @ +/- 1.5 feet due to resistance(concentrations of rocks and cobbles) - no bedrock - no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

Soils Southwest, Inc.
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Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-6

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
								gravels, rocks, cobbles GRAVEL/SAND mixture-light tan to brown, slightly silty, fine to medium coarse,rocks cobbles, dry
							5	- Abandoned test boring @ 2.0 ft. due to resistance (concentrations of rocks and cobbles) - no bedrock - no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING P-1

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GM-SM			- disturbed surface gravels and soils
								GRAVELS/SAND mixture -light yellow tan,silty fine, dry with rocks and cobbles
					SM			SAND - gray-brown, silty, fine to medium coarse, pebbles, rock fragments, rocks, cobbles, dry
					GP		5	GRAVELS with little to no sand,rocks,cobbles
								- Abandoned infiltration test boring @3.0 ft due to resistance (concentrations of rock and cobbles) - no bedrock
								- no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

Soils Southwest, Inc.
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Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING P-2

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			disturbed gravels and soils
								SAND - yellowish tannish brown, silty, fine to medium coarse, pebbles, rock fragments, rocks, dry
								- with rocks and cobbles
					GP		5	GRAVELS
								- Abandoned infiltration test boring @5.0ft. due to resistance (concentrations of rocks and cobbles)
								- no bedrock
								- no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location

Planned Headquarter Facility
400 East 20th Street
Upland, California

Plate #

Soils Southwest, Inc.
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Colton, CA 92324
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LOG OF BORING P-3

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GM-SM			gravels, rocks, and cobbles
								GRAVEL/SAND mixture- light yellow gray tan, silty, fine, rock fragments, rocks, cobbles scattered small boulders, dry
							5	SAND (fill) - color change to light brown, silty, fine to medium coarse, pebbles, rock fragments, rocks, cobbles, scattered debris, dry
							10	- Abandoned infiltration test boring @ 1.5ft due to resistance (concentrations of rock and cobbles) - no bedrock - no groundwater
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

Soils Southwest, Inc.
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LOG OF BORING P-4

Project: San Antonio Water District Headquarters		**Job No.:** 24036-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** August 9,2024

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GP			disturbed surface gravels and soils
								GRAVEL with little sand, rocks, cobbles,and occasional small boulders, dry
								- Abandoned infiltration test boring @ 1.0ft due to resistance(concentration of rocks cobbles)
							5	- no bedrock
								- no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Planned Headquarter Facility 400 East 20th Street Upland, California	**Plate #**

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Poorly graded gravel
	Silty sand and gravel
	Silty sand

Notes:

1. Exploratory borings were drilled on August 9,2024 using a 4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or when re-checked the following day.

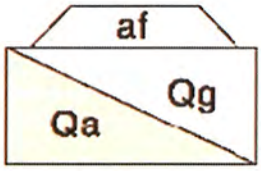
3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.



LEGEND

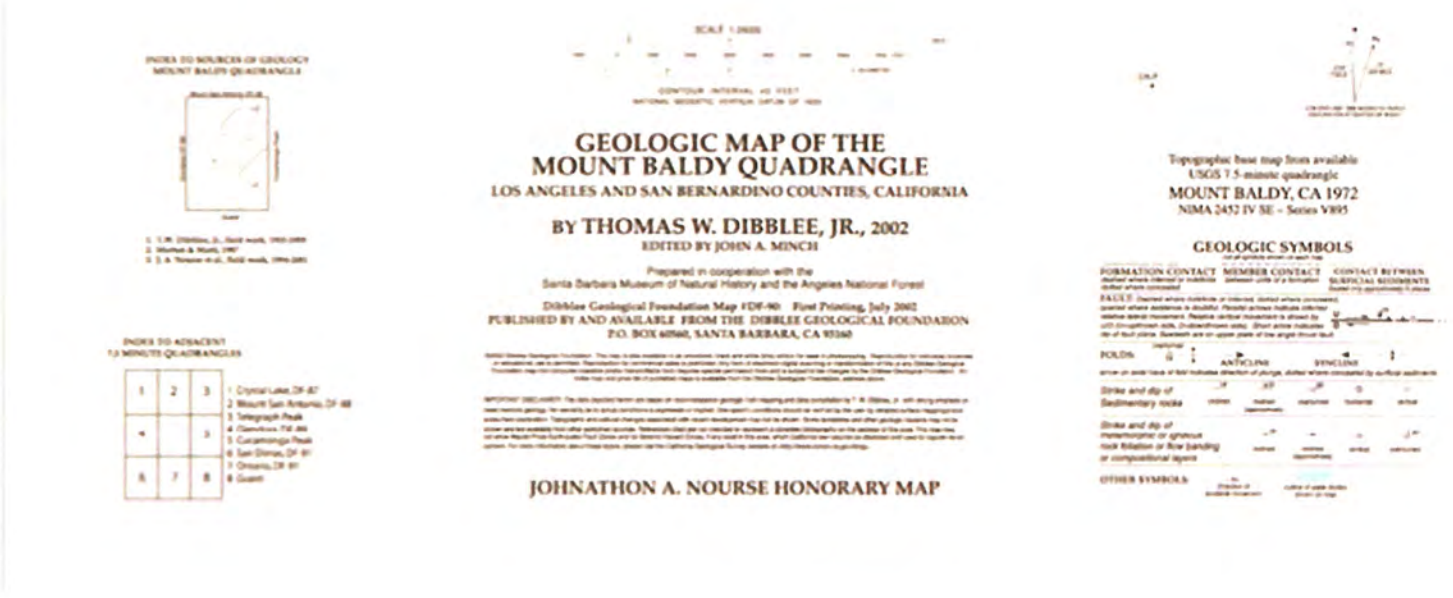


SURFICIAL SEDIMENTS

af *artificial fill*

Qg *alluvial gravel and sand of stream channels*

Qa *alluvial gravel and sand of valley areas*



INDEX TO SOURCES OF GEOLOGY
MOUNT BALDY QUADRANGLE

INDEX TO ADJACENT 7.5 MINUTE QUADRANGLES

GEOLOGIC MAP OF THE
MOUNT BALDY QUADRANGLE
LOS ANGELES AND SAN BERNARDINO COUNTIES, CALIFORNIA

BY THOMAS W. DIBBLEE, JR., 2002
EDITED BY JOHN A. MINCH

Prepared in cooperation with the
Santa Barbara Museum of Natural History and the Angeles National Forest

Dibblee Geological Foundation Map #DF-90 First Printing, July 2002
PUBLISHED BY AND AVAILABLE FROM THE DIBBLEE GEOLOGICAL FOUNDATION
P.O. BOX 60760, SANTA BARBARA, CA 93160

JOHNATHON A. NOURSE HONORARY MAP

Topographic base map from available
USGS 7.5-minute quadrangle
MOUNT BALDY, CA 1972
NIMA 2452 IV SE – Series V895

GEOLOGIC SYMBOLS

SOURCE: USGS/AASG National Geological Map/Map View (beta) NGMDB

USDA United States Department of Agriculture
Natural Resources Conservation Service

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Area of Interest (AOI) | Soil Map | Soil Data Explorer | Download Soils Data | Shopping Cart (Free)

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Map Unit Legend

San Bernardino County Southwestern Part, California (CA677)

San Bernardino County Southwestern Part, California (CA677)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HaC	Hanford coarse sandy loam, 2 to 9 percent slopes	11.8	17.2%
RmC	Ramona sandy loam, 2 to 9 percent slopes, MLRA 19	5.7	8.3%
SoC	Soboba gravelly loamy sand, 0 to 9 percent slopes	9.9	14.5%
SpC	Soboba stony loamy sand, 2 to 9 percent slopes	41.2	60.0%
Totals for Area of Interest		**68.7**	**100.0%**

Legend

Soil Map

Scale (not to scale)



San Bernardino County Southwestern Part, California

SpC—Soboba stony loamy sand, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hckv
Elevation: 960 to 3,690 feet
Mean annual precipitation: 12 to 39 inches
Mean annual air temperature: 60 to 65 degrees F
Frost-free period: 260 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Soboba and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soboba

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

Ap - 0 to 10 inches: stony loamy sand
C1 - 10 to 24 inches: very stony loamy sand
C2 - 24 to 60 inches: very stony sand

Properties and qualities

Slope: 2 to 9 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 19.99 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XG912CA - Sandy Fan

Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Tujunga, gravelly loamy sand

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 15, Aug 30, 2023

San Bernardino County Southwestern Part, California

SoC—Soboba gravelly loamy sand, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hckt
Elevation: 30 to 4,200 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 175 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Soboba and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soboba

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 12 inches: gravelly loamy sand
H2 - 12 to 36 inches: very gravelly loamy sand
H3 - 36 to 60 inches: very stony sand

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: R019XG912CA - Sandy Fan
Hydric soil rating: No

Minor Components

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

Delhi, fine sand
Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga, gravelly loam
Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 2 percent
Landform: Drainageways
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 15, Aug 30, 2023

San Bernardino County Southwestern Part, California

HaC—Hanford coarse sandy loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2y8tl
Elevation: 890 to 2,860 feet
Mean annual precipitation: 11 to 22 inches
Mean annual air temperature: 64 to 65 degrees F
Frost-free period: 320 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 12 inches: sandy loam
C - 12 to 60 inches: fine sandy loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Minor Components

Greenfield, sandy loam

Percent of map unit: 10 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Tujunga, loamy sand

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 15, Aug 30, 2023

APPENDIX B

Laboratory Test Programs

Laboratory tests were conducted on representative soils for the purpose of classification and for the determination of the physical properties and engineering characteristics. The number and selection of the types of testing for a given study are based on the geotechnical conditions of the site. A summary of the various laboratory tests performed for the project is presented below.

Moisture Content and Dry Density (D2937):

Data obtained from these tests, performed on undisturbed samples are used to aid in the classification and correlation of the soils and to provide qualitative information regarding soil strength and compressibility.

Direct Shear (D3080):

Data obtained from this test performed at increased and field moisture conditions on relatively remolded soil sample is used to evaluate soil shear strengths. Samples contained in brass sampler rings, placed directly on test apparatus are sheared at a constant strain rate of 0.002 inch per minute under saturated conditions and under varying loads appropriate to represent anticipated structural loadings. Shearing deformations are recorded to failure. Peak and/or residual shear strengths are obtained from the measured shearing load versus deflection curve. Test results, plotted on graphical form, are presented on Plate B-1 of this section.

Consolidation (D2835):

Drive-tube samples are tested at their field moisture contents and at increased moisture conditions since the soils may become saturated during lifetime use of the planned structure.

Data obtained from this test performed on relatively undisturbed and/or remolded samples, were used to evaluate the consolidation characteristics of foundation soils under anticipated foundation loadings. Preparation for this test involved trimming the sample, placing it in a one-inch-high brass ring, and loading it into the test apparatus which contained porous stones to accommodate drainage during testing. Normal axial loads are applied at a load increment ratio, successive loads being generally twice the preceding.

Soil samples are usually under light normal load conditions to accommodate seating of the apparatus. Samples were tested at the field moisture conditions at a predetermined normal load. Potentially moisture sensitive soil typically demonstrated significant volume change with the introduction of free water. The results of the consolidation tests are presented in graphical forms on Plate B-2.

Laboratory Test Results

Table I: Max. Density/Optimum Moisture Content (ASTM D1557)

Sample Location @ Depth, feet	Max. Dry Density, pcf	Optimum Moisture Content, %
B-1 @ 0-3 SAND – GP-SP Tannish light brown, gravel sand mixture, fine to coarse with trace silts, rock fragments, rocks, and cobbles	133	8.0

Table III: Direct Shear (ASTM D3080)

Test Boring No. @ Sample Depth, feet	Test Condition	Cohesion, psf	Friction, degrees
B-1 @ 0-3	Remolded to 90%	640	39

Table IV: Consolidation (ASTM D2435)

Boring No., B	Depth, feet	Consolidation prior to saturation, % @ 2 kips	Hydro Collapse, % @ 2 kips	Total Consolidation, % @ 8 kips (saturated)
1 (remolded)	0-3	0.5	0.1	1.8

Table V: Sand Equivalent, SE (ASTM D2419)

Sample Location @ depth, feet	**Sand Equivalent Average, SE**
B-3 @ 0-3.0 B-6 @ 0-3.0	55.9 46.7

Table VI: Sieve Analysis (ASTM D422)

SAMPLE: B-6 @ 0-3 feet

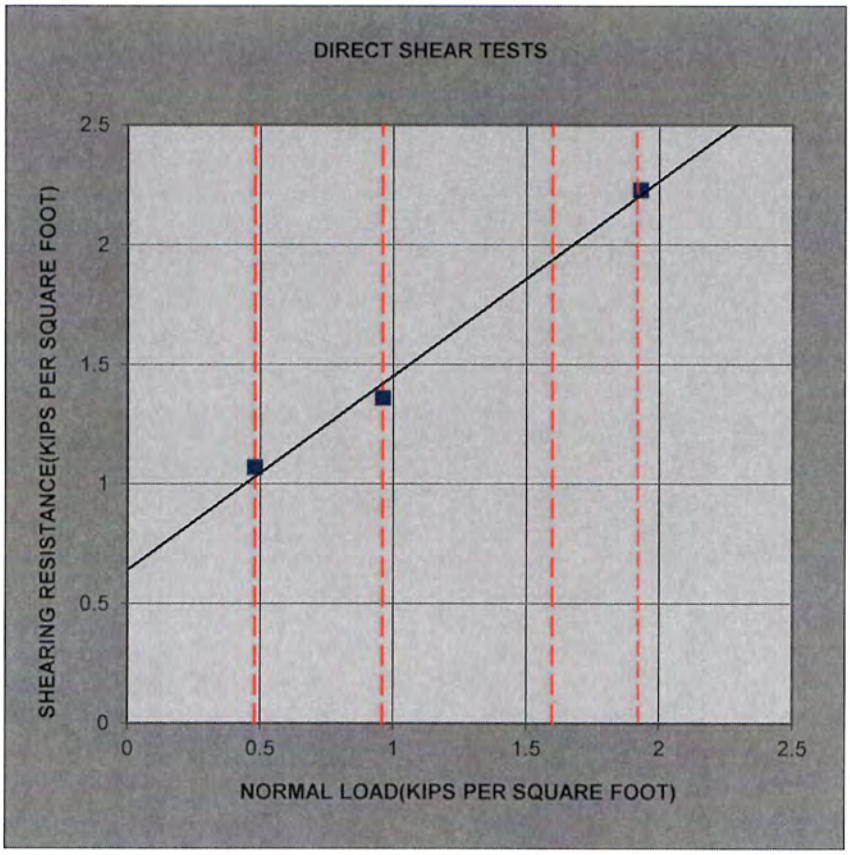
Grain Size	% Retained
Gravels	33
Medium to Coarse	37
Fines	18
Silts	12

