Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

PROJECT SPECIFIC PRELIMINARY WATER QUALITY MANAGEMENT PLAN (P-WQMP)

FOR:
P21-00006
HARLEY KNOX COMMERCE CENTER
25264 NANCE STREET
PERRIS, CALIFORNIA 92571
APNs: 302-100-020, -030 AND -031

PREPARED FOR:
PROFICIENCY CAPITAL, LLC
11777 SAN VICENTE BOULEVARD, SUITE #780
LOS ANGELES, CA 90049
PHONE: (310) 979-8000
CONTACT: MATT ENGLHARD

DECMEMBER 1, 2021

JOB NO. 3951

PREPARED BY:
THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
PHONE: (714) 521-4811
FAX: (714) 521-4173
CONTACT: LUIS PRADO (luisp@thieneseng.com)

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FOR

"HARLEY KNOX COMMERCE CENTER"

PREPARED BY LUIS PRADO
UNDER THE SUPERVISION OF:

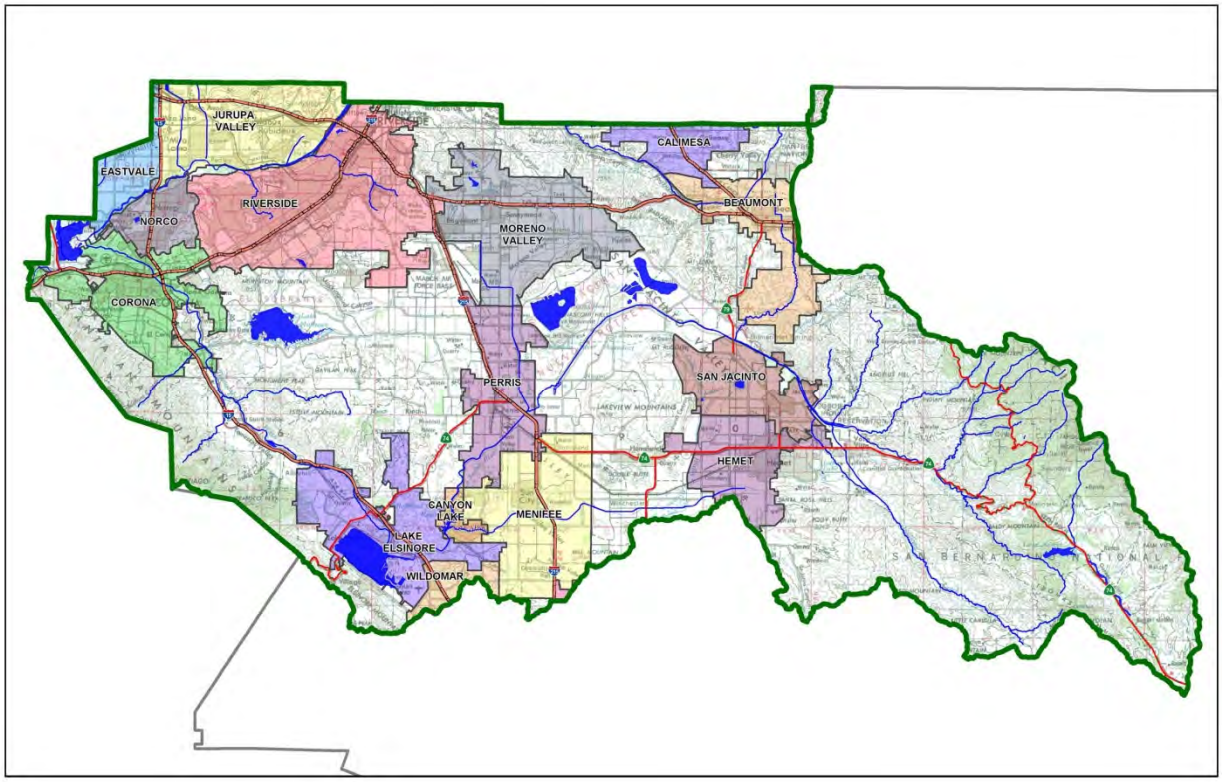
12/1/2021

REINHARD STENZEL DATE
R.C.E. 56155
EXP. 12/31/2022

Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Harley Knox Commerce Center
Development No: P21-00006
Design Review/Case No: P21-00006



☒ **Preliminary**
☐ **Final**

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Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

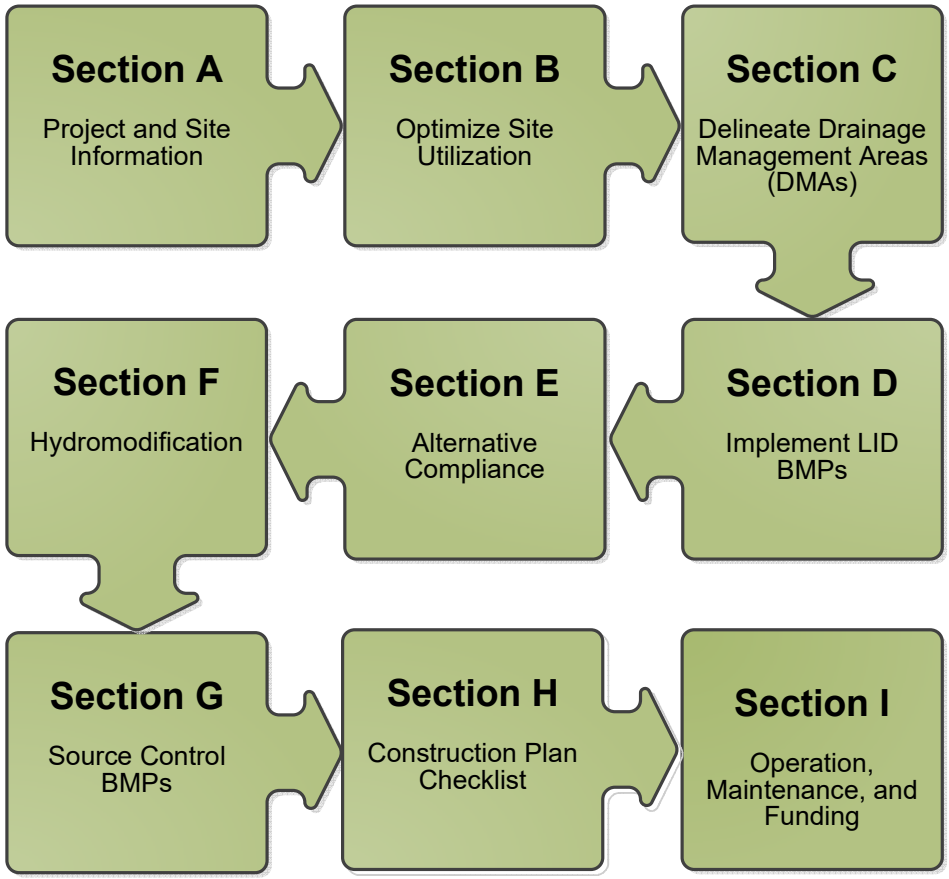
Contact Information:

Prepared for:
Harley Knox 2021, LLC
11777 San Vicente Boulevard, Suite #780
Los Angeles, CA 90049
Phone: (310) 979-8000
Contact: Matt Englhard

Prepared by:
Thienes Engineering, Inc.
14349 Firestone Boulevard
La Mirada, CA 90638
(714) 521-4811
Contact: Luis Prado (luisp@thieneseng.com)
Job No. 3951

A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **Harley Knox 2021, LLC** by **Thienes Engineering, Inc.** for the **Harley Knox Commerce Center** project.

This WQMP is intended to comply with the requirements of **City of Perris** for **Ordinance No. 1194** which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under **City of Perris** Ordinance **No. 1194**.

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Matt Englhard	Vice President
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature	Date
Reinhard Stenzel	Director of Engineering
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

Table of Contents

List of Tables

List of Appendices

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Light Industrial Warehouse
Planning Area:	Light Industrial
Community Name:	N/A
Development Name:	Harley Knox Commerce Center
PROJECT LOCATION	
Latitude & Longitude (GIS): 33.856463, -117.220328	
Project Watershed and Sub-Watershed: Santa Ana River & San Jacinto	
APN(s): 302-100-020, -030 and -031	
Map Book and Page No.: Assessor's Map BK302 PG. 10	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Light Industrial
Proposed or Potential SIC Code(s)	4225
Area of Existing Impervious Project Footprint (SF)	2,893
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	248,292 (5.70 acres)
Does the project consist of offsite road improvements?	☒ Y ☐ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	2,893
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	Soil Type D
What is the Water Quality Design Storm Depth for the project?	0.648

Project Description:

The project site encompasses approximately 6.45 acres. Proposed improvements to the site include a light industrial warehouse of approximately 156,094 square feet utilized for the transfer and storage of finished goods. There will be a truck yard east of the building. Vehicle parking lots will be on the west and east sides of the building. Landscaping will be adjacent to the streets and scattered throughout the site. Two underground infiltration galleries will be proposed to retain runoff produced by the 85th percentile storm rainfall depth. In addition, catch basin and roof drain filters will be provided in order to pre-treat runoff prior to entering the underground infiltration galleries.

Existing Site:

Under existing conditions, the site is mostly vacant with natural grasses and sparse vegetation throughout. There are foundations from residential buildings in the southeast and southwest sections of the site. The site generally drains from north to south toward Nance Street. A proposed wall along the westerly property line will block potential run-on from the westerly neighbor and will be directed southerly, similar to the existing condition.

Hydrology:

Runoff from the westerly portion of the building, the truck yard, and the southwesterly and northwesterly parking lots will surface drain to several catch basins located within the truck yard (DMA A). Flows from the easterly portion of the building and the parking lot to the east will surface drain to two catch basins within the parking lot (DMA B). Proposed storm drain systems, Lines A and B, will convey stormwater to the south and discharge into a

proposed public storm drain system in Nance Street which ultimately drains into the existing public storm drain in Redlands Avenue.

The proposed northerly and southerly street-adjacent landscaping (DMAs C & D) will surface drain offsite.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, and the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Perris Valley Storm Drain	None	None	Not classified as a RARE waterbody.
San Jacinto River, Reach 3	None	AGR, GWR, REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.
Canyon Lake (aka San Jacinto River, Reach 2)	Nutrients, Pathogens	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.
San Jacinto River, Reach 1	None	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.
Lake Elsinore	Nutrients, Organic Enrichment/Low Dissolved Oxygen, Indicator Bacteria	REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☒ Y	☐ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)* City of Perris Grading Permit	☒ Y	☐ N
Other *(please list in the space below as required)* City of Perris Building Permit	☒ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

- *There are no creeks, wetlands, or riparian habitats nearby.*
- *Existing drainage patterns flow southerly to Nance Street. Proposed condition drainage patterns mimic pre-development conditions.*

Did you identify and protect existing vegetation? If so, how? If not, why?

- *Not applicable, there are no sensitive areas.*
- *No applicable, there are no existing trees or vegetation to preserve.*

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

- *Stormwater BMPs are located in areas to promote infiltration to the maximum extent feasible (see Appendix 3 for infiltration report). Two underground infiltration galleries are proposed within the truck yard and easterly vehicle parking lot.*

Did you identify and minimize impervious area? If so, how? If not, why?

- *Impervious area on the site has been minimized to City standards.*
- *Due to the nature of the project site (large trucks), substitution of pavement for landscaping is not feasible. The project does not propose overflow parking where substitution of pavement for landscaping would be optimal. Landscaping has been provided wherever applicable and to the maximum extent practicable.*

- *The entire Design Capture Volume (DCV) is handled by the proposed underground infiltration galleries. Permeable pavement is not needed to meet the DCV.*

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

- *Roof runoff is directed to the underground infiltration galleries for treatment.*
- *The site is not on a hillside.*
- *All stormwater runoff will be piped or sheet flow into the underground infiltration galleries; therefore curb-cuts into landscaped areas are not utilized.*

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	Area (Acres)	DMA Type
A-1	Roofs/Conc/Asphalt	191,664	4.40	Type D
A-2	Ornamental Landscaping	4,356	0.10	Type D
B-1	Roofs/Conc/Asphalt	56,628	1.30	Type D
B-2	Ornamental Landscaping	6,534	0.15	Type D
C-2	Ornamental Landscaping	10,890	0.25	Type A
D-2	Ornamental Landscaping	10,890	0.25	Type A

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column.*

DMAs C and D consist of landscaping that drains offsite.

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
C-2	10,890	California Native Vegetation	Timed Sprinklers
D-2	10,890	California Native Vegetation	Timed Sprinklers

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
n/a	n/a	n/a	n/a	n/a	n/a	n/a

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
A-1	Underground Infiltration Gallery (CMP "A")
A-2	Underground Infiltration Gallery (CMP "A")
B-1	Underground Infiltration Gallery (CMP "B")
B-2	Underground Infiltration Gallery (CMP "B")

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X[1]
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

[1] **BMPs are specifically placed in areas and at depths were infiltration rates were equal to or greater than 1.6 in/hr.**

D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐ Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☒ The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: N/A

Type of Landscaping (Conservation Design or Active Turf): N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: N/A

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
N/A	N/A

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: N/A

Project Type: N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-2 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: N/A

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
N/A	N/A

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3: N/A

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
N/A	N/A

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

☒ Not applicable

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				Alternative Compliance	Site Design (Type A, B, C)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment		
A-1	☒	☐	☐	☐	☐	☐
A-2	☒	☐	☐	☐	☐	☐
B-1	☒	☐	☐	☐	☐	☐
B-2	☒	☐	☐	☐	☐	☐
C-2	☐	☐	☐	☐	☐	☒
D-2	☐	☐	☐	☐	☐	☒

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	[A]		[B]	[C]	[A] x [C]			
A-1	191,664	Roofs/Conc/Asphalt	*1.00*	*0.89*	*170,964.3*	*0.648*	*9232.1*	*9,273*
A-2	4,356	Ornamental Landscaping	*0.10*	*0.11*	*481.2*	*0.648*	*26*	
B-1	56,628	Roofs/Conc/Asphalt	*1.00*	*0.89*	*50,512.2*	*0.648*	*2727.7*	*2,785*
B-2	6,534	Ornamental Landscaping	*0.10*	*0.11*	*721.7*	*0.648*	*39*	
	259,182				*222,679*	0.648	12,024.8	12,058

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- Or -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☒ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☒	☒	☐	☒	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1]Cannot Exceed 50%

[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imp Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor				
	[A]		[B]	[C]	[A] x [C]				
N/A	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*Design Storm Depth (in)*	*Minimum Design Capture Volume (cubic feet)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A		
N/A		

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐Y ☒N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐Y ☒ N

If yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration (min)	n/a	n/a	n/a
Volume (cubic-feet)	n/a	n/a	n/a

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered

and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

All pertinent documentation used in analysis of the items a, b or c can be found in Appendix 7.

The project site is located within the exempted HCOC area, as presented in the April 20, 2017 approved WAP/HCOC document attached in Appendix 7.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	• Mark all inlets with the words "Only Rain Down the Storm Drain" or similar.	• Maintain and periodically repaint or replace inlet markings annually. • Provide stormwater pollution prevention information to new site owners, lessees, or operators upon occupancy and annually thereafter. • See CASQA fact sheet SC-44 for "Drainage System Maintenance," included in Appendix of this document. • Include the following lease agreements: "Tenant shall not allow anyone to discharge anything to storm drain or to store or deposit materials so as to create a potential discharge to storm drains."

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
B. Interior floor drains and elevator shaft sump pumps	• Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	• Inspect and maintain drains semi-annually to prevent blockages and overflow.
D2. Landscape / Outdoor Pesticide Use	• Landscape plans will minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. • Pest-resistant plans will be used adjacent to hardscape. • The landscape plans will consider plants appropriate to the site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	• Maintain landscaping only using minimum pesticides, when needed. • See Appendix 10 for "Landscape and Gardening" brochure by RCFlood. • Provide Integrated Pest Management (IPM) information to new owners, lessees and operators upon occupancy and annually thereafter. IPM is an effective and environmentally sensitive approach to pest management.
G. Refuse Areas	• Site refuse will be handled by contractor on a weekly basis. • Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	• A minimum of two receptacles will be provided and located indoors. Receptacles are to be inspected daily and repairs or replacements to leaky receptacles will be completed immediately. Receptacles are to remain covered when not in use. Dumping of liquid or hazardous wastes is prohibited. A "no hazardous materials" sign will be posted. Spills will be cleaned immediately upon discovery. Spill control materials will be available onsite. See Appendix 10 for CASQA fact sheet SC-34 for "Waste Handling and Disposal."
H. Industrial processes	• All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.	• See Appendix 10 for CASQA fact sheet SC-10 for "Non-Stormwater Discharges"
M. Loading Docks	• Spills will be cleaned up immediately and disposed of properly.	• Move loaded and unloaded items indoors as soon as possible. • See Appendix 10 for CASQA fact sheet SC-30 for "Outdoor Loading and Unloading"
P. Plazas, sidewalks, and parking lots		• Sweep plazas, sidewalks, and parking lots monthly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	Latitude	Longitude
A	On-site storm drain inlets	WQMP Site Map	---	---
B	Interior floor drains and elevator shaft sump pumps	N/A	---	---
D2	Landscape / Outdoor Pesticide Use	On-Site Landscape Improvement Plans	---	---
G	Refuse Areas	WQMP Site Map	---	---
H	Industrial processes	WQMP Site Map	---	---
M	Loading Docks	WQMP Site Map	---	---
P	Plazas, sidewalks, and parking lots	WQMP Site Map	---	---
CMP "A"	Underground Infiltration Gallery	WQMP Site Map	33.856182	-117.221049
CMP "B"	Underground Infiltration Gallery	WQMP Site Map	33.855898	-117.219599

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: City of Perris:

Covenant and Agreement

Water Quality Management Plan and Urban Runoff BMP Transfer, Access and Maintenance Agreement

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

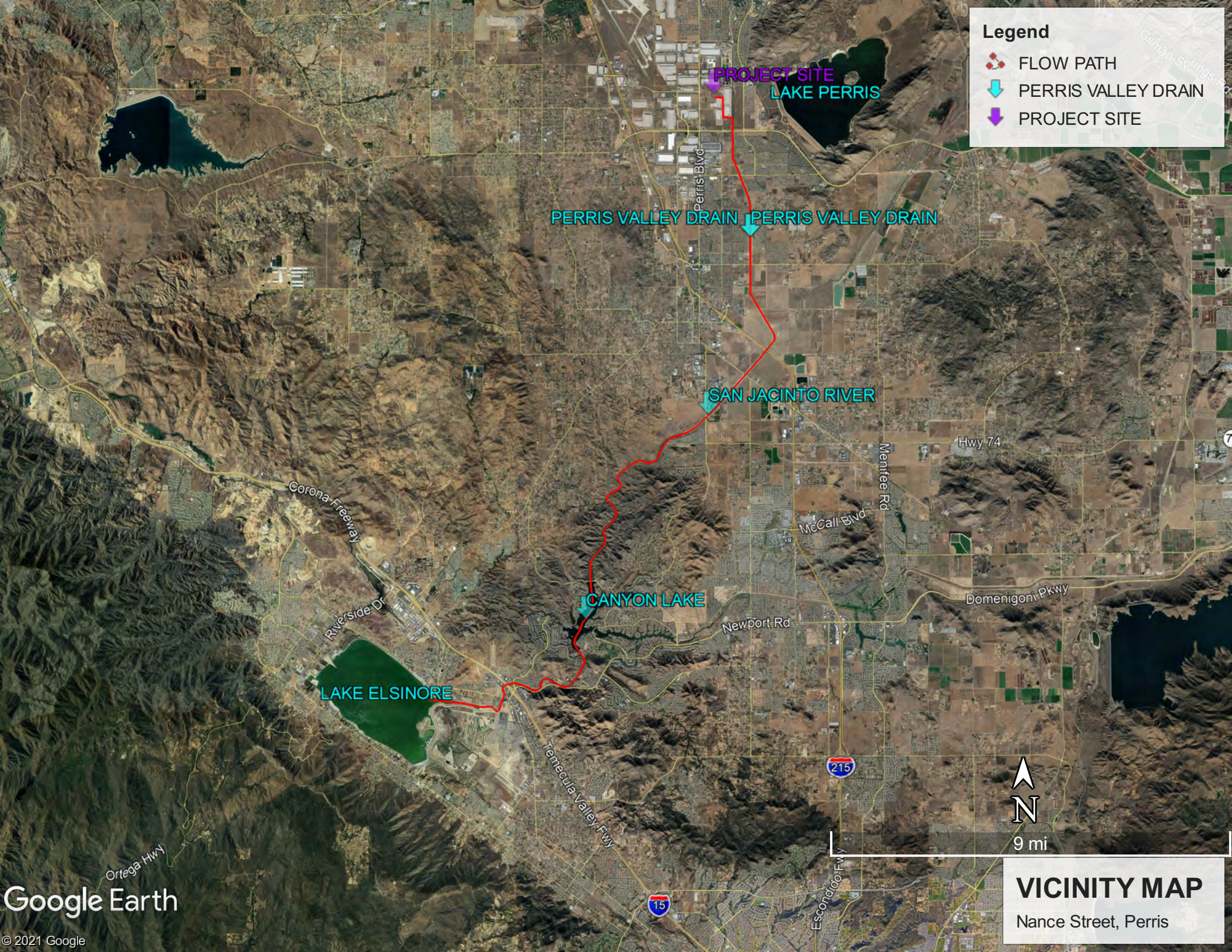
Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

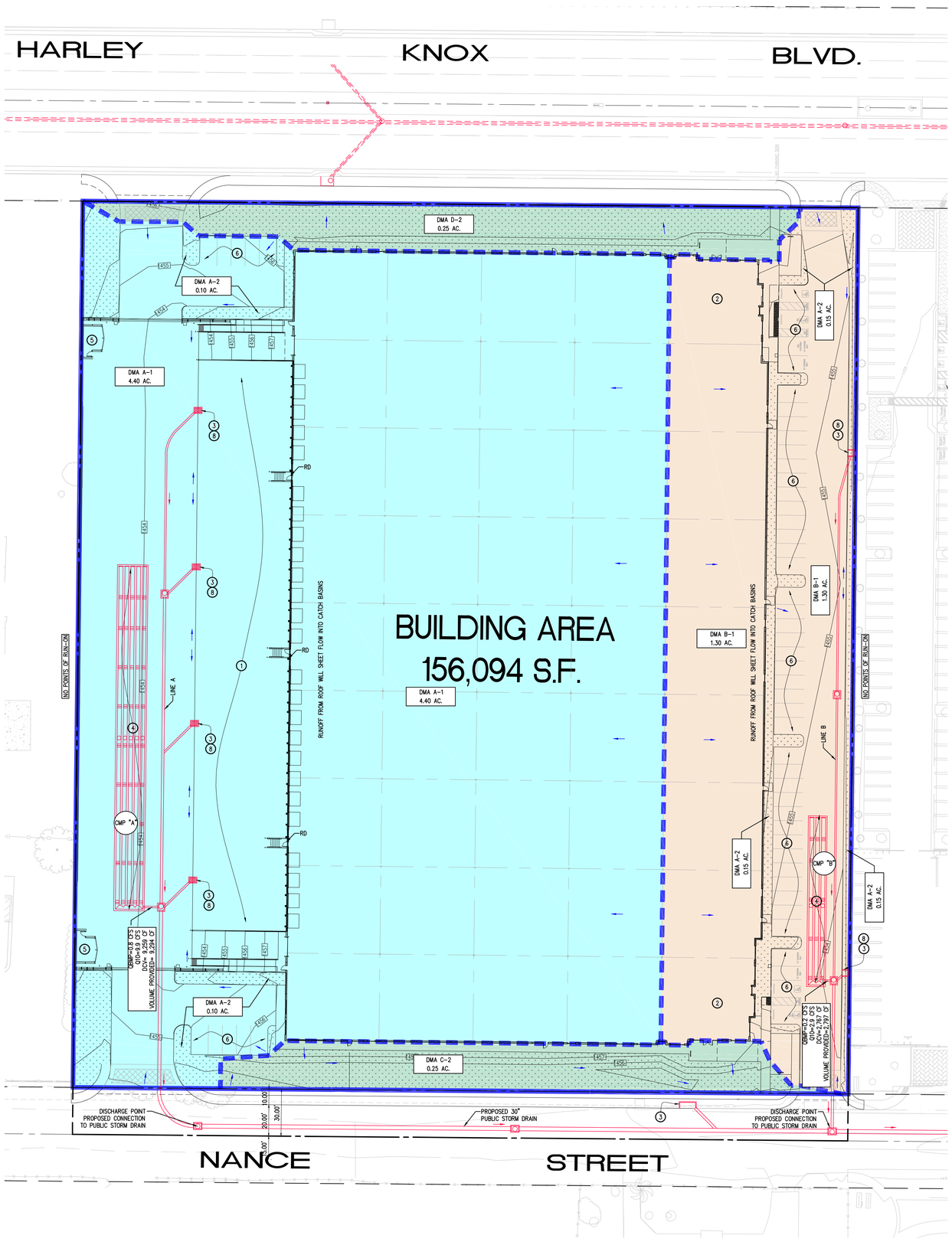
VICINITY MAP

Nance Street, Perris

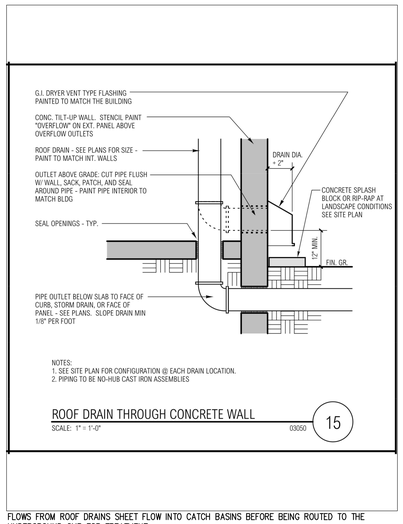


VICINITY MAP

Nance Street, Perris

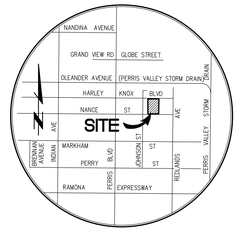


DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	Area (Acres)	DMA Type
A-1	Roofs/Conc/Asphalt	191,664	4.40	Type D
A-2	Ornamental Landscaping	4,356	0.10	Type D
B-1	Roofs/Conc/Asphalt	56,628	1.30	Type D
B-2	Ornamental Landscaping	6,534	0.15	Type D
C-2	Ornamental Landscaping	10,890	0.25	Type A
D-2	Ornamental Landscaping	10,890	0.25	Type A



FLOWS FROM ROOF DRAINS SHEET FLOW INTO CATCH BASINS BEFORE BEING ROUTED TO THE UNDERGROUND CMP FOR TREATMENT

TRASH ENCLOSURE DETAIL



VICINITY MAP
N.T.S.