Table VII: Soils' Chemical Test Results at Sample Location B-1 @ 0-3 feet

Sample	Method	Result	Units	Remarks
pH	EPA 9040 B	7.93	units	Not corrosive
Resistivity	SM 2510B	3,640	ohms-cm	Moderately corrosive
Chloride	EPA 300.0	29	mg/kg	Not corrosive
Sulfate	EPA 300.0	82	mg/kg	Not corrosive

Table VIII: Soils' Density Correlation to SPT Blow Counts

Density/Consistency		1" Soil Tube -- Blows Per Foot			Standard Penetration Blows Per Foot
Granular	Cohesive	Sand and Gravel	Silt	Clay	
Very Loose	Very Soft	0-50	0-50	0-60	0-5
Loose	Soft	50-100	50-180	60-250	5-10
Slightly Compact	Stiff	100-350	180-1000	250-1000	10-20
Compact	Very Stiff	350-525	1000-2000	1000-4000	20-35
Dense	Hard	525-1500	2000-5000	4000-5000	35-70
Very Dense	Very Hard	1500+	5000+	5000+	70+



SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-1	0 to 3	Remolded to 90%	640.10	39.08

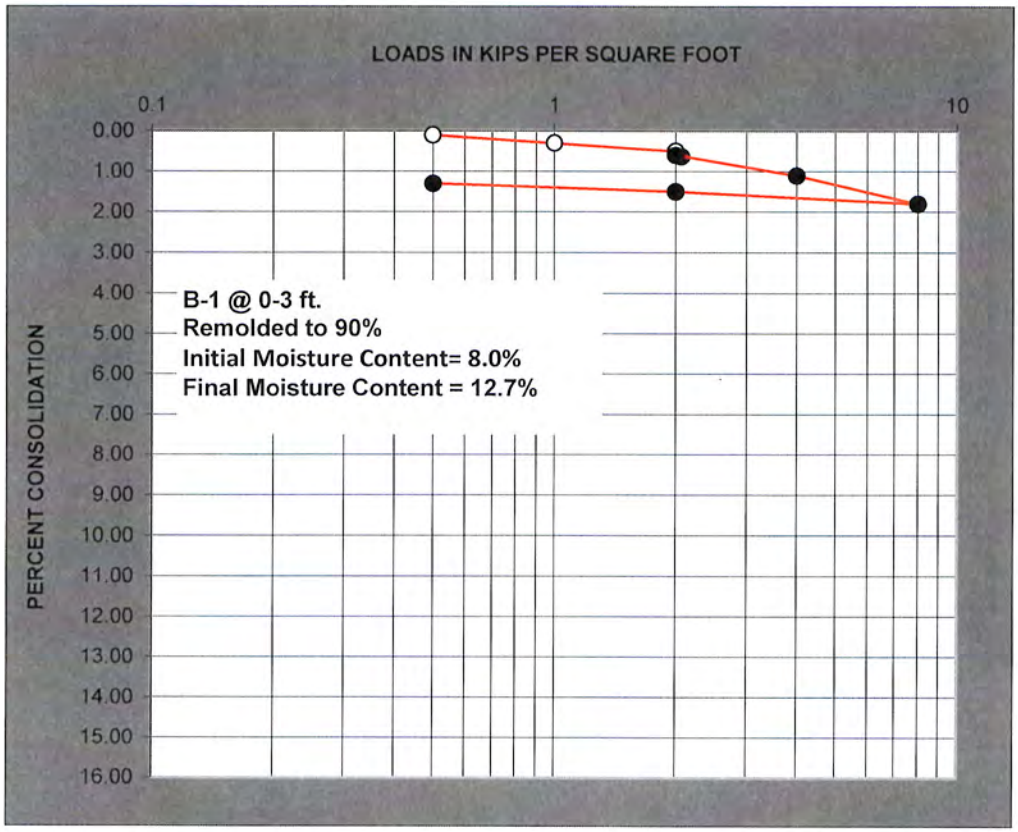
Proposed Administrative Office and Maintenance Structures
400 E. 20th Street
Upland, California

PROJECT NO. 24036-F

PLATE B-1

SOILS SOUTHWEST, INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS



- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Adiminstrative Office and Maintenance Structures 400 E. 20th Street		
	PROJECT NO.	24036-F	PLATE	B-2

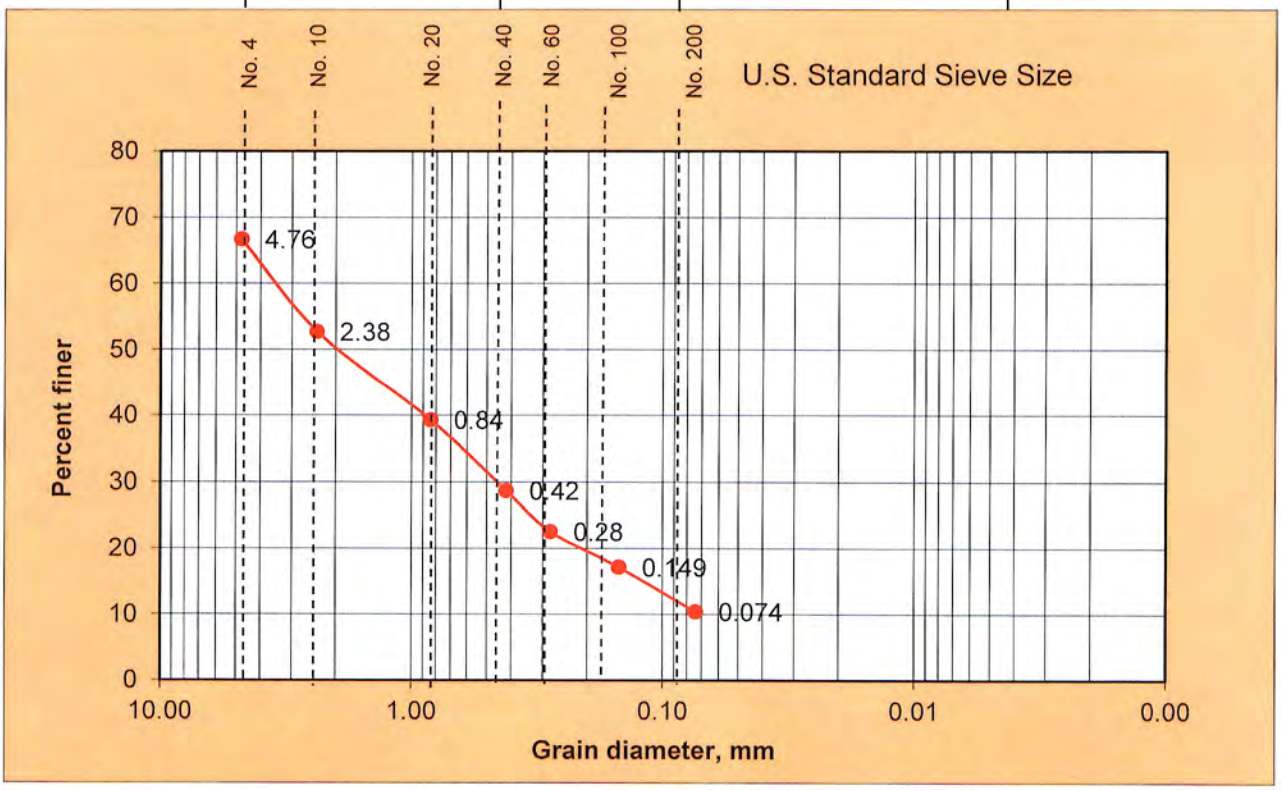
SOILS SOUTHWEST INC.
Consulting Foundation Engineers

GRAIN SIZE DISTRIBUTION

Project: San Antonio Water District HDQ **Job #** 24036-F
Location: 400 E. 20th Street, Upland **Boring No:** B-6/P2@0-3' **Sample No:** 1
Description of Soil: GP-SP
Date of Sample: 8/9/2024
Tested By: JG **Date of Testing:** 8/16/2024

Sieve No.	Sieve Openings in mm	Percent Finer	Grain Size	% Retained
4	4.76	66.74	Gravel	33
10	2.38	52.74	Med. to Crs	37
20	0.84	39.34	Fines	18
40	0.42	28.74	Silts	12
60	0.28	22.54		
100	0.149	17.20		
200	0.074	10.44		

Gravel	Sand			
	Coarse to Medium	Fine	Silt	Clay



Visual Soil Description : GRAVEL/SAND mixture with trace silts, fine to coarse with rock fragments, rocks, and cobbles

Soil Classification: GP-SP

System: USC

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

SAND EQUIVALENT TEST

Test Date: August 16,2024

Project No.: 24036-F/PV

Job Name: San Antonio Water District Headquarters
400 E. 20th Street
Upland

Sample Location: B-6/PV-2 @ 0-3ft

Sample by: JF Tested by: JG

LABORATORY DATA

SAMPLE NO.	1	2	3	4
TIME START	6:13	6:18	6:23	
TIME SOAK (10 min.)	6:23	6:28	6:33	
TIME AT LEVEL 15ML	6:25	6:30	6:35	
TIME of READING (20-min)	6:45	6:50	6:55	
FINE, ML	5.8	5.6	5.7	
COARSE, ML	2.8	2.6	2.6	
SE = 100x (coarse/fine)	48.27	46.42	45.61	
SE Average	46.76			

SAND EQUIVALENT TEST

Test Date: August 15,2024

Project No.: 24036-F/PV

Job Name: San Antonio Water District Headquarters
400 E. 20th Street
Upland

Sample Location: B-3/PV-1 @ 0-3ft

Sample by: JF Tested by: JG

LABORATORY DATA

SAMPLE NO.	1	2	3	4
TIME START	1:52	1:57	2:02	
TIME SOAK (10 min.)	2:02	2:07	2:12	
TIME AT LEVEL 15ML	2:04	2:09	2:14	
TIME of READING (20-min)	2:24	2:29	2:34	
FINE, ML	6.0	5.8	5.7	
COARSE, ML	3.6	3.0	3.2	
SE = 100x (coarse/fine)	60	51.7	56.1	
SE Average	55.9			

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909-781-6335
www.arlaboratories.com office@arlaboratories.com

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FOOD · COSMETICS · WATER · SOIL · SOIL VAPOR · WASTES

CASE NARRATIVE

Authorized Signature Name / Title (print)	Ken Zheng, President
Signature / Date	Ken Zheng, President 08/19/2024 18:03:02
Laboratory Job No. (Certificate of Analysis No.)	2408-00123
Project Name / No.	24036-F SAN ANTONIO WTR DIST. / 400 E. 20th ST., UPLAND
Dates Sampled (from/to)	08/14/24 To 08/14/24
Dates Received (from/to)	08/15/24 To 08/15/24
Dates Reported (from/to)	08/19/24 To 8/19/2024
Chains of Custody Received	Yes

Comments:

Subcontracting

Inorganic Analyses

No analyses sub-contracted

Other Analyses

No analyses sub-contracted

Sample Condition(s)

All samples intact

Positive Results (Organic Compounds)

None

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CERTIFICATE OF ANALYSIS

2408-00123

SOILS SOUTHWEST INC
MOLOY GUPTA
897 VIA LATA SUITE N
COLTON, CA 92324

Date Reported	08/19/24
Date Received	08/15/24
Invoice No.	2349
Cust #	S192
Permit Number	
Customer P.O.	

Project: 24036-F SAN ANTONIO WTR DIST. / 400 E. 20th ST., UPLAND

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 **B-1@0-3ft**					Date & Time Sampled:		08/14/24 @	10:00
Sample Matrix: **Soil**								
pH@25C-as Dissolved in Wtr	**7.93**		units	EPA 9040 B	1.0	0	08/15/24	DV
Resistivity	**3640**		ohms/cm	SM 2510B	1.0	1.0	08/15/24	DV
Chloride	**29**		mg/Kg	EPA 300.0 (1993 Rev 2.:	1.0	5.0	08/18/24	TLB
Sulfate	**82**		mg/Kg	EPA 300.0 (1993 Rev 2.:	1.0	5.0	08/18/24	TLB

Respectfully Submitted: Ken Zheng

Ken Zheng - Lab Director

QUALIFIERS

B = Detected in the associated Method Blank at a concentration above the routine RL.
B1 = BOD dilution water is over specifications . The reported result may be biased high.
D = Surrogate recoveries are not calculated due to sample dilution.
E = Estimated value; Value exceeds calibration level of instrument.
H = Analyte was prepared and/or analyzed outside of the analytical method holding time
I = Matrix Interference.
J = Analyte concentration detected between RL and MDL.
Q = One or more quality control criteria did not meet specifications. See Comments for further explanation.
S = Customer provided specification limit exceeded.

ABBREVIATIONS

DF = Dilution Factor
RL = Reporting Limit, Adjusted by DF
MDL = Method Detection Limit, Adjusted by DF
Qual = Qualifier
Tech = Technician

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USDA-EPA-NIOSH Testing Food Sanitation Consulting Chemical and Microbiological Analyses and Research

ARL

A & R Laboratories
1650 S. Grove Ave., Ste C, Ontario, CA 91761
Tel: 951-779-0310 / 909-781-6335 Fax: 951-779-0344
E-mail: office@arlaboratories.com

CHAIN OF CUSTODY

A & R Work Order #: 2408-123

Page 1 of 1

Client Name: Soils Southwest, Inc.
E-mail: soilssouthwest@aol.com
Address: 897 Via Lata, Suite N, Colton CA
Report Attention: Moloy G. | Phone #: 909-370-0474 | Fax: #
Sampled By: John Flippin
Project No./ Name: 24036-F
Project Site: 400 East 20th Street, Upland

☒ Chilled ☒ Intact ☐ Seal

Turn Around Time Requested: ☐ Rush 8 12 24 48 Hours ☑ Normal

Lab # (Lab use)	Client Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserve	No., type* & size of container	EPA8260B (VOCs & Oxygenates)	EPA8260B(BTEX & Oxygenates)	8260B / 8015 (Gasoline)	8015 (Diesel)	EPA8081A (Organochlorine Pesticides)	EPA 8082 (PCBs)	EPA 8015M (Carbon Chain C4-C40)	EPA 6010B/7000 (CAM 17 Metals)	Micro: Plate Cnt., Coliform, E-Coli	Sulfate	Chloride	pH	Resistivity			Remarks
1	B-1 @ 0-3 ft	8/14/24	10:00 A.M	soil	Jar	4 ounce										✓	✓	✓	✓			

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
[signature]	SSW	8/15	9:23	[signature]		8/15/24	9:23
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.

Matrix Code: DW=Drinking Water; GW=Ground Water; WW=Waste Water; SD=Solid Waste; SL=Sludge; SS=Soil/Sediment; AR=Air; PP=Pure Product

Preservative Code: IC=Ice; HC=HCl; HN=HNO_3; SH=NaOH; ST=$Na_2S_2O_3$; HS=H_2SO_4

* Sample Container Types: T=Tedlar Air Bag; G=Glass Container; ST= Steel Tube; B= Brass Tube; P=Plastic Bottle; V=VOA Vial; E= EnCore

L San Antonio Water District

Sample Acceptance Checklist

CLIENT: Soils Southwest WORK ORDER NUMBER: 2408-123

Temperature:(Criteria:0.0°C-6.0°C)

Sample Temp. (°C) 5.6c ID#: 22-0030

- [ ] Sample(s) outside temprature criteria: PM contacted by :
- [ ] Sample(s) outside temprature criteria, but received on ice/chilled on same day of sampling.
- [ ] Sample(s) received at ambient temprature; placed on ice for transport by courier.

CUSTODY SEAL:

Cooler	[ ]	Present and Intact	[ ]	Present and Not Intact	[X]	Not Present
Sample(s)	[ ]	Present and Intact	[ ]	Present and Not Intact	[X]	Not Present

Sample Condition:	Yes	No	N/A
Was a COC received	X		
Were sample IDs present?	X		
Were sampling dates & times present?	X		
Was a relingquished signature present?	X		
Were the tests required clearly indicated?	X		
Were all samples sealed in plastic bags?		X	~~X~~ ORE
Did all bottle labels agree with COC? (ID, dates and times)	X		
Were correct containers used for the tests required?	X		
Was a sufficient amount of samples sent for tests indicated?	X		
Was there headspace in VOA vials?			X
Were the containers labeled with correct preservatives?			X

Explanations/Comments:

Notification:

For discrepancies, how was the Project Manager notified?

Verbal: PM Initials: _____ Data/Time: _____

Email: Send to: _____ Data/Time: _____

Project Manager's response:

Completed By: [signature] Date: 8/15/24

A R Laboratories
1650 S. Grove Ave., Suite C, Ontario, CA 91761
PH: 909-781-6335
Email: office@arlaboratories.com

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

SOILS SOUTHWEST, INC.
897 VIA LATA, SUITE N
COLTON, CA. 92324

DATE: 8/26/2024

P.O. NO.: Verbal

LAB NO.: C-8132

SPECIFICATION: CA 301

MATERIAL: Brown, Silty Sand w. Gravel

Project No.: 24036-F
Project: San Antonio Water District HDQ
400 East 20th St, Upland, CA
Sample ID: B-6/PV-2 @ 0-3'
Sample Date: 8/16/2024

ANALYTICAL REPORT
"R" VALUE

BY EXUDATION	BY EXPANSION
75	N/A

RESPECTFULLY SUBMITTED

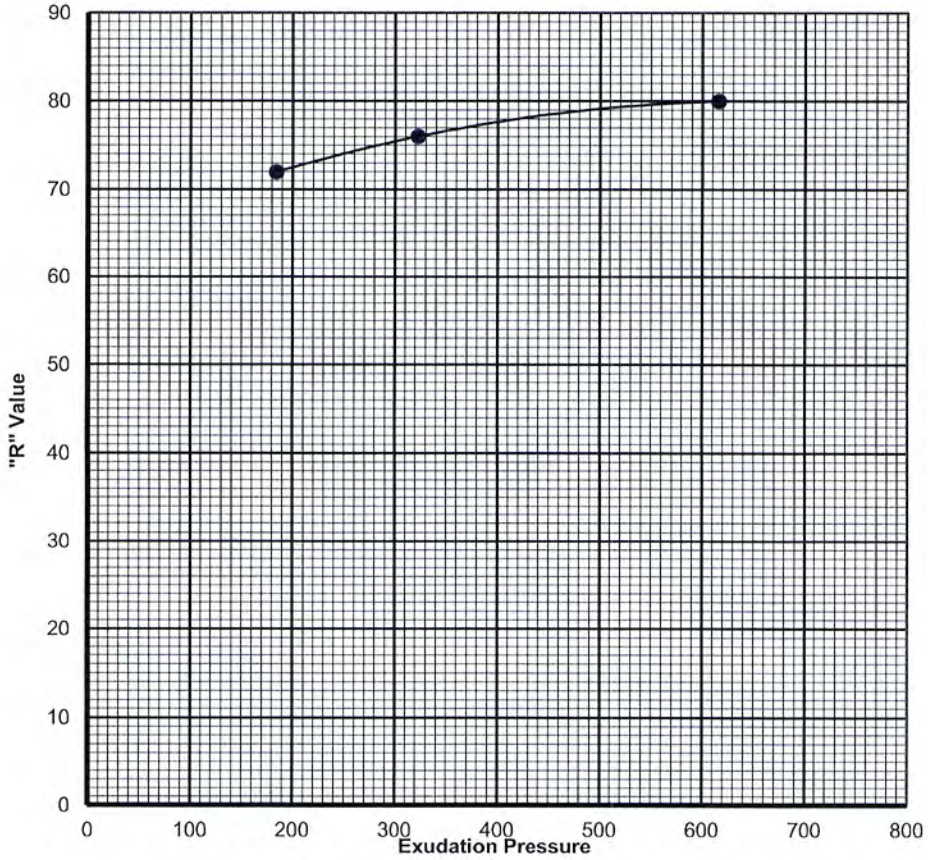
WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: Soils Southwest, Inc. **ATL No.:** C 8132 **Date:** 8/26/2024
Client Reference No.: 24036-F
Sample: B-6/PV-2 @ 0-3' **Soil Type:** Brown, Silty Sand w. Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	350	350	350	
Initial Moisture Content	%	2.0	2.0	2.0	
Moisture at Compaction	%	7.6	7.1	7.3	
Briquette Height	in.	2.45	2.46	2.49	
Dry Density	pcf	135.5	134.2	134.8	
EXUDATION PRESSURE	psi	184	616	322	
EXPANSION PRESSURE	psf	0	0	0	
Ph at 1000 pounds	psi	20	13	16	
Ph at 2000 pounds	psi	35	22	28	
Displacement	turns	3.45	3.86	3.81	
"R" Value		72	80	76	
CORRECTED "R" VALUE		72	80	76	