LEGEND

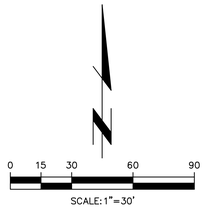
1. LOADING/UNLOADING TRUCK DOCKS
2. EDUCATIONAL MATERIAL/OFFICE
3. STORM DRAIN STENCIL
4. UNDERGROUND INFILTRATION GALLERY
5. TRASH ENCLOSURE
6. PARKING LOT MAINTENANCE (SWEEPING)
7. NOT USED
8. DRAIN INSERT(S)

NOTE:

- BOUNDARY
- SUBAREA
- DMA A
- DMA B
- SD FLOW DIRECTION
- SURFACE FLOW DIRECTION
- LANDSCAPE/EFFICIENT IRRIGATION

RD ROOF DRAIN

SAMPLE STORM DRAIN STENCIL



SCALE: 1"=30'

Last Update:12/1/21
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CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

POST-CONSTRUCTION BMP SITE PLAN

HARLEY KNOX COMMERCE CENTER
25264 NANCE STREET
PERRIS, CA

P21-XXXXX

PREPARED FOR:
HARLEY KNOX 2021, LLC
11777 SAN VICENTE BLVD., STE. 780
LOS ANGELES, CA. 90049
PHONE: (310) 979-8000

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH:(714)521-4811 FAX(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____
Public Works Director _____ R.C.E. _____

Sheet 1 of 2 Sheets

3951/1 OF 2 SHEET

DYODS™ Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings, and pricing send completed worksheet to: **dyods@contech-cpi.com**

Project Summary

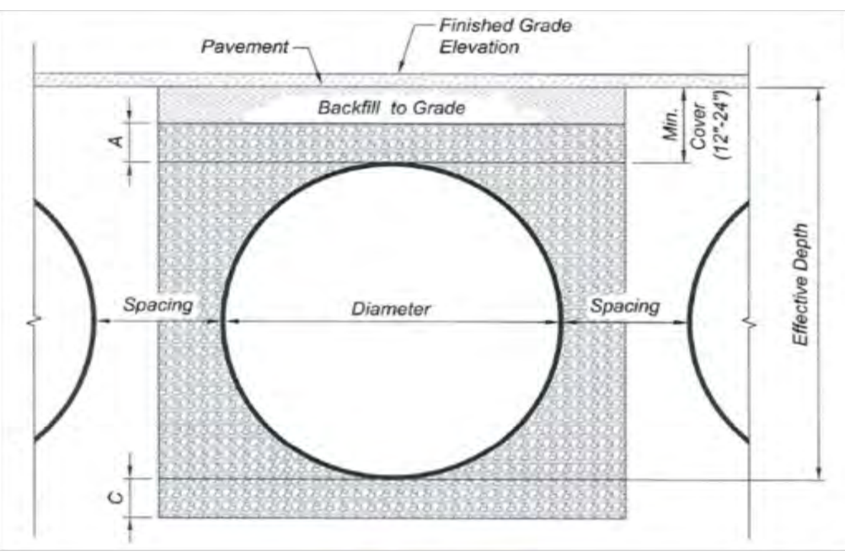
Date:	4/28/2021
Project Name:	Nance Street Industrial Dev. (DMA A)
City / County:	Perris, Riverside County
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	9,259
Limiting Width (ft):	21.00
Invert Depth Below Asphalt (ft):	3.50
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	30
Number Of Headers:	1
Spacing between Barrels (ft):	1.25
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

4.91 ft^2 Pipe Area



System Sizing

Pipe Storage:	5,412 cf
Porous Stone Storage:	3,882 cf
Total Storage Provided:	9,294 cf — 100.4% Of Required Storage
Number of Barrels:	5 barrels
Length per Barrel:	217.0 ft
Length Per Header:	17.5 ft
Rectangular Footprint (W x L):	19.5 ft x 221.5 ft

CONTECH Materials

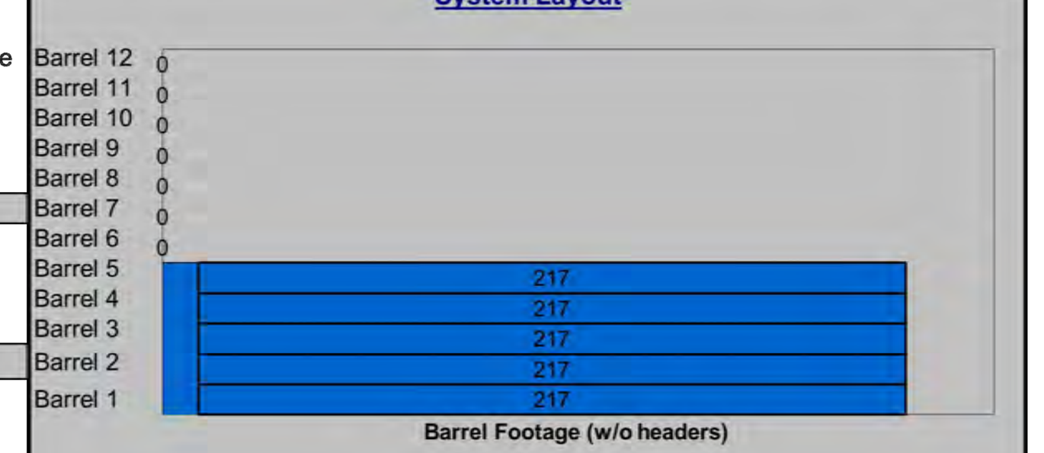
Total CMP Footage:	1,103 ft
Approximate Total Pieces:	51 pcs
Approximate Coupling Bands:	50 bands
Approximate Truckloads:	3 trucks

Construction Quantities**

Total Excavation:	560 cy
Porous Stone Backfill For Storage:	359 cy stone
Backfill to Grade Excluding Stone:	0 cy fill

**Construction quantities are approximate and should be verified upon final design

System Layout

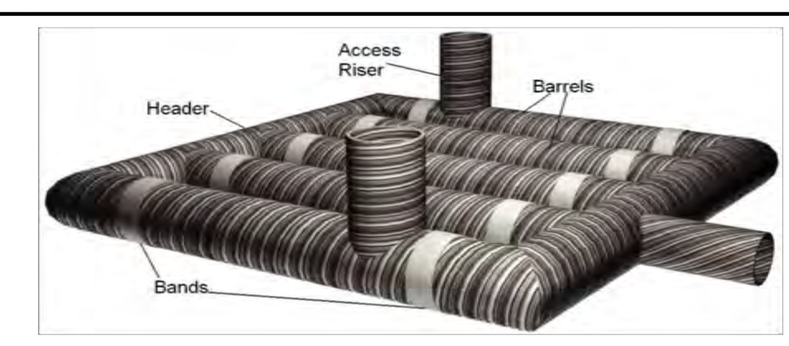


DYODS™ Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings, and pricing send completed worksheet to: **dyods@contech-cpi.com**



Project Summary

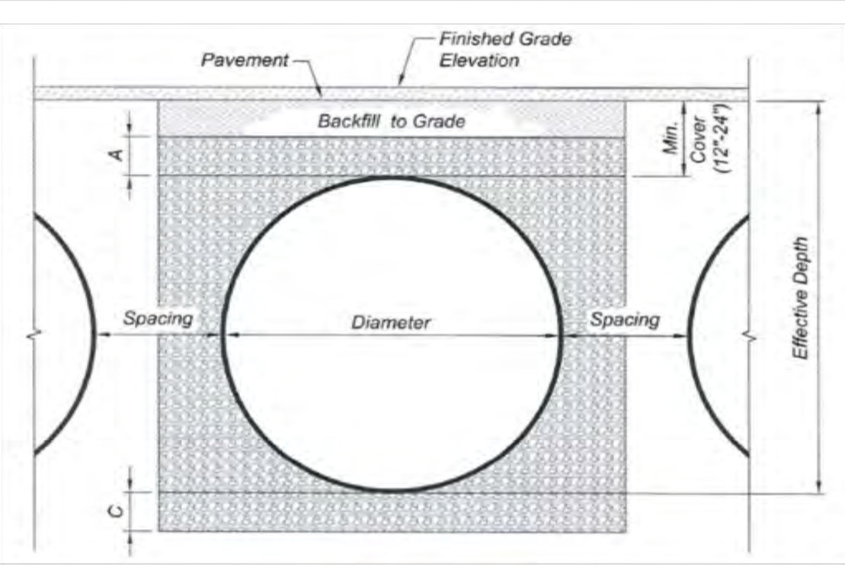
Date:	4/28/2021
Project Name:	Nance Street Industrial Dev. (DMA B)
City / County:	Perris, Riverside County
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	2,767
Limiting Width (ft):	12.00
Invert Depth Below Asphalt (ft):	3.50
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	30
Number Of Headers:	1
Spacing between Barrels (ft):	1.25
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

4.91 ft^2 Pipe Area



System Sizing

Pipe Storage:	1,595 cf
Porous Stone Storage:	1,201 cf
Total Storage Provided:	2,797 cf — 101.1% Of Required Storage
Number of Barrels:	3 barrels
Length per Barrel:	105.0 ft
Length Per Header:	10.0 ft
Rectangular Footprint (W x L):	12. ft x 109.5 ft

CONTECH Materials

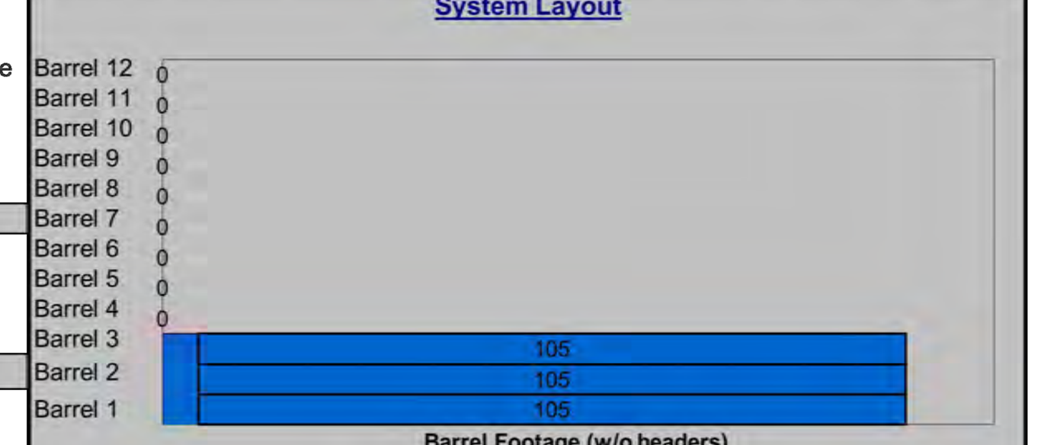
Total CMP Footage:	325 ft
Approximate Total Pieces:	16 pcs
Approximate Coupling Bands:	15 bands
Approximate Truckloads:	1 trucks

Construction Quantities**

Total Excavation:	171 cy
Porous Stone Backfill For Storage:	111 cy stone
Backfill to Grade Excluding Stone:	1 cy fill

**Construction quantities are approximate and should be verified upon final design

System Layout



BIO CLEAN FULL CAPTURE FILTER WITH TROUGH SYSTEM

FOR USE IN CURB INLETS

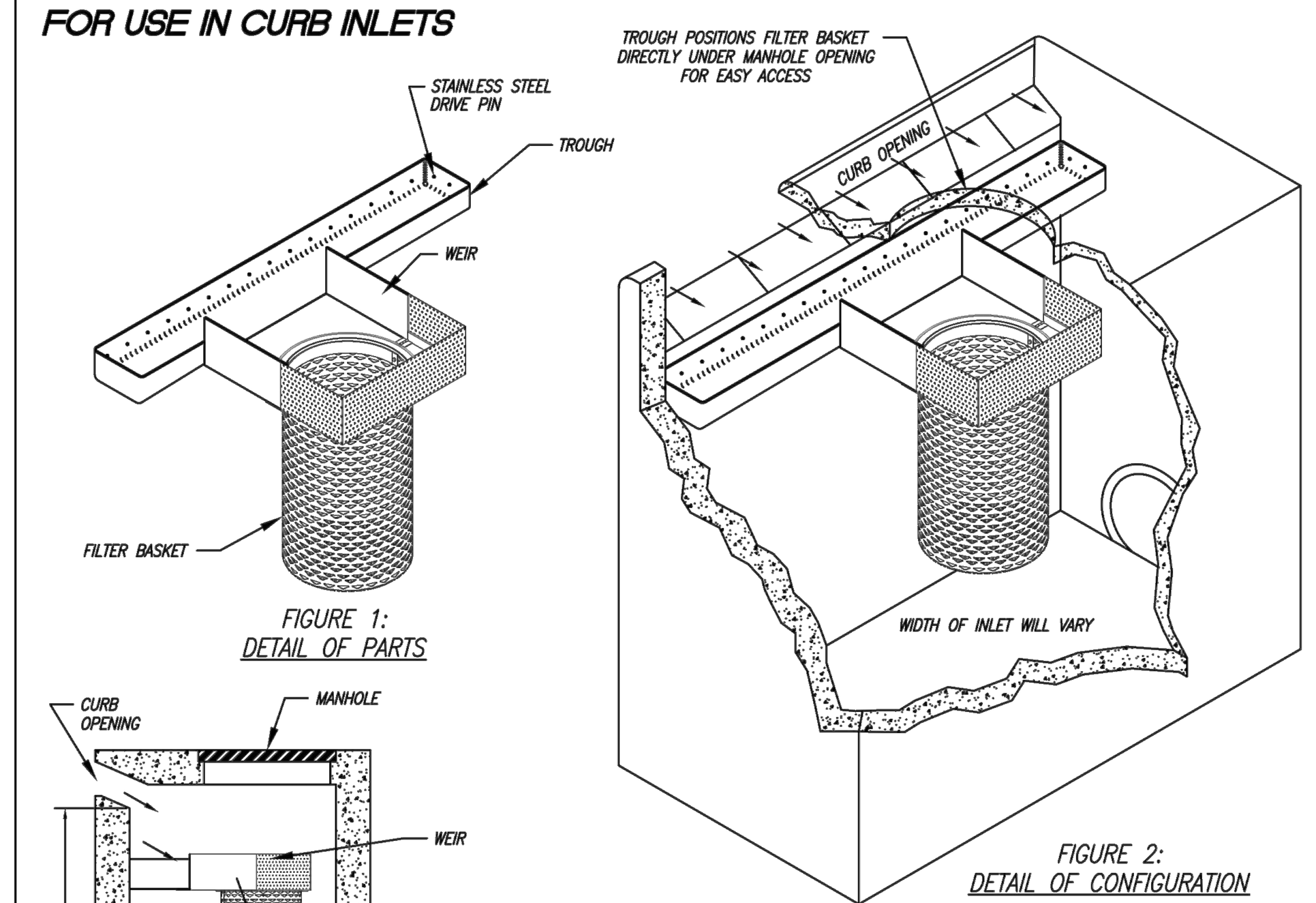


FIGURE 1:
DETAIL OF PARTS

FIGURE 2:
DETAIL OF CONFIGURATION

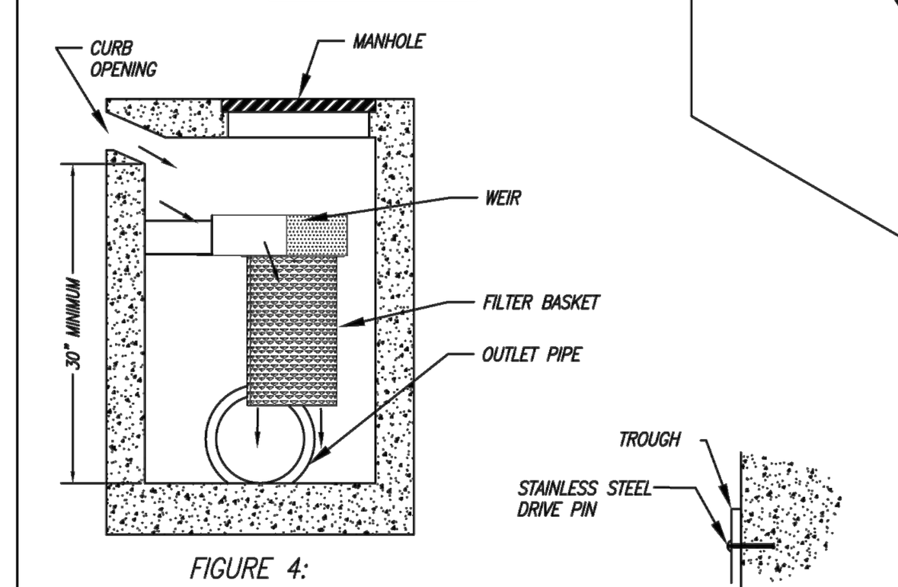


FIGURE 4:
DETAIL OF PROFILE

FIGURE 3:
DETAIL OF MOUNTING

NOTES:

1. TROUGH SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO FILTER.
2. TROUGH SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTER MANUFACTURED OF 100% STAINLESS STEEL.
5. FILTER MADE OF NON-CLOGGIN SCREEN WITH 4.7 MM OPENINGS AND MEETS FULL CAPTURE REQUIREMENTS.
6. FILTER CAN BE FITTED WITH HYDROCARBON ABSORBENT BOOM
7. FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE FOR EASY REMOVAL AND MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 2' TO 30'
9. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
10. CONSIDERS A SAFETY FACTOR OF 2.0
11. BYPASS IS FACILITATED VIA OVERFLOW OF THE TROUGH SYSTEM AND IS EQUAL TO THE CAPACITY OF THE CURB OPENING
12. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
13. ADDITIONAL TREATMENT AND STORAGE CAPACITY CAN BE ACHIEVED BY UTILIZING MULTIPLE FILTER BASKETS.

MODEL NUMBER	TREATMENT FLOW (cfs)*	SOLIDS STORAGE CAPACITY (cu ft)
BIO-CURB-FULL-24	2.85	1.40
BIO-CURB-FULL-18	2.85	1.05
BIO-CURB-FULL-12	2.85	0.70

*SEE PAGE 2 FOR EXPLANATION OF FLOW RATES

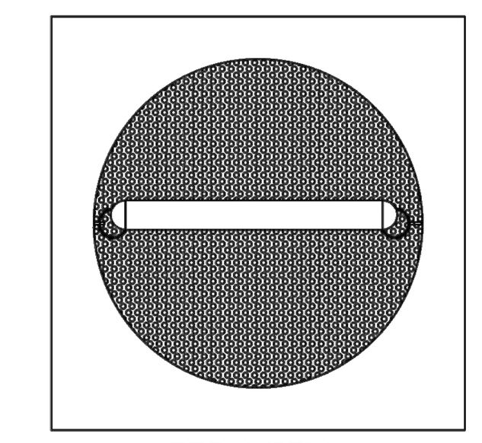
DRAWING: BIO CLEAN CURB INLET FILTER DETAILS		MEETS FULL CAPTURE REQUIREMENTS	
TREATMENT FLOW RATE: 2.85 cfs		MODEL #: BIO-CURB-FULL	
WARRANTY: 8 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640 FAX: 760-433-3176		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 10/12/2017	SCALE: NTS	REVISIONS:	DATE:
DRAFTER: M.C.P.	UNITS = INCHES	REVISIONS:	DATE:

Bio Clean
A Forterra Company

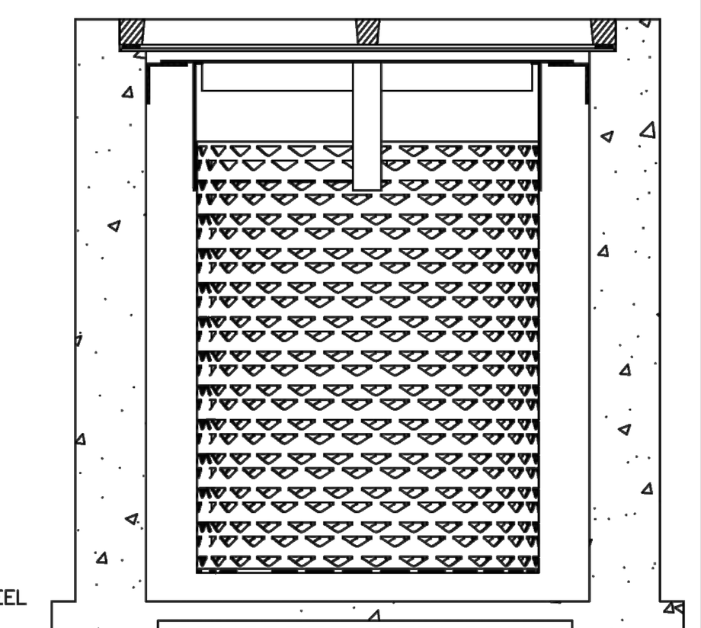
PAGE 1

BIO CLEAN FULL CAPTURE FILTER

FOR USE IN GRATE INLETS



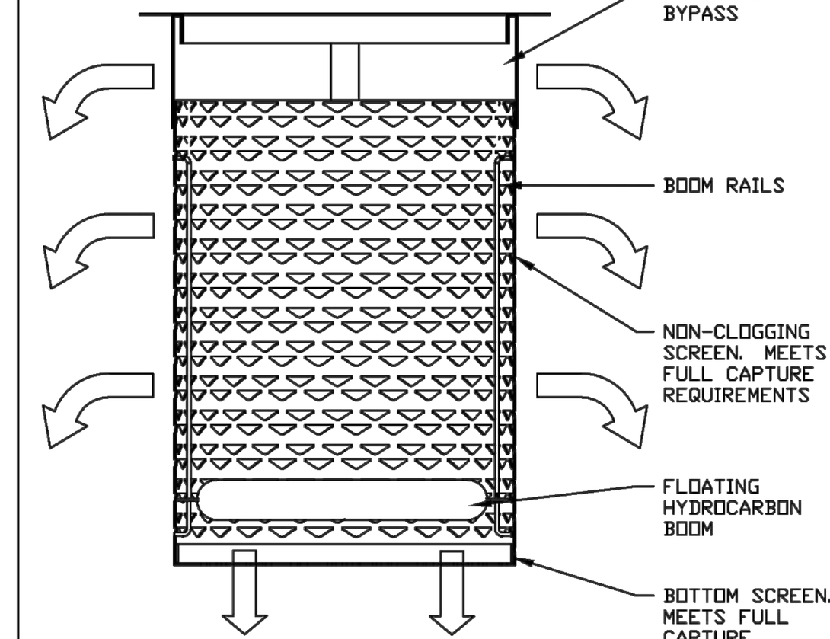
TOP VIEW



CONCRETE STRUCTURE

NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDIING DEPTH OF 6 INCHES.
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.



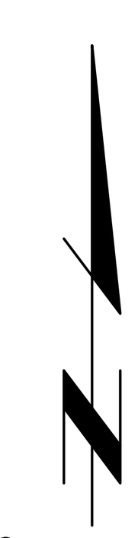
FLOW SCHEMATIC

MODEL #	TREATMENT FLOW (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BIO-GRATE-FULL 12-12-12	1.55	1.55	0.27
BIO-GRATE-FULL 18-18-18	4.32	3.68	1.05
BIO-GRATE-FULL 24-24-24	7.67	4.83	2.41
BIO-GRATE-FULL 30-30-24	12.97	6.21	3.98
BIO-GRATE-FULL 25-38-24	13.53	6.59	4.16
BIO-GRATE-FULL 36-36-24	19.64	7.60	5.94
BIO-GRATE-FULL 48-48-18	25.59	10.13	7.92

DRAWING: BIO CLEAN GRATE INLET FILTER DETAILS		MEETS FULL CAPTURE REQUIREMENTS	
TYPICAL MODEL DETAIL			
WARRANTY: 8 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640 FAX: 760-433-3176		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 10/12/17	SCALE: SF = 15	REVISIONS:	DATE:
DRAFTER: M.C.P.	UNITS = INCHES	REVISIONS:	DATE:

Bio Clean
A Forterra Company

PAGE 1



0 15 30 60 90

SCALE: 1"=30'

Last Update: 5/17/21
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PREPARED FOR:

HARLEY KNOX 2021, LLC
11777 SAN VICENTE BLVD., STE. 780
LOS ANGELES, CA. 90049
PHONE: (310) 979-8000

PREPARED BY:

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

CITY OF PERRIS

PUBLIC WORKS DEPARTMENT

POST-CONSTRUCTION BMP SITE PLAN

HARLEY KNOX COMMERCE CENTER
25264 NANCE STREET
PERRIS, CA

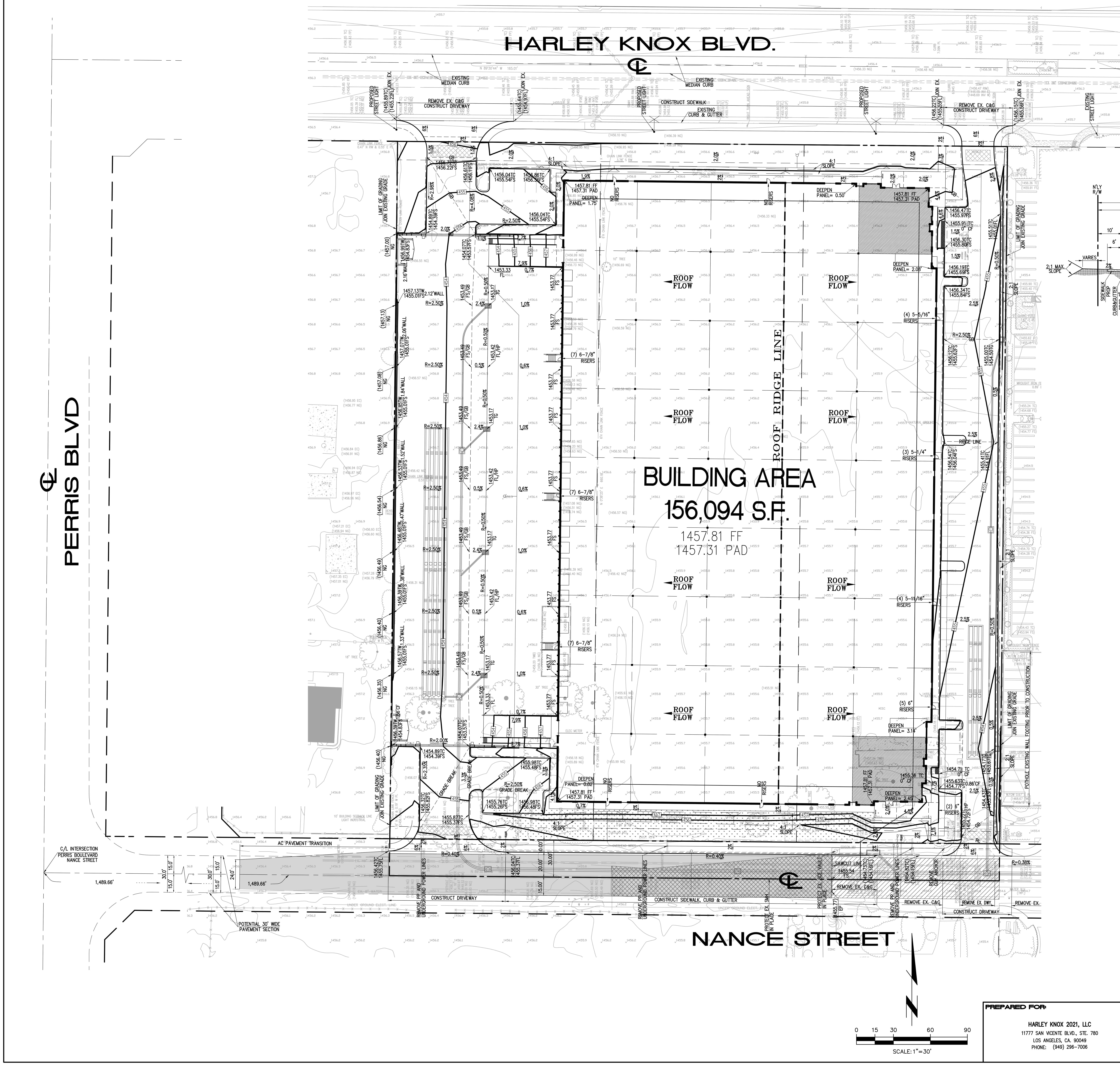
P21-XXXXX

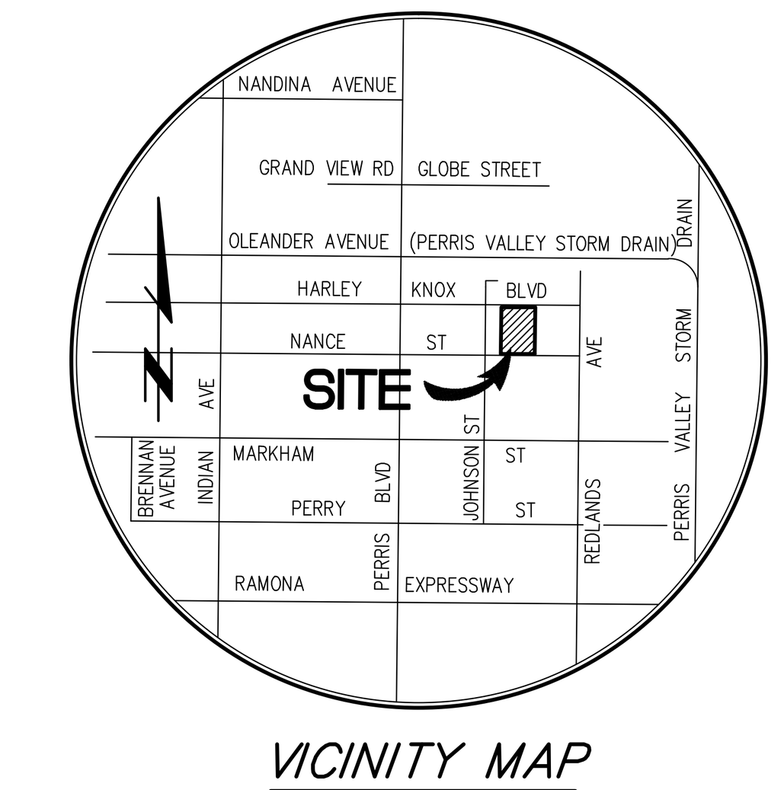
Designed by ______	Approved by	Date ______	
Date ______			
Checked by ______			
Date ______			
Designed by ______	Public Works Director	R.C.E. ______	
Date ______			
Checked by ______	Sheet 2 of 2 Sheets		
Date ______			

3951/2 OF 2 SHEET

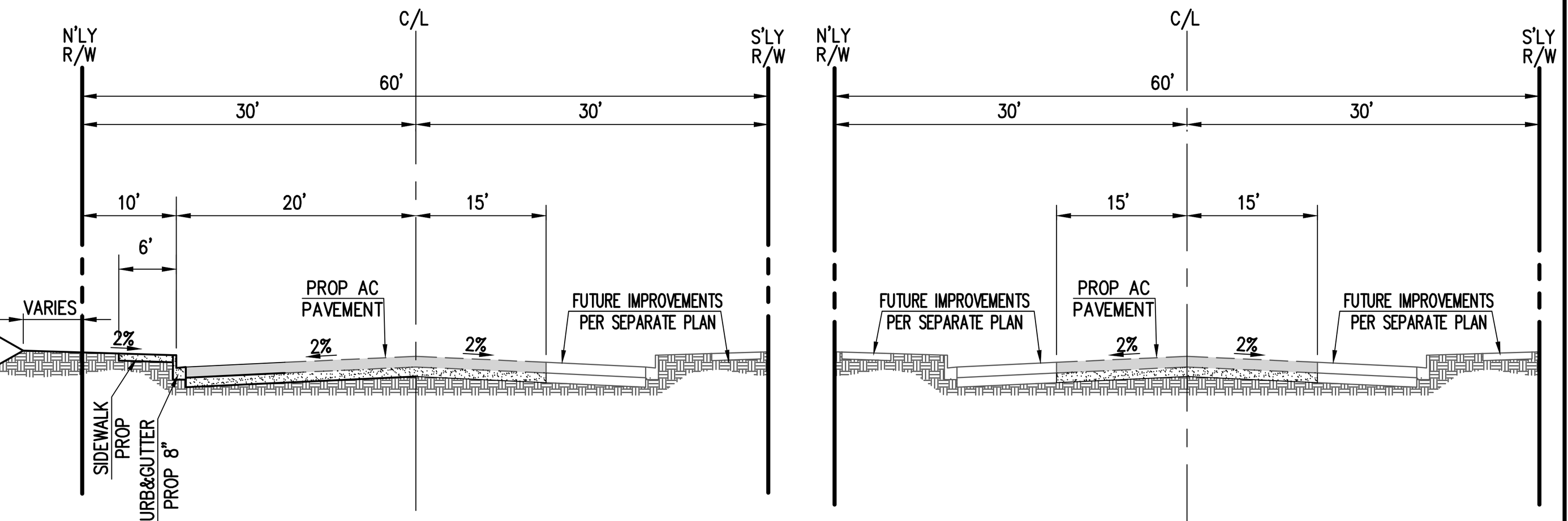
Appendix 2: Construction Plans

Grading and Drainage Plans



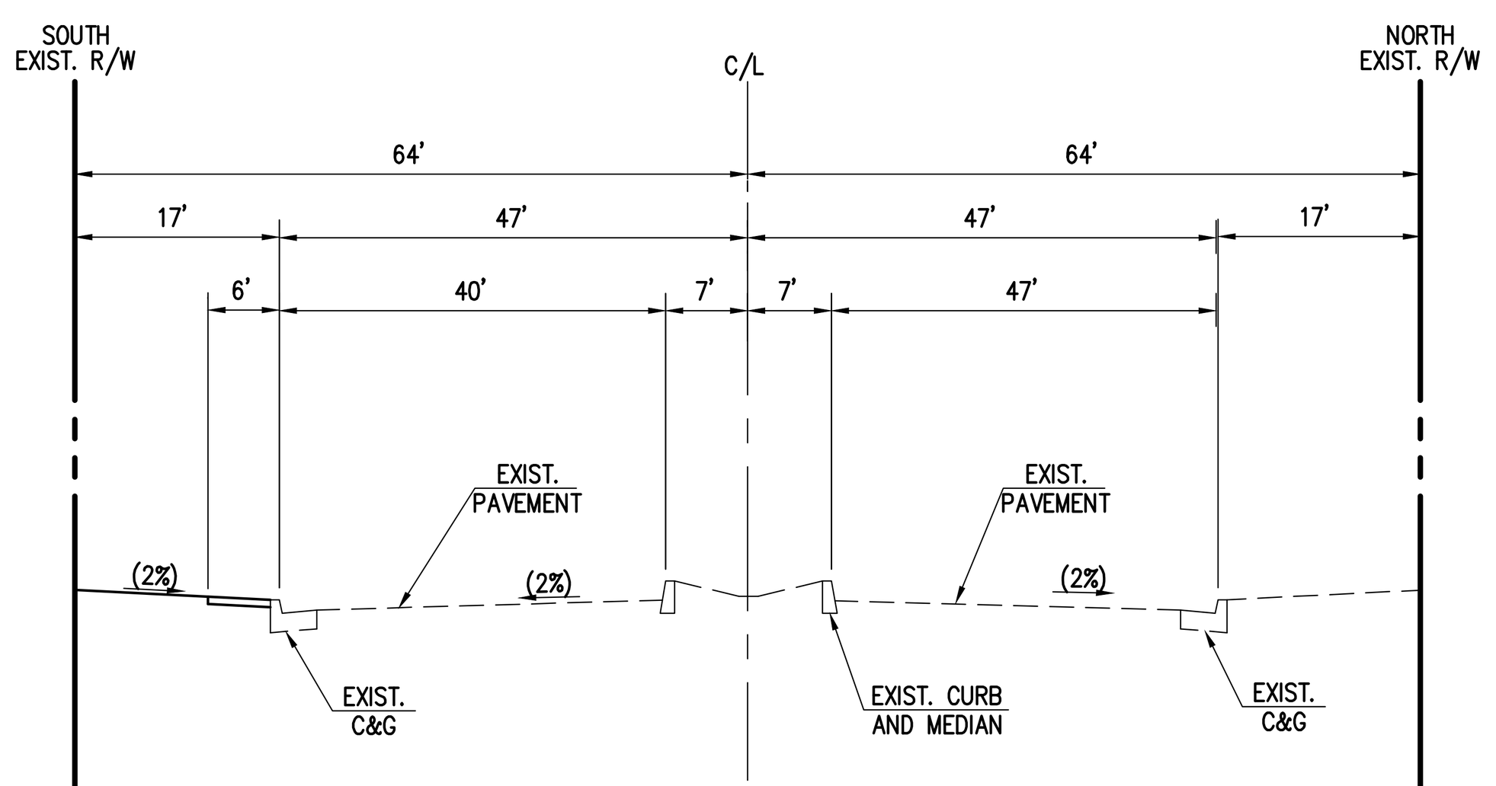


VICINITY MAP
N.T.S.



NANCE STREET
TYPICAL SECTION
at Project Frontage

NANCE STREET
TYPICAL SECTION
from Perris Blvd. to Project



HARLEY KNOX BLVD
TYPICAL SECTION
TRAFFIC INDEX = 10

EARTHWORK BALANCE CALCULATIONS

PROJECT: Nance Street
JOB# 3951

K.	SITE AREA:	280,238	SF
L.	SUBSIDENCE FACTOR:	0.125	
M.	SHRINKAGE FACTOR:	10.00	%
N.	SITE STRIPPING FACTOR:	0	
O.	OVEREXCAVATION:	28,289	CY
A.	CALCULATED CUT:	9,366	CY
B.	FOOTING AND UTILITY SPOILS	**2,025**	CY
B1.	UNDERGROUND CHAMBERS	**1,250**	
C.	**TOTAL CUT: (A+B)**	**12,641**	CY
D.	CALCULATED FILL:	7,251	CY
E.	LIGHT PAVING FILL:	-	CY
F.	SUBSIDENCE: (LxK)/27=	1,297	CY
G.	SHRINKAGE: (M/100)C=	1,264	CY
H.	SITE STRIPPING	-	
I.	OVEREXCAVATION SHRINKAGE	2,829	CY
J.	**TOTAL FILL: (D+E+F+G+H)=**	**12,641**	CY
K.	TOTAL	**(0)**	

LEGEND:

- 6" AC OVER 12" AB CLASS II
- GRIND AND OVERLAY EX. AC PVMT.
- REMOVE EX. AC PVMT.

Last Update:12/1/21
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CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

CONCEPTUAL GRADING PLAN

HARLEY KNOX COMMERCE CENTER

25264 NANCE STREET
PERRIS, CA

PREPARED FOR:

HARLEY KNOX 2021, LLC
11777 SAN VICENTE BLVD., STE. 780
LOS ANGELES, CA. 90049
PHONE: (949) 296-7006

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by ______ Date ______

Public Works Director R.C.E. XXXXX

Sheet 1 of 3 Sheets

3951/1 OF 3 SHEET

HARLEY KNOX BLVD.

BUILDING AREA
156,094 S.F.
1457.81 FF
1457.31 PAD

NANCE STREET

SCALE: 1"=30'

Last Update: 12/1/21
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CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

CONCEPTUAL UTILITY PLAN
HARLEY KNOX COMMERCE CENTER
25264 NANCE STREET
PERRIS, CA

PREPARED FOR:
HARLEY KNOX 2021, LLC
11777 SAN VICENTE BLVD., STE. 780
LOS ANGELES, CA. 90049
PHONE: (949) 296-7006

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH:(714)521-4811 FAX(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____
Public Works Director _____ R.C.E. XXXXX

Sheet 2 of 3 Sheets

3951/2 OF 3 SHEET

HARLEY KNOX BLVD.
℄

BUILDING AREA
156,094 S.F.

NANCE STREET

REDLANDS AVE

PUBLIC STORM DRAIN

PUBLIC STORM DRAIN

LINE A

LINE B

STA 14+78.84
END PIPE
1450.58 INV.

N45°38'22"E 15.93'
12" HDPE S=0.0020

STA. 14+62.91
F.C.
1450.55 INV.
STA. 14+45.24
B.C.
1450.51 INV.

N0°38'22"E 86.93'
12" HDPE S=0.0020

STA. 13+58.31
BEGIN PIPE
1450.34 INV.

PROP SD MH
PER SPPWC 321-2

STA. 13+54.31
END PIPE
1450.33 INV.

N0°38'22"E 196.00'
18" HDPE S=0.0020

STA. 11+58.31
BEGIN PIPE
1449.94 INV.

STA. 11+54.31
END PIPE
1449.93 INV.

N0°38'22"E 113.60'
24" HDPE S=0.0020

STA. 10+40.71
ANGLE PT.
1449.70 INV.

PROP SD CATCH BASIN
PER SPPWC 305-3

CONTECH 30-INCH PERFORATED UNDERGROUND CMP
1,100 LINEAR FEET (2,259' 0' MIN.)

STA. 22+48.34
END PIPE
1449.58 INV.

STA. 21+48.45
BEGIN PIPE
1448.99 INV.

STA. 20+43.78
END PIPE
1448.97 INV.

STA. 18+45.89
BEGIN PIPE
1448.38 INV.

STA. 18+41.23
END PIPE
1448.36 INV.

PROP SD CATCH BASIN
PER SPPWC 300-3

STA. 14+32.52
END PIPE
1451.16 INV.

N15°38'22"E 23.46'
12" HDPE S=0.0030

STA. 14+09.06
F.C.
1451.09 INV.
STA. 14+03.17
B.C.
1451.08 INV.

N0°38'22"E 122.26'
12" HDPE S=0.0030

STA. 12+80.91
BEGIN PIPE
1450.71 INV.

PROP SD MH
PER SPPWC 321-2

STA. 12+76.91
END PIPE
1450.70 INV.

N0°38'22"E 178.71'
12" HDPE S=0.0030

STA. 10+98.20
BEGIN PIPE
1450.16 INV.

PROP SD CATCH BASIN
PER SPPWC 300-3
PROP 12" HDPE

PROP SD MH
PER SPPWC 321-2
STA. 10+94.20
END PIPE
1450.15 INV.

N0°38'22"E 92.45'
18" HDPE S=0.0030

STA. 10+01.75
BEGIN PIPE
1449.97 INV.

JUNCTION STRUCTURE
PER SPPWC 331-3

STA. 10+02.25
BEGIN PIPE
1445.85 INV.

STA. 12+83.46
BEGIN PIPE
1446.69 INV.

STA. 12+78.80
END PIPE
1446.68 INV.

STA. 15+64.68
BEGIN PIPE
1447.53 INV.

STA. 15+60.01
END PIPE
1447.52 INV.

PROP SD MH
PER SPPWC 321-2

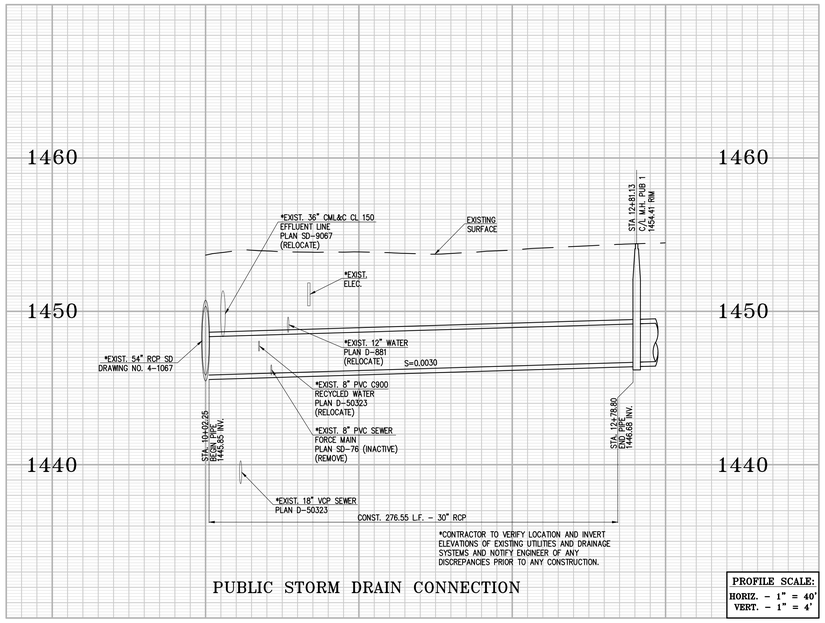
N89°30'57"W 197.89'
30" RCP S=0.0030

N89°30'57"W 197.89'
30" RCP S=0.0030

N89°30'57"W 276.55'
30" RCP S=0.0030

N89°30'57"W 276.55'
30" RCP S=0.0030

N89°30'57"W 276.65'
30" RCP S=0.0030



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CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

CONCEPTUAL STORM DRAIN PLAN
HARLEY KNOX COMMERCE CENTER
25264 NANCE STREET
PERRIS, CA

3951/3 OF 3 SHEET

PREPARED FOR:
HARLEY KNOX 2021, LLC
11777 SAN VICENTE BLVD., STE. 780
LOS ANGELES, CA. 90049
PHONE: (949) 296-7006

Thienes Engineering, Inc.
CIVIL ENGINEERING * LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH:(714)521-4811 FAX(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____
Public Works Director R.C.E. XXXXX

Sheet 3 of 3 Sheets

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL INVESTIGATION
Proposed Warehouse Development
220 to 280 East Nance Street
Perris, California

Harley Knox 2021 LLC
c/o Proficiency Capital, LLC
11777 San Vicente Blvd, No. 780
Los Angeles, California 90049

Project Number 22387-21
March 24, 2021

NorCal Engineering

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS
10641 HUMBOLT STREET LOS ALAMITOS, CA 90720
(562)799-9469 FAX (562)799-9459

March 24, 2021 Project Number 22387-21

Harley Knox 2021 LLC
c/o Proficiency Capital, LLC
11777 San Vicente Blvd, No. 780
Los Angeles, California 90049

RE: **GEOTECHNICAL INVESTIGATION** - Proposed Warehouse Development - Located at 220 to 280 East Nance Street, in the City of Perris, California

Dear Mr. Englhard:
Pursuant to your request, this firm has performed this Geotechnical Investigation for the above referenced project. The purpose of this investigation is to evaluate the geotechnical conditions of subject property and to provide recommendations for the proposed development. This geotechnical engineering report presents the findings of our study along with conclusions and recommendations for development.

1.0 STRUCTURAL CONSIDERATIONS

1.1 Proposed Development

It is currently proposed to construct a new concrete tilt-up structures totaling 152,760 square feet on the 6.5-acre property. Asphaltic and concrete pavement areas and landscaping will also be installed. Grading for the development will include cut and fill procedures. Final building plans shall be reviewed by this firm prior to submittal for city approval to determine the need for any additional study and revised recommendations pertinent to the proposed development, if necessary.

2.0 SITE DESCRIPTION

2.1 **Location:** The property is located at 220 to 280 East Nance Street, in the City of Perris, Harley Knox Boulevard borders the north side of property as shown on the Vicinity Map, Figure 1.

2.2 **Existing Improvements:** The property is currently undeveloped and contains some small vegetation scattered across the site with some large trees on the southern portion of the property. An existing chain link extends across the site in a north to south direction.

2.3 **Drainage:** The site topography is generally flat and drainage pattern is not readily discernible.

3.0 SEISMICITY EVALUATION

The proposed development lies outside of any Alquist Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered unlikely.

The following seismic design parameters are provided and are in accordance with the 2019 California Building Code (CBC) as determined using the ASCE 7 Hazard Tool (https://asce7hazardtool.online/) for the referenced project. Complete printout from the source is included in Appendix A.

Seismic Design Parameters

Site Location	Latitude	33.856419°
	Longitude	-117.220632°
Site Class		D
Risk Category		II
Maximum Spectral Response Acceleration	S_S	1.500g
	S_1	0.600g
Adjusted Maximum Acceleration	S_{MS}	1.500g
Design Spectral Response Acceleration Parameters	S_{DS}	1.000g

The San Jacinto (San Jacinto Valley) Fault zone is located approximately 12 kilometers from the site and is capable of producing a Magnitude 6.9 earthquake and a PGA_M of 0.589g. Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults.

4.0 FIELD INVESTIGATION

4.1 Site Exploration

The investigation consisted of the placement of four (4) subsurface exploratory boring by hollow-stem auger drill rig and eight (8) excavations by backhoe. Explorations extended to a maximum depth of 51.5 feet below current ground elevations. The explorations were placed at accessible locations throughout the site; existing improvements somewhat limited the placement of explorations.

The explorations were visually classified and logged by a field engineer with locations of the subsurface excavations are shown on the attached Figure 2. Detailed descriptions of the subsurface conditions are listed on the logs in Appendix B. It should be noted that the transition from one soil type to another as shown on the logs is approximate and may in fact be a gradual transition. The soils encountered are described as follows:

Fill/Disturbed Top Soils– Fill and disturbed top soils classifying as silty SAND to sandy SILT, some minor debris and roots were encountered in the explorations to depths ranging from 1 to 1½ feet. These soils were noted to be soft to firm and damp to moist.

Native Soils – Native soils classifying as sandy SILT to clayey SAND were encountered beneath the upper fill soils. These soils were noted to be medium stiff to stiff and damp to moist. Sand, silt and clay content varied with depth of exploration.

4.2 **Groundwater**

Groundwater was encountered at a depth of approximately 23 feet at the site.

5.0 LABORATORY TESTS

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These relatively undisturbed ring samples were obtained by driving a thin-walled steel sampler lined with one-inch-long brass rings with an inside diameter of 2.42 inches into the undisturbed soils.

Bulk bag samples were obtained in the upper soils for expansion index tests, corrosion tests, resistance value and maximum density tests. Wall loadings on the order of 4,000 lbs./lin.ft. and maximum compression loads on the order of 100 kips were utilized for testing and design purposes. All test results are included in Appendix C, unless otherwise noted.

5.1 **Field moisture content** (ASTM:D 2216-10) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of explorations.

5.2 **Maximum density tests** (ASTM: D-1557-12) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

5.3 **Expansion index tests** (ASTM: D-4829-11) were performed on remolded samples of the upper soils to determine the expansive characteristics and to provide any necessary recommendations for reinforcement of the slabs-on-grade and the foundations. Results of these tests are provided on Table II and are discussed later in this report.

5.4 **Sieve analyses** and the percent by weight of soil finer than the No. 200 sieve (ASTM: 1140-00) were performed on selected soil samples. These results are detailed later in this report along with discussion of the liquefaction potential at the site.

5.5 **Atterberg Limits** (ASTM: D 4318-10) consisting of liquid limit, plastic limit and plasticity index were performed on selected soil samples. Results are shown on Table III.

5.6 **Direct shear tests** (ASTM: D-3080-11) were performed on undisturbed and/or remolded samples of the subsurface soils. These tests were performed to determine parameters for the calculation of the allowable soil bearing capacity. The test is performed under saturated conditions at loads of 1,000 lbs./sq.ft., 2,000 lbs./sq.ft., and 3,000 lbs./sq.ft. with results shown on Plates A - B.

5.7 **Consolidation tests** (ASTM: D-2435-11) were performed on undisturbed samples to determine the differential and total settlement which may be anticipated based upon the proposed loads. Water was added to the samples at a surcharge of one KSF and the settlement curves are plotted on Plates C - E.

5.8 **Soluble sulfate, pH, Resistivity and Chloride tests** to determine potential corrosive effects of soils on concrete and metal structures were performed in the laboratory. Test results are given in Tables IV – VII and are discussed later in this report.

5.9 **Resistance 'R' Value tests** (CA 301) were conducted on a representative soil sample to determine preliminary pavement section design for the proposed pavement areas. Test results are provided in Table VIII and recommended pavement sections are provided later within the text of this report.

6.0 LIQUEFACTION EVALUATION

The property lies within areas mapped as potentially liquefiable by the County of Riverside Safety Element. The site is expected to experience ground shaking and earthquake activity that is typical of Southern California area. It is during severe ground shaking that loose, granular soils below the groundwater table can liquefy. A review of the exploratory boring log and the laboratory test results on selected soil samples obtained indicate the following soil classifications, field blow counts and amounts of fines passing through the No. 200 sieve.

Field Blowcounts and Gradation Data

Boring No.	Classification	Blowcounts (blows/ft)	Relative Density	% Passing No. 200 Sieve
B-1 @ 5'	SC	18	Very Dense	47
B-1 @ 10'	ML	20	Very Stiff	71
B-1 @ 15'	SM	35	Very Dense	19
B-1 @ 20'	SW	25	Very Dense	10
B-1 @ 25'	SM	16	Medium Dense	37
B-1 @ 30'	ML	9	Medium Stiff	63
B-1 @ 35'	CL	13	Medium Stiff	71
B-1 @ 40'	ML	8	Firm	88
B-1 @ 45'	ML	10	Firm	66
B-1 @ 50'	SC	42	Very Dense	45

Our liquefaction evaluation utilized the nearest mode of predominate Magnitude 6.9 Mw earthquake. The analysis indicates the potential for liquefaction at this site to be moderate based upon a historic groundwater depth of 19 feet deep and a Peak Ground Acceleration (PGA_M) of 0.5891g. The associated seismic-induced settlements would be on the order of 2.5 inches and would occur rather uniformly across the site.

Differential settlements would be on the order of 1.5 inches over a 50-foot (horizontal) distance. Our seismic settlement calculations are included in Appendix D.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures and grading will be safe from excessive settlements under the anticipated design loadings and conditions. The proposed grading and development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent land or structures.

The following recommendations are based upon soil conditions encountered in our field investigation; these near-surface soil conditions could vary across the site. Variations in the soil conditions may not become evident until the commencement of grading operations for the proposed development and revised recommendations from the soils engineer may be necessary based upon the conditions encountered.

7.1 Site Grading Recommendations

It is recommended that site inspections be performed by a representative of this firm during all grading and construction of the development to verify the findings and recommendations documented in this report. Any unusual conditions which may be encountered in the course of the project development may require the need for additional study and revised recommendations.

Any vegetation and organic laden soils shall be removed and hauled from proposed grading areas prior to and during the grading operations if encountered. Existing vegetation shall not be mixed or disced into the soils. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. Grading operations shall be performed in accordance with the attached *Specifications for Placement of Compacted Fill.*

7.1.1 Removal and Recompaction Recommendations

The upper existing fill soils (1 to 1½ feet) shall be removed to competent native materials, the exposed surface scarified to a depth of 8 inches, brought to approximately 2% above optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557) prior to placement of any additional compacted fill soils and pavement.

The upper 12 inches of soils beneath building pad and concrete paving shall be compacted to a minimum of 95%. Grading shall extend a minimum of 5 horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase.

Adequate drainage away from the structures, pavement and slopes should be provided at all times.

It is likely that isolated areas of undiscovered fill not described in this report or materials disturbed during demolition operations will be encountered on site; if found, these areas should be treated as discussed earlier. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed or properly abandoned prior to the proposed construction. Abandonment procedures will be provided once underground structures are encountered.

If placement of slabs-on-grade and pavement is not performed immediately upon completion of grading operations, additional testing and grading of the areas may be necessary prior to continuation of construction operations. Likewise, if adverse weather conditions occur which may damage the subgrade soils, additional assessment by the soils engineer as to the suitability of the supporting soils may be needed.

7.1.2 **Fill Blanket Recommendations**

Due to the potential for differential settlement of structures supported on both compacted fill and native soils, it is recommended that all foundations be underlain by a uniform compacted fill blanket at least 2 feet in thickness. The fill blanket shall extend a minimum of 5 horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

Building floor slabs should also be underlain by a minimum of 2 feet of compacted fill soils.

7.1.3 **Shrinkage and Subsidence**

Results of our in-place density tests reveal that the soil shrinkage will be on the order of 8 to 10% due to excavation and recompaction, based upon the assumption that the fill is compacted to 92% of the maximum dry density per ASTM standards. Subsidence should be 0.08 feet due to earthwork operations. The volume change does not include any allowance for vegetation or organic stripping, removal of subsurface improvements or topographic approximations.

Although these values are only approximate, they represent our best estimate of shrinkage values which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing using the actual equipment and grading techniques should be conducted.

7.2 Temporary Excavations and Shoring Design

Temporary unsurcharged excavations less than 4 feet in height may be excavated at vertical inclinations. Excavations over 4 feet in height in the existing site materials may be trimmed at a 1 to 1 (horizontal to vertical) gradient for the entire height of the cut. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring, slot-cutting, or flatter excavations may be required.

The temporary cut slope gradients given above do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of the soils engineer, CAL-OSHA and other public agencies having jurisdiction.

Temporary shoring design may utilize an active earth pressure of 25 pcf without any surcharge due to adjacent traffic, equipment or structures. The passive fluid pressures of 250 pcf may be doubled to 500 pcf for temporary design.

7.3 Foundation Design

All foundations may be designed utilizing the following allowable soil bearing capacities for an embedded depth of 24 inches into approved compacted fill materials with the corresponding widths. Footings shall not traverse from compacted fill to native soils due to the potential for differential settlement of structures.

\Allowable Soil Bearing Capacity (psf)

Width (ft)	Continuous Foundation	Isolated Foundation
1.5	2000	2500
2.0	2075	2575
4.0	2375	2875
6.0	2675	3175

The bearing value may be increased by 500 psf for each additional foot of depth in excess of the 24-inch minimum depth, up to a maximum of 4,000 psf. Property line screen wall foundations where proper overexcavation and recompaction is not possible due to property line restrictions may be designed using a reduced allowable soil bearing capacity of 1,800 psf for foundations a minimum of 24 inches in depth *and* at least 8 inches into the underlying competent native soils. A one-third increase may be used when considering short-term loading from wind and seismic forces.

All continuous foundations shall be reinforced with a minimum of two #4 steel bars top and bottom. Isolated pad foundations shall be reinforced at the discretion of the project structural engineer. Additional reinforcement may be necessary due to soil expansion or proposed loadings and shall be further evaluated by the project engineers and/or architect. A representative of this firm shall observe foundation excavations prior placement of steel reinforcement and concrete.

7.4 **Settlement Analysis**

Resultant pressure curves for the consolidation tests are shown on Plates C-E. Computations utilizing these curves and the recommended allowable soil bearing capacities reveal that the foundations will experience normal settlements on the order of ¾ inch and differential settlements of less than ¼ inch.

7.5 Lateral Resistance

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the California Building Code should be adhered to when the coefficient of friction and passive pressures are combined.

Coefficient of Friction - 0.35
Equivalent Passive Fluid Pressure = 200 lbs./cu.ft.
Maximum Passive Pressure = 2,000 lbs./cu.ft.

The passive pressure recommendations are valid only for approved compacted fill soils or competent native ground.

7.6 Retaining Wall Design Parameters

Active earth pressures against retaining walls will be equal to the pressures developed by the following fluid densities. These values are for **granular backfill material** placed behind the walls at various ground slopes above the walls.

Surface Slope of Retained Materials (Horizontal to Vertical)	Equivalent Fluid Density (lb./cu.ft.)
Level	30
5 to 1	35
4 to 1	38
3 to 1	40
2 to 1	45

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

During a local Magnitude 6.9 earthquake along the San Jacinto fault zone, additional lateral pressures will occur along the back of walls retaining more than 6 feet of soil. 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 final design of retaining walls.

Sliding resistance values and passive fluid pressure values given in our previous report may be increased by 1/3 during short-term wind and seismic loading conditions.

7.7 Floor Slab Design

Concrete floor slabs-on-grade shall be a minimum of 5 and 6 inches in thickness in office and warehouse areas, respectively, and may be placed upon fill soils compacted to a minimum of *95%* relative compaction and brought to 3% above optimum moisture contents to a depth of 18 inches, as verified by the soil engineer. Slabs should be reinforced with a minimum of #3 steel bars, placed at 18 inches on-center in each direction, positioned mid-height in the slab. Additional reinforcement requirements and an increase in thickness of the slabs-on-grade may be necessary based upon soils expansion potential and proposed loading conditions in the structures and should be evaluated further by the project engineers and/or architect.

A vapor retarder should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.*

The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs*.

The moisture retarder may be placed upon 4 inches of sand or gravel. The surface upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

All concrete slab areas to receive floor coverings should be moisture tested to meet all manufacturer requirements prior to placement.