Final "R" Value	
BY EXUDATION: @ 300 psi	**75**
BY EXPANSION: TI = 5.0	**N/A**

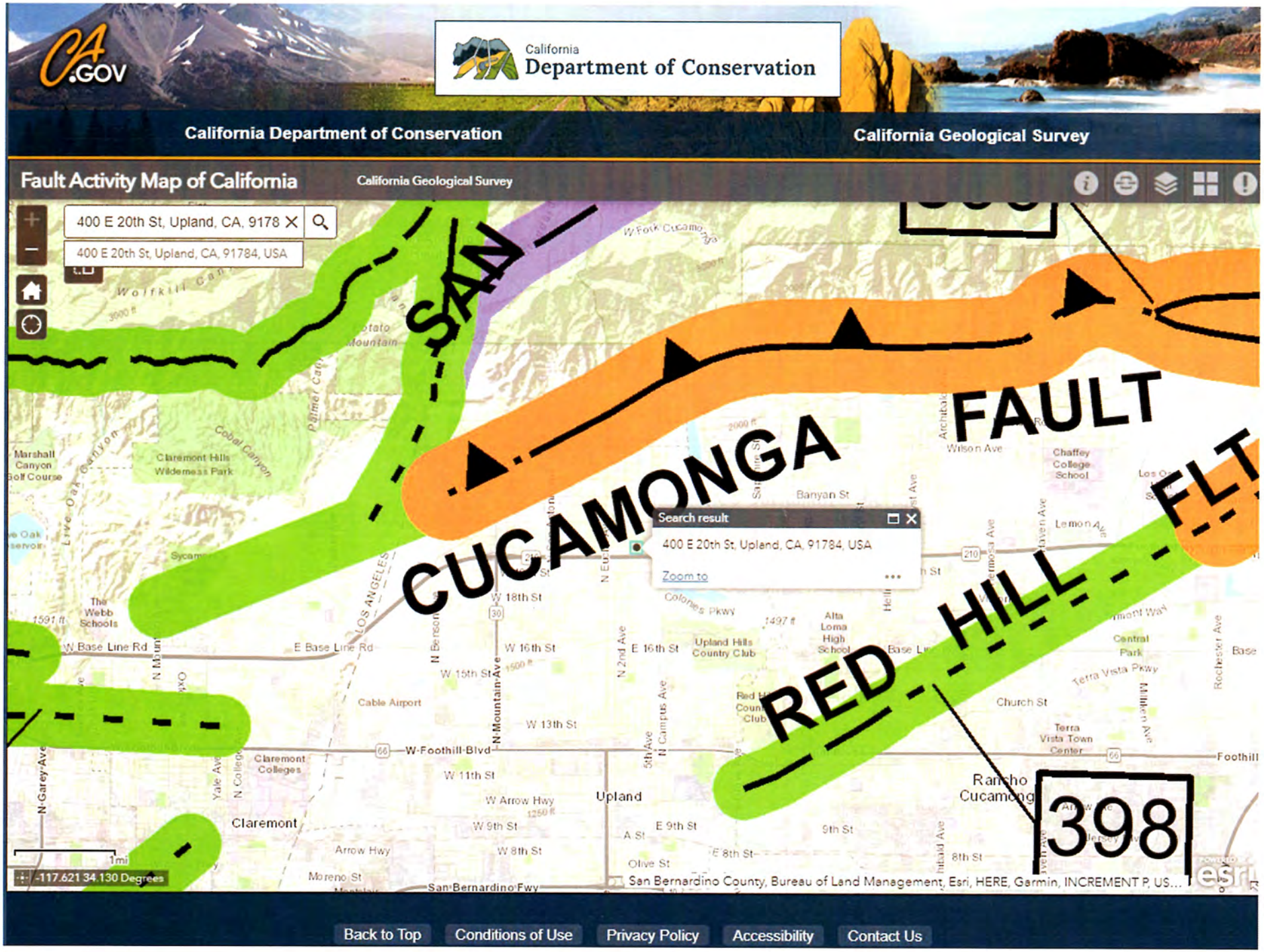


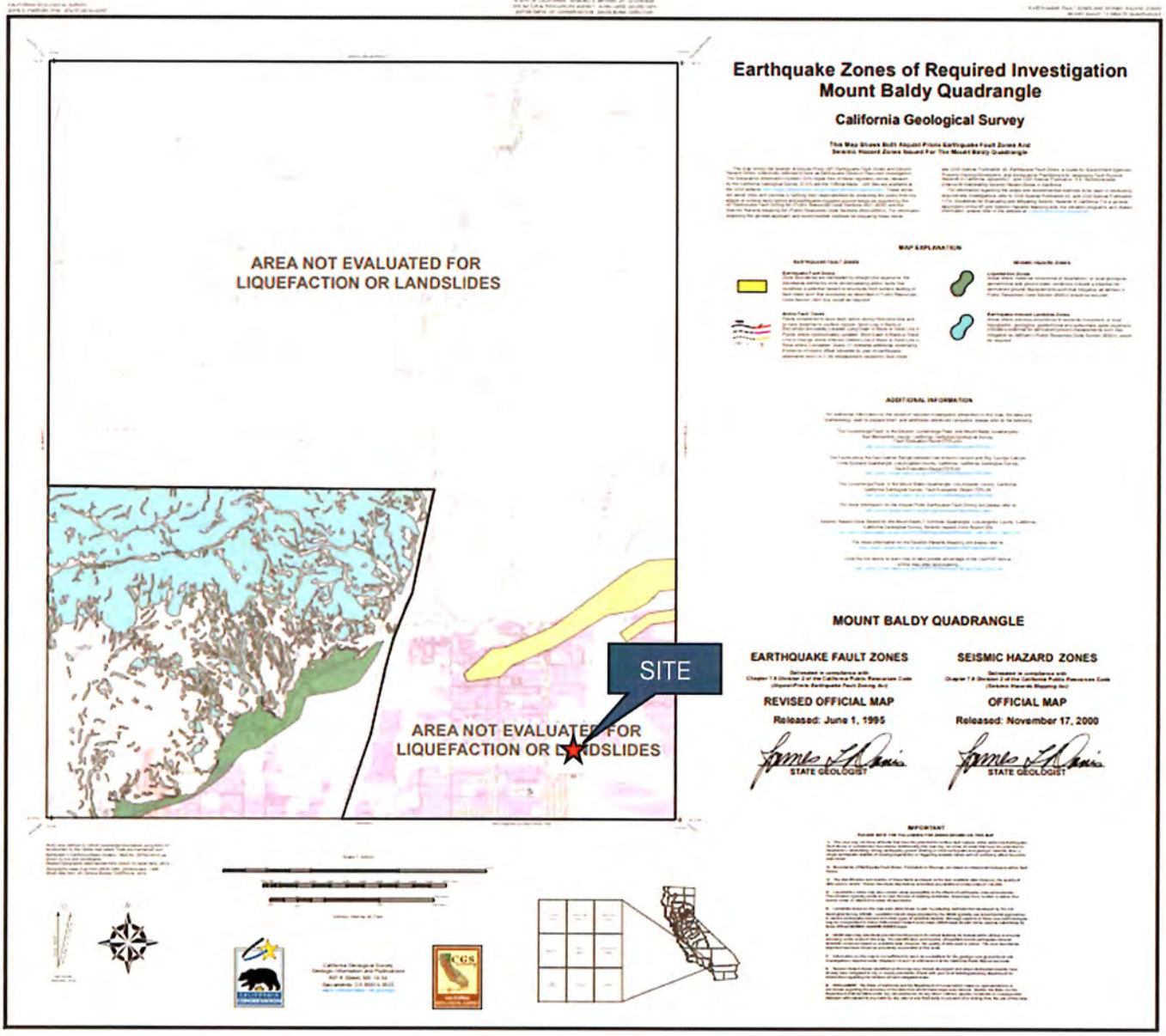
APPENDIX C

Supplemental Seismic Design Parameters

&

FEMA National Flood Hazard Layer Map


CA.GOV
California
Department of Conservation
California Department of Conservation
California Geological Survey
Fault Activity Map of California
California Geological Survey
400 E 20th St, Upland, CA, 9178
400 E 20th St, Upland, CA, 91784, USA
SAN
CUCAMONGA
FAULT
RED HILL
Search result
400 E 20th St, Upland, CA, 91784, USA
Zoom to
Claremont Hills Wilderness Park
Marshall Canyon Golf Course
Live Oak Canyon
Cobal Canyon
Palmer Canyon
Wolfskill Canyon
W Fork Cucamonga
Wilson Ave
Chaffey College School
Banyan St
Lemon Ave
Colonies Pkwy
W 18th St
W 16th St
E 16th St
W 15th St
W 13th St
W 11th St
W 9th St
E 9th St
E 8th St
Olive St
8th St
9th St
A St
E Base Line Rd
W Base Line Rd
The Webb Schools
Upland Hills Country Club
Alta Loma High School
Central Park
Terra Vista Pkwy
Terra Vista Town Center
Church St
Cable Airport
W Foothill Blvd
Foothill
Claremont Colleges
Claremont
Upland
W Arrow Hwy
Arrow Hwy
Moreno St
San Bernardino Fwy
N Garey Ave
N Mountain Ave
N Campus Ave
N 2nd Ave
5th Ave
Yale Ave
N College
N Benson
Rancho Cucamonga
398
1mi
-117.621 34.130 Degrees
San Bernardino County, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, US...
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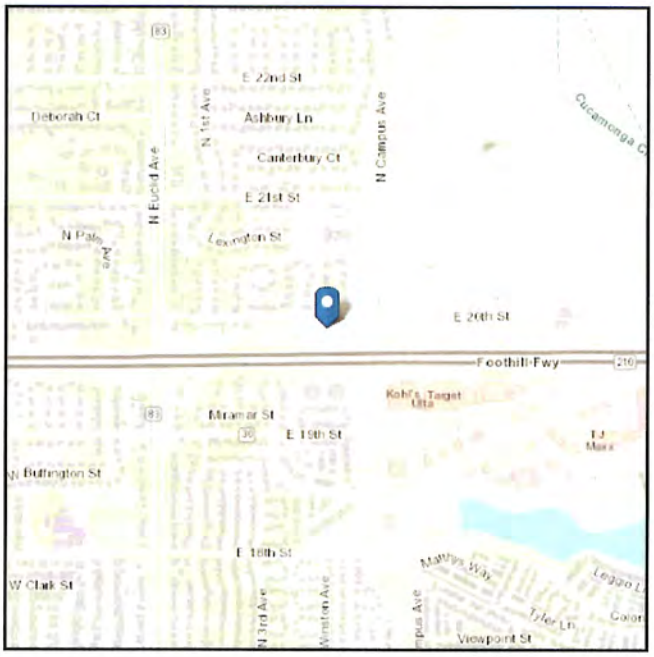

Earthquake Zones of Required Investigation
Mount Baldy Quadrangle
California Geological Survey
AREA NOT EVALUATED FOR
LIQUEFACTION OR LANDSLIDES
SITE
AREA NOT EVALUATED FOR
LIQUEFACTION OR LANDSLIDES
MAP EXPLANATION
ADDITIONAL INFORMATION
MOUNT BALDY QUADRANGLE
EARTHQUAKE FAULT ZONES
REVISED OFFICIAL MAP
Released: June 1, 1995
STATE GEOLOGIST
SEISMIC HAZARD ZONES
OFFICIAL MAP
Released: November 17, 2000
STATE GEOLOGIST
IMPORTANT

ASCE Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: III
Soil Class: D - Stiff Soil

Latitude: 34.135692
Longitude: -117.64504
Elevation: 1649.1604629371752 ft (NAVD 88)





ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.766	S_{D1} :	N/A
S_1 :	0.658	T_L :	12
F_a :	1	PGA :	0.753
F_v :	N/A	PGA_M :	0.829
S_{MS} :	1.766	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1.25
S_{DS} :	1.177	C_v :	1.453

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Mon Jul 22 2024

Date Source: USGS Seismic Design Maps

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Miles	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)	Length (km)
1.30	Cucamonga	CA	5	45	N	thrust	0	8	28
3.02	San Jose	CA	0.5	74	NW	strike slip	0	15	20
5.56	Sierra Madre	CA	2	53	N	reverse	0	14	57
5.56	Sierra Madre Connected	CA	2	51		reverse	0	14	76
9.14	Chino, alt 2	CA	1	65	SW	strike slip	0	14	29
9.22	Chino, alt 1	CA	1	50	SW	strike slip	0	9	24
11.28	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16	134
11.28	San Jacinto;SBV+SJV	CA	n/a	90	V	strike slip	0	16	88
11.28	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17	181
11.28	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16	181
11.28	San Jacinto;SBV	CA	6	90	V	strike slip	0	16	45
11.28	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	241
11.28	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	215
13.53	S. San Andreas;BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	85		strike slip	0.1	13	390
13.53	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	512
13.53	S. San Andreas;NSB+SSB+BG+CO	CA	n/a	79		strike slip	0.2	12	206
13.53	S. San Andreas;BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	220

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Fault Name	State
Cucamonga	**California**

GEOMETRY	
Dip (degrees)	45
Dip direction	N
Sense of slip	thrust
Rupture top (km)	0
Rupture bottom (km)	8
Rake (degrees)	90
Length (km)	28

MODEL VALUES		
Slip Rate	5	
Probability of activity	1	
	ELLSWORTH	HANKS
Minimum magnitude	6.5	6.5
Maximum magnitude	6.70	6.50
b-value	0.8	0.8

Fault Model	Deformation Model	Char Rate[1]	GR-a-value[1]	Weight
Stitched	2.1	3.31e-03 / 6.61e-03	2.648 / NA	0.50
UnStitched	2.1	3.31e-03 / 6.61e-03	2.648 / NA	0.50
Stitched	2.4	3.31e-03 / 6.61e-03	2.648 / NA	0.50
UnStitched	2.4	3.31e-03 / 6.61e-03	2.648 / NA	0.50

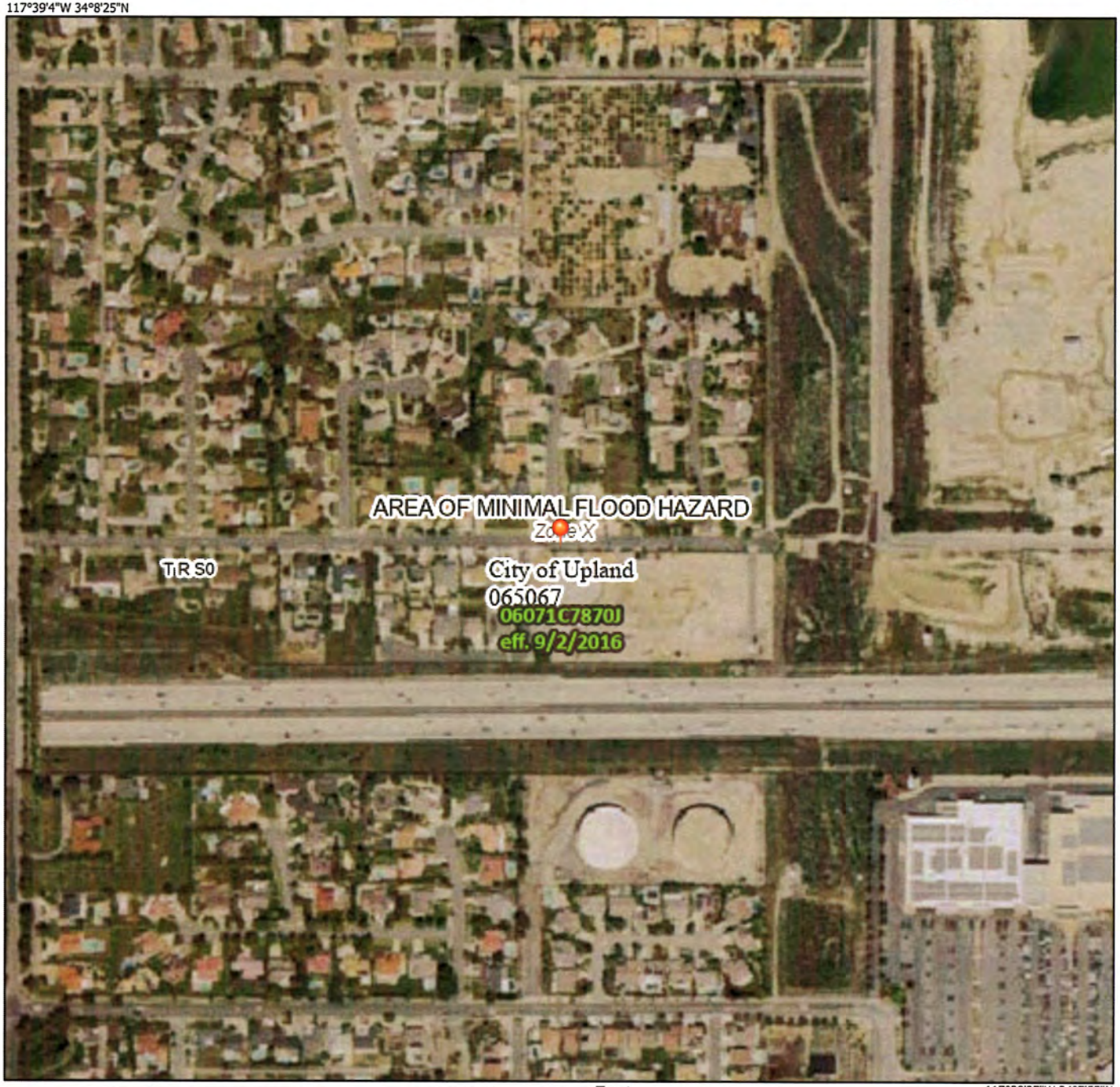
[1] 1st Value is based on Ellsworth relation and 2nd value is based on Hanks and Bakun relation

Comments

Slip rate based on cumulative vertical displacement across three strands reported by Morton and Matti (1987, 1991).

National Flood Hazard Layer FIRMette

FEMA



Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- **SPECIAL FLOOD HAZARD AREAS**
  - Without Base Flood Elevation (BFE) *Zone A, V, A99*
  - With BFE or Depth *Zone AE, AO, AH, VE, AR*
  - Regulatory Floodway
- **OTHER AREAS OF FLOOD HAZARD**
  - 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
  - Future Conditions 1% Annual Chance Flood Hazard *Zone X*
  - Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
  - Area with Flood Risk due to Levee *Zone D*
- **OTHER AREAS**
  - NO SCREEN — Area of Minimal Flood Hazard *Zone X*
  - Effective LOMRs
  - Area of Undetermined Flood Hazard *Zone D*
- **GENERAL STRUCTURES**
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall
- **OTHER FEATURES**
  - 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
  - Coastal Transect
  - Base Flood Elevation Line (BFE)
  - Limit of Study
  - Jurisdiction Boundary
  - Coastal Transect Baseline
  - Profile Baseline
  - Hydrographic Feature
- **MAP PANELS**
  - Digital Data Available
  - No Digital Data Available
  - Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/22/2024 at 3:06 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX D

Field Infiltration Test Data
Porchet Method Calculation Summary

Conversion Table (Porchet Method)
San Antonio Water District Headquarters
400 E. 20th Street, Upland
Project No. 24036-BMP

Test N no.	Test Hole Depth (inches) D_T	Time Interval Δ_T	Initial Depth (inches) D_O (in)	Final Depth (inches) D_f (in)	Initial Water Height (inches) $H_O=D_T-D_O$	Final Water Height (inches) $H_f = D_T-D_f$	Change Height/Time $\Delta H/\Delta D= H_O-H_f$	Average Head Height/Time $Havg = (H_O+H_f)/2$
P-1	36	10	12	35.5	24	0.5	23.5	12.25
P-2	60	10	36	56.5	24	3.5	20.5	13.75
P-3	Test at required depth could not be performed							
P-4	Test at required depth could not be performed							

	Observed Infiltration Rate (It) = $\Delta H60r/\Delta t\ (r+2Havg)$		
	A	B	C
	$\Delta H60r$	$\Delta t\ (r+2H_{avg})$	A/B= inch/hr
P-1	5640	285	**19.79**
P-2	4920	315	**15.62**
P-3			
P-4			

Legend

Δ H/ΔD = Observed Field Rate

H_O = inches of water filled from bottom

D_O = initial height of water (inches) from bottom

D_f = final heigh of water (inches) from bottom

Columns A-B-C : Porchet Conversion Calculations

Column C: Observed Rate following Porchet Conversion

D_t = depth of test hole bottom (inches)

Percolation Test Data Sheet

Project: SAN ANTONIO WATER DISTRICT HDQ - UPLAND			Project No. 24036	
Test Hole No:	P-1	Tested By: JG		Date: 8-9-24
Depth of Test Hole, D_T	36	USCS Soil Classification		
Test Hole Dimensions (inches)			Length	Width
Diameter (if round)=	8.0 in.	Sides (if rectangular)=		

Sandy Soil Criteria Test *

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Greater Than or Equal to 6.0 inches??? (Y/N)
1	10:38	10:45	25	12	36	24	Y
2	10:45	10:55	25	12	36	24	Y

* If two consective measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fiill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25."