7.8 Expansive Soil

The upper soils at the site are low (Expansion Index = 21-50) in expansion potential. Sites with expansive soils (Expansion Index >20) require special attention during project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers, architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

7.9 Utility Trench and Excavation Backfill

Trenches from installation of utility lines and other excavations may be backfilled with on-site soils or approved imported soils compacted to a minimum of 90% relative compaction. All utility lines shall be properly bedded and shaded with clean sand having a sand equivalency rating of 30 or more. This material shall be thoroughly water jetted around the pipe structure prior to placement of compacted backfill soils.

7.10 Corrosion Design Criteria

Representative samples of the surficial soils revealed negligible sulfate concentrations and no special concrete design recommendations are deemed necessary at this time. It is recommended that additional sulfate tests be performed at the completion of rough grading to assure that the as graded conditions are consistent with the recommendations stated in this design. Sulfate test results may be found on the attached Table IV.

Tests were also conducted on a random representative sample of soils to determine the potential corrosive effects on buried metallic structures. Tests for pH, resistivity and chloride are included on Tables V – VII. Soil pH indicates a slightly acidic condition. Resistivity is representative of moderately corrosive soils and metallic structures should be protected as necessary. Chloride content measured 178 ppm.

7.11 Preliminary Pavement Design

The table below provides a preliminary pavement design based upon a tested R-Value of 54 for the proposed pavement areas. Final pavement design should be based on R-Value testing of the subgrade soils near the conclusion of rough grading to assure that the as-graded conditions are consistent with those used in this preliminary design.

On-Site Flexible (Asphaltic) Pavement Section Design

Type of Traffic	Traffic Index	Inches Asphalt	Inches Base
Auto Parking/Circulation	5.0	3.0	3.0
Truck	7.0	4.0	3.0
Heavy Truck	8.0	5.0	5.0

Subgrade soils to receive base material shall be compacted to a minimum of 90% relative compaction; base material shall be compacted to at least 95%. Any concrete slab-on-grade in pavement areas shall be a minimum of 6 inches in thickness and may be placed on subgrade soils compacted to at least 95% relative compaction and brought to 3% above optimum moisture levels to a depth of 18 inches, as verified by the soil engineer. An increase in slab thickness and placement of steel reinforcement due to loading conditions and soil expansion may be necessary and should be reviewed by the structural engineer.

The above recommendations are based upon estimated traffic loadings. Client should submit anticipated traffic loadings for the pavement areas to the soils engineer, when available, so that pavement sections may be reviewed to determine adequacy to support the proposed loadings.

8.0 INFILTRATION TESTING

Two test locations (T-1 and T-2) were excavated to determine the infiltration rate of the proposed infiltration/bio-retention systems. The test locations were excavated by backhoe to depths of 5 to 10 feet below existing ground surface (bgs). Excavations were trimmed at 1:1 (horizontal to vertical) inclinations in order to provide safe entry into the excavations. No significant caving occurred to the depths of these test excavations

The infiltration test consisted of the double ring infiltration test per ASTM Method D 3385. The double ring infiltrometer method consists of driving two open cylinders, one inside the other, into the ground, partially filling the ring with water, and then maintaining the liquid at a constant level. The volume of liquid added to the inner ring, to maintain the liquid level constant is the measure of the volume of liquid that infiltrates into the soil.

The volume infiltrated during timed intervals is converted to an incremental infiltration velocity, usually expressed in centimeters per hour or inches per hour and plotted verses elapsed time. The maximum-steady state or average incremental infiltration velocity, depending on the purpose/application of the test is equivalent to the infiltration rate.

Water levels were maintained at a constant level in both the inner ring and annular space between rings throughout the test, to prevent flow of water from one ring to the other.

The volume of liquid used during each measured time interval was converted into an incremental infiltration velocity of both the inner ring in the annular space using the following equations:

For the inner ring calculated as follows:

$Vir=\Delta Vir/(Air\Delta t)$

where:

Vir = inner ring incremental infiltration velocity, cm/hr

ΔVir = volume of water used during time interval to maintain constant head in the inner ring, cm^3

Air = internal area of the inner ting, cm^2

Δt = time interval, hr

Three additional Infiltration tests were performed to provide additional preliminary infiltration rates for the purpose of planning and design of an on-site water disposal system. A truck mounted Simco 2800 Drill Rig equipped with a hollow stem auger was used to excavate the additional exploratory borings to depths of 13 below existing ground surface.

The borings consisted of six-inch diameter test holes. A three-inch diameter perforated PVC casing with solid end cap was installed in the borings and then surrounded with gravel materials to prevent caving.

The infiltration holes were carefully filled with clean water and refilled after two initial readings. Based upon the initial rates of infiltration at each location, test measurements were measured at selected maximum intervals thereafter. Measurements were obtained by using an electronic tape measure with 1/16-inch divisions and timed with a stopwatch. The field infiltration rate was computed using a reduction factor – Rf based on the field measurements with our calculations given in Appendix D. Based upon the results of our testing, the soils encountered in the planned on-site drainage disposal system area exhibit the following infiltration rates.

The correction factors CFt, CFv and CFs are given below based on soils at 13 feet from our field tests.

a) CFt = Rf =5.8 for our three infiltration test holes.

b) CFv = 1.0 based on uniform soils encountered in two borings for infiltration tests.

c) CFs = 2.0 for long-term siltation, plugging and maintenance. The subsurface soils are likely to have some plugging and regular maintenance of storm water discharge devices is required.

An average of the final readings obtained was used for design purposes in each of the basins. The testing data sheets are attached in Appendix E and summarized below.

The *field* infiltration rates given below may be utilized in the final basin design with a safety factor of 3.0 or greater in compliance with the County of Riverside "Low Impact Development BMP Design" guidelines.

Test No.	Depth (feet bgs)	Soil Type	Infiltration Rate (cm/hr)	(in/hr)
T-1	5.0	clayey sandy SILT	1.6	0.64
T-2	10.0	clayey SAND	4.0	1.6
B-2	13.0	clayey SILT		1.3
B-3	13.0	clayey SILT		3.1
B-4	13.0	clayey SAND		3.6

All systems must meet the latest city and/or county specifications and the California Regional Water Quality Control Board (CRWQCB) requirements. It is recommended that foundations shall be setback a minimum distance of 10 feet from the drainage disposal system and the bottom of footing shall be a minimum of 10 feet from the expected zone of saturation.

9.0 CLOSURE

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans (72 hours for review required) to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
Project Engineer
R.G.E. 841

Mike Barone
Project Manager

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Excavation
Any existing low-density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Soils Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-12).

In any area where a transition between fill and native soil or between bedrock and soil are encountered, additional excavation beneath foundations and slabs will be necessary in order to provide uniform support and avoid differential settlement of the structure. Verification of elevations during grading operations will be the responsibility of the owner or his designated representative.

Material For Fill
The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Soils Engineering firm a minimum of 72 hours prior to importation of site.

Placement of Compacted Fill Soils
The approved fill soils shall be placed in layers not excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 2% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-12) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Soils Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Soils Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24-hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.

EXPANSIVE SOIL GUIDELINES

The following expansive soil guidelines are provided for your project. The intent of these guidelines is to inform you, the client, of the importance of proper design and maintenance of projects supported on expansive soils. ***You, as the owner or other interested party, should be warned that you have a duty to provide the information contained in the soil report including these guidelines to your design engineers, architects, landscapers and other design parties in order to enable them to provide a design that takes into consideration expansive soils.***

In addition, you should provide the soil report with these guidelines to any property manager, lessee, property purchaser or other interested party that will have or assume the responsibility of maintaining the development in the future.

Expansive soils are fine-grained silts and clays which are subject to swelling and contracting. The amount of this swelling and contracting is subject to the amount of fine-grained clay materials present in the soils and the amount of moisture either introduced or extracted from the soils. Expansive soils are divided into five categories ranging from "very low" to "very high". Expansion indices are assigned to each classification and are included in the laboratory testing section of this report. *If the expansion index of the soils on your site, as stated in this report, is 21 or higher, you have expansive soils.* The classifications of expansive soils are as follows:

Classification of Expansive Soil*

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

*From Table 18A-I-B of California Building Code (1988)

When expansive soils are compacted during site grading operations, care is taken to place the materials at or slightly above optimum moisture levels and perform proper compaction operations. Any subsequent excessive wetting and/or drying of expansive soils will cause the soil materials to expand and/or contract. These actions are likely to cause distress of foundations, structures, slabs-on-grade, sidewalks and pavement over the life of the structure. ***It is therefore imperative that even after construction of improvements, the moisture contents are maintained at relatively constant levels, allowing neither excessive wetting or drying of soils.***

Evidence of excessive wetting of expansive soils may be seen in concrete slabs, both interior and exterior. Slabs may lift at construction joints producing a trip hazard or may crack from the pressure of soil expansion. Wet clays in foundation areas may result in lifting of the structure causing difficulty in the opening and closing of doors and windows, as well as cracking in exterior and interior wall surfaces. In extreme wetting of soils to depth, settlement of the structure may eventually result. Excessive wetting of soils in landscape areas adjacent to concrete or asphaltic pavement areas may also result in expansion of soils beneath pavement and resultant distress to the pavement surface.

Excessive drying of expansive soils is initially evidenced by cracking in the surface of the soils due to contraction. Settlement of structures and on-grade slabs may also eventually result along with problems in the operation of doors and windows.

Projects located in areas of expansive clay soils will be subject to more movement and "hairline" cracking of walls and slabs than similar projects situated on non-expansive sandy soils. There are, however, measures that developers and property owners may take to reduce the amount of movement over the life the development. The following guidelines are provided to assist you in both design and maintenance of projects on expansive soils:

- Drainage away from structures and pavement is essential to prevent excessive wetting of expansive soils. Grades of at least 3% should be designed and maintained to allow flow of irrigation and rain water to approved drainage devices or to the street. Any "ponding" of water adjacent to buildings, slabs and pavement after rains is evidence of poor drainage; the installation of drainage devices or regrading of the area may be required to assure proper drainage. Installation of rain gutters is also recommended to control the introduction of moisture next to buildings. Gutters should discharge into a drainage device or onto pavement which drains to roadways.

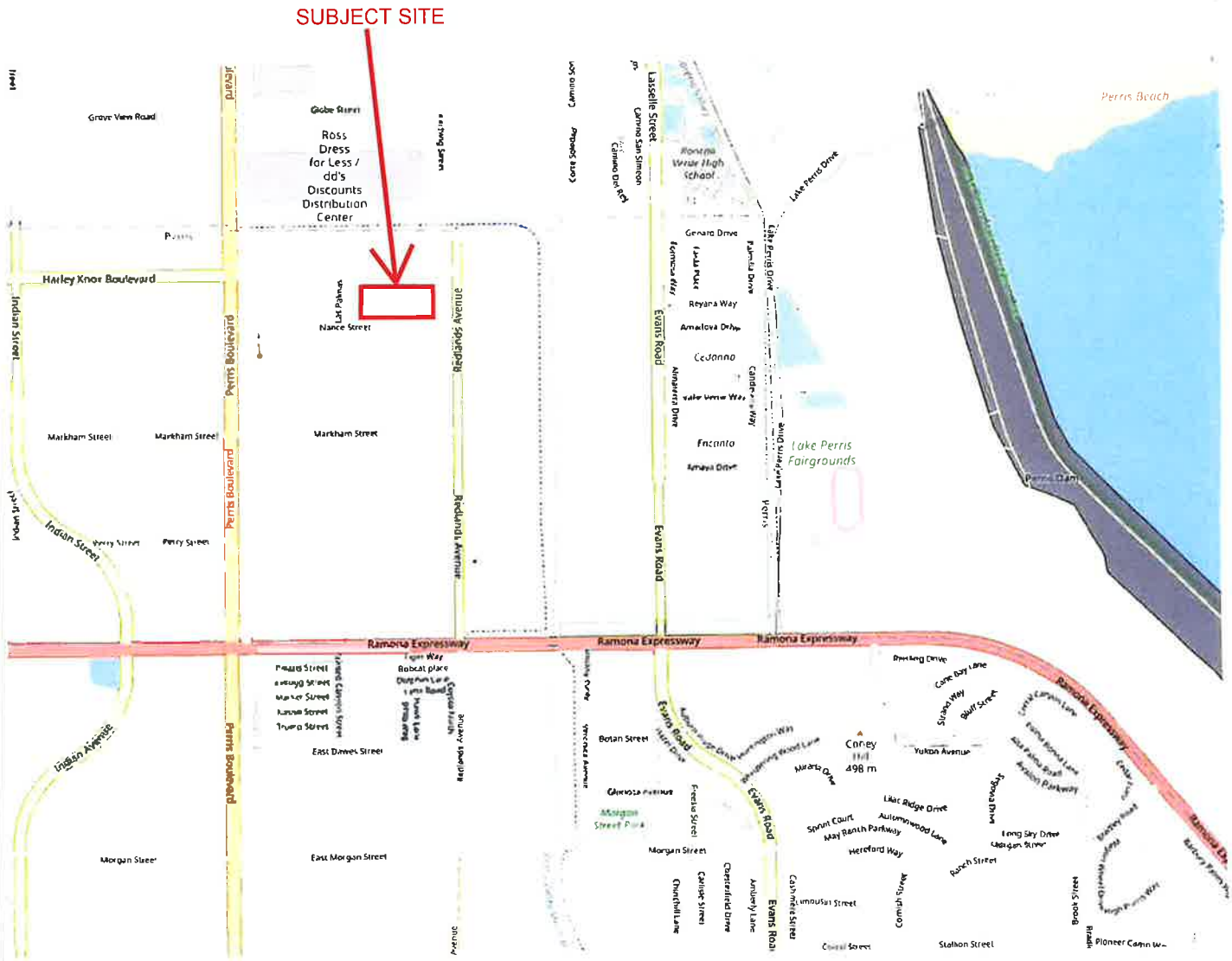
- Irrigation should be strictly controlled around building foundations, slabs and pavement and may need to be adjusted depending upon season. This control is essential to maintain a relatively uniform moisture content in the expansive soils and to prevent swelling and contracting. Over-watering adjacent to improvements may result in damage to those improvements. NorCal Engineering makes no specific recommendations regarding landscape irrigation schedules.

- Planting schemes for landscaping around structures and pavement should be analyzed carefully. Plants (including sod) requiring high amounts of water may result in excessive wetting of soils. Trees and large shrubs may actually extract moisture from the expansive soils, thus causing contraction of the fine-grained soils.

- Thickened edges on exterior slabs will assist in keeping excessive moisture from entering directly beneath the concrete. A six-inch thick or greater deepened edge on slabs may be considered. Underlying interior and exterior slabs with 6 to 12 inches or more of non-expansive soils and providing presaturation of the underlying clayey soils as recommended in the soil report will improve the overall performance of on-grade slabs.

- Increase the amount of steel reinforcing in concrete slabs, foundations and other structures to resist the forces of expansive soils. The precise amount of reinforcing should be determined by the appropriate design engineers and/or architects.

- Recommendations of the soil report should always be followed in the development of the project. Any recommendations regarding presaturation of the upper subgrade soils in slab areas should be performed in the field and verified by the Soil Engineer.



NorCal Engineering

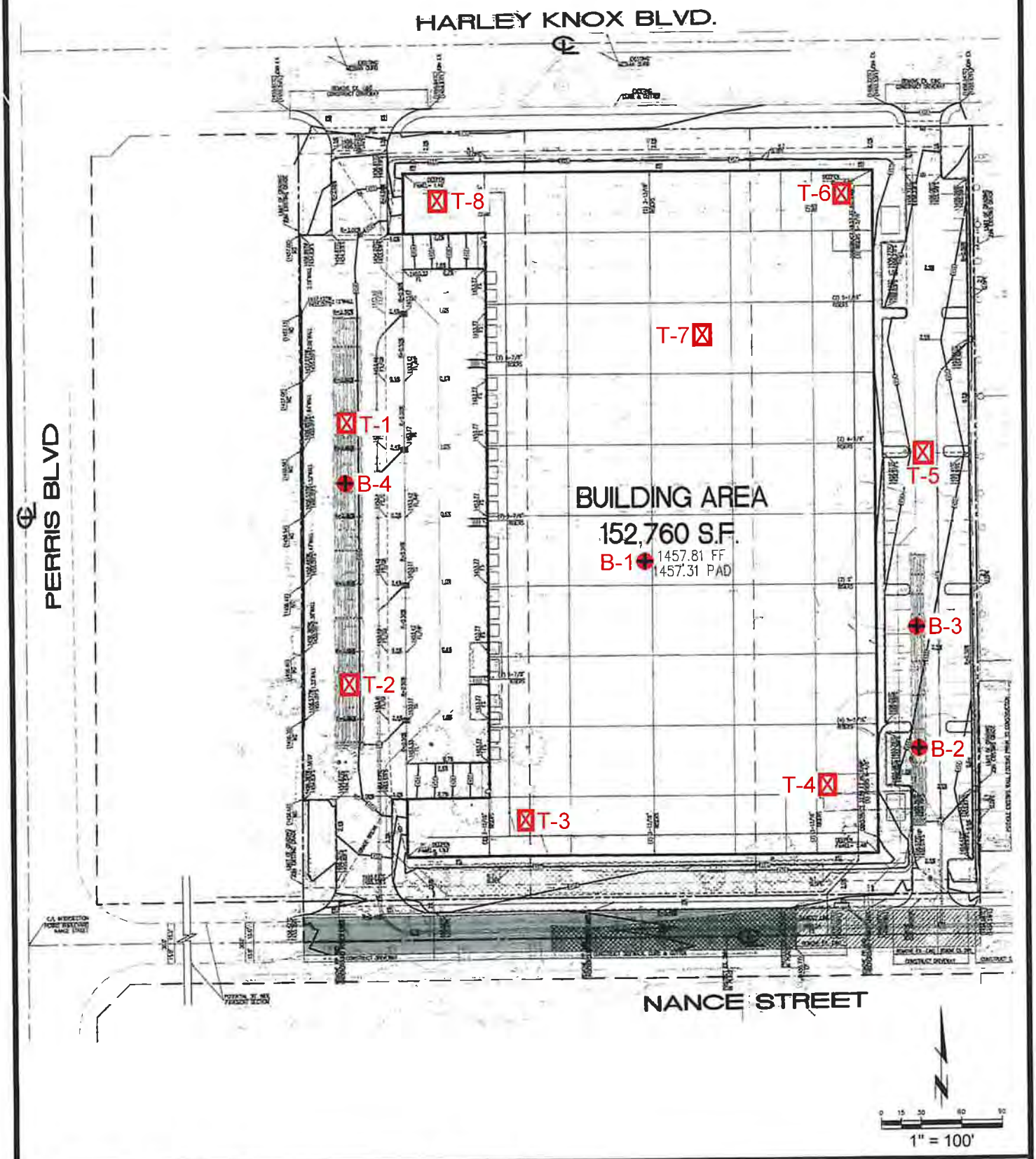
SOILS AND GEOTECHNICAL CONSULTANTS

VICINITY MAP

PROJECT: 22387-21

DATE: MARCH 2021

FIGURE 1



NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

GEOTECHNICAL MAP

PROJECT: 22387-21

DATE: MARCH 2021

FIGURE 2

List of Appendices
(in order of appearance)

Appendix A – Seismic Design Report

Appendix B – Log of Excavations

Log of Borings B-1 to B-4

Log of Test Excavations T-1 to T-8

Appendix C – Laboratory Tests

Table I – Maximum Dry Density
Table II – Expansion Index Test
Table III – Atterberg Limits Test
Table IV – Sulfate Tests
Table V - pH Tests
Table VI – Resistivity Tests
Table VII – Chloride Tests
Table VIII – Resistance "R" Value Tests

Plate A and B – Direct Shear
Plates C and D - Consolidation

Appendix D – Liquefaction Calculations

Appendix E – Soil Infiltration Data

Appendix A
Seismic Design Report

ASCE 7 Hazards Report

Address:
No Address at This Location

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

Elevation: 1459.54 ft (NAVD 88)
Latitude: 33.856419
Longitude: -117.220632

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.5	S_{D1} :	N/A
S_1 :	0.6	T_L :	8
F_a :	1	PGA :	0.536
F_v :	N/A	PGA_M :	0.589
S_{MS} :	1.5	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	1	C_v :	1.4

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

Data Accessed: Thu Mar 18 2021

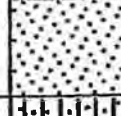
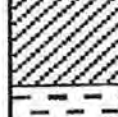
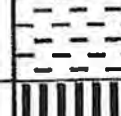
Date Source: USGS Seismic Design Maps

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

Appendix B
Log of Excavations

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL, SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY:

- Indicates 2.5-inch Inside Diameter. Ring Sample.
- Indicates 2-inch OD Split Spoon Sample (SPT).
- Indicates Shelby Tube Sample.
- Indicates No Recovery.
- Indicates SPT with 140# Hammer 30 in. Drop.
- Indicates Bulk Sample.
- Indicates Small Bag Sample.
- Indicates Non-Standard
- Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

Harley Knox 2021 LLC
22387-21

Log of Boring B-1

Boring Location: 220-280 East Nance St, Perris

Date of Drilling: 2/22/2021 | **Groundwater Depth:** 23'

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, loose, damp					
		NATURAL Sandy SILT Brown, stiff, damp					
5		Clayey SAND Brown, dense, damp	☒	10/9/9	8.0		47
10		Clayey SILT Brown, stiff, moist	☒	9/9/11	15.8		71
15		Silty SAND Brown, dense, moist to wet	☒	9/13/22	7.0		19
20			☒	14/13/12	13.3		10
25		Clayey SAND Brown, medium dense, saturated	☒	5/9/7	20.4		37
30		Clayey SILT Brown, medium stiff, saturated	☒	3/4/5	30.0		63
35							

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22387-21

Log of Boring B-1

Boring Location: 220-280 East Nance St, Perris

Date of Drilling: 2/22/2021 | **Groundwater Depth:** 23'

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

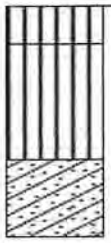
Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
35		Silty CLAY Brown, medium stiff, saturated		3/4/9	34.3		71
40		Clayey SILT Brown, medium stiff, saturated		4/4/4	40.0		88
45				5/5/5	26.3		66
50		Clayey SAND Brown, dense, saturated		14/20/22	14.5		45
		Boring completed at depth of 51.5'					
55							
60							
65							
70							

Harley Knox 2021 LLC
22387-21

Log of Trench T-1

Boring Location: 220-280 East Nance St, Perris	
Date of Drilling: 2/22/2021	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	



Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, stiff, damp	☒				
		NATURAL Sandy SILT Brown, medium stiff, damp					
5		Clayey sandy SILT Brown, stiff, damp					
		Boring completed at depth of 6'					
10							
15							
20							
25							
30							
35							

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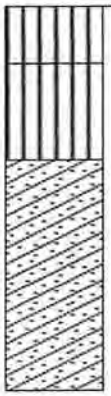
Log of Trench T-2

Boring Location: 220-280 East Nance St, Perris	
Date of Drilling: 2/22/2021	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	



GWT not encountered

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, loose, dry					
		NATURAL Sandy SILT Brown, stiff, moist					
5		Clayey SAND Brown, dense, moist					
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

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Harley Knox 2021 LLC
22387-21

Log of Trench T-3

Boring Location: 220-280 East Nance St, Perris	
Date of Drilling: 2/22/2021	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT with occasional concrete Brown, soft, dry	■		9.2	82.9	
		NATURAL Clayey SILT Brown, stiff, damp	■		3.4	105.3	
5		Clayey sandy SILT Brown, stiff, damp Boring completed at depth of 6'					
10							
15							
20							
25							
30							
35							

GWT not encountered

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NorCal Engineering

Harley Knox 2021 LLC
22387-21

Log of Trench T-4

Boring Location: 220-280 East Nance St, Perris

Date of Drilling: 2/22/2021 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Clayey SILT with occasional rootlets Brown, soft, moist	■		7.3	101.9	
		NATURAL Clayey SILT with some sand Brown, medium stiff, moist	▽				
5		Silty SAND Brown, dense, damp	■		8.8	100.8	
		Clayey SILT Brown, medium stiff, moist					
10			■		17.0	90.3	
15			■		17.1	106.3	
		Boring completed at depth of 16'					
20							
25							
30							
35							

GWT not encountered

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22387-21

Log of Trench T-5

Boring Location: 220-280 East Nance St, Perris	
Date of Drilling: 2/22/2021	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL Sandy SILT with occasional gravel, rootlets Brown, soft, dry					
		NATURAL Clayey sandy SILT Brown, medium stiff, moist					
5		Boring completed at depth of 5.5'					
10							
15							
20							
25							
30							
35							

GWT not encountered

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22387-21

Log of Trench T-6

Boring Location: 220-280 East Nance St, Perris

Date of Drilling: 2/22/2021 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Silty SAND with occasional gravel, concrete, asphalt Brown, loose, dry					
		NATURAL Silty SAND Brown, dense, moist	■		2.7	113.8	
5		Silty (medium to coarse grained) SAND Brown, dense, moist	■		2.4	110.4	
		Boring completed at depth of 7'					
10							
15							
20							
25							
30							
35							

GWT not encountered

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22387-21

Log of Trench T-7

Boring Location: 220-280 East Nance St, Perris

Date of Drilling: 2/22/2021 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Clayey SILT with occasional rootlets Brown, soft, dry	■		6.1	89.6	
		NATURAL Clayey SILT Brown, stiff, damp					
5		Clayey SAND Brown, dense, moist	■		5.2	107.5	
10			■		8.7	113.9	
		Boring completed at depth of 10.5'					
15							
20							
25							
30							
35							

GWT not encountered

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22387-21

Log of Trench T-8

Boring Location: 220-280 East Nance St, Perris

Date of Drilling: 2/22/2021 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT with occasional rootlets Brown, soft, dry					
		NATURAL Clayey sandy SILT Brown, stiff, damp	■		5.3	113.7	
5		GWT not encountered					
		Clayey SILT Brown, stiff, moist	■		13.3	96.1	
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

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Appendix C
Laboratory Tests

TABLE I
MAXIMUM DENSITY TESTS

Sample	Classification	Optimum Moisture (%)	Maximum Dry Density (lbs/cu.ft)
T-4 @ 2'	Sandy SILT	12.0	126.0

TABLE II
EXPANSION TESTS
(ASTM D-4829)

Sample	Classification	Expansion Index
T-4 @ 2'	Sandy SILT	32

TABLE III
ATTERBERG LIMITS

Sample	Liquid Limit	Plastic Limit	Plasticity Index
B-1 @ 30'	32	19	13
B-1 @ 40'	38	21	17
B-1 @ 40'	57	25	32
B-1 @ 45'	32	16	16

TABLE IV
SOLUBLE SULFATE TESTS
(ASTM D-4318)

Sample	Sulfate (%)
T-6 @ 2'	N.D.

N.D. = Non-Detectible
% by weight

TABLE V
pH TESTS

Sample	pH
T-6 @ 2'	6.9

TABLE VI
RESISTIVITY TESTS
(CT 643)

Sample	Resistivity (ohm-cm)
T-6 @ 2'	8718

TABLE VII
CHLORIDE TESTS
(CT 422)

Sample	Concentration (ppm)
T-6 @ 2'	178

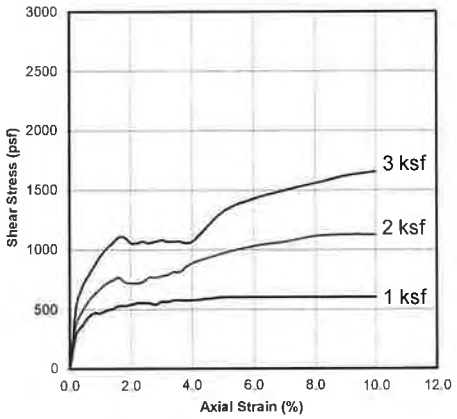
ppm – mg/kg

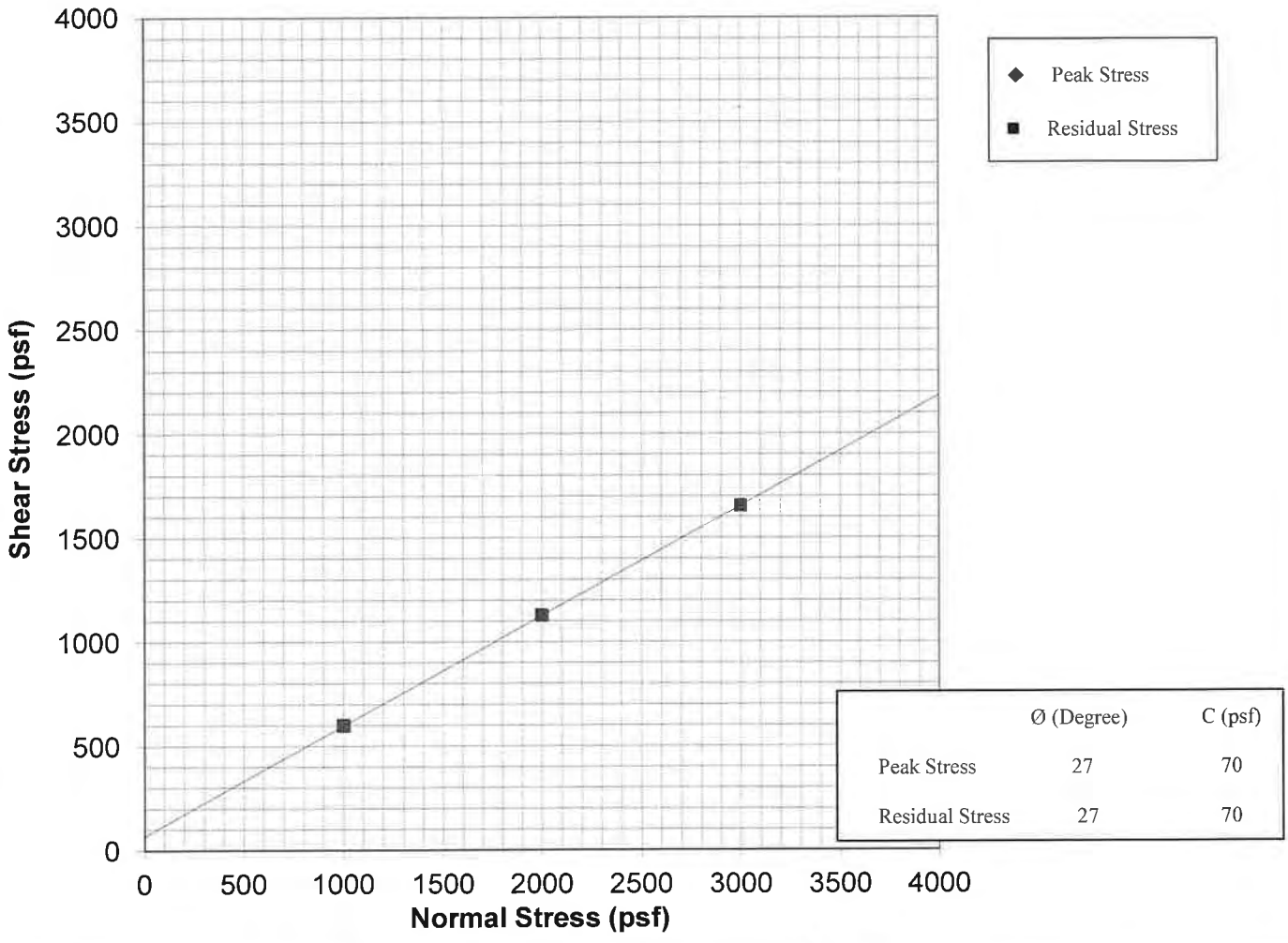
TABLE VIII
RESISTANCE 'R' VALUE TESTS
(CT 301)

Sample	'R' Value
T-1 @ 2'	54

Sample No.	T4@2'
Sample Type:	Remolded/Saturated
Soil Description:	Silty Clay w/ Some Bedrock Fragments

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	600	1128	1656
Displacement	(in)	0.125	0.225	0.250
Residual Stress	(psf)	600	1128	1656
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	117.0	117.0	117.0
In Situ Water Content	(%)	10.0	10.0	10.0
Saturated Water Content	(%)	16.2	16.2	16.2
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	27	70
Residual Stress	27	70

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SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT NUMBER: 22387-21

DATE: 3/18/2021

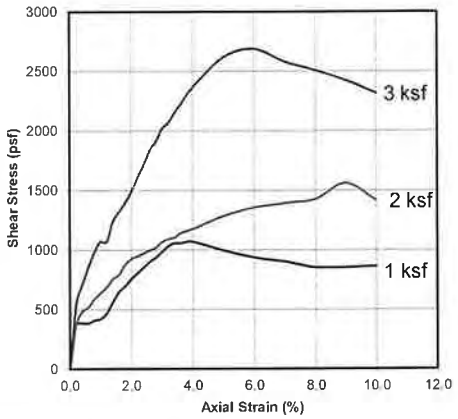
DIRECT SHEAR TEST

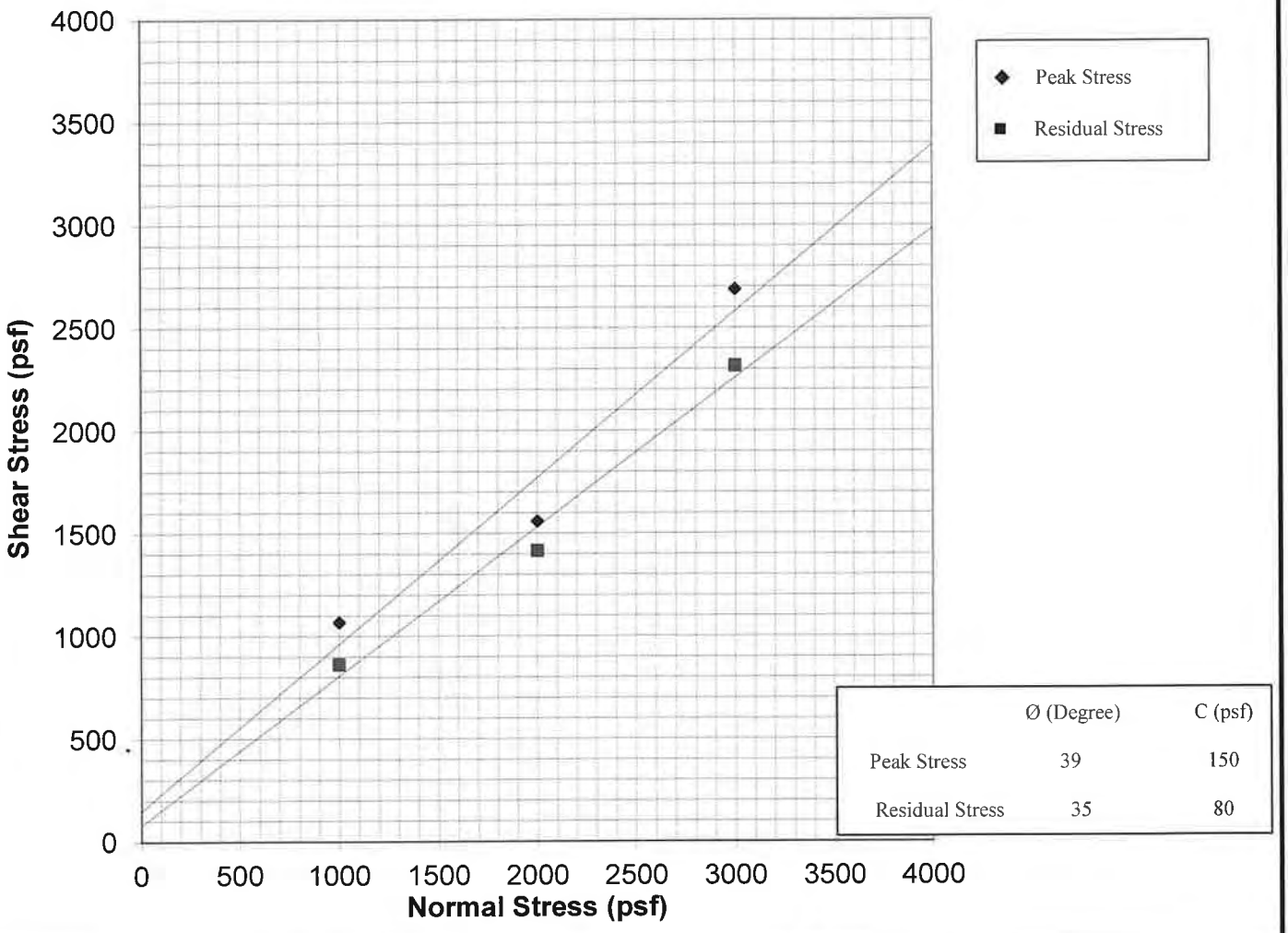
ASTM D3080

Plate A

Sample No.	T4@5'
Sample Type:	Undisturbed/Saturated
Soil Description:	Fine-Very Coarse Grained Sand w/ Some Silt

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	1068	1560	2688
Displacement	(in.)	0.100	0.225	0.150
Residual Stress	(psf)	864	1416	2316
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	100.8	100.8	100.8
In Situ Water Content	(%)	8.8	8.8	8.8
Saturated Water Content	(%)	24.8	24.8	24.8
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	39	150
Residual Stress	35	80

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SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT NUMBER: 22387-21

DATE: 3/18/2021

DIRECT SHEAR TEST

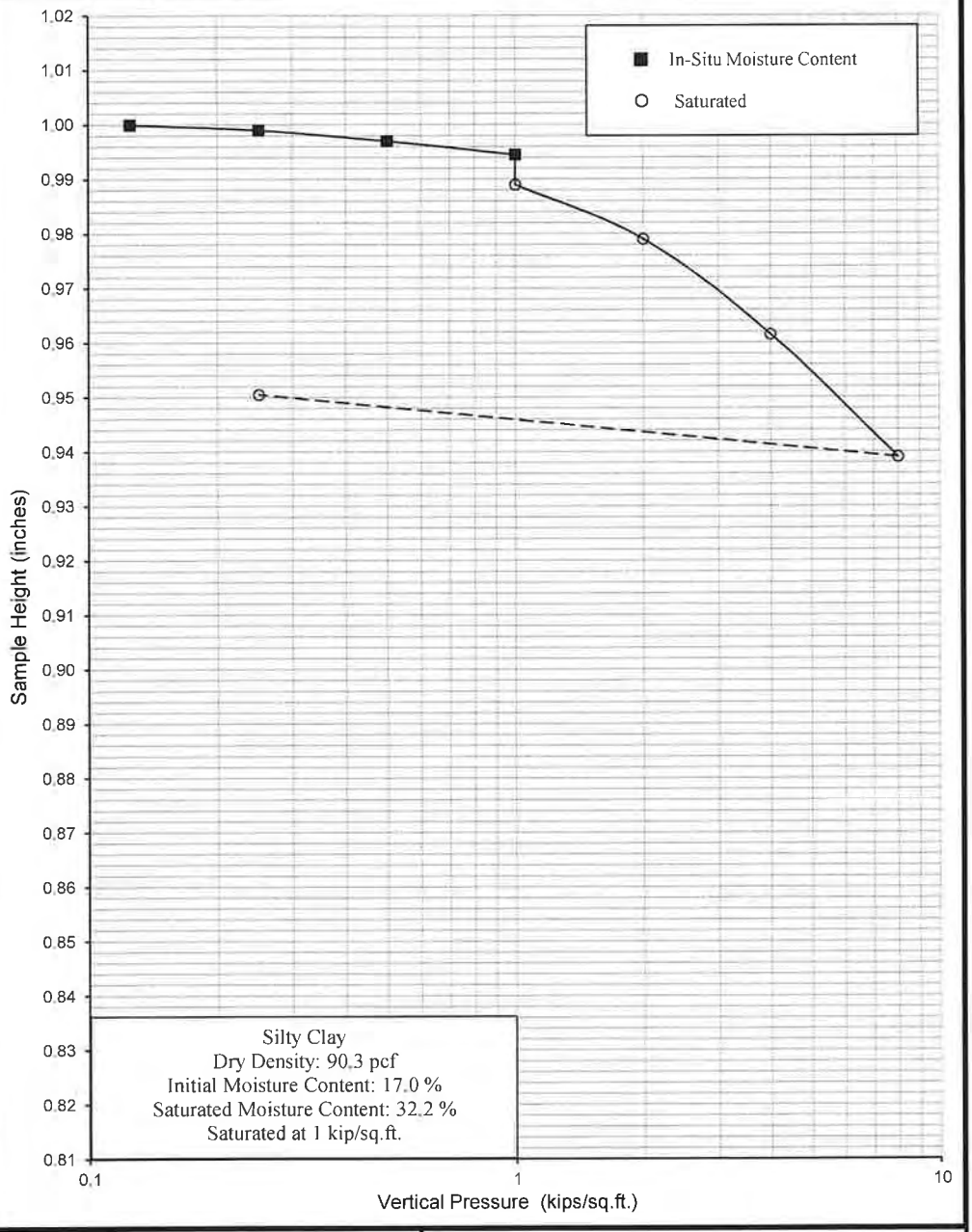
ASTM D3080

Plate B

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9990	0.1	
0.5	0.9970	0.3	
1	0.9945	0.6	
1	0.9890	1.1	Saturated
2	0.9790	2.1	
4	0.9615	3.9	
8	0.9390	6.1	
0.25	0.9505	5.0	

Date Tested:	**3/8/2021**
Sample:	**T4**
Depth:	**10'**

Sample No.	T4	Depth	10'	Date	3/18/2021



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SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT NUMBER: 22387-21

DATE: 3/18/2021

CONSOLIDATION TEST

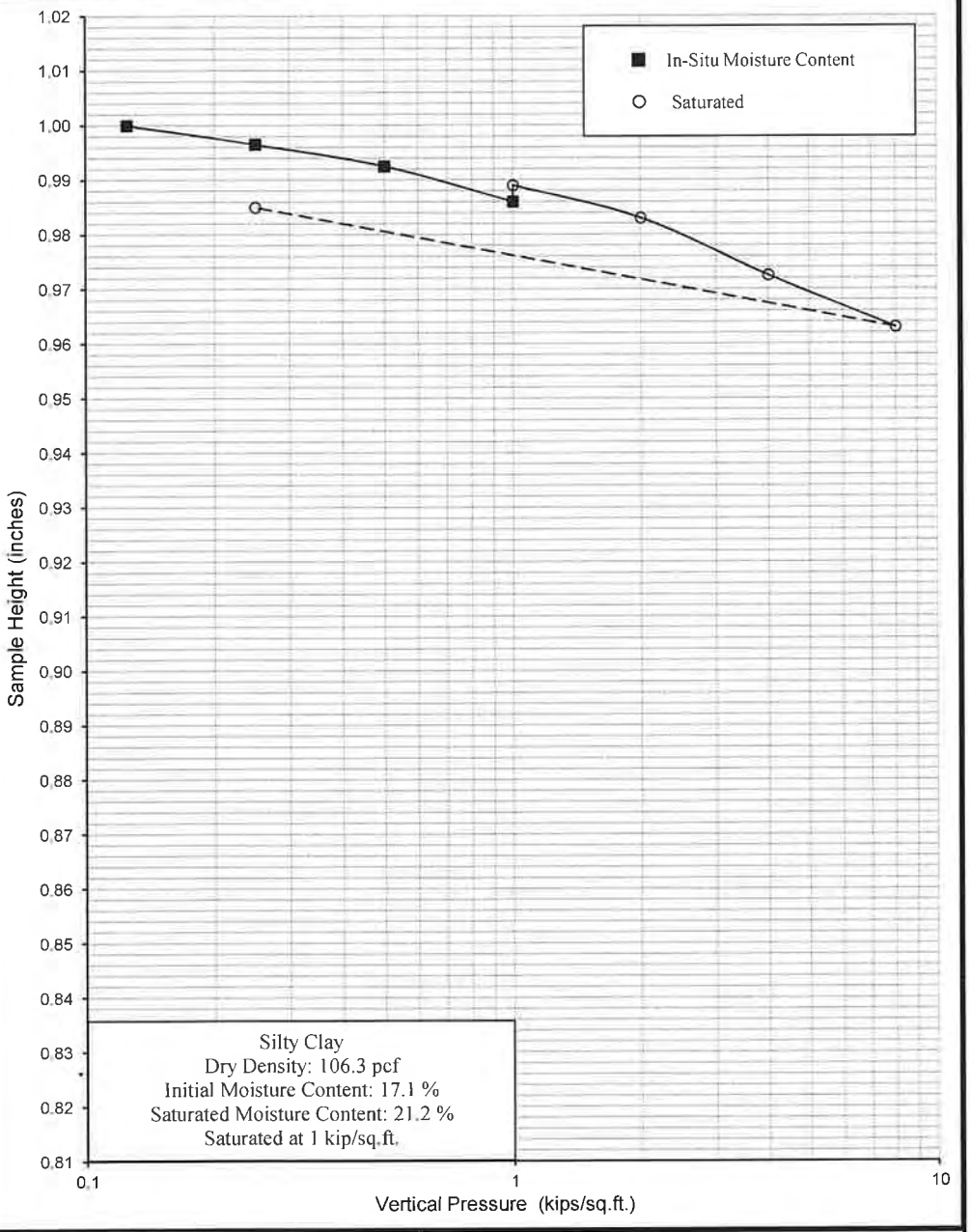
ASTM D2435

Plate C

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9965	0.4	
0.5	0.9925	0.8	
1	0.9860	1.4	
1	0.9890	1.1	Saturated
2	0.9830	1.7	
4	0.9725	2.8	
8	0.9630	3.7	
0.25	0.9850	1.5	

Sample No.	T4	Depth	15'	Date	3/18/2021

Date Tested: 3/8/2021
Sample: T4
Depth: 15'



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SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT NUMBER: 22387-21

DATE: 3/18/2021

CONSOLIDATION TEST

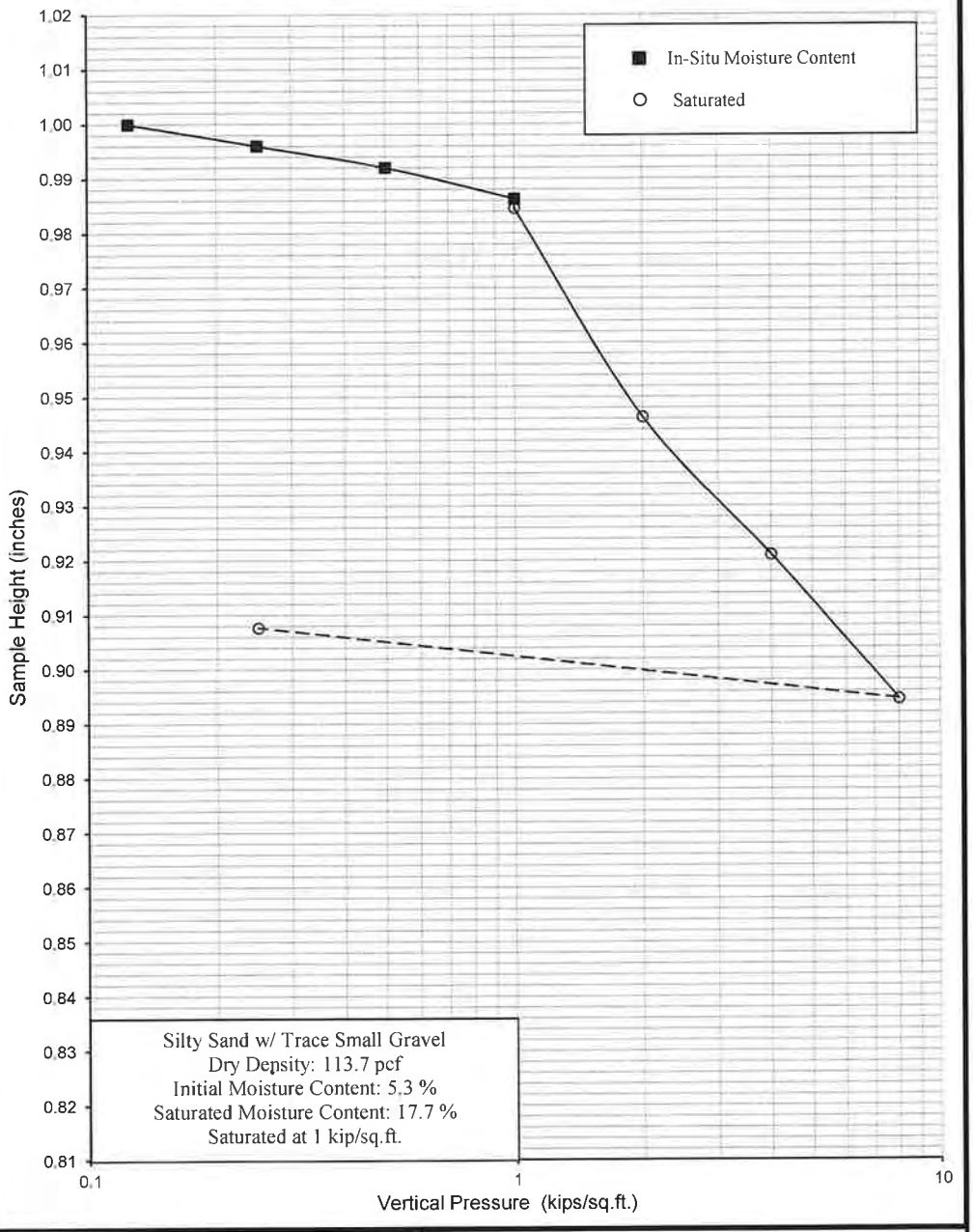
ASTM D2435

Plate D

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9960	0.4	
0.5	0.9920	0.8	
1	0.9863	1.4	
1	0.9846	1.5	Saturated
2	0.9463	5.4	
4	0.9210	7.9	
8	0.8945	10.6	
0.25	0.9077	9.2	

Date Tested:	**3/10/2021**
Sample:	**T8**
Depth:	**4'**

Sample No.	T8	Depth	4'	Date	3/18/2021



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SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT NUMBER: 22387-21

DATE: 3/18/2021

CONSOLIDATION TEST

ASTM D2435

Plate E

Appendix D
Liquefaction Calculations

SITE LOCATION: _____

GEOTECHNICAL REPORT: _____

GEOLOGY REPORT: _____

DEPTH TO WATER TABLE = 19'

EARTHQUAKE MAGNITUDE = 6.9

PEAK GROUND ACCELERATION = 0.59g

DEPTH BELOW FINAL GRADE (FEET)	MOIST DENSITY (PCF)	σ_o TOTAL STRESS (PSF)	$\bar{\sigma}_o$ EFFECTIVE STRESS (PSF)	$\sigma_o/\bar{\sigma}_o$ (-)	r_d (-)	① $\tau_h/\bar{\sigma}_o$ (-)	N VALUE (BLOWS/FT)	RELATIVE DENSITY (%)	C_N (-)	C_E (-)	C_B (-)	C_R (-)	C_S (-)	$(N_1)_{60}$ (BLOWS/ft)	FINES (%)	CRR M=7.5	MSF (-)	CRR M=6.9	LIQ. F.S.	
5	110	550	Same	1.00	0.99	0.38	18	90	>1.6	1.00	1.05	0.70	1.20	>25	47	>0.50	1.3	>0.65	>1.7	
10	115	1125	↓	↓	0.96	0.36	20	85	1.3	↓	↓	0.75	↓	25	71	>0.50	↓	>0.65	>1.8	
15	120	1725	↓	↓	0.92	0.35	35	>90	1.06	↓	↓	0.85	↓	40	19	>0.50	↓	>0.65	>1.9	
20	↓	2325	2263	1.03	0.87	0.34	25	80	0.94	↓	↓	0.90	↓	27	10	0.40	↓	0.52	1.5	
25	↓	2925	2551	1.15	0.80	0.35	16	65	0.90	↓	↓	0.95	↓	17	37	>0.29	↓	>0.38	>1.1	
30	↓	3525	2839	1.24	0.74	0.35	9	50	0.84	↓	↓	1.00	↓	9.5	63	>0.18	↓	>0.23	>0.7	
35	↓	4125	3127	1.32	0.68	0.34	13	55	0.80	↓	↓	↓	↓	13	71	>0.22	↓	>0.29	>0.8	NL
40	↓	4725	3415	1.38	0.64	0.34	8	45	0.76	↓	↓	↓	↓	8	88	>0.17	↓	>0.22	>0.7	NL
45	↓	5325	3703	1.44	0.61	0.33	10	50	0.72	↓	↓	↓	↓	9	66	>0.18	↓	>0.23	>0.7	
50	↓	5925	3991	1.48	0.58	0.33	42	85	0.76	↓	↓	↓	↓	40	45	>0.50	↓	>0.65	>2.0	

① INDUCED CYCLIC STRESS RATIO = $\tau_{ave}/\bar{\sigma}_o = 0.65 \cdot \frac{a_{max}}{g} \cdot \frac{\sigma_o}{\bar{\sigma}_o} \cdot r_d$

- C_E = Corr. - Energy Ratio = Energy Ratio / 60%
- C_B = Corr. - Borehole Dia. = 1.15 for 8" dia. borehole
- C_R = Corr. - Rod Length
- C_S = Corr. - Sampling Method

Actual Energy Ratio = 0.67-1.17 (Safety Hammer)
= 0.50-1.00 (Donut Hammer)

Sampling Method = 1.0 Standard Sampler
= ~~1.2 Sampler W/o liners~~

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PROJECT | DATE

EVALUATION OF LIQUEFACTION POTENTIAL

SEISMIC SETTLEMENT EVALUATION ⇒ GWT @ 19'

EQ Magnitude = 6.9, Hor. Ground Acceleration = 0.59 g

Depth (ft)	$N_{1,60}$ (Blows/ft)	Fines (%)	EQ CSR	M_{design} $M_{7.5}$	Design CSR	Vert. Strain	Seismic Settle	Liquefaction F.S.
20-25'	17 (25)	37 (5)	0.35	1.30	0.27	0.2%	0.1"	>1.1
25-30'	9.5 (14.5)	63 (5)	0.35		0.27	2.0%	1.2"	>0.7
30-35'	13 (20)	71 (5)	0.34		0.26	1.3%	0.8" x	>0.8 (NL)
35-40'	8 (13)	88 (5)	0.34		0.26	2.1%	1.3" x	>0.7 (NL)
40-45'	9 (14)	66 (5)	0.33		0.25	2.0%	1.2"	>0.7

$\Sigma S = 4.6"$

Say $\Delta_{EQ} = 2\frac{1}{2}"$ ←

NL - Non liquefiable soil layers with LL > 39%
PL > 18%

Appendix E
Soil Infiltration Data

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Project: Harley Knox 2021 LLC
Project No.: 22387-21
Date: 2/24/2021
Test No. T-1
Depth: 5'
Tested By: D.R.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
8:03			106.5			42.1					
8:13	10	10	106.9	0.4		42.2	0.1				
8:13			106.9			42.2					
8:23	10	20	107.2	0.3		42.4	0.2				
8:23			107.2			42.4					
8:33	10	30	107.5	0.3		42.5	0.1				
8:33			107.5			42.5					
8:43	10	40	108.0	0.5		43.0	0.5				
8:43			108.0			43.0					
8:53	10	50	108.2	0.2		43.5	0.5				
8:53			108.2			43.5					
9:03	10	60	108.9	0.7		44.0	0.5				
9:03			108.9			44.0					
9:13	10	70	109.1	0.2		44.2	0.2		1.2	1.2	
9:13			109.1			44.2					
9:23	10	80	109.3	0.2		44.5	0.3		1.2	1.8	
9:23			109.3			44.5					
9:33	10	90	109.6	0.3		44.5	0.0		1.8	0.0	
9:33			109.6			44.5					
9:43	10	100	110.0	0.4		45.0	0.5		2.4	3.0	
9:43			110.0			45.0					
9:53	10	110	110.3	0.3		45.5	0.5		1.8	3.0	
9:53			110.3			45.5					
10:03	10	120	110.5	0.2		46.0	0.5		1.2	3.0	

Average = 1.6 / 2.0 cm/hr

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SOILS AND GEOTECHNICAL CONSULTANTS

Project: Harley Knox 2021 LLC
Project No.: 22387-21
Date: 2/24/2021
Test No. T-2
Depth: 10'
Tested By: D.R.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
9:07			74.9			44.7					
9:17	10	10	76.0	1.1		46.1	1.4				
9:17			76.0			46.1					
9:27	10	20	77.8	1.8		47.5	1.4				
9:27			77.8			47.5					
9:37	10	30	78.8	1.0		48.7	1.2				
9:37			78.8			48.7					
9:47	10	40	79.8	1.0		49.5	1.8				
9:47			79.8			49.5					
9:57	10	50	80.5	0.7		50.5	1.0				
9:57			80.5			50.5					
10:07	10	60	81.5	1.0		51.5	1.0				
10:07			81.5			51.5					
10:17	10	70	82.0	0.5		52.0	0.5		3.0	3.0	
10:17			78.5			49.5					
10:27	10	80	79.5	1.0		50.0	0.5		6.0	3.0	
10:27			79.5			50.0					
10:37	10	90	80.0	0.5		50.5	0.5		3.0	3.0	
10:37			80.0			50.5					
10:47	10	100	80.5	0.5		51.0	0.5		3.0	3.0	
10:47			80.5			51.0					
10:57	10	110	81.5	1.0		51.5	0.5		6.0	3.0	
10:57			81.5			51.5					
11:07	10	120	82.0	0.5		52.0	0.5		3.0	3.0	

Average = 4.0 / 3.0 cm/hr

SOIL INFILTRATION RATE CALCS ⇒ Auger Boring

Location:	B-2	B-3	B-4
• Depth =	13 ft	13 ft	13 ft
• Hole Dia. =	6 in	6 in	6 in
• Drop = Δd	4.0 in	3.0 in	3.5 in
• Time = Δt Interval	30 min	10 min	10 min
• Preadjusted Perc. Rate	8.0 in/hr	18 in/hr	21 in/hr
• Initial Water Depth = d_i	18 in	16 in	16 in
• Reduction Factor = R_f	6.3	5.8	5.8
• INFILTRATION RATE	1.3 in/hr	3.1 in/hr	3.6 in/hr

$$\text{Infiltration Rate} = \frac{\text{Preadjusted Perc. Rate}}{\text{Reduction Factor}}$$

$$\text{Reduction Factor} = R_f = \left[\frac{2 \cdot d_i - \Delta d}{\text{Dia.}}\right] + 1$$

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22387-21 | DATE

SOIL INFILTRATION RATE CALCULATIONS

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PERCOLATION TEST DATA

Client: Harley Knox 2021 LLC	**Date:** 3/23/2021
Project No.: 22387-21	**Tested By:** Mike P.
Test Hole: B-2	**USCS Soil Classification:**
Depth of Test Hole: 13'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	7:50	8:15	25.0	136.0	140.0	4.0	N
2	8:15	8:40	25.0	140.0	144.0	4.0	N

*If two consecutive 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 (fill) 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)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	7:03	7:33	30	136.0	142.0	6.0	
2	7:33	8:03	30	138.0	143.5	5.5	
3	8:03	8:33	30	139.0	144.0	5.0	
4	8:33	9:03	30	137.0	142.0	5.0	
5	9:03	9:33	30	137.0	141.5	4.5	
6	9:33	10:03	30	137.0	141.0	4.0	
7	10:03	10:33	30	137.0	141.5	4.5	
8	10:33	11:03	30	138.0	142.0	4.0	
9	11:03	11:33	30	138.0	142.0	4.0	
10	11:33	12:03	30	137.0	141.5	4.5	
11	12:03	12:33	30	138.0	142.0	4.0	
12	12:33	1:03	30	138.0	142.0	4.0	
13							
14							
15							
COMMENTS:							

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SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Harley Knox 2021 LLC	**Date:** 3/23/2021
Project No.: 22387-21	**Tested By:** Mike P
Test Hole: B-3	**USCS Soil Classification:**
Depth of Test Hole: 13'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	8:27	8:52	25	140.0	153.0	13.0	Y
2	8:52	9:17	25	140.5	147.5	7.0	Y

*If two consecutive 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 (fill) 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)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	9:17	9:27	10	140.0	143.0	3.0	
2	9:27	9:37	10	140.0	143.5	3.5	
3	9:37	9:47	10	140.0	143.0	3.0	
4	9:47	9:57	10	140.0	143.0	3.0	
5	9:57	10:07	10	140.0	143.0	3.0	
6	10:07	10:17	10	140.0	143.0	3.0	
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:

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SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Harley Knox 2021 LLC	**Date:** 3/23/2021
Project No.: 22387-21	**Tested By:** Jimmy
Test Hole: B-4	**USCS Soil Classification:**
Depth of Test Hole: 13'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	9:22	9:47	25	140.0	152.0	12.0	Y
2	9:47	10:12	25	140.0	152.0	12.0	Y

*If two consecutive 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 (fill) 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)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	10:12	10:22	10	140.0	144.0	4.0	
2	10:22	10:32	10	140.0	144.0	4.0	
3	10:32	10:42	10	140.0	144.0	4.0	
4	10:42	10:52	10	140.0	143.5	3.5	
5	10:52	11:02	10	140.0	144.0	4.0	
6	11:02	11:12	10	140.0	144.0	3.5	
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

PHASE I ENVIRONMENTAL SITE ASSESSMENT

220, 280, and 25264 East Nance Street and Assessor's Parcel Numbers: 302-100-031 Perris, California 92571

Prepared for:

Proficiency Capital
11777 San Vincente Boulevard Suite 780
Los Angeles, California 90049

Prepared by:

Hazard Management Consulting, Inc.
211 W. Avenida Cordoba, Suite 200
San Clemente, CA 92672
(949) 361-3902

March 12, 2021

Executive Summary

Hazard Management Consulting, Inc. (HMC) is pleased to submit this Environmental Site Assessment (ESA) for the property referenced above in the City of Perris, California (Site) (Figures 1 & 2). This ESA was prepared to evaluate the Site for potential Recognized Environmental Conditions (RECs) that may be present and was conducted as part of your efforts to acquire the Site. The Site is noted to be a 8.59-acre parcel. The Site has historically been used for agricultural purposes and residential uses. The Site currently contains a residence, vacant land, and remnants and foundations of former storage and residential structures.