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	ΔT/ΔD Percolation Rate (min./in.)
1	10:56	11:06	10	12	36	24	0.42
2	11:07	11:17	10	12	36	24	0.42
3	11:18	11:28	10	12	36	24	0.42
4	11:29	11:39	10	12	36	24	0.42
5	11:40	11:50	10	12	35.5	23.5	0.43
6	11:51	12:01	10	12	35.5	23.5	0.43
7	12:01	12:11	10	12	35.5	23.5	0.43
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							

Comments

Percolation Test Data Sheet

Project: SAN ANTONIO WATER DISTRICT HDQ - UPLAND			Project No. 24036	
Test Hole No:	P-2	Tested By: JG	Date: 8-9-24	
Depth of Test Hole, D_T	60	USCS Soil Classification		
Test Hole Dimensions (inches)			Length	Width
Diameter (if round)=	8.0 in.	Sides (if rectangular)=		

Sandy Soil Criteria Test *

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Greater Than or Equal to 6.0 inches??? (Y/N)
1	10:49	11:04	25	36	60	24	Y
2	11:05	11:20	25	36	60	24	Y

* If two consective measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fiill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25."

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	ΔT/ΔD Percolation Rate (min./in.)
1	11:21	11:31	10	36	57	21	0.48
2	11:32	11:42	10	36	57	21	0.48
3	11:43	11:52	10	36	57	21	0.48
4	11:54	12:04	10	36	57	21	0.48
5	12:07	12:17	10	36	56.5	20.5	0.49
6	12:18	12:28	10	36	56.5	20.5	0.49
7	12:29	12:39	10	36	56.5	20.5	0.49
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							

Comments

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 **Infiltration rate of underlying soils (in/hr)** ***See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods***	19.79	15.62	
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*			
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*			
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*			
8 Infiltrating surface area, *SA_{BMP}* (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*			
9 Amended soil depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity			
11 Gravel depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*			
12 Gravel porosity			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*			
16 Total Retention Volume from LID Infiltration BMPs: *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: % *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☐ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

PROFESSIONAL LIMITATIONS

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances by other reputable geotechnical engineers practicing in these general or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The investigations are based on soil samples only, consequently the recommendations provided shall be considered 'preliminary'. The samples taken and used for testing and the observations made are believed representative of site conditions; however, soil and geologic conditions can vary significantly between boring. As in most major projects, conditions revealed by excavations may vary with preliminary findings. If this occurs, the changed conditions must be evaluated by the project geotechnical engineer and designs adjusted as required or alternate design recommended.

The report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the project architect and engineers. Appropriate recommendations should be incorporated into structural plans. The necessary steps should be taken to see that out such recommendations in field.

The findings of this report are valid as of this present date. However, changes in the conditions of a property can occur with the passage of time, whether they due to natural process or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur from legislation or broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside of our control. Therefore, this report is subject to review and should be updated after a period of one year.

RECOMMENDED SERVICES

The review of grading plans and specifications, field observations and testing by a geotechnical representative of this office is integral part of the conclusions and recommendations made in this report. If Soils Southwest, Inc. (SSW) is not retained for these services, the Client agrees to assume SSW's responsibility for any potential claims that may arise during and after construction or during the lifetime use of the structure and its appurtenant.

The recommendations supplied should be considered valid and applicable, provided the following conditions, at a minimum, are met:

i. Pre-grade meeting with the contractor, public agency, and the geotechnical engineer,
ii. Excavated bottom inspections and verifications by the greotechnical engineer prior to backfill placement,
iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Subgrade verifications including plumbing trench backfills prior to concrete slab-on-grade placement,
vi. On and off-site utility trench backfill testing and verifications,
vii. Precise-grading plan review, and
viii. Consultations as required during construction or upon request.

In the event that the above conditions are not strictly fulfilled, Soils Southwest, Inc. will assume no responsibility for any structural distresses during the lifetime use of the development planned.

PROFESSIONAL LIMITATIONS

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances by other reputable geotechnical engineers practicing in these general or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

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iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Subgrade verifications including plumbing trench backfills prior to concrete slab-on-grade placement,
vi. On and off-site utility trench backfill testing and verifications,
vii. Precise-grading plan review, and
viii. Consultations as required during construction or upon request.

In the event that the above conditions are not strictly fulfilled, Soils Southwest, Inc. will assume no responsibility for any structural distresses during the lifetime use of the development planned.

Infiltration Facility Operations and Maintenance

General Requirements

Infiltration facility maintenance should include frequent inspections to ensure that water infiltrates into the subsurface completely within the recommended infiltration time of 72 hours or less after a storm (see Appendix E for guidance on facility inspection and Appendix F for an infiltration inspection and maintenance checklist).

Maintenance and regular inspections are of primary importance if infiltration basins and trenches are to continue to function as originally designed. A specific maintenance plan shall be developed specific to each facility outlining the schedule and scope of maintenance operations, as well as the documentation and reporting requirements. The following are general maintenance requirements:

1. Regular inspection should determine if the sediment pretreatment structures require routine maintenance.

2. If water is noticed in the basin more than 72 hours after a major storm or in the observation well of the infiltration trench more than 48 hours after a major storm, the infiltration facility may be clogged. Maintenance activities triggered by a potentially clogged facility include:

    - Check for debris/sediment accumulation, rake surface and remove sediment (if any) and evaluate potential sources of sediment and vegetative or other debris (e.g., embankment erosion, channel scour, overhanging trees, etc). If suspected upland sources are outside of the County's jurisdiction, additional pretreatment operations (e.g., trash racks, vegetated swales, etc.) may be necessary.

    - For basins, removal of the top layer of native soil may be required to restore infiltrative capacity.

    - For trenches, assess the condition of the top aggregate layer for sediment buildup and crusting. Remove top layer of pea gravel and replace. If slow draining conditions persist, entire trench may need to be excavated and replaced.

3. Any debris or algae growth located on top of the infiltration facility should be removed and disposed of properly.

4. Facilities should be inspected annually. Trash and debris should be removed as needed, but at least annually prior to the beginning of the wet season.

5. Site vegetation should be maintained as frequently as necessary to maintain the aesthetic appearance of the site, and as follows:

    - Vegetation, large shrubs, or trees that limit access or interfere with basin operation should be pruned or removed.

- Slope areas that have become bare should be revegetated and eroded areas should be regraded prior to being revegetated.
- Grass should be mowed to 4"-9" high and grass clippings should be removed.
- Fallen leaves and debris from deciduous plant foliage should be raked and removed.
- Invasive vegetation, such as Alligatorweed (*Alternanthera philoxeroides*), Halogeton (*Halogeton glomeratus*), Spotted Knapweed (*Centaurea maculosa*), Giant Reed (*Arundo donax*), Castor Bean (*Ricinus communis*), Perennial Pepperweed (*Lepidium latifolium*), and Yellow Starthistle (*Centaurea solstitalis*) must be removed and replaced with non-invasive species. Invasive species should never contribute more than 25% of the vegetated area. For more information on invasive weeds, including biology and control of listed weeds, look at the "encycloweedia" located at the California Department of Food and Agriculture website at http://www.cdfa.ca.gov/wma or the California Invasive Plant Council website at http://portal.cal-ipc.org/weedlist. .
- Dead vegetation should be removed if it exceeds 10% of area coverage. Vegetation should be replaced immediately to maintain cover density and control erosion where soils are exposed.

6. For infiltration basins, sediment buildup exceeding 50% of the forebay sediment storage capacity, as indicated by the steel markers, should be removed. Sediment from the remainder of the basin should be removed when 6 inches of sediment accumulates. Sediments should be tested for toxic substance accumulation in compliance with current disposal requirements if visual or olfactory indications of pollution are noticed. If toxic substances are encountered at concentrations exceeding thresholds of Title 22, Section 66261 of the California Code of Regulations, the sediment must be disposed of in a hazardous waste landfill and the source of the contaminated sediments should be investigated and mitigated to the extent possible.

7. Following sediment removal activities, replanting and/or reseeding of vegetation may be required for reestablishment.

Maintenance Standards

A summary of the routine and major maintenance activities recommended for infiltration facilities is shown in Table 6-1. Detailed routine and major maintenance standards are listed in Tables 6-2 and 6-3.

Table 6-1: Infiltration Facility Routine and Major Maintenance Quick Guide

Inspection and Maintenance Activities Summary	
Routine Maintenance	• Remove trash and debris as required • Repair and reseed erosion near inlet if necessary • Remove any visual evidence of contamination from floatables such as oil and grease • Clean under-drain (if present) and outlet piping to alleviate ponding and restore infiltrative capacity. • Remove minor sediment accumulation, debris and obstructions near inlet and outlet structures as needed • Mow routinely to maintain ideal grass height and to suppress weeds • Periodically observe function under wet weather conditions • Take photographs before and after maintenance (encouraged)
Major Maintenance	• Clean out under-drains if present to alleviate ponding. Replace media if ponding or loss of infiltrative capacity persists and revegetate • Repair structural damage to flow control structures including inlet, outlet and overflow structures • De-thatch grass to remove accumulated sediment and aerate compacted areas to promote infiltration

Table 6-2: Routine Maintenance – Infiltration Facilities

Defect	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed**	**Frequency**
Trash & Debris	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (one standard garbage can). In general, there should be no visual evidence of dumping. If less than threshold, all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.	Annually prior to wet season. After major storm events (>0.75 in/24 hrs) if spot checks indicate widespread damage/ maintenance needs. Litter removal is dependent on site conditions and desired aesthetics and should be done at a frequency to meet those objectives.
Inlet Erosion	Visible evidence of erosion occurring near inlet structures.	Eroded areas repaired/reseeded	
Visual Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No contaminants or pollutants present.	
Slow Drain Time	Standing water long after storm has passed (after 48 to 72 hours), or visual inspection of wells (if available) indicates that design drain times are not being achieved.	Water drains within 48 to 72 hours. Drainage pipe is cleared, accumulated litter on surface is removed, and top 1-2" of soil is raked or replaced.	
Inlets Blocked	Trash and debris or sediment blocking inlet structures.	Inlets clear and free of trash and debris.	
Appearance of Poisonous, Noxious or Nuisance Vegetation	Excessive grass and weed growth. Noxious weeds, woody vegetation establishing, Turf growing over rock filter.	Vegetation is mowed or trimmed to restore function. Weeds are removed to prevent noxious and nuisance plants from becoming established.	Monthly (or as dictated by agreement between County and landscape contractor).

Table 6-3: Major Maintenance – Infiltration Facilities

Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed	Frequency
Standing Water	Standing water long after storm has passed (after 24 to 48 hours), or visual inspection of wells (if available) indicates that design drain times are not being achieved	Design infiltration rate restored, either through excavation and filter media replacement or surface sediment removal. If applicable, underdrain cleaned, reset or replaced.	As needed

After the Storm

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.

- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

A Citizen's Guide to Understanding Stormwater

THE YEAR OF CLEAN WATER

EPA United States Environmental Protection Agency

EPA 833-B-03-002

January 2003

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For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

Stormwater Pollution Solutions



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential



Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Auto care



Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Lawn care



Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Septic systems



Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Pet waste



Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.



Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.



Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

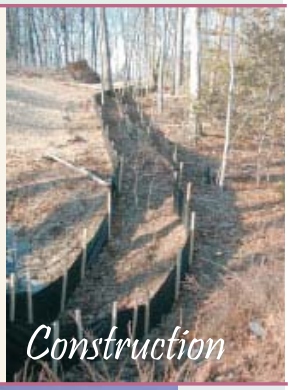
Commercial



Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

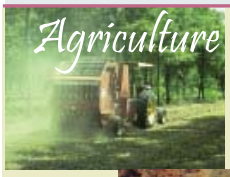
Construction



Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.

Agriculture

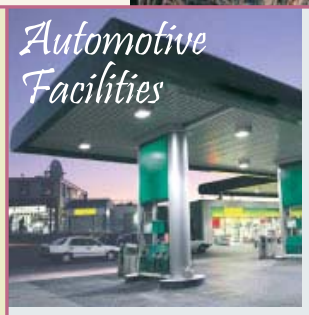


Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.



- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

Forestry



Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.



RIVERSIDE COUNTY
ANIMAL SERVICES LOCATIONS:

www.rcdas.org

BLYTHE
16450 West Hobson Way
Blythe, CA 92225
760-921-7857

COACHELLA VALLEY ANIMAL CAMPUS
72-050 Petland Place
Thousand Palms, CA 92276
760-343-3644

RIVERSIDE COUNTY ANIMAL SERVICES
6851 Van Buren Blvd.
Riverside, CA 92509
951-688-4340

OTHER ANIMAL SHELTERS:

ANIMAL CARE CENTER OF INDIO
45-355 Van Buren
Indio, CA 92201
760-391-4138

ANIMAL FRIENDS OF THE VALLEYS
29001 Bastron Avenue
Lake Elsinore, CA 92530
951-674-0618
(Serving incorporated Temecula, Wildomar, Lake Elsinore, Murrieta and Canyon Lake)

MARY S. ROBERTS PET ADOPTION CENTER
6185 Industrial Avenue
Riverside, CA 92504
951-688-4340

RAMONA HUMANE SOCIETY
690 Humane Way
San Jacinto 92586
951-654-8002
(Serving Sun City, Menifee, Romoland and Homeland)

Looking to adopt a pet?
This website is linked to many animal shelters.
www.petfinder.com

To report illegal storm drain disposal, call
1-800-506-2555

Or visit our website at www.rcflood.org

E-mail fcnpdes@rcflood.org

What's the Scoop?



Tips for a Healthy Pet and a Healthier Environment

CREATE A HEALTHY ENVIRONMENT in and around your home by following these simple pet practices. Your pet, family and neighbors will appreciate their clean comfortable surroundings.

HOUSEHOLD PETS

We all love our pets, but pet waste is a subject everyone likes to avoid. Pet waste left on trails, sidewalks, streets and grassy areas can be washed into the nearest waterway when it rains. Even if you can't see streams or lakes near you, rainfall (stormwater) or sprinkler runoff can wash pet waste into the storm drains that carry runoff to the nearest streams or lakes untreated. The risk of stormwater contamination increases if pet waste is allowed to accumulate in outdoor animal pen areas or left on sidewalks, streets or driveways.