The Site is relatively flat with an elevation of approximately 1,460 feet above mean sea level (msl) with a regional slope to the southeast. The Site is located in the City of Perris, Riverside County and is set in a developing area noted with vacant land, residential, and industrial uses.

The Site is located in a mixed use area and is bound:

- to the north by Harley Knox Boulevard across which are two residential structures and a semi-truck staging compound;
- on the east by an industrial warehouse;
- to the south by East Nance Street across which is a semi-truck staging yard; and,
- to the west by vacant land.

Key findings of this Phase I ESA are as follows:

- The Site and Site vicinity was observed to have historically been used for agricultural or vacant land since from the earliest aerial photograph in 1938 until the Site was first seen developed with residential and associated storage structures in 1985. The Site has remained in residential use as well as vacant land until today. Given the city directory records, it appeared that some of the residents may have run business from their homes. The Site vicinity was seen to be vacant, agricultural, or residential land throughout the available records. In recent years the Site vicinity has been noted with sparse industrial developments;

- Based on the review of the available regulatory information, the Site is located in an area with a minimal history of industrial or commercial uses. No facilities in the Site vicinity were found to pose an environmental condition affecting the Site. No RECs were identified from off Site sources;

- The Site is currently vacant and residential land. There were no RECs noted from the current use of the Site.

- Given the findings of this Phase I ESA, a vapor intrusion condition is considered unlikely to exist at the Site; and,

- Given the age of the residential structure at the Site, ACMs are likely to be present.

Conclusions

We have performed a Phase I Environmental Site Assessment in accordance with ASTM E1527-13 Guidelines for the property located at 220, 280, and 25264 East Nance Street and Assessor's Parcel Numbers: 302-100-031 in Perris, California. **No RECs, HRECs or CRECs were identified during this investigation.**

While not an REC by ASTM standards, ACMs are suspected to be present at the residential structure at the Site.

Recommendations

Based on the findings of this ESA, HMC recommends that an ACM survey be conducted at the residential structure prior to any disturbance of suspect materials.

PHASE I ENVIRONMENTAL SITE ASSESSMENT
220, 280, and 25264 East Nance Street and
Assessor's Parcel Numbers: 302-100-031
Perris, California 92571

1. INTRODUCTION

Hazard Management Consulting, Inc. (HMC) is pleased to submit this Environmental Site Assessment (ESA) for the property referenced above in the City of Perris, California (Site) (Figures 1 & 2). This ESA was prepared to evaluate the Site for potential Recognized Environmental Conditions (RECs) that may be present and was conducted as part of your efforts to acquire the Site. The Site is noted to be a 8.59-acre parcel. The Site has historically been used for agricultural purposes and residential uses. The Site currently contains a residence, vacant land, and remnants and foundations of former storage and residential structures.

The Site is relatively flat with an elevation of approximately 1,460 feet above mean sea level (msl) with a regional slope to the southeast. The Site is located in the City of Perris, Riverside County and is set in a developing area noted with vacant land, residential, and industrial uses.

1.1. Objective

In accordance with the ASTM E 1527-13 Standard Practice for Environmental Site Assessments, the objective of the ESA is to assess, to the extent feasible under the standard, the likelihood that Recognized Environmental Conditions (RECs), as defined by ASTM, are present at the Site.

A Recognized Environmental Condition "means the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health

or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies" (ASTM Standard Practice E1527-13). Performance of a Phase I ESA is intended to reduce, but not eliminate, uncertainty regarding the potential for Recognized Environmental Conditions in connection with a property, within reasonable limits of time and cost.

All Appropriate Inquires (AAI) as defined in the Final Rule (40 CFR, Part 312), must be conducted by persons seeking the landowner liability protections under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) prior to acquiring a property or seeking or receiving federal brownfields grants under the authorities of CERCLA. The purpose of AAI, as defined in the AAI Final Rule, is to identify releases and threatened releases of hazardous substances, which cause or threaten to cause the incurrence of response costs. The U.S. Environmental Protection Agency (EPA) has stated that ASTM Standard E-1527-13 is consistent with the Standards and Practices for AAI and is compliant with the statutory criteria for AAI.

1.2. Scope of Services, Methodology and Limitations

The findings of this ESA must be viewed in recognition of certain limiting conditions. The scope of work commissioned for this project does not represent an exhaustive study, but rather a reasonable inquiry, consistent with good commercial practice, in general accordance with ASTM Practice E-1527-13.

The scope of work for this ESA included the following activities:

- A Site walk to document the current condition of the Site and neighboring facilities.
- Review of a regulatory database report.
- Review of previously prepared reports for the Site.
- Submittal of questionnaires to the current Owner and User of the report.

- Review of historical references including aerial photographs, city directories, Sanborn Maps and topographic maps.

- On-line research and file review requests concerning the Site and suspect off site sources at the State of California Regional Water Quality Control Board (RWQCB) and Department of Toxic Substances Control (DTSC) websites.

- Review of records maintained by the Riverside County Department of Environmental Health.

- Review of records kept by the Riverside County Transportation and Land Management Agency's Building and Safety Department

- Review of Records kept by the City of Perris.

- Review of the records kept by South California Air Quality Management District's online database Facility Information Detail (FIND).

- Preparation of this report of findings.

In the course of this assessment, HMC has relied on information provided by outside parties, such as regulatory agencies, previous reports and interview sources. For the purpose of this assessment, such third-party information is assumed to be accurate unless contradictory evidence is noted, and HMC does not express or imply any warranty regarding information provided by third-party sources.

2. SITE DESCRIPTION

2.1. Site Setting

The Site is noted to be a 8.59-acre parcel. The Site is relatively flat with an elevation of approximately 1,460 feet above mean sea level (msl) with a regional slope to the southeast. The Site is located in the City of Perris, Riverside County and is set in a developing area noted with vacant land, residential, and industrial uses.

The Site is located in mixed use area and is bound:

- to the north by Harley Knox Boulevard across which are two residential structures

and a semi-truck staging compound;

- on the east by an industrial warehouse;
- to the south by East Nance Street across which is a semi-truck staging yard; and,
- to the west by vacant land.

Utilities at the Site are provided by:

- Electricity: Southern California Edison
- Natural Gas: Southern California Gas Company
- Water: Eastern Municipal Water District

2.2. Regional Geology and Hydrogeology

Information regarding regional geological and hydrogeological conditions was obtained from information included on the California Department of Water Resources website. The Site lies within the San Jacinto Groundwater Basin which underlies San Jacinto, Perris, Moreno, and Menifee Valleys in western Riverside County. This basin is bound by the San Jacinto Mountains on the east, the San Timoteo Badlands on the northeast, the Box Mountains on the north, the Santa Rosa Hills, and Bell Mountain on the south, and unnamed hills on the west. Lake Perris is located in the eastern part of Perris Valley. The valleys are drained by the San Jacinto River and its tributaries. Average annual precipitation ranges from 10 to 18 inches.

The San Jacinto Groundwater Basin contains sediments that have filled valleys and underlying canyons incised into crystalline basement rock. The valley fill deposits are generally divided into younger and older alluvium. Maximum depths of valley fill reach about 900 feet in the western and northern parts of the basin but may exceed 5,000 feet in the eastern part of the basin between the Casa Loma and Claremont faults. Confined groundwater is found in the eastern part of the basin between the Casa Loma and Claremont fault. Wells in this basin produce 200 to 2,600 gpm (CDWR 2006).

The following groundwater information was found on the Regional Water Quality Control Board's website GeoTracker. In 2009, groundwater was reported at depths of approximately 80 feet below ground surface in a groundwater monitoring report generated for a Shell facility located approximately 3,900 feet southwest of the Site.

Groundwater is reported to flow southwest at gradient of 0.003 feet per foot below this facility (DC 2009).

2.3. Interviews and User Provided Information

The User of this report is Proficiency Capital who is looking to acquire the Site and would be considered a "User" of the report per ASTM definitions. We requested all available information from the User and was provided two Preliminary Title Reports.

2.4. Title Records

Two Title Reports (Report) prepared by First American Title Insurance Company dated January 22, 2021 for 280 East Nance Street and January 25, 2021 for 25264 Nance Street were provided to HMC for review.

Title for 280 East Nance Street was reported to be vested in Cheng-Ping Chang and Shueh-Lee Wang Chang, Trustees of the Chang Family Trust, dated January 10, 2003. Title for 25264 Nance Street was reported to be vested in Than Van Thai, a Married Man, as His Sole and Separate Property; Xuan Nguyen, an Unmarried Man; Joseph Nguyen and Lynn Nguyen, Husband and Wife and Diana Giang, an Unmarried Woman, all as Joint Tenants.

The Reports included information regarding tax obligations, mortgage liens, easements for various utilities, and related matters but did not contain any information of an environmental nature. One environmental constraint item was noted in each Report stating that, as of 1979, the land division fell within the 70 to 75 decibel range of March Air Force Base. The environmental constraints also noted that new dwelling units must be floodproofed by raising the finished floor a minimum of 24 inches above ground surface and that erosion protection shall be provided to mobile home supports. These environmental notes did not provide any concerns relating to the environmental condition of the Site.

2.5. User Knowledge

We interviewed Mr. Matt Englhard of Proficiency Capital who indicated that his firm has no previous knowledge or experience with the property and is unaware of any chemical spills or releases or ongoing environmental matters. He indicated that they are paying full market value for the Site.

2.6. Owner Knowledge

An Owner Questionnaire was not supplied to HMC and representatives of the Site were not available for an interview.

2.7. Environmental Liens or Activity and Use Limitations

The best of HMC's knowledge from the review of material provided by third parties, there are no environmental liens or AULs in relation to the Site.

3. SITE USE AND HISTORY

Past usage of the subject Site was assessed through a review of historical aerial photographs, topographic maps and an EDR search of city directories and prior reports. Sanborn maps were not generated for the Site.

3.1. Aerial Photograph Review

Aerial photographs covering the Site were obtained from Environmental Data Resources, Inc. (EDR). Photographs were available from the period 1938 through 2016. Copies of the aerial photographs are included in Appendix B. A summary of the observations noted from the aerial photographs are as follows:

1938-78 The Site and Site vicinity was observed to be vacant or in agricultural use during this time period.

1985 The Site was first seen to be developed with a residential structure as well as storage structures in the west. A small structure was noted immediately east the residential structure. A residential structure was also noted along the eastern border of the Site. The Site vicinity was noted with some residential and agricultural structures but remained largely in use for agriculture.

1989 The small structure east of the western residence was no longer seen however a larger storage structure was observed in its place. No significant changes to the Site vicinity were noted.

1997 No significant changes were seen at the Site. Additional residential and new industrial development were noted in the Site vicinity.

2002-16 No significant changes were seen to the Site. The Site vicinity was noted with sparse industrial developments within this time period.

3.2. Topographic Maps

Historical topographic maps were also reviewed as part of this effort and aided in interpreting the overall Site history although no specific observations were made from the review of these maps.

3.3. Sanborn Maps

Sanborn maps are maps that were created for the insurance industry to document site activities in metropolitan areas of the country and were used in underwriting. They often times contain detailed information about a site. While they were prepared for insurance underwriting and were not environmental maps per se, they often times contain information that is useful in evaluating the historical use of a site. Sanborn maps were not generated for the Site.

3.4. EDR City Directory Review

EDR performed a search of the City Directory records for the Site addresses provided at the initiation of this Phase I ESA and nearby properties at approximately five-year intervals. The following records were found:

220 E. Nance St.

Year	Occupant
2017	Chaboyn, Ricardo
2014	Chaboyn, Ricardo
2010	Chaboyn, Ricardo
	RCC Concrete Structures
2005	Yates, Sherilynn R.

280 E. Nance St.

Year	Occupant
2017	Arias, Gabriela
2014	Arias, Gabriela
2010	Arias, Gabriela

1990 CA Network Design
Rudd, Willard R.

3.5. Summary

The Site and Site vicinity was observed to have historically been used for agricultural or vacant land since at least from the earliest aerial photograph in 1938 until the Site was first seen developed with residential and associated storage structures in 1985. The Site has remained in residential use as well as vacant land until today. Given the city directory records, it appeared that some of the residents may have run business from their homes. The Site vicinity was seen to be vacant, agricultural, or residential land throughout the available records. In recent years the Stie vicinity has been noted with sparse industrial developments.

4. PRIOR INVESTIGATIONS

We were not provided with any previously prepared environmental reports for the Site.

5. SITE RECONNAISSANCE

Mr. Troy Taylor of HMC conducted a Site and Site vicinity reconnaissance on February 25, 2021. The reconnaissance was conducted in order to identify visible evidence of REC's at the Site and to assess possible conditions off Site that may impact the Site. Mr. Taylor was unaccompanied during the investigation at the Site.

The Site was noted to be a rectangular parcel and was seen to contain a residence and vacant land noted with the footprints and/or foundations of former storage structures. Evidence of illegal trash dumping was observed in the vacant portions of the Site that included E-waste, cushions, empty plastic containers, used tires, and pre-cast concrete tubes. A back-hoe was seen parked along the eastern border of the Site. There were no chemical uses or storage noted at the Site. No staining, spills, or other evidence of chemical releases were seen at the Site. No RECs were identified during the Site reconnaissance.

While not considered an REC, given the age of the residence at the Site, asbestos containing materials (ACMs) are likely present in the structure.

Selected photographs illustrating the Site and nearby off-Site conditions are included in Appendix A. Summaries of the Site and observations are detailed below.

Description and Use of Site:	The Site was seen to contain a residence and vacant land.
Underground and Aboveground Storage Tanks:	No evidence of UST or AST use was noted.
Hazardous Materials, Hazardous Wastes or Petroleum Products:	No hazardous materials were observed at the Site.
Drains, Drain lines and Sumps:	No drainage features were seen at the Site.
Pits, Ponds, Lagoons	These features were not observed at the Site.
Industrial Wastewater:	Industrial wastewater was not being generated at the Site.
Stains:	No staining was observed at the Site.
Wells:	No wells were observed at the Site.
Transformers:	Transformers were not observed at the Site.
Other Features:	A back-hoe was parked along the eastern border of the Site.

5.1. Site Vicinity

The Site is located in mixed use area and is bound:

- to the north by Harley Knox Boulevard across which are two residential structures and a semi-truck staging compound;
- on the east by an industrial warehouse;
- to the south by East Nance Street across which is a semi-truck staging yard; and,
- to the west by vacant land.

6. REGULATORY AGENCY DATABASE RESEARCH

Regulatory agency database information was obtained from a standard radius Site Assessment (ASTM) report by Environmental Data Resources, Inc. The center of the search was in the approximate center of the Site. Search distances for specific databases were one-quarter to one mile as specified in the ASTM 1527-13 standard. The database search includes over 70 federal, state, local, and proprietary records. A complete copy of this report is included in Appendix B.

6.1. Database Records Concerning the Target Property

The Site was not listed in any database searched as part of the EDR report.

6.2. Database Records Concerning the Site Vicinity

We reviewed the database report for off-Site potential sources within the relevant search distance. In review of the many entries on the database, we reviewed the following factors that affect the ability of a facility to affect the Site:

- Distance from the Site,
- Location from the Site with regard to the direction of groundwater flow,
- Nature of the release and whether the release has affected soil, groundwater or both,
- Status of the investigation (e.g. open or closed)

Groundwater was noted to flow in a southwesterly direction at another nearby facility, therefore facilities located adjacent to or to the northeast were further considered. Only those facilities judged using these factors are discussed below. The following presents a summary of our findings:

Location	Address	Dist.	Direction	Lists	REC	RATIONALE
Meade Valley Elementary School Addition	21-100 Oleander Avenue	465'	WNW	ENVIROSTOR SCH	NO	This facility was noted to have been investigated by DTSC since it is a school facility and no RECs were identified.

Orphan Sites

Orphan Sites are those properties that are included on various agency lists, but for which the records do not have sufficient address information for the database program to map the site. No orphan sites were identified as part of the EDR database research.

6.3. Summary of Off-Site Issues

Based on the review of the available regulatory information, the Site is located in an area with a sparse history of industrial or commercial uses. No facilities in the Site vicinity were found to pose an environmental condition affecting the Site. No RECs were identified from off Site sources.

7. LOCAL AGENCY AND OTHER RECORDS REVIEW

7.1. Tribal Records

The Site is not located in a tribal area therefore there were no tribal records to review.

7.2. Oil and Gas Wells

The State of California Department of Conservation, Division of Oil, Gas, and Geothermal Resources online mapping website was reviewed for the location of active, plugged, or abandoned oil and gas wells in the vicinity of the Site. No oil or gas wells were listed as having been drilled on Site.

7.3. State of California

The State of California Geotracker and EnviroStor websites were also reviewed for information on potential on or off-Site facilities that are being remediated under either RWQCB or DTSC oversight. No active cases were listed on these databases that were not listed in the EDR review.

HMC also submitted public records requests to the DTSC and RWQCB. After thorough records searches, neither the RWQCB nor the DTSC found files responsive to our request for the Site.

7.4. Riverside County Department of Environmental Health

A public records request was submitted online to the RCDEH. HMC's request is still being processed at this time. Given the limited historical use, we do not anticipate any significant findings from this search.

7.5. Riverside County Department of Building and Safety

No building permits were found for the addresses and APN of the Site.

7.6. South Coast Air Quality Management District

A review of the SCAQMD Facility Information Detail website indicated that no records are maintained for the Site by this agency.

7.7. City Clerk City of Perris

A public records request was submitted to the City. HMC's request is still being processed at this time.

8. VAPOR INTRUSION, ASBESTOS AND OTHER CONCERNS

8.1. Vapor Intrusion

Given the findings of this Phase I ESA, a vapor intrusion condition is considered unlikely to exist at the Site.

8.2. Asbestos

Given the age of the residential structure at the Site, ACMs are likely to be present.

8.3. Radon

The Site is listed as being located in Zone 2 with regards to radon indicating that radon maybe present at concentrations less than 4 pico curies / liter.

8.4. Mold

No evidence of mold or water damage was observed at the Site.

9. SUMMARY OF FINDINGS

Key findings of this Phase I ESA are as follows:

- The Site and Site vicinity was observed to have historically been used for agricultural or vacant land since from the earliest aerial photograph in 1938 until the Site was first seen developed with residential and associated storage structures in 1985. The Site has remained in residential use as well as vacant land until today. Given the city directory records, it appeared that some of the residents may have run business from their homes. The Site vicinity was seen to be vacant, agricultural, or residential land throughout the available records. In recent years the Site vicinity has been noted with sparse industrial developments;

- Based on the review of the available regulatory information, the Site is located in an area with a minimal history of industrial or commercial uses. No facilities in the Site vicinity were found to pose an environmental condition affecting the Site. No RECs were identified from off Site sources;

- The Site is currently vacant and residential land. There were no RECs noted from the current use of the Site.

- Given the findings of this Phase I ESA, a vapor intrusion condition is considered unlikely to exist at the Site; and,

- Given the age of the residential structure at the Site, ACMs are likely to be present.

10. DATA GAPS

Data gaps identified during this investigation include the following:

- Public records requests submitted to the City of Perris and Riverside County Department of Environmental Health are still being processed at the time of this report; and,

- An Owner Questionnaire has not been supplied to HMC for review.

These data gaps are not considered to affect the outcome of this investigation.

11. CONCLUSIONS

We have performed a Phase I Environmental Site Assessment in accordance with ASTM We have performed a Phase I Environmental Site Assessment in accordance with ASTM E1527-13 Guidelines for the property located at 220, 280, and 25264 East Nance Street and Assessor's Parcel Numbers: 302-100-031 in Perris, California. **No RECs, HRECs or CRECs were identified during this investigation.**

While not an REC by ASTM standards, ACMs are suspected to be present at the residential structure at the Site.

12. RECOMMENDATIONS

Based on the findings of this ESA, HMC recommends that an ACM survey be conducted at the residential structure prior to any disturbance of suspect materials.

13. QUALIFICATIONS

Mark S. Cousineau, NREP

Mr. Mark S. Cousineau, principal with HMC, has a diverse professional background in environmental management, which includes working as a generator, regulator, consultant, and corporate advisor in hazardous waste and other environmental issues.

Mr. Cousineau's technical background is focused in the area of overseeing large-scale environmental investigations and regulatory compliance management related to site assessments, subsurface investigations, facility surveys, and site remediation. To projects such as these, Mr. Cousineau brings expertise in evaluating complex sites and developing solutions to solve the technical, operational, regulatory, financial and timing issues. In addition, Mr. Cousineau routinely assists clients in developing environmental business plans for single assets and multi-site real estate portfolios and has designed and implemented several tenant audit programs involving the proactive management of environmental risk caused by on-site commercial and industrial tenant activities.

Mr. Cousineau has provided litigation support and has served, as a court-appointed expert on environmental issues, is a Member of the National Registry of Environmental Professionals, holds a M.S. in Environmental Sciences from California State University Fullerton and a B.S. in Chemistry from University California San Diego.

As signatory to this report, I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in § 312.10 of this part. I have the specific qualifications based on education, training, and experience to assess the property of the nature, history, and setting of the subject property. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312."

Mark Cousineau, NREP
Principal

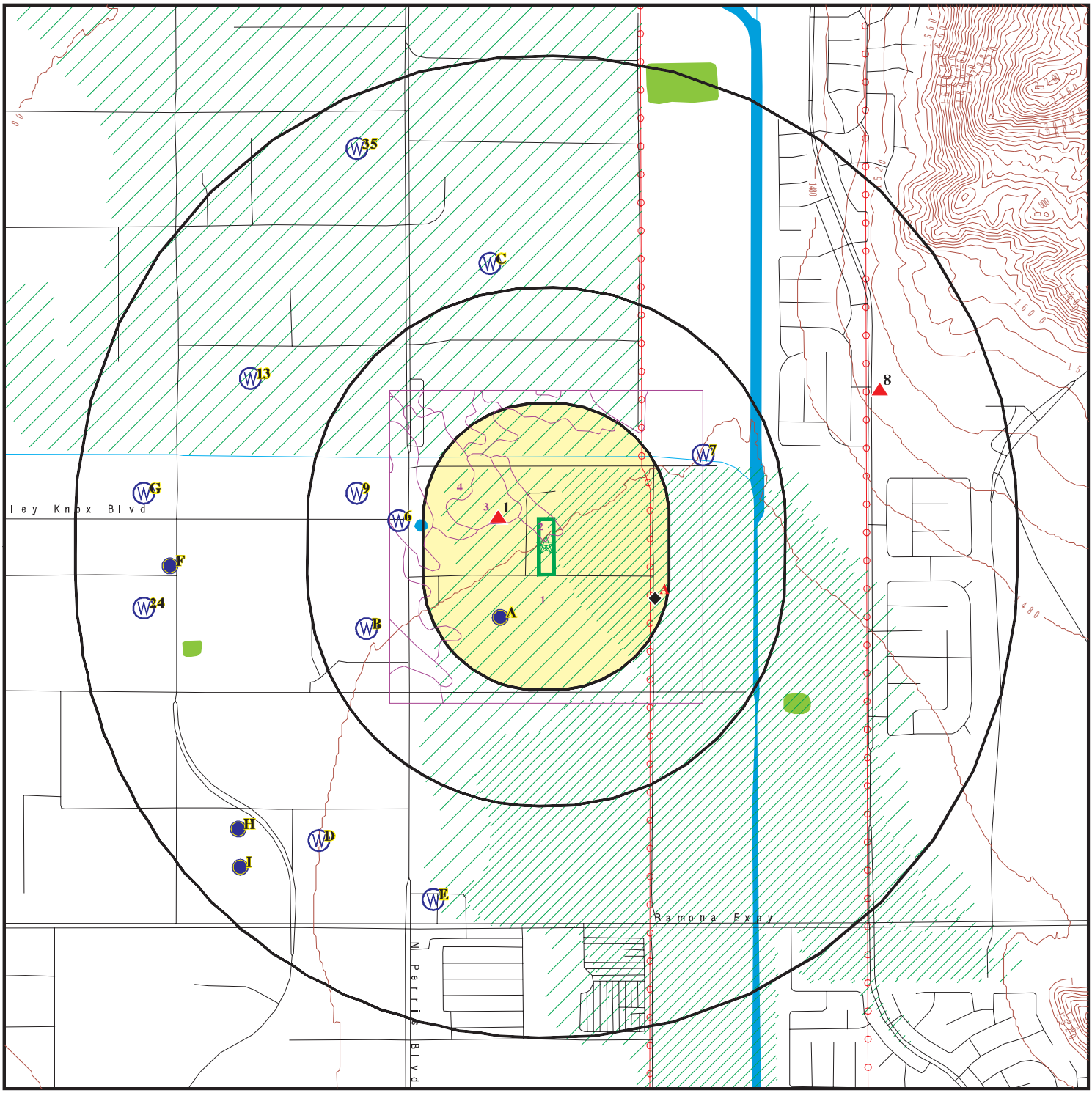
14. REFERENCES

CDWR 2006 California Department of Water Resources, Bulletin 118 - San Jacinto Groundwater Basin, January 20, 2006

DC 2009 Delta Consultants, Second Quarter 2009 Groundwater Monitoring Report Shell Service Station 4039 N. Perris Boulevard Perris, California, July 1, 2009

TABLES

OVERVIEW MAP - 6362629.2S

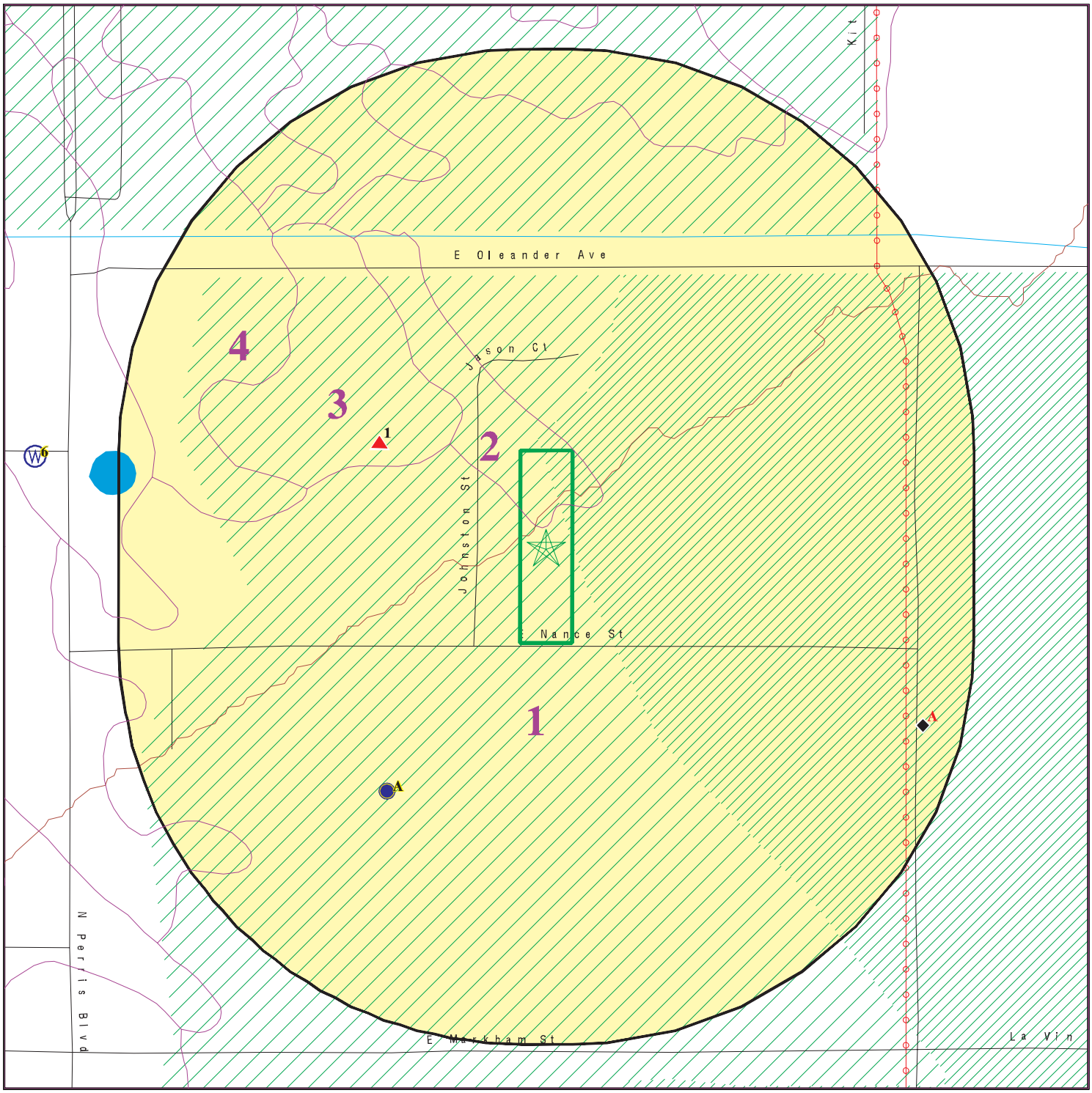


- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Special Flood Hazard Area (1%)
- 0.2% Annual Chance Flood Hazard
- National Wetland Inventory
- State Wetlands
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 220-280 E Nance ADDRESS: 220-280 Nance Perris CA 92571 LAT/LONG: 33.856423 / 117.220891	CLIENT: Hazard Management Consulting CONTACT: Mark Cousineau INQUIRY #: 6362629.2s DATE: February 10, 2021 9:30 am

DETAIL MAP - 6362629.2S



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

Sensitive Receptors

National Priority List Sites

Dept. Defense Sites

0 1/16 1/8 1/4 Miles

Indian Reservations BIA

Power transmission lines

Special Flood Hazard Area (1%)

0.2% Annual Chance Flood Hazard

Areas of Concern

N

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

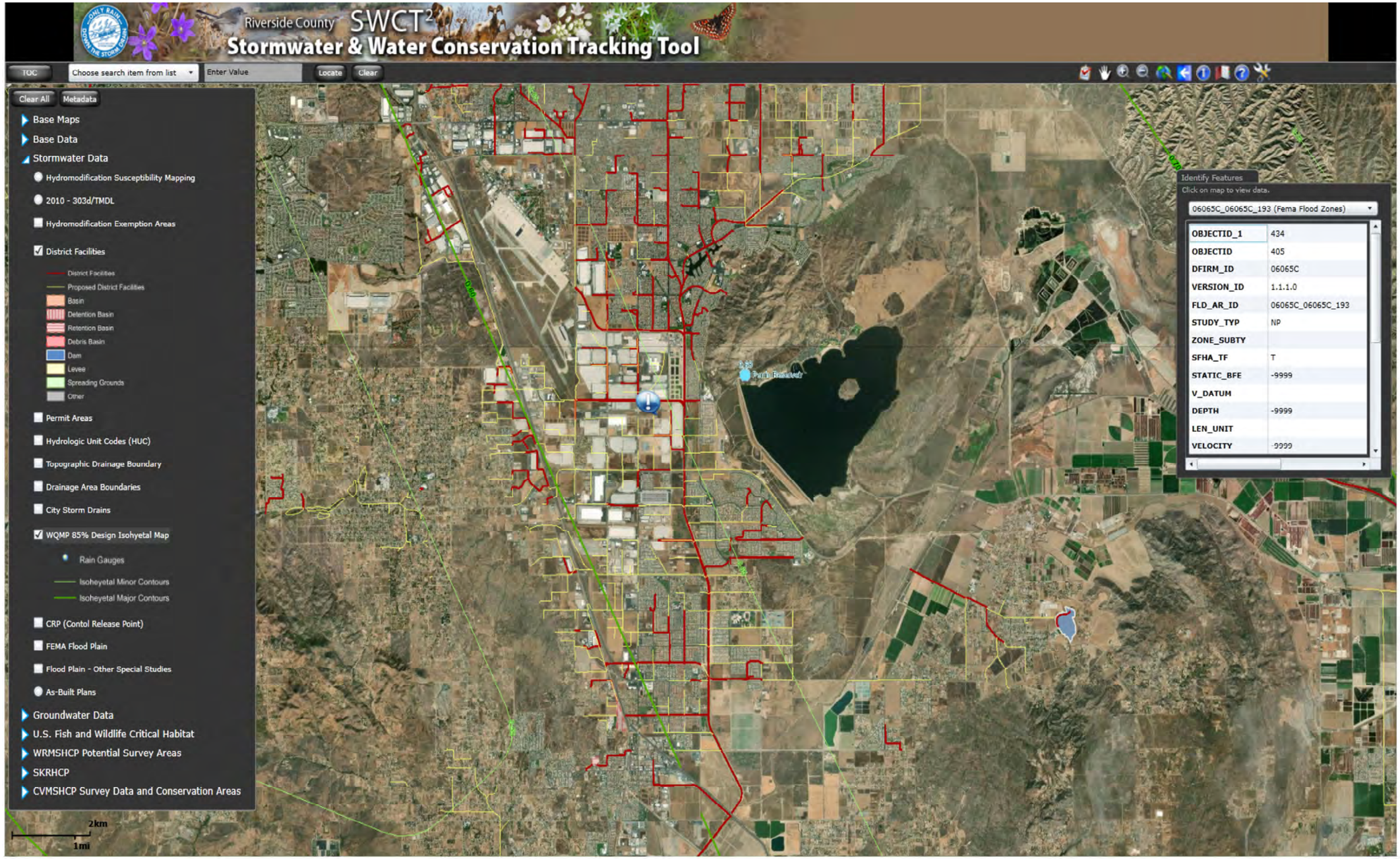
SITE NAME:	220-280 E Nance	CLIENT:	Hazard Management Consulting
ADDRESS:	220-280 Nance Perris CA 92571	CONTACT:	Mark Cousineau
		INQUIRY #:	6362629.2s
LAT/LONG:	33.856423 / 117.220891	DATE:	February 10, 2021 9:33 am

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis (NOT APPLICABLE)

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation


Riverside County SWCT²
Stormwater & Water Conservation Tracking Tool
TOC
Choose search item from list
Enter Value
Locate
Clear
Clear All
Metadata
Base Maps
Base Data
Stormwater Data
Hydromodification Susceptibility Mapping
2010 - 303d/TMDL
Hydromodification Exemption Areas
District Facilities
District Facilities
Proposed District Facilities
Basin
Detention Basin
Retention Basin
Debris Basin
Dam
Levee
Spreading Grounds
Other
Permit Areas
Hydrologic Unit Codes (HUC)
Topographic Drainage Boundary
Drainage Area Boundaries
City Storm Drains
WQMP 85% Design Isohyetal Map
Rain Gauges
Isoheyetal Minor Contours
Isoheyetal Major Contours
CRP (Contol Release Point)
FEMA Flood Plain
Flood Plain - Other Special Studies
As-Built Plans
Groundwater Data
U.S. Fish and Wildlife Critical Habitat
WRMSHCP Potential Survey Areas
SKRHCP
CVMSHCP Survey Data and Conservation Areas
2km
1mi
Identify Features
Click on map to view data.
06065C_06065C_193 (Fema Flood Zones)
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OBJECTID 405
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VERSION_ID 1.1.1.0
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ZONE_SUBTY
SFHA_TF T
STATIC_BFE -9999
V_DATUM
DEPTH -9999
LEN_UNIT
VELOCITY -9999

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	11/29/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Harley Knox Commerce Center - JN3951		

BMP Identification

BMP NAME / ID: Underground Infiltration Gallery (CMP "A") / DMA A

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85} = 0.648 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
DMA A-1	*191664*	*Roofs*	*1*	*0.89*	*170964.3*			
DMA A-2	*4356*	*Ornamental Landscaping*	*0.1*	*0.11*	*481.2*			
	196020	***Total***			**171445.5**	**0.65**	***9258.1***	***9273***

Notes:

Tributary Area = 4.50 acres

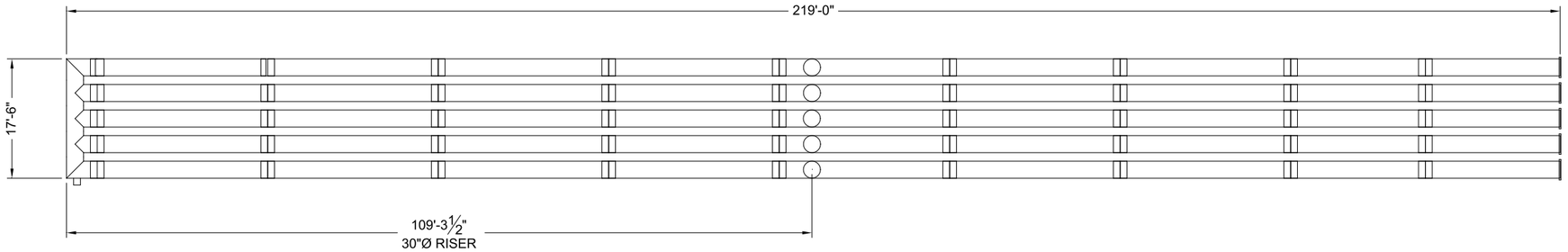
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20 & HS25
- APPROX. LINEAR FOOTAGE = 1,100 lf.

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 9,259 cf.
- PIPE STORAGE VOLUME = 5,400 cf.
- BACKFILL STORAGE VOLUME = 3,874 cf.
- TOTAL STORAGE PROVIDED = 9,273 cf.

PIPE DETAILS
- DIAMETER = 30 IN.
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = Perforated
- BARRELL SPACING = 15 IN.

BACKFILL DETAILS
- WIDTH AT ENDS = 12 IN.
- ABOVE PIPE = 6 IN.
- WIDTH AT SIDES = 12 IN.
- BELOW PIPE = 6 IN.



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO7473 25264 Nance Street (#3951)
DMA A
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
677368	10	5/3/2021
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: D1		

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Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID CMP "A"	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 5/17/2021

Designed by: Luis Prado — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	4.5	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	9,259	ft^3

Maximum Depth

a) Infiltration rate	I =	1.6	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	3.2	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		35	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		35	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	24.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	3.2	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	N/A	:1
b) Proposed basin depth (excluding freeboard)	d_B =	2.9	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	3193	ft^2
d) Proposed Design Surface Area	A_D =	4319	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	46	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =		ft
c) Forebay surface area (minimum)	Area =		ft^2
d) Full height notch-type weir	Width (W) =		in

Notes: Ponding Depth = 2.9 feet = ((0.5' + 0.5') x 0.40) + 2.5' (perf cmp)

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	11/29/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Harley Knox Commerce Center - JN3951		

BMP Identification

BMP NAME / ID: Underground Infiltration Gallery (CMP "B") / DMA B

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.648 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA B-1	*56628*	*Roofs*	*1*	*0.89*	*50512.2*			
DMA B-2	*6534*	*Ornamental Landscaping*	*0.1*	*0.11*	*721.7*			
	63162	***Total***			**51233.9**	**0.65**	***2766.6***	***2785***

Notes:

Tributary Area = 1.45 acres

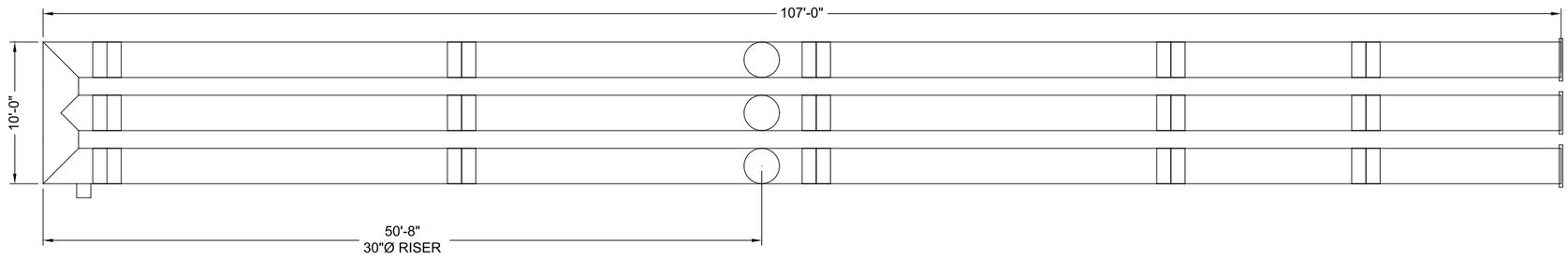
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20 & HS25
- APPROX. LINEAR FOOTAGE = 324 lf.

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 2,767 cf.
- PIPE STORAGE VOLUME = 1,588 cf.
- BACKFILL STORAGE VOLUME = 1,195 cf.
- TOTAL STORAGE PROVIDED = 2,785 cf.

PIPE DETAILS
- DIAMETER = 30 IN.
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = Perforated
- BARRELL SPACING = 15 IN.

BACKFILL DETAILS
- WIDTH AT ENDS = 12 IN.
- ABOVE PIPE = 6 IN.
- WIDTH AT SIDES = 12 IN.
- BELOW PIPE = 6 IN.



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- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
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ASSEMBLY
SCALE: 1" = 10'

C:\EXPORTS\TEMPLATES\CMP_V5.DWG 10/18/2019 10:02 AM

DATE	REVISION DESCRIPTION	BY

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO7477 25264 Nance Street (#3951)
DMA B
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
677368	20	5/3/2021
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: D1		

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID CMP "B"	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 5/17/2021

Designed by: Luis Prado — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	1.45	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,767	ft^3

Maximum Depth

a) Infiltration rate	I =	1.6	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	3.2	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		35	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		35	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	24.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	3.2	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	N/A	:1
b) Proposed basin depth (excluding freeboard)	d_B =	2.9	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	954	ft^2
d) Proposed Design Surface Area	A_D =	1314	ft^2

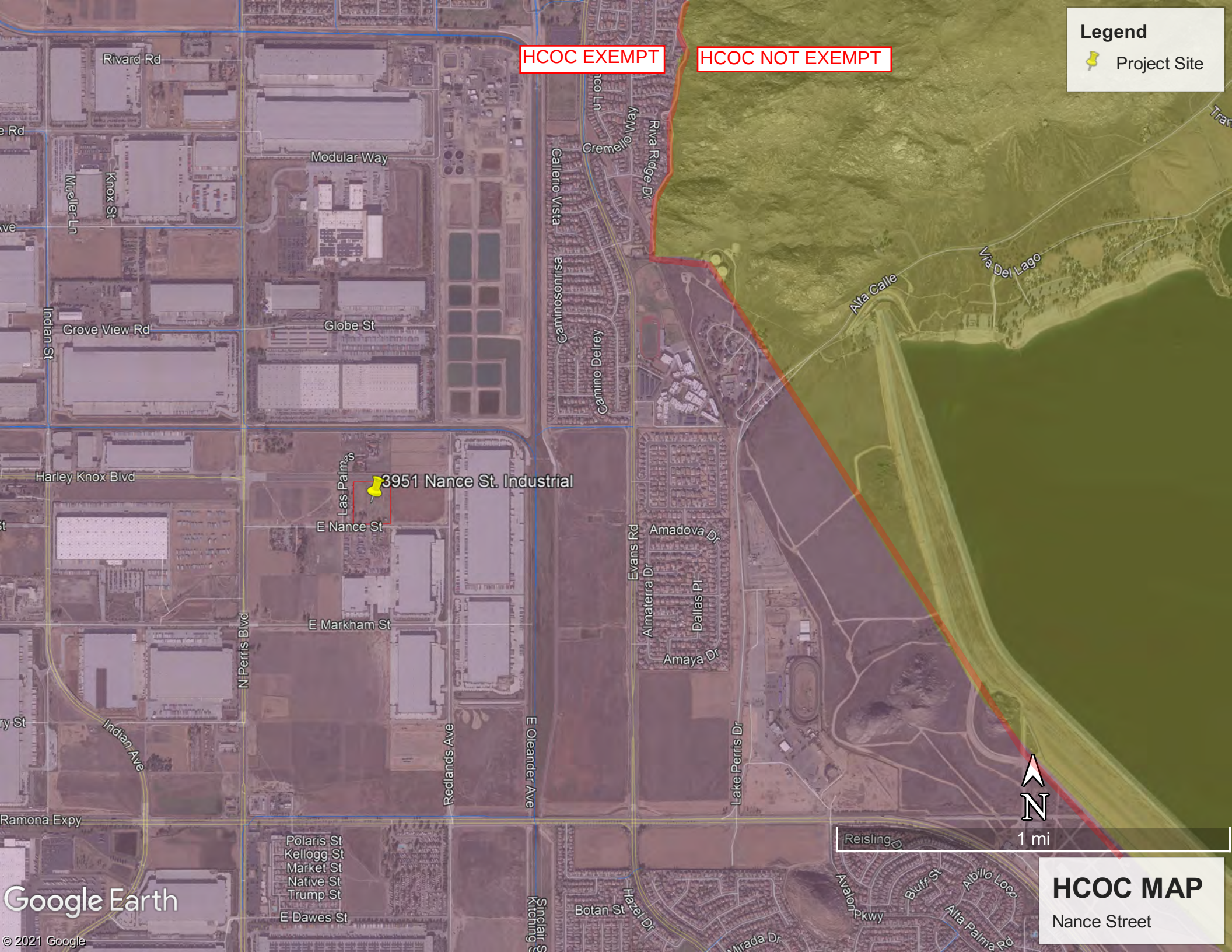
Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	14	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =		ft
c) Forebay surface area (minimum)	Area =		ft^2
d) Full height notch-type weir	Width (W) =		in

Notes: Ponding Depth = 2.9 feet = ((0.5' + 0.5') x 0.40) + 2.5' (perf cmp)

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern


HCOC EXEMPT
HCOC NOT EXEMPT
Legend
Project Site
3951 Nance St. Industrial
Rivard Rd
Modular Way
Mueller Ln
Knox St
Indian St
Grove View Rd
Globe St
Harley Knox Blvd
Las Palmas
E Nance St
E Markham St
N Perris Blvd
Indian Ave
Ramona Expy
Redlands Ave
E Oleander Ave
Polaris St
Kellogg St
Market St
Native St
Trump St
E Dawes St
Sinclair St
Kitching St
Botan St
Hazel Dr
Callerio Vista
Cremello Way
Riva Ridge Dr
Camino Delrey
Evans Rd
Amadova Dr
Almaterra Dr
Dallas Pl
Amaya Dr
Lake Perris Dr
Alta Calle
Via Del Lago
Reisling Dr
Avalon Pkwy
Bluff St
Albillo Loop
Alta Palma Rd
Mirada Dr
N
1 mi
Google Earth
© 2021 Google
HCOC MAP
Nance Street

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets**	☒ **Locations of inlets.**	☒ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☒ **Maintain and periodically repaint or replace inlet markings.** ☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☒ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☒ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☒ B. **Interior floor drains and elevator shaft sump pumps**		☒ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☒ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ D1. **Need for future indoor & structural pest control**		❑ **Note building design features that discourage entry of pests.**	❑ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	❑ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☒ **Show self-retaining landscape areas, if any.** ❑ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ❑ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☒ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	❑ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
❑ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☒ G. **Refuse areas**	☒ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☒ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ❑ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☒ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☒ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☒ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ H. **Industrial processes.**	☐ **Show process area.**	☒ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	☒ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑**Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ M. **Loading Docks**	☒ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		☒ **Move loaded and unloaded items indoors as soon as possible.** ☒ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ N. **Fire Sprinkler Test Water**		❑ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	❑ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ❑ **Boiler drain lines** ❑ **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ❑ **Roofing, gutters, and trim.** ❑ **Other sources**		❑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ❑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ❑ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ❑ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ❑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ P. **Plazas, sidewalks, and parking lots.**			☒ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Operation and Maintenance Plan

Project Title: Perris Harley Industrial Building 1

Original Date Prepared: December 1, 2021

Revision Date(s): _____

Revision Date(s): _____

Revision Date(s): _____

Revision Date(s): _____

Contact Information:

Prepared for:
Commercial Realty Advisors, Inc.
9327 Fairway View Place, #306
Rancho Cucamonga, CA 91730
Phone: (909) 484-9800
Contact: TBD

Prepared by:
Thienes Engineering, Inc.
14349 Firestone Boulevard
La Mirada, CA 90638
(714) 521-4811
Contact: Luis Prado (luisp@thieneseng.com)
Job No. 3858

Table of Contents

List of Appendices

I. Inspection and Maintenance Log

Date	Observations/Actions	Inspector

Additional inspection and maintenance logs to be included in Appendix 1 of this O&M Plan.

II. Updates, Revisions, and Errata

Revision Number	Date	Brief Description of Update/Revision/Errata, include section and page number	Prepared and Approved By

Additional updates, revisions, and errata to be include in Appendix 2 of this O&M Plan.

III. Introduction

Project Description:

The project site encompasses approximately 12.90 acres. Proposed improvements to the site include a light industrial warehouse (Building 1) of approximately 308,481 square feet utilized for the transfer and storage of finished goods. There will be a truck yard south of the building. Vehicle parking lots will be on the west, east and south sides of the building. Landscaping will be adjacent to the streets and scattered throughout the site. An underground 18" CMP system will be proposed to retain a minimum of 24,633 cu-ft of runoff produced by the 85th percentile storm rainfall depth. An infiltration study is pending in order to support infiltration type BMPs. In addition, catch basin and roof drain filters will be provided in order to pre-treat runoff prior to entering the underground CMP system.

Existing Site:

Most of the project is vacant (consisting of dry grass and scrub that appears to be regularly disked and various random weeds) with the exception of residential structures located closer to the easterly property line. The site surface is relatively flat, sloping from north to south onto Nance Street.

Hydrology:

Runoff from the northerly portion of the building roof will drain into a proposed storm drain via roof drains. This proposed storm drain will route runoff southerly around the building and connect to a proposed public storm drain in Nance Street. Before discharging offsite, the proposed storm drain will also pick up flows from the rest of the building, the westerly and easterly vehicle parking lots and the southerly truck yard. The proposed public storm drain in Nance Street will ultimately discharge into the existing public storm drain in Markham Street approximately 1,300 feet south of the project.

The proposed northerly landscape fronting Harley Knox Boulevard (0.55 acres total) will surface drain offsite.

IV. Responsibility for Maintenance

IV.A General

Funding will be provided by the owner:

Commercial Realty Advisors, Inc.
9327 Fairway View Place, #306
Rancho Cucamonga, CA 91730
Phone: (909) 484-9800
Contact: TBD

A copy of the Covenant Agreement will be attached in Appendix 3 of this O&M Plan.

IV.B Staff Training Program

Staff training records and descriptions will be inserted in Appendix 4 of this O&M Plan.

IV.C Records

Maintenance records are to be inserted chronologically in Appendix 1 of this O&M Plan.

IV.D Safety

All maintenance procedures shall comply with the latest OSHA standards.

			Maintenance Responsibility					Funding Mechanism for Maintenance			Maintenance Costs	
BMP	Used	Not Used	Owner	City	County	Flood District	Caltrans	Owner	Developer	Public	1-yr ($)	2-yr ($)
Hydroseeding & Mulching		X										
Landscape Private	X		X					X			TBD	TBD
Landscape Public	X			X						X	TBD	TBD
Lawns		X										
Impervious permanent cover (concrete/asphalt) Private	X		X					X			TBD	TBD
Impervious permanent cover (concrete/asphalt) Public	X			X						X	TBD	TBD
Pervious permanent cover (gravel)		X										
Down drains	X		X					X			TBD	TBD
Ribbon Gutter Public	X	X										
Ribbon Gutter Private	X		X					X			*	*
Curb & gutter Public	X			X						X	**	**
Curb & gutter Private	X		X					X			*	*
Storm Drain Public		X								X		
Storm Drain Private	X		X					X			TBD	TBD
Detention Basin		X										
Educational Materials	X		X					X			TBD	TBD
Vehicle Wash Area		X										
Underground Infiltration Gallery	X		X					X			TBD	TBD
Sump Pump	X		X								TBD	TBD
Drain Inserts	X		X								TBD	TBD

*This value is included under impervious permanent cover for private use.
**This value in included under impervious permanent cover for public use.

V. Summary of Drainage Management Areas and Stormwater BMPs

V.A Drainage Areas

See Appendix 5 of this O&M Plan for WQMP site map.

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	Area (Acres)	DMA Type
A-1	Roofs/Conc/Asphalt	511,830	11.75	Type D
A-2	Ornamental Landscaping	26,136	0.60	Type D
B-2	Ornamental Landscaping	23,958	0.55	Type A

Geo-location of the BMPs using latitude and longitude coordinates

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	Latitude	Longitude
A	On-site storm drain inlets	WQMP Site Map	---	---
B	Interior floor drains and elevator shaft sump pumps	N/A	---	---
D2	Landscape / Outdoor Pesticide Use	On-Site Landscape Improvement Plans	---	---
G	Refuse Areas	WQMP Site Map	---	---
H	Industrial processes	WQMP Site Map	---	---
M	Loading Docks	WQMP Site Map	---	---
P	Plazas, sidewalks, and parking lots	WQMP Site Map	---	---
CMP "A"	Underground Infiltration Gallery	WQMP Site Map	33.855784	-117.222128

V.B Structural Post-Construction BMPs

See Appendix 5 of this O&M Plan for WQMP site map.

Additional BMP details are available in Appendix 10 of the WQMP.

V.C Self-Retaining Areas or Other

Landscaped areas in DMA B-2 are considered self-treating areas.

VI. Stormwater BMP Design Documentation

VI.A "As-Built" Drawings of each Stormwater BMP

See Appendix 6 of this O&M Plan for "as-built" drawings.

VI.B Manufacturer's Data, Manuals, and Maintenance Requirements

Not applicable, there are no manufactured stormwater BMPs.

VI.C Specific Operation and Maintenance Concerns and Troubleshooting

Not applicable.

VII. Maintenance Schedule or Matrix

VII.A Maintenance Schedule

Schedule (Underground Infiltration Gallery)	Inspection and Maintenance Activity (Underground Infiltration Gallery)
Semi-annually (October 1st and February 1st) through maintenance service contract with the vendor or equally qualified contractor.	The manholes shall be inspected semi-annually (October 1st and February 1st) and maintained upon sediment reaching 3-inches in depth. The rows shall be inspected and maintained by a qualified technician and he/she will properly dispose of all wastes. Manholes are installed in order to inspect and maintain the system. It is installed per OSHA codes to ensure operator and inspector safety.