Pet waste contains nutrients and bacteria. Nutrients can promote the growth of algae in streams and lakes. Algae can cause fish kills and other environmental damage if it is fed too many nutrients. Pet Waste also contains e. Coli and fecal bacteria, which can cause disease in other animals and humans that come in contact with it when swimming or splashing in streams and lakes. Dogs also carry salmonella and giardia, which can make people sick.

Pet waste that is not picked up and properly disposed can also increase vector problems. Flies and other insects are not only attracted to and feed on pet waste, but can also be infected with diseases and spread those diseases to humans and other animals.

WHAT CAN YOU DO?

- SCOOP up pet waste and flush it down the toilet or place in trash can.
- NEVER DUMP pet waste into a storm drain or catch basin.
- USE the complimentary bags or mutt mitts offered in dispensers at local parks.
- CARRY EXTRA BAGS when walking your dog and make them available to other pet owners who are without.
- TEACH CHILDREN how to properly clean up after a pet.
- TELL FRIENDS AND NEIGHBORS about the ill effects of animal waste on the environment. Encourage them to clean up after pets.

Call 1-800-506-2555 TOLL FREE to report illegal dumping to the storm drain, find the dates and times of local Household Hazardous Waste Collection Events, obtain additional information on stormwater problems and solutions, request presentations about stormwater pollution in your child's classroom, or learn about free grasscycling and composting workshops.

SCOOP THE POOP



Many communities have "Scoop the Poop" laws that govern pet waste cleanup. Some of these laws specifically require anyone who walks an animal off their property to carry a bag, shovel, or scooper. Any waste left by the animal must be cleaned up immediately. CALL YOUR LOCAL CODE ENFORCEMENT OFFICE to find out more about pet waste regulations.

OTHER WAYS TO PROTECT YOUR PETS AND THE ENVIRONMENT

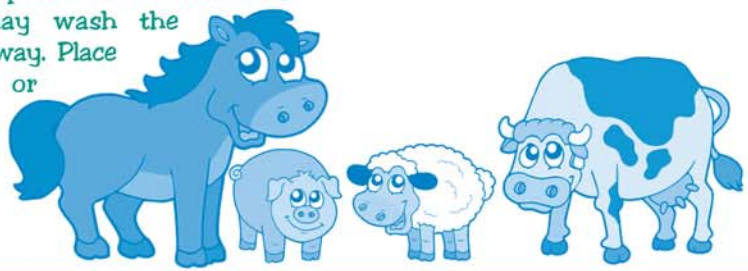
Pets are only one of many sources that contribute to water pollution. However, these other sources of water pollution cannot only harm the environment but also harm your pet. Improperly used or stored lawn fertilizers, pesticides, soaps, grease and vehicle fluids cannot only be washed into local streams and lakes, these chemicals can also harm your pet if they ingest or touch these chemicals. Call 1-800-506-2555 for information regarding how to properly dispose of household hazardous wastes such as these. You can also keep your pets and our environment healthy by properly maintaining your vehicles, and limiting use of pesticides and fertilizers to only the amount that is absolutely needed.

Make sure to not only protect your pets, but to also protect your neighbors pets. NEVER HOSE VEHICLE FLUIDS into the street or gutter. USE ABSORBENT MATERIALS such as cat litter to clean-up spills. SWEEP UP used absorbent materials and place it in the trash.

HORSES AND LIVESTOCK

Fortunate enough to own a horse or livestock? You, too, can play a part in protecting and cleaning up our water resources. The following are a few simple Best Management Practices (BMPs) specifically designed for horses and livestock.

- STORE your manure properly. Do not store unprotected piles of manure in places where stormwater runoff may wash the manure away. Place a cover or tarp over the pile to keep rainwater out.



- BUILD a manure storage facility to protect your pets, property and the environment. These structures usually consist of a concrete pad to protect groundwater and a short wall on one or two sides to make manure handling easier.
- READ the Only Rain Down the Storm Drain brochure titled "Tips for Horse Care" for additional guidance and recommendations. This brochure should be available from your local city office or for download at www.rcflood.org/stormwater.
- KEEP animals out of streams - Horses and livestock can deficate in streams causing stormwater pollution. Livestock and horses in streams can also disturb sensitive habitat and vegetation, causing additional environmental damage. Keep livestock and horses away from streams and use designated stream crossings whenever possible.
- MATERIAL STORAGE SAFETY TIPS Many of the chemicals found in barns require careful handling and proper disposal. When using these chemicals, be certain to follow these common sense guidelines:
  - Buy only what you need.
  - Treat spills of hoof oils like a fuel spill. Use kitty litter to soak up the oil and dispose of it in a tightly sealed plastic bag.
  - Store pesticides in a locked, dry, well-ventilated area.
  - Protect stored fertilizer and pesticides from rain and surface water.

RESOURCE CONSERVATION DISTRICTS CAN HELP

Call 1-800-506-2555 for assistance with locating a local conservation district that can help you properly manage your manure, re-establish healthy pastures, control weeds, or identify appropriate grasses for your soils.



Thank you for doing your part to protect your watershed, the environment, your pets and your community!



Landscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call
1-800-506-2555
"Only Rain Down the Storm Drain"

Important Links:

Riverside County Household Hazardous Waste Collection Information
1-800-304-2226 or www.rivcowm.org

Riverside County Backyard Composting Program
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions
www.ipm.ucdavis.edu

California Master Gardener Programs
www.mastergardeners.org
www.camastergardeners.ucdavis.edu

California Native Plant Society
www.cnps.org

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

...Only Rain Down ...the Storm Drain

What you should know for... Landscape and Gardening

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators



Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.



- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.
- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:
  - **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
  - **Biological Controls** - Use predatory insects to control harmful pests.
  - **Chemical Controls** - Check out www.ipm.ucdavis.edu before using chemicals. Remember, all chemicals should be used cautiously and in moderation.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

www.bewaterwise.com Great water conservation tips and drought tolerant garden designs.

www.ourwaterourworld.com Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers



Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

Do you know where street flows actually go?

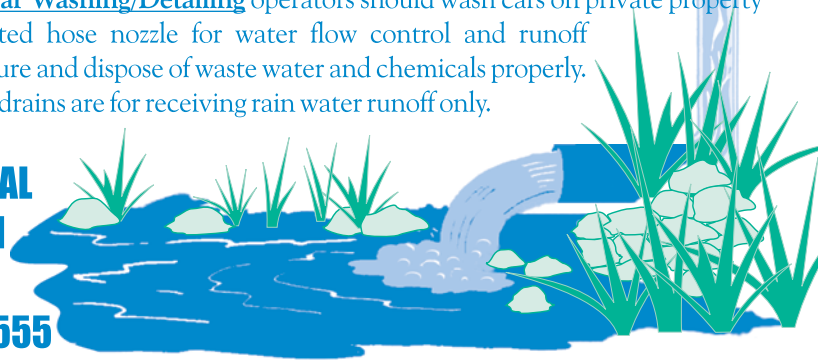
Storm drains are NOT connected to sanitary sewer systems and treatment plants!



The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.



Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.



When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

Saltwater Pools

- Salt water pools, although different from regular pools, are in fact, sanitized using chlorine. A salt-chlorine generator separates the chlorine and sodium molecules in salt and reintroduces them into the pool water. The same harmful effects of chlorine still apply.
- A salt water pool is still maintained with chemicals such as Muriatic acid, soda ash and sodium carbonate to help keep a proper pH, total Alkalinity, Calcium Hardness and Stabilizer levels.



- It may be illegal to discharge salt water to land. The salt may kill plants and the build-up of salt in soil puts animals, plants, and groundwater at risk. Consult your city representatives to determine local requirements regarding salt water drainage.

NEVER put unused chemicals into the trash, onto the ground or down a storm drain.

IMPORTANT: The discharge of pollutants into the street, gutter, storm drain system or waterways - without a permit or waiver - is strictly prohibited by local ordinances, state and federal law. Violations may result in monetary fines and enforcement actions.

Helpful telephone numbers and links

Riverside County Water Agencies:

City of Banning	(951) 922-3130
City of Beaumont/Cherry Valley	(951) 845-9581
City of Blythe	(760) 922-6161
City of Coachella	(760) 398-3502
City of Corona	(951) 736-2263
City of Hemet	(951) 765-3710
City of Norco	(951) 270 5607
City of Riverside Public Works	(951) 351-6140
City of San Jacinto	(951) 654-4041
Coachella Valley Water District	(760) 398-2651
Desert Water Agency (Palm Springs)	(760) 323-4971
Eastern Municipal Water District	(951) 928-3777
Elsinore Valley Municipal Water District	(951) 674 3146
Elsinore Water District	(951) 674-2168
Farm Mutual Water Company	(951) 244-4198
Idyllwild Water District	(951) 659-2143
Indio Water Authority	(760) 391-4129
Jurupa Community Services District	(951) 685-7434
Lee Lake Water	(951) 658-3241
Mission Springs Water	(760) 329-6448
Rancho California Water District	(951) 296-6900
Ripley, CSA #62	(760) 922-4951
Riverside Co. Service Area #51	(760) 227-3203
Rubidoux Community Services District	(951) 684-7580
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(951) 789-5000
Yucaipa Valley Water District	(909) 797-5117

CALL 1-800-506-2555 to:

- Report clogged storm drains or illegal storm drain disposal from residential, industrial, construction and commercial sites into public streets, storm drains and/or water bodies.
- Find out about our various storm drain pollution prevention materials.
- Locate the dates and times of Household Hazardous Waste (HHW) Collection Events.
- Request adult, neighborhood, or classroom presentations.
- Locate other County environmental services.
- Receive grasscycling information and composting workshop information.

Or visit our
Riverside County Flood Control and Water Conservation District
website at: www.rcflood.org

Other links to additional storm drain pollution information:

- County of Riverside Environmental Health: www.rivcoeh.org
- State Water Resources Control Board: www.waterboards.ca.gov
- California Stormwater Quality Association: www.casqa.org
- United States Environmental Protection Agency (EPA): www.epa.gov/compliance/assistance (compliance assistance information)

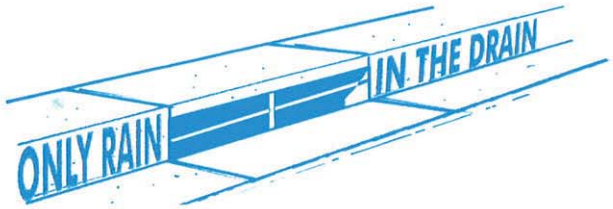
Riverside County's, "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

Guidelines for Maintaining your...



Swimming Pool, Jacuzzi and Garden Fountain

Where does the water go?



Pool, Jacuzzi and Fountain wastewater and rain water runoff (also called stormwater) that reach streets can enter the storm drain and be conveyed directly into local streams, rivers and lakes.



A storm drain's purpose is to prevent flooding by carrying rain water away from developed areas. Storm drains are not connected to sanitary sewers systems and treatment plants!

Wastewater, from residential swimming pools, Jacuzzis, fishponds and fountains, often contains chemicals used for sanitizing or cleansing purposes. Toxic chemicals (such as chlorine or copper-based algaecides) may pollute the environment when discharged into a storm drain system.

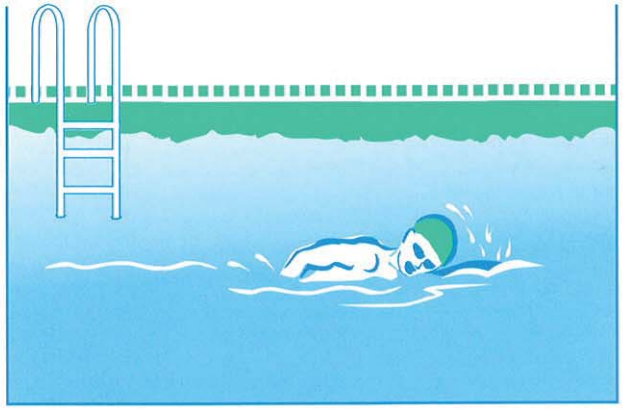
The Cities and County of Riverside have adopted ordinances that prohibit the discharge of wastewater to the street and storm drain system.



Discharge Regulations

Regulatory requirements for discharging wastewater from your pool may differ from city to city. Chlorinated water should not be discharged into the street, storm drain or surface waters. Check with your water agency to see if disposal to the sanitary sewer line is allowed for pool discharges (see reverse for Riverside County sewer agencies).

If allowed, a hose can be run from the pool Jacuzzi, or fountain to the private sewer cleanout, washing machine drain or a sink or bathtub.



If you cannot discharge to the sewer, you may drain your fountain, pool, or jacuzzi to your landscaping by following these guidelines:

First, reduce or eliminate solids (e.g. debris, leaves or dirt) in the pool water and allow the chemicals in the pool water to dissipate before draining the pool (this could take up to 7 days, verify using a home pool test kit).

Second, slowly drain to a landscaped area away from buildings or structures. Control the flow to prevent soil erosion; it may take more than one day to empty. Do not allow sediment to enter the street, gutter or storm drain.

Maintenance & Chemicals



Cleaning Filters

Filter rinse water and backwash must be discharged to the sanitary sewer, on-site septic tank and drain field system (if properly designed and adequately sized), or a seepage pit. Alternatively, rinse water or backwash may be diverted to landscaped or dirt areas. Filter media and other non-hazardous solids should be picked up and disposed of in the trash.

Algaecides

Avoid using copper-based algaecides unless absolutely necessary. Control algae with chlorine, organic polymers or other alternatives to copper-based pool chemicals. Copper is a heavy metal that can be toxic to aquatic life when you drain your pool.

Chemical Storage and Handling

- Use only the amount indicated on product labels
- Store chlorine and other chemicals in a covered area to prevent runoff. Keep out of reach of children and pets.
- Chlorine kits, available at retail swimming pool equipment and supply stores, should be used to monitor the chlorine and pH levels before draining your pool.
- Chlorine and other pool chemicals should never be allowed to flow into the gutter or storm drain system.

Take unwanted chemicals to a Household Hazardous Waste (HHW) Collection Event. There's no cost for taking HHW items to collection events – it's FREE! Call **1-800-506-2555** for a schedule of HHW events in your community.



Stormwater Pollution Found in Your Area!

This is not a citation.

This is to inform you that our staff found the following pollutants in the storm sewer system in your area. This storm sewer system leads directly to

_____ .

- ❑ Motor oil
- ❑ Oil filters
- ❑ Antifreeze/ transmission fluid
- ❑ Paint
- ❑ Solvent/degreaser
- ❑ Cooking grease
- ❑ Detergent
- ❑ Home improvement waste (concrete, mortar)
- ❑ Pet waste
- ❑ Yard waste (leaves, grass, mulch)
- ❑ Excessive dirt and gravel
- ❑ Trash
- ❑ Construction debris
- ❑ Pesticides and fertilizers
- ❑ Other





_____

For more information or to report an illegal discharge of pollutants, please call:

Riverside County Residents, Call . . .
1-800-506-2555



WHEN IT RAINS
IT DRAINS

EPA
United States
Environmental Protection
Agency

www.epa.gov/npdes/stormwater

EPA 833-F-03-002
April 2003

Stormwater runoff is precipitation from rain or snowmelt that flows over the ground. As it flows, it can pick up debris, chemicals, dirt, and other pollutants and deposit them into a storm sewer system or waterbody.

Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

Remember: Only Rain Down the Drain

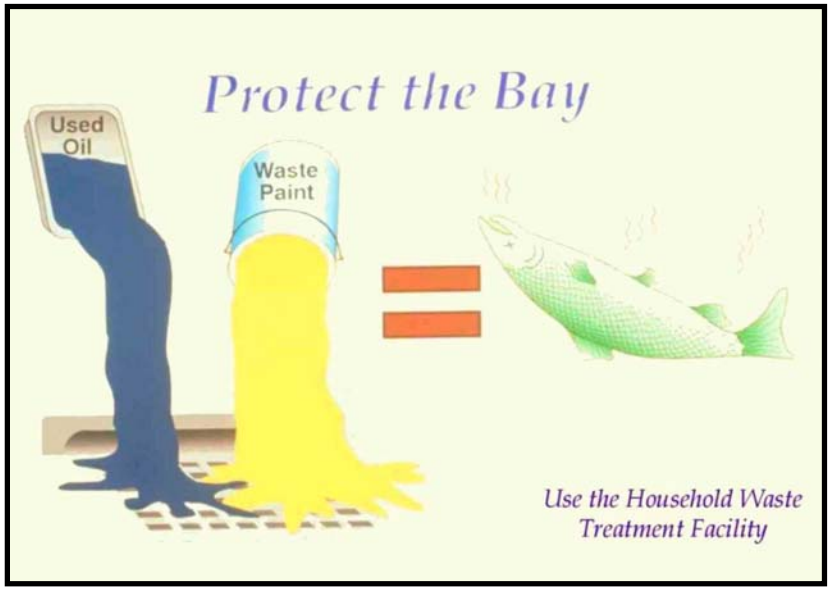
To keep the stormwater leaving your home or workplace clean, follow these simple guidelines:



- Use pesticides and fertilizers sparingly.
- Repair auto leaks.
- Dispose of household hazardous waste, used auto fluids (antifreeze, oil, etc.), and batteries at designated collection or recycling locations.
- Clean up after your pet.
- Use a commercial car wash or wash your car on a lawn or other unpaved surface.
- Sweep up yard debris rather than hosing down areas. Compost or recycle yard waste when possible.
- Clean paint brushes in a sink, not outdoors. Properly dispose of excess paints through a household hazardous waste collection program.
- Sweep up and properly dispose of construction debris like concrete and mortar.



Non-Stormwater Discharges SC-10



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

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Pollution Prevention

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

Suggested Protocols

Recommended Complaint Investigation Equipment

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms
  - Educational materials

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.
- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled or demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

Illicit Connections

- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

Visual Inspection and Inventory

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping

- A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

Dye Testing

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Drainage System

- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Training

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.
- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.
- When a responsible party is identified, educate the party on the impacts of his or her actions.

Spill Response and Prevention

- See SC11 Spill Prevention Control and Cleanup.

Other Considerations

- Many facilities do not have accurate, up-to-date schematic drawings.

Requirements

Costs (including capital and operation & maintenance)

- The primary cost is for staff time and depends on how aggressively a program is implemented.
- Cost for containment and disposal is borne by the discharger.
- Illicit connections can be difficult to locate especially if there is groundwater infiltration.
- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

Maintenance (including administrative and staffing)

- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Further Detail of the BMP

Illegal Dumping

- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots

- Types and quantities (in some cases) of wastes
- Patterns in time of occurrence (time of day/night, month, or year)
- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

Performance Evaluation

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Spill Prevention, Control & Cleanup SC-11



Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

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- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel

- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- If consistent illegal dumping is observed at the facility:
  - Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

- Routine maintenance:
  - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
  - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
  - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

  - Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).
- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.
- Clean up leaks and spills immediately.
- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to local agencies, such as the fire department; they can assist in cleanup.
- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

- Responsible parties

Training

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from

tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net/

Outdoor Loading/Unloading SC-30



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

The loading/unloading of materials usually takes place outside on docks or terminals; therefore, materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by stormwater runoff or when the area is cleaned. Additionally, rainfall may wash pollutants from machinery used to unload or move materials. Implementation of the following protocols will prevent or reduce the discharge of pollutants to stormwater from outdoor loading/unloading of materials.

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of material to rainfall whenever possible.
- Prevent stormwater run-on.
- Check equipment regularly for leaks.

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Suggested Protocols

Loading and Unloading – General Guidelines

- Develop an operations plan that describes procedures for loading and/or unloading.
- Conduct loading and unloading in dry weather if possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- Consider placing a seal or door skirt between delivery vehicles and building to prevent exposure to rain.
- Design loading/unloading area to prevent stormwater run-on, which would include grading or berming the area, and position roof downspouts so they direct stormwater away from the loading/unloading areas.
- Have employees load and unload all materials and equipment in covered areas such as building overhangs at loading docks if feasible.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a deadend.

Inspection

- Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
- Look for dust or fumes during loading or unloading operations.

Training

- Train employees (e.g., fork lift operators) and contractors on proper spill containment and cleanup.
- Have employees trained in spill containment and cleanup present during loading/unloading.
- Train employees in proper handling techniques during liquid transfers to avoid spills.
- Make sure forklift operators are properly trained on loading and unloading procedures.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Contain leaks during transfer.
- Store and maintain appropriate spill cleanup materials in a location that is readily accessible and known to all and ensure that employees are familiar with the site's spill control plan and proper spill cleanup procedures.
- Have an emergency spill cleanup plan readily available.
- Use drip pans or comparable devices when transferring oils, solvents, and paints.

Other Considerations (Limitations and Regulations)

- Space and time limitations may preclude all transfers from being performed indoors or under cover.
- It may not be possible to conduct transfers only during dry weather.

Requirements

Costs

Costs should be low except when covering a large loading/unloading area.

Maintenance

- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Conduct regular broom dry-sweeping of area.

Supplemental Information

Further Detail of the BMP

Special Circumstances for Indoor Loading/Unloading of Materials

Loading or unloading of liquids should occur in the manufacturing building so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - The transfer area should be designed to prevent run-on of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.

- The transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer. A positive control valve should be installed on the drain.

- For transfer from rail cars to storage tanks that must occur outside, use the following procedures:

  - Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.

  - Drip pan systems should be installed between the rails to collect spillage from tank cars.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Safer Alternative Products SC-35

Description

Promote the use of less harmful products and products that contain little or no TMDL pollutants. Alternatives exist for most product classes including chemical fertilizers, pesticides, cleaning solutions, janitorial chemicals, automotive and paint products, and consumables (batteries, fluorescent lamps).

Approach

Pattern a new program after the many established programs around the state and country. Integrate this best management practice as much as possible with existing programs at your facility.

Develop a comprehensive program based on:

- The "Precautionary Principle," which is an alternative to the "Risk Assessment" model that says it's acceptable to use a potentially harmful product until physical evidence of its harmful effects are established and deemed too costly from an environmental or public health perspective. For instance, a risk assessment approach might say it's acceptable to use a pesticide until there is direct proof of an environmental impact. The Precautionary Principle approach is used to evaluate whether a given product is safe, whether it is really necessary, and whether alternative products would perform just as well.
- Environmentally Preferable Purchasing Program to minimize the purchase of products containing hazardous ingredients used in the facility's custodial services, fleet maintenance, and facility maintenance in favor of using alternate products that pose less risk to employees and to the environment.
- Integrated Pest Management (IPM) or Less-Toxic Pesticide Program, which uses a pest management approach that minimizes the use of toxic chemicals and gets rid of pests by methods that pose a lower risk to employees, the public, and the environment.
- Energy Efficiency Program including no-cost and low-cost energy conservation and efficiency actions that can reduce both energy consumption and electricity bills, along with long-term energy efficiency investments.

Consider the following mechanisms for developing and implementing a comprehensive program:

- Policies

Objectives

- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

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- Procedures
  - Standard operating procedures (SOPs)
  - Purchasing guidelines and procedures
  - Bid packages (services and supplies)
- Materials
  - Preferred or approved product and supplier lists
  - Product and supplier evaluation criteria
  - Training sessions and manuals
  - Fact sheets for employees

Implement this BMP in conjunction with the Vehicle and Equipment Management fact sheets (SC20 – SC22) and SC41, Building and Grounds Maintenance.

Training

- Employees who handle potentially harmful materials in the use of safer alternatives.
- Purchasing departments should be encouraged to procure less hazardous materials and products that contain little or no harmful substances or TMDL pollutants.

Regulations

This BMP has no regulatory requirements. Existing regulations already encourage facilities to reduce the use of hazardous materials through incentives such as reduced:

- Specialized equipment storage and handling requirements,
- Storm water runoff sampling requirements,
- Training and licensing requirements, and
- Record keeping and reporting requirements.

Equipment

- There are no major equipment requirements to this BMP.

Limitations

- Alternative products may not be available, suitable, or effective in every case.

Requirements

Cost Considerations

- The primary cost is for staff time to: 1) develop new policies and procedures and 2) educate purchasing departments and employees who handle potentially harmful materials about the availability, procurement, and use of safer alternatives.

- Some alternative products may be slightly more expensive than conventional products.

Supplemental Information

Employees and contractors / service providers can both be educated about safer alternatives by using information developed by a number of organizations including the references and resources listed below.

The following discussion provides some general information on safer alternatives. More specific information on particular hazardous materials and the available alternatives may be found in the references and resources listed below.

- Automotive products – Less toxic alternatives are not available for many automotive products, especially engine fluids. But there are alternatives to grease lubricants, car polishes, degreasers, and windshield washer solution. Rerefined motor oil is also available.
- Vehicle/Trailer lubrication – Fifth wheel bearings on trucks require routine lubrication. Adhesive lubricants are available to replace typical chassis grease.
- Cleaners – Vegetables-based or citrus-based soaps are available to replace petroleum-based soaps/detergents.
- Paint products – Water-based paints, wood preservatives, stains, and finishes are available.
- Pesticides – Specific alternative products or methods exist to control most insects, fungi, and weeds.
- Chemical Fertilizers – Compost and soil amendments are natural alternatives.
- Consumables – Manufacturers have either reduced or are in the process of reducing the amount of heavy metals in consumables such as batteries and fluorescent lamps. All fluorescent lamps contain mercury, however low-mercury containing lamps are now available from most hardware and lighting stores. Fluorescent lamps are also more energy efficient than the average incandescent lamp.
- Janitorial chemicals – Even biodegradable soap can harm fish and wildlife before it biodegrades. Biodegradable does not mean non-toxic. Safer products and procedures are available for floor stripping and cleaning, as well as carpet, glass, metal, and restroom cleaning and disinfecting.

Examples

There are a number of business and trade associations, and communities with effective programs. Some of the more prominent are listed below in the references and resources section.

References and Resources

Note: Many of these references provide alternative products for materials that typically are used inside and disposed to the sanitary sewer as well as alternatives to products that usually end up in the storm drain.

General Sustainable Practices and Pollution Prevention Including Pollutant-Specific Information

California Department of Toxic Substances Control (www.dtsc.ca.gov)

California Integrated Waste Management Board (www.ciwmb.ca.gov)

City of Santa Monica (www.santa-monica.org/environment)

City of Palo Alto (www.city.palo-alto.ca.us/cleanbay)

City and County of San Francisco, Department of the Environment (www.ci.sf.ca.us/sfenvironment)

Earth 911 (www.earth911.org/master.asp)

Environmental Finance Center Region IX (www.greenstart.org/efc9)

Flex Your Power (www.flexyourpower.ca.gov)

GreenBiz.com (www.greenbiz.com)

Green Business Program (www.abag.org/bayarea/enviro/gbus/gb.html)

Pacific Industrial and Business Association (www.piba.org)

Sacramento Clean Water Business Partners (www.sacstormwater.org)

USEPA BMP fact sheet – Alternative products (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_2.cfm)

USEPA Region IX Pollution Prevention Program (www.epa.gov/region09/p2)

Western Regional Pollution Prevention Network (www.westp2net.org)

Metals (mercury, copper)

National Electrical Manufacturers Association - Environment, Health and Safety (www.nema.org)

Sustainable Conservation (www.suscon.org)

- Auto Recycling Project
- Brake Pad Partnership

Pesticides and Chemical Fertilizers

Bio-Integral Resource Center (www.birc.org)

California Department of Pesticide Regulation (www.cdpr.ca.gov)

University of California Statewide IPM Program (www.ipm.ucdavis.edu/default.html)

Dioxins

Bay Area Dioxins Project (http://dioxin.abag.ca.gov/)

Building & Grounds Maintenance SC-41



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

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- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Building Repair and Construction SC-42



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Recycle

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Modifications are common particularly at large industrial sites. The activity may vary from minor and normal building repair to major remodeling, or the construction of new facilities. These activities can generate pollutants including solvents, paints, paint and varnish removers, finishing residues, spent thinners, soap cleaners, kerosene, asphalt and concrete materials, adhesive residues, and old asbestos installation. Protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants to stormwater from building repair, remodeling, and construction by using soil erosion controls, enclosing or covering building material storage areas, using good housekeeping practices, using safer alternative products, and training employees.

Approach

Pollution Prevention

- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practical.
- Buy recycled products to the maximum extent practical.
- Inform on-site contractors of company policy on these matters and include appropriate provisions in their contract to ensure certain proper housekeeping and disposal practices are implemented.

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- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.