VII.B Service Agreement Information

See Appendix 8 of this O&M Plan for service agreement information with any contractors regarding the O&M of BMPs at the site, if any.

Appendix 1: Inspection and Maintenance Logs

Insert Additional Inspection or Maintenance Logs Here

Date	Observations/Actions	Inspector

Appendix 2: Updates, Revisions, and Errata

Insert Additional Updates, Revisions, and Errata Logs Here

Revision Number	Date	Brief Description of Update/Revision/Errata, include section and page number	Prepared and Approved By

Appendix 3: Maintenance Mechanism

Copy of Covenant Agreement
Establishing Notification Process And Responsibility
For Water Quality Management Plan Implementation And Maintenance

Notification Process and Responsibility

1. **Name:** _____
   Title: _____
   Phone No.: _____

   WQMP Responsibilities, Duties, and Activities:
   (1) Routine inspections to evaluate BMP effectiveness.
   (2) Identifying when BMPs require maintenance.
   (3) Working with qualified contractors to maintain the BMP.
   (4) Recordkeeping of inspections and maintenance activities.

2. **Name:** _____
   Title: _____
   Phone No.: _____

   WQMP Responsibilities, Duties, and Activities:
   (1) Cleaning, repairing, servicing, and maintenance of BMP.

3. **Name:** _____
   Title: _____
   Phone No.: _____

   WQMP Responsibilities, Duties, and Activities:
   (1) In event of failure, and with City Engineer's authorization, modify or replace with an upgraded BMP to prevent future failure.
   (2) Notify successors of BMPs and maintenance requirements.

Covenant and Agreement

Water Quality Management Plan and Urban Runoff BMP Transfer, Access and Maintenance Agreement (adapted from documents from Ventura County Stormwater Management Program)

Recorded at the request of:

City of Perris

After recording, return to:

City of Perris

City Clerk _____

Water Quality Management Plan and Urban Runoff BMP
Transfer, Access and Maintenance Agreement

OWNER: Commercial Realty Advisors, Inc.

PROPERTY LOCATION: Southeast corner of Harley Knox Boulevard and Nance Street, Perris, CA 92571

APNS: 302-100-011, -019 and -020

THIS AGREEMENT is made and entered into in

Perris , California, this _____ day of _____, 2021

by and between: Commercial Realty Advisors, Inc., herein after referred to as "Owner" and the City of Perris, a Municipal corporation, located in the County of Riverside, State of California hereinafter referred to as "CITY".

WHEREAS, the Owner owns real property ("Property") in the City of Perris, County of Riverside, 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;

WHEREAS, at the time of initial approval of the development project known as Perris Harley Industrial Building 1 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;

WHEREAS, the Owner 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;

WHEREAS, said WQMP has been certified by the Owner and reviewed and approved by the City;
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 in accordance with the terms of this Agreement;

WHEREAS, the Owner 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's 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 hereby provides the City of City'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 City's Director of Public Works 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's expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

2. Owner 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 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 shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination.

3. In the event Owner, 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 or Owner' successors or assigns, including administrative costs, attorney's 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.

4. The City may require the owner to post security in form and for a time period satisfactory to the city to guarantee the performance of the obligations state herein. Should the Owner fail to perform the obligations under the Agreement, the City may, in the case of a cash bond, act for the Owner using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement. As an additional remedy, the Director may withdraw any previous urban Runoff-related approval with respect to the property on which BMPs have been installed and/or implemented until such time as Owner repays to City its reasonable costs incurred in accordance with paragraph 3 above.

5. This agreement shall be recorded in the Office of the Recorder of Riverside County, California, at the expense of the Owner 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.

6. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, then the Owner 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.

7. **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.**

8. **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 its 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 shall provide such notice prior to such successor obtaining an interest in or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.**

9. **Time is of the essence in the performance of this Agreement.**

10. **Any notice to a party required or called for in this agreement shall be served in person, or be 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 THE CITY:

City Manager
City of Perris
101 North D Street
Perris, CA 92570

IF TO OWNER:

TBD
Commercial Realty Advisors, Inc.
9327 Fairway View Place, #306
Rancho Cucamonga, CA 91730

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

APPROVED AS TO FORM:

_____
City Attorney

_____
City of Perris

Eric Dunn
Name
City Attorney
Title

OWNER:

Commercial Realty Advisors, Inc.
By:

By: _____
Name: _____
Title: _____

OWNER:

N/A
Name
N/A
Title

ATTEST:

_____
City Clerk **Date**

NOTARIES ON FOLLOWING PAGE

_____
Richard Belmudez
City Manager of City of Perris

EXHBIT A
LEGAL DESCRIPTION

EXHIBIT B
MAP/ILLISTRATION

Appendix 4: Training Records

Insert Training Records with Brief Discussion Here

Source Control and Treatment Control Best Management Practices (BMPs) Employee Training

Describe the employee training program for your facility below. The program should, at a minimum, address spill prevention and response, good housekeeping and material management practices.

Training Topics	Description of Training	Schedule for Training	Participants

Appendix 5: Site Plan and Details

WQMP Site Map and BMP Details

Appendix 6: “As-Built” Drawings

Insert “As-Builts” Here When Available

Appendix 7: Manufacturer Information

Brochures, Manuals, and Maintenance Requirements

Appendix 8: Service Agreement Information

Insert Contractor Information (if any)

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information


WHEN IT RAINS
IT DRAINS
After the Storm
For more information contact:
or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps
EPA United States Environmental Protection Agency
EPA 833-B-03-002
January 2003
Internet Address (URL) • HTTP://www.epa.gov
Recycled/Recyclable • Printed With Vegetable
Oil Based Inks on 100% Postconsumer,
Process Chlorine Free Recycled Paper
THE YEAR OF CLEAN WATER
Celebration of Recommitment
A Citizen's Guide to
Understanding Stormwater
WHEN IT RAINS
IT DRAINS

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.

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.

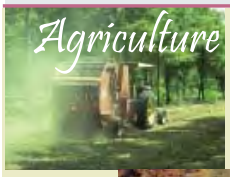
- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming 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.

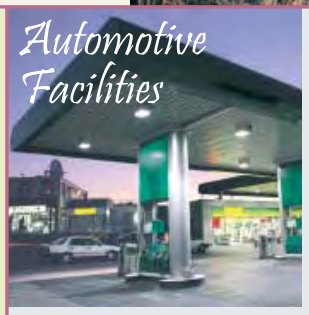
Agriculture



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.

For Information:

For more information on the General Industrial Storm Water Permit contact:

State Water Resources Control Board (SWRCB)
(916) 657-1146 or www.swrcb.ca.gov/ or, at your Regional Water Quality Control Board (RWQCB).

Santa Ana Region (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
(909) 782-4130

San Diego Region (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952

Colorado River Basin Region (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

SPILL RESPONSE AGENCY:
HAZ-MAT: (909) 358-5055
HAZARDOUS WASTE DISPOSAL: (909) 358-5055
RECYCLING INFORMATION: 1-800-366-SAVE
TO REPORT ILLEGAL DUMPING OR A CLOGGED STORM DRAIN: 1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, call: (909) 955-1111.

StormWater CleanWater
PROTECTION PROGRAM

Riverside County gratefully acknowledges the State Water Quality Control Board and the American Public Works Association, Storm Water Quality Task Force for the information provided in this brochure.

DID YOU KNOW . . .

YOUR FACILITY MAY NEED A STORM WATER PERMIT?

Many industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit

FIND OUT IF YOUR FACILITY MUST OBTAIN A PERMIT

StormWater Pollution . . . What you should know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

In recent years, awareness of the need to protect water quality has increased. As a result, federal, state, and local programs have been established to reduce polluted stormwater discharges to our waterways. The emphasis of these programs is to prevent stormwater pollution since it's much easier, and less costly, than cleaning up "after the fact."

National Pollutant Discharge Elimination System (NPDES)

In 1987, the Federal Clean Water Act was amended to establish a framework for regulating industrial stormwater discharges under the NPDES permit program. In California, NPDES permits are issued by the State Water Resources Control Board (SWRCB) and the nine (9) Regional Water Quality Control Boards (RWQCB). In general, certain industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit if the type of facilities or operations falls into one of the several categories described in this brochure.

How Do I Know If I Need A Permit?

Following are ***general descriptions*** of the industry categories types that are regulated by the Industrial Activities Storm Water General Permit. Contact your local Region Water Quality Control Board to determine if your facility/operation requires coverage under the Permit.

➜ Facilities such as cement manufacturing; feedlots; fertilizer manufacturing; petroleum refining; phosphate manufacturing; steam electric power generation; coal mining; mineral mining and processing; ore mining and dressing; and asphalt emulsion;

➜ Facilities classified as lumber and wood products (except wood kitchen cabinets); pulp, paper, and paperboard mills; chemical producers (except some pharmaceutical and biological products); petroleum and coal products; leather production and products; stone, clay and glass products; primary metal industries; fabricated structural metal; ship and boat building and repairing;

➜ Active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations;

➜ Hazardous waste treatment, storage, or disposal facilities;

➜ Landfills, land application sites and open dumps that receive or have received any industrial waste; unless there is a new overlying land use such as a golf course, park, etc., and there is no discharge associated with the landfill;

➜ Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards;

➜ Steam electric power generating facilities, facilities that generate steam for electric power by combustion;

➜ Transportation facilities that have vehicle maintenance shops, fueling facilities, equipment cleaning operations, or airport deicing operations. This includes school bus maintenance facilities operated by a school district;

➜ Sewage treatment facilities;

➜ Facilities that have areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water.

How do I obtain coverage under the Industrial Activities Storm Water General Permit?

Obtain a permit application package from your local Regional Water Quality Control Board listed on the back of this brochure or the State Water Resources Control Board (SWRCB). Submit a completed Notice of Intent (NOI) form, site map and the appropriate fee ($250 or $500) to the SWRCB. Facilities must submit an NOI thirty (30) days prior to beginning operation. Once you submit the NOI, the State Board will send you a letter acknowledging receipt of your NOI and will assign your facility a waste discharge identification number (WDID No.). You will also receive an annual fee billing. These billings should roughly coincide with the date the State Board processed your original NOI submittal.

What are the requirements of the Industrial Activities Storm Water General Permit?

The basic requirements of the Permit are:

1. The facility must eliminate any non-stormwater discharges or obtain a separate permit for such discharges.

2. The facility must develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must identify sources of pollutants that may be exposed to stormwater. Once the sources of pollutants have been identified, the facility operator must develop and implement Best Management Practices (BMPs) to minimize or prevent polluted runoff.

   Guidance in preparing a SWPPP is available from a document prepared by the California Storm Water Quality Task Force called the California Storm Water Best Management Practice Handbook.

3. The facility must develop and implement a Monitoring Program that includes conducting visual observations and collecting samples of the facility's storm water discharges associated with industrial activity. The General Permit requires that the analysis be conducted by a laboratory that is certified by the State of California.

4. The facility must submit to the Regional Board, every July 1, an annual report that includes the results of its monitoring program.

A Non-Storm Water Discharge is... *any discharge to a storm drain system that is not composed entirely of storm water. The following non-storm water discharges are authorized by the General Permit: fire hydrant flushing; potable water sources, including potable water related to the operation, maintenance, or testing of potable water systems; drinking fountain water; atmospheric condensates including refrigeration, air conditioning, and compressor condensate; irrigation drainage; landscape watering; springs; non-contaminated ground water; foundation or footing drainage; and sea water infiltration where the sea waters are discharged back into the sea water source.*

A BMP is . . . *a technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge. BMPs may include simple, non-structural methods such as good housekeeping, staff training and preventive maintenance. Additionally, BMPs may include structural modifications such as the installation of berms, canopies or treatment control (e.g. setting basins, oil/water separators, etc.)*

WARNING*: There are significant penalties for non-compliance: a minimum fine of $5,000 for failing to obtain permit coverage, and, up to $10,000 per day, per violation plus $10 per gallon of discharge in excess of 1,000 gallons.*

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities

Riverside County Stormwater Program Members

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

City of Cathedral City
(760) 770-0340

City of Coachella
(760) 398-3502

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 Jurupa Valley
(951) 332-6464

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) 826-5311

City of San Jacinto
(951) 487-7330

City of Temecula
(951) 694-6444

City of Wildomar
(951) 677-7751

Coachella Valley Water District
(760) 398-2651

County of Riverside
(951) 955-1000

Riverside County Flood Control District
(951) 955-1200

YOU can prevent Stormwater Pollution following these practices...

Industrial and Commercial Facilities

The Riverside County Stormwater Program has identified a number of Best Management Practices (BMPs) for Industrial and Commercial Facilities. These BMPs control and reduce stormwater pollutants from reaching our storm drain system and ultimately our local water bodies. City and County ordinances require businesses to use these BMPs to protect our water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.

Prohibited Discharges

Discontinue all non-stormwater discharges to the storm drain system. It is *prohibited* to discharge any chemicals, paints, debris, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage BMPs

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, at all times when not in use.
- Sweep outdoor areas instead of using a hose or pressure washer.
- Move all process operations including vehicle/equipment maintenance inside of the building or under a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to local standards and discharged to a sanitary sewer or take them to a commercial car wash.

Spills and Clean Up BMPs

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep up the area.
- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials or sweep followed by proper disposal of materials.
- Always have a spill kit available near chemical loading dock doors and vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the local Fire Department.
- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator as listed on the back of this pamphlet.

- Report hazardous materials spills to 951-358-5055 or call after hours to 951-782-2973 or, if an emergency, call the Fire Department's Haz Mat Team at 911.

Plastic Manufacturing Facilities BMPs

AB 258 requires plastic product manufacturers to use BMPs, such as safe storage and clean-up procedures to prevent plastic pellets (nurdles) from entering the waterway. The plastic pellets are released into the environment during transporting, packaging and processing and migrate to waterways through the storm drain system. AB 258 will help protect fish and wildlife from the hazards of plastic pollution.

Training BMPs

As prescribed by your City and County Stormwater Ordinance(s), train employees in spill procedures and prohibit non-stormwater discharges to the storm drain system. Applicable BMP examples can be found at www.cabmphandbooks.com.

Permitting

Stormwater discharges associated with specific categories for industrial facilities are regulated by the State Water Resources Control Board through an Industrial Stormwater General Permit. A copy of this General Permit and application forms are available at: www.waterboards.ca.gov, select stormwater then the industrial quick link.

To report illegal dumping or for more information on stormwater pollution prevention call: 1-800-506-2555 or e-mail us at: fcnpdes@rcflood.org.

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

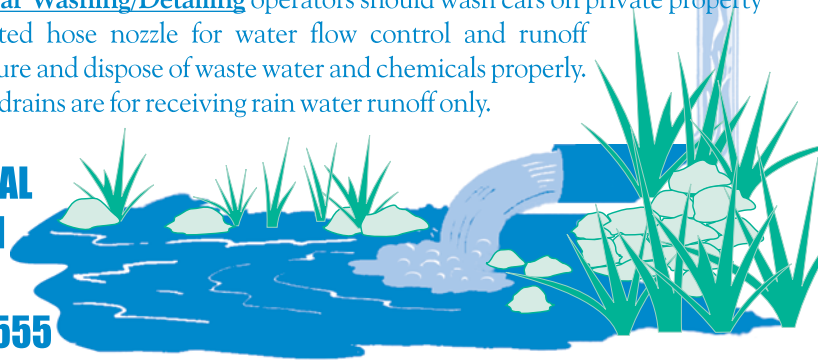
Do you know where street flows actually go?

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.

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

SAMPLE STENCIL

PER BMP SD-13

3.1 INFILTRATION BASIN

Type of BMP	LID - Infiltration
Treatment Mechanisms	Infiltration, Evapotranspiration (when vegetated), Evaporation, and Sedimentation
Maximum Treatment Area	50 acres
Other Names	Bioinfiltration Basin

Description

An Infiltration Basin is a flat earthen basin designed to capture the design capture volume, V_{BMP}. The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72 hour drawdown period. Flows exceeding V_{BMP} must discharge to a downstream conveyance system. Trash and sediment accumulate within the forebay as stormwater passes into the basin. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.

Figure 1 – Infiltration Basin

See Appendix A, and Appendix C, Section 1 of *Basin Guidelines*, for additional requirements.

Siting Considerations

The use of infiltration basins may be restricted by concerns over ground water contamination, soil permeability, and clogging at the site. See the applicable WQMP for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin's long term performance. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low water use plant species.

In addition, these basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur
- Sites with very low soil infiltration rates
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect ground water quality
- Sites with unstabilized soil or construction activity upstream
- On steeply sloping terrain
- Infiltration basins located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions

Setbacks

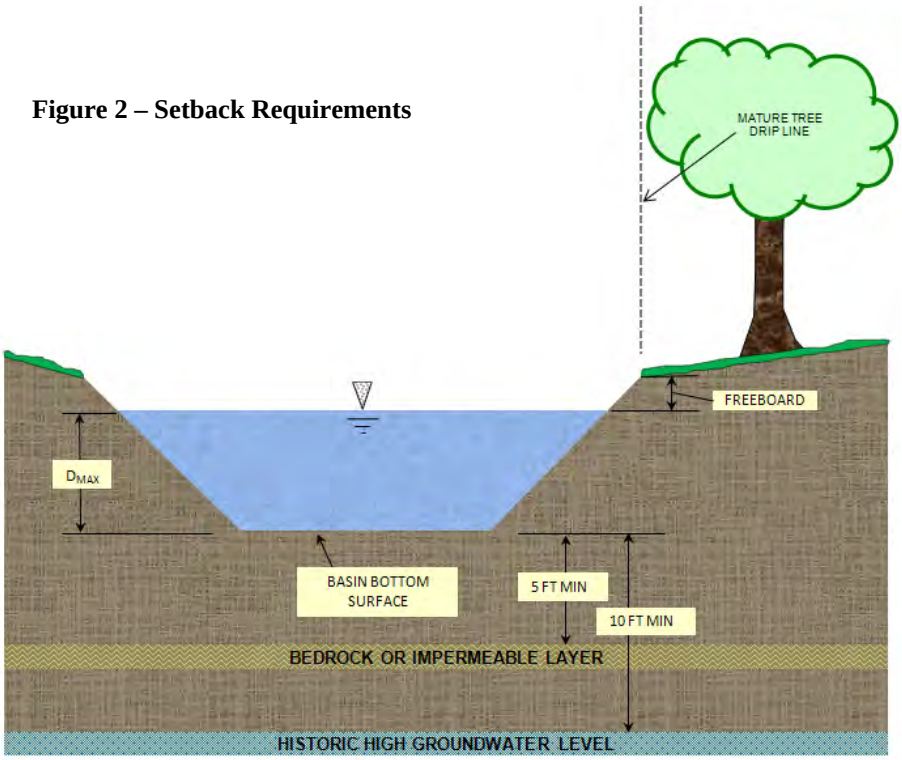
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process since they can affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration basin infeasible. In that instance, another BMP must be selected.

Infiltration basins typically must be set back:

- 10 feet from the historic high groundwater (measured vertically from the bottom of the basin, as shown in Figure 2)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the basin, as shown in Figure 2)
- From all existing mature tree drip lines as indicated in Figure 2 (to protect their root structure)
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report. All other setbacks shall be in accordance with applicable standards of the District's *Basin Guidelines* (Appendix C).

Figure 2 – Setback Requirements



Forebay

A concrete forebay shall be provided to reduce sediment clogging and to reduce erosion. The forebay shall have a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall / berm. Full height notch-type weir(s), offset from the line of flow from the basin inlet to prevent short circuiting, shall be used to outlet the forebay. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

Overflow

Flows exceeding V_{BMP} must discharge to an acceptable downstream conveyance system. Where an adequate outlet is present, an overflow structure may be used. Where an embankment is present, an emergency spillway may be used instead. Overflows must be placed just above the design water surface for V_{BMP} and be near the outlet of the system. The overflow structure shall be similar to the District's Standard Drawing CB 110. Additional details may be found in the District's *Basin Guidelines* (Appendix C).

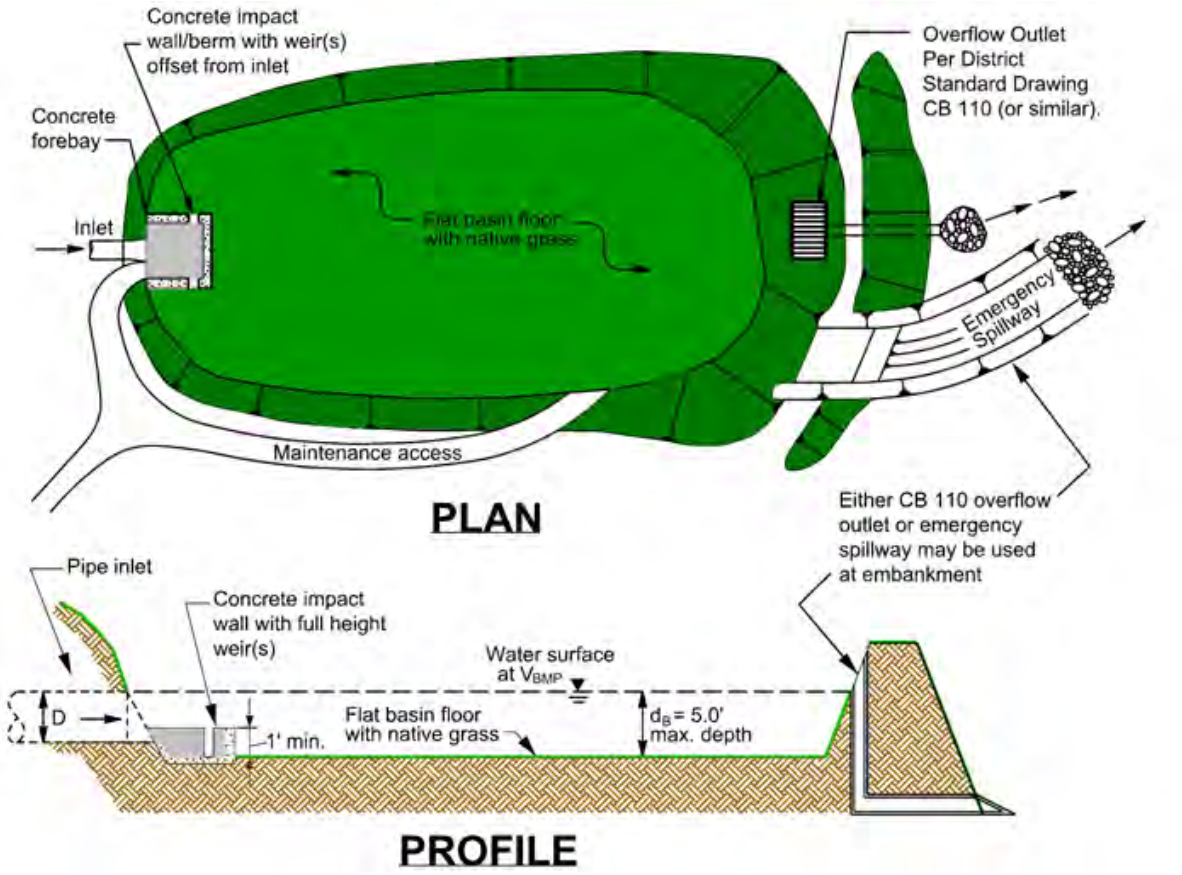


Figure 3 – Infiltration Basin

Landscaping Requirements

Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The basin surface and side slopes shall be planted with native grasses. Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with County of Riverside Ordinance 859 and the District's *Basin Guidelines* (Appendix C), or other guidelines issued by the Engineering Authority.

Maintenance

Normal maintenance of an infiltration basin includes the maintenance of landscaping, debris and trash removal from the surface of the basin, and tending to problems associated with standing water (vectors, odors, etc.). Significant ponding, especially more than 72 hours after an event, may indicate that the basin surface is no longer providing sufficient infiltration and requires aeration. See the District's *Basin Guidelines* (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.).

Table 1 - Inspection and Maintenance

Schedule	Inspection and Maintenance Activity
Ongoing including just before annual storm seasons and following rainfall events.	• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used, o Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding. o Fertilizers should not be applied within 15 days before, after, or during the rain season. • Remove debris and litter from the entire basin to minimize clogging and improve aesthetics. • Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water. • Check for erosion and sediment laden areas in the basin. Repair as needed. Clean forebay if needed. • Revegetate side slopes where needed.
Annually. If possible, schedule these inspections within 72 hours after a significant rainfall.	• Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element. • Check for erosion, slumping and overgrowth. Repair as needed. • Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation. • Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis[1]. • No water should be present 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed.

1. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Table 2 - Design and Sizing Criteria for Infiltration Basins

Design Parameter	Infiltration Basin
Design Volume	V_{BMP}
Forebay Volume	0.5% V_{BMP}
Drawdown time (maximum)	72 hours
Maximum tributary area	50 acres [2]
Minimum infiltration rate	Must be sufficient to drain the basin within the required Drawdown time over the life of the BMP. The WQMP may include specific requirements for minimum tested infiltration rates.
Maximum Depth	5 feet
Spillway erosion control	Energy dissipators to reduce velocities[1]
Basin Slope	0%
Freeboard (minimum)	1 foot [1]
Historic High Groundwater Setback (max)	10 feet
Bedrock/impermeable layer setback (max)	5 feet
Tree setbacks	Mature tree drip line must not overhang the basin
Set back from wells, tanks or springs	100 feet
Set back from foundations	As recommended in Geotechnical Report

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the District's Basin Guidelines (Appendix C). In addition, information herein may be superseded by other guidelines issued by the co-permittee.

INFILTRATION BASIN SIZING PROCEDURE

1. Find the Design Volume, V_{BMP}.
   a) Enter the Tributary Area, $A_{T.}$
   b) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.
2. Determine the Maximum Depth.
   a) Enter the infiltration rate. The infiltration rate shall be established as described in Appendix A: "Infiltration Testing".
   b) Enter the design Factor of Safety from Table 1 in Appendix A: "Infiltration Testing".
   c) The spreadsheet will determine D_1, the maximum allowable depth of the basin based on the infiltration rate along with the maximum drawdown time (72 hours) and the Factor of Safety.

$$D_1 = [(t) \times (I)] / 12s$$

Where I = site infiltration rate (in/hr)
s = safety factor
t = drawdown time (maximum 72 hours)

d) Enter the depth of freeboard.

e) Enter the depth to the historic high groundwater level measured from the top of the basin.

f) Enter the depth to the top of bedrock or other impermeable layer measured from the finished grade.

g) The spreadsheet will determine D_2, the total basin depth (including freeboard, if used) of the basin, based on restrictions to the depth by groundwater and an impermeable layer.

D_2 = Depth to groundwater – (10 + freeboard) (ft);

or

D_2 = Depth to impermeable layer – (5 + freeboard) (ft)

Whichever is least.

h) The spreadsheet will determine the maximum allowable effective depth of basin, D_{MAX}, based on the smallest value between D_1 and D_2. D_{MAX} is the maximum depth of water only and does not include freeboard. D_{MAX} shall not exceed 5 feet.

3. Basin Geometry

a) Enter the basin side slopes, z (no steeper than 4:1).

b) Enter the proposed basin depth, d_B excluding freeboard.

c) The spreadsheet will determine the minimum required surface area of the basin:

$$A_s = V_{BMP} / d_B$$

Where A_s = minimum area required (ft^2)
V_{BMP} = volume of the infiltration basin (ft^3)
d_B= proposed depth not to exceed maximum allowable depth, D_{MAX} (ft)

d) Enter the proposed bottom surface area. This area shall not be less than the minimum required surface area.

4. Forebay

A concrete forebay with a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall shall be provided. Full-height rectangular weir(s) shall be used to outlet the forebay. The weir(s) must be offset from the line of flow from the basin inlet. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

a) The spreadsheet will determine the minimum required forebay volume based on 0.5% V_{BMP}.

b) Enter the proposed depth of the forebay berm/splashwall (1foot minimum).

c) The spreadsheet will determine the minimum required forebay surface area.

d) Enter the width of rectangular weir to be used (minimum 1.5 inches). Weir width should be established based on a 5 minute drawdown time.

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ENGINEERED SOLUTIONS

Contech® CMP Detention & Infiltration Maintenance Guide

CONTECH®
CMP DETENTION SYSTEMS

Maintenance

Underground storm water detention and retention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. CONTECH recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. CONTECH suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.

Inspection & Maintenance Log Sample Template

_____" Diameter System			Location: Anywhere, USA		
Date	**Depth of Sediment**	**Accumulated Trash**	**Maintenance Performed**	**Maintenance Personnel**	**Comments**
12/01/10	2"	None	Removed Sediment	B. Johnson	Installed
03/01/11	1"	Some	Removed Sediment and Trash	B. Johnson	Swept parking lot
06/01/11	0"	None	None		
09/01/11	0"	Heavy	Removed Trash	S. Riley	
12/01/11	1"	None	Removed Sediment	S. Riley	
04/01/12	0"	None	None	S. Riley	
04/15/01	2	Some