Suggested Protocols

Repair & Remodeling

- Follow BMPs identified in Construction BMP Handbook.
- Maintain good housekeeping practices while work is underway.
- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Cover materials of particular concern that must be left outside, particularly during the rainy season.
- Do not dump waste liquids down the storm drain.
- Dispose of wash water, sweepings, and sediments properly.
- Store materials properly that are normally used in repair and remodeling such as paints and solvents.
- Sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout if when repairing roofs, small particles have accumulated in the gutter. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is tight lined, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.
- Properly store and dispose waste materials generated from construction activities. See Construction BMP Handbook.
- Clean the storm drain system in the immediate vicinity of the construction activity after it is completed.

Painting

- Enclose painting operations consistent with local air quality regulations and OSHA.
- Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect water quality.
- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint containers.
- Mix paint indoors before using so that any spill will not be exposed to rain. Do so even during dry weather because cleanup of a spill will never be 100% effective.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.

- Do not transfer or load paint near storm drain inlets.
- Plug nearby storm drain inlets prior to starting painting and remove plugs when job is complete when there is significant risk of a spill reaching storm drains.
- Cover nearby storm drain inlets prior to starting work if sand blasting is used to remove paint.
- Use a ground cloth to collect the chips if painting requires scraping or sand blasting of the existing surface. Dispose the residue properly.
- Cover or enclose painting operations properly to avoid drift.
- Clean the application equipment in a sink that is connected to the sanitary sewer if using water based paints.
- Capture all cleanup-water and dispose of properly.
- Dispose of paints containing lead or tributyl tin and considered a hazardous waste properly.
- Store leftover paints if they are to be kept for the next job properly, or dispose properly.
- Recycle paint when possible. Dispose of paint at an appropriate household hazardous waste facility.

Training

Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employees can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Clean up spills immediately.
- Excavate and remove the contaminated (stained) soil if a spill occurs on dirt.

Limitations

- This BMP is for minor construction only. The State's General Construction Activity Stormwater Permit has more requirements for larger projects. The companion "Construction Best Management Practice Handbook" contains specific guidance and best management practices for larger-scale projects.
- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Be certain that actions to help stormwater quality are consistent with Cal- and Fed-OSHA and air quality regulations.

SC-42 Building Repair and Construction

Requirements

Costs

These BMPs are generally low to modest in cost.

Maintenance

N/A

Supplemental Information

Further Detail of the BMP

Soil/Erosion Control

If the work involves exposing large areas of soil, employ the appropriate soil erosion and control techniques. See the Construction Best Management Practice Handbook. If old buildings are being torn down and not replaced in the near future, stabilize the site using measures described in SC-40 Contaminated or Erodible Areas.

If a building is to be placed over an open area with a storm drainage system, make sure the storm inlets within the building are covered or removed, or the storm line is connected to the sanitary sewer. If because of the remodeling a new drainage system is to be installed or the existing system is to be modified, consider installing catch basins as they serve as effective "in-line" treatment devices. See Treatment Control Fact Sheet TC-20 Wet Pond/Basin in Section 5 of the New Development and Redevelopment Handbook regarding design criteria. Include in the catch basin a "turn-down" elbow or similar device to trap floatables.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Parking/Storage Area Maintenance SC-43



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)
- Keep accurate maintenance logs to evaluate BMP implementation.

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SC-43 Parking/Storage Area Maintenance

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

SC-43 Parking/Storage Area Maintenance

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Drainage System Maintenance SC-44



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

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- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Housekeeping Practices SC-60

Description

Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals. Related information is provided in BMP fact sheets SC-11 Spill Prevention, Control & Cleanup and SC-34 Waste Handling & Disposal.

Approach

Pollution Prevention

- Purchase only the amount of material that will be needed for foreseeable use. In most cases this will result in cost savings in both purchasing and disposal. See SC-61 Safer Alternative Products for additional information.
- Be aware of new products that may do the same job with less environmental risk and for less or the equivalent cost. Total cost must be used here; this includes purchase price, transportation costs, storage costs, use related costs, clean up costs and disposal costs.

Suggested Protocols

General

- Keep work sites clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Dispose of wash water, sweepings, and sediments, properly.
- Recycle or dispose of fluids properly.
- Establish a daily checklist of office, yard and plant areas to confirm cleanliness and adherence to proper storage and security. Specific employees should be assigned specific inspection responsibilities and given the authority to remedy any problems found.
- Post waste disposal charts in appropriate locations detailing for each waste its hazardous nature (poison, corrosive, flammable), prohibitions on its disposal (dumpster, drain, sewer) and the recommended disposal method (recycle, sewer, burn, storage, landfill).
- Summarize the chosen BMPs applicable to your operation and post them in appropriate conspicuous places.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

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- Require a signed checklist from every user of any hazardous material detailing amount taken, amount used, amount returned and disposal of spent material.
- Do a before audit of your site to establish baseline conditions and regular subsequent audits to note any changes and whether conditions are improving or deteriorating.
- Keep records of water, air and solid waste quantities and quality tests and their disposition.
- Maintain a mass balance of incoming, outgoing and on hand materials so you know when there are unknown losses that need to be tracked down and accounted for.
- Use and reward employee suggestions related to BMPs, hazards, pollution reduction, work place safety, cost reduction, alternative materials and procedures, recycling and disposal.
- Have, and review regularly, a contingency plan for spills, leaks, weather extremes etc. Make sure all employees know about it and what their role is so that it comes into force automatically.

Training

- Train all employees, management, office, yard, manufacturing, field and clerical in BMPs and pollution prevention and make them accountable.
- Train municipal employees who handle potentially harmful materials in good housekeeping practices.
- Train personnel who use pesticides in the proper use of the pesticides. The California Department of Pesticide Regulation license pesticide dealers, certify pesticide applicators and conduct onsite inspections.
- Train employees and contractors in proper techniques for spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and Countermeasure (SPCC) plant up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- There are no major limitations to this best management practice.
- There are no regulatory requirements to this BMP. Existing regulations already require municipalities to properly store, use, and dispose of hazardous materials

Requirements

Costs

- Minimal cost associated with this BMP. Implementation of good housekeeping practices may result in cost savings as these procedures may reduce the need for more costly BMPs.

Maintenance

- Ongoing maintenance required to keep a clean site. Level of effort is a function of site size and type of activities.

Supplemental Information

Further Detail of the BMP

- The California Integrated Waste Management Board's Recycling Hotline, 1-800-553-2962, provides information on household hazardous waste collection programs and facilities.

Examples

There are a number of communities with effective programs. The most pro-active include Santa Clara County and the City of Palo Alto, the City and County of San Francisco, and the Municipality of Metropolitan Seattle (Metro).

References and Resources

British Columbia Lake Stewardship Society. Best Management Practices to Protect Water Quality from Non-Point Source Pollution. March 2000.
http://www.nalms.org/bclss/bmphome.html#bmp

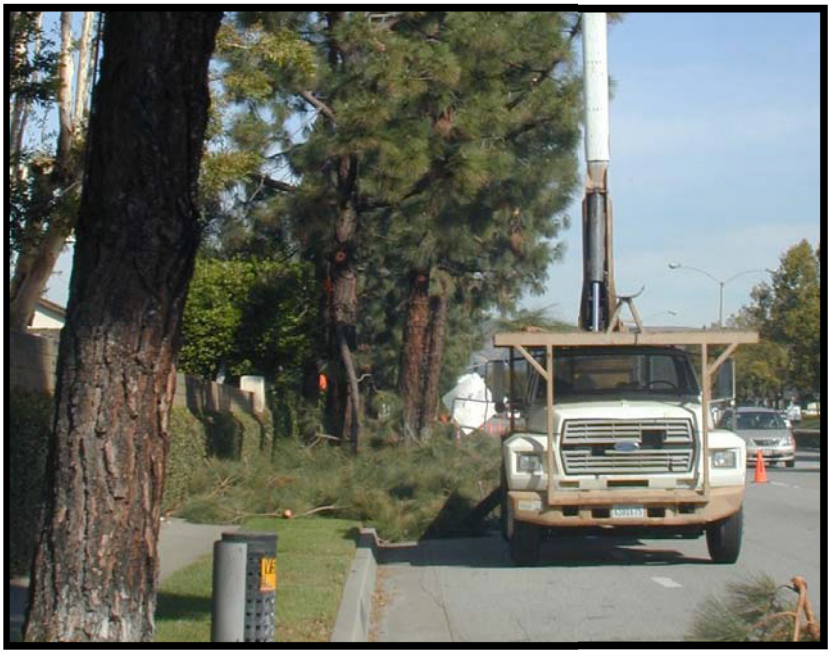
King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities, Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July, 1998, Revised by California Coastal Commission, February 2002.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

San Mateo STOPPP - (http://stoppp.tripod.com/bmp.html)

Landscape Maintenance SC-73



Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

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- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a know in location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.
- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.
- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

References and Resources

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. 1995. King County Surface Water Management. July. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Los Angeles County Stormwater Quality Model Programs. Public Agency Activities http://ladpw.org/wmd/npdes/model_links.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Landscaping and Lawn Care. Office of Water. Office of Wastewater Management. On-line: http://www.epa.gov/npdes/menuofbmps/poll_8.htm

Site Design & Landscape Planning SD-10



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11



Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13



Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include “NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

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19.28.110 EROSION CONTROL LANDSCAPING

Landscaping for the purpose of erosion control shall be in compliance with the standards outlined in Chapter 15 of the Municipal Code.

19.28.120 WATER EFFICIENT LANDSCAPING STANDARDS
(MC 1368 02/08/12)

1. PURPOSE AND INTENT

A. The purpose of this Chapter is to:

(1) Promote the aesthetic and recreational values of landscapes, while recognizing the need to invest water resources as efficiently as possible;

(2) Establish a structure for planning, designing, installing and maintaining water efficient landscapes in new construction and rehabilitated projects;

(3) Establish provisions for water management practices and water waste prevention in the irrigation of existing landscapes;

(4) Implement water quality management practices that minimize storm water and irrigation runoff, to achieve on-site filtration and groundwater recharge;

(5) Promote and encourage the use of low water use plants in landscapes;

(6) Minimize the use of cool season turf;

(7) Promote conservation of potable water by encouraging the use of recycled water and water-conserving technology in landscape irrigation; and

(8) Promote public education about water conservation and water efficient landscape irrigation.

B. The intent of this Chapter is to implement water efficient landscape regulations at least as effective as the state model ordinance adopted pursuant to California Government Code Section 65595.

2. APPLICABILITY

After January 1, 2010, the provisions of this Chapter shall apply as follows:

A. All provisions of this chapter for planning, design, installation and management of new landscapes shall apply to the following new construction and rehabilitation landscape projects normally subject to building or landscaping plan review and permits.

(1) Public agency projects and private development projects with a landscape area equal to or greater than 2,500 square feet;

(2) Developer-installed single-family and multi-family residential projects with a landscape area equal to or greater than 2,500 square feet in the aggregate;

(3) Homeowner-installed and/or homeowner-hired single-family and multifamily residential projects with a total project landscape area equal to or greater than 5,000 square feet.

B. Limited applicability. Existing landscapes, cemeteries and certain Special Landscape Areas are exempt from the provisions of this Chapter as follows:

(1) Existing landscapes installed before January 1, 2010 and exceeding one acre in area are subject only to water waste prevention and efficient irrigation requirements of Sections 19.28.110(12) and 19.28.110(13).

(2) New cemeteries or cemetery expansion projects exceeding 2,500 square feet in landscape area shall be subject to the Water Efficient Landscape worksheet requirement and the irrigation analysis and maintenance requirements of Section 19.28.110(9) and Section 19.28.110(10).

(3) New development or rehabilitation of landscapes including Special Landscape Areas (SLAs), such as edible landscapes, landscapes irrigated with recycled water, and active parks or sport field landscaping shall be subject to the provisions of this Ordinance, except that the Maximum Applies Water Allowance (MAWA) shall be adjusted to provide for adequate irrigation of SLAs.

C. Exemptions. The provisions of this Chapter shall not apply to the following exempt landscapes:

(1) Registered local, state or federal historic sites;

(2) Ecological restoration projects that do not require permanent irrigation systems;

(3) Mined land restoration projects that do not require permanent irrigation systems;

(4) Botanical gardens and arboretums open to the public.

3. LANDSCAPE DESIGN STANDARDS AND PLANNING GUIDELINES

For the efficient use of water, landscapes shall be carefully designed and planned to thrive in local soil and climatic conditions and to suit the intended function of the project. The following design guidelines shall also be considered in landscape planning:

A. Plant Selection:

(1) Native plants and drought-tolerant species are encouraged to promote low maintenance, water efficient landscapes.

(2) Any plant may be used in the landscape, provided that the EAWU (estimated annual applied water use) does not exceed the MAWA (maximum annual applied water allowance).

(3) Plants with similar water use requirements shall be grouped together in "hydrozones" wherever possible.

(4) Turf areas should be minimal, limited mainly to active recreation areas and small lawns. Where turf is used, it should not be planted on slopes greater than 4:1, and warm season varieties are preferred.

(5) Fire resistant plant species and fuel modification requirements shall be top priority for landscape design in high fire hazard areas.

(6) Invasive plant species should be avoided, especially near natural areas, fuel modification zones, parks and water bodies.

(7) The use of mulch is encouraged to retain moisture.

(8) Plant placement shall be planned to create shade in summer and permit solar gain in winter.

(9) Plant size and root characteristics at maturity should be considered in plant selection and placement, to avoid damage to property or infrastructure.

B. Water Features:

(1) Recirculating water systems shall be used for all decorative water features.

(2) If available, recycled water should be used in decorative water features, except pools and spas.

(3) The surface area of a water feature shall be included in MAWA calculation with an evaporation rate equivalent to that of a high water use plant.

(4) Pool and spa covers are highly recommended.

C. Content Requirements of Landscape Design Plans:

(1) Each hydrozone shall be identified as a "low", "moderate", "high", or "mixed" water use zone.

(2) Landscape areas with unique water budget considerations, such as recreation areas, areas dedicated to edible landscapes, and areas to be irrigated with recycled water shall be delineated.

(3) Areas planned for soil amendments, mulch application, surface water features, and hardscapes (pervious and impervious) shall be delineated with applicable notes regarding installation and design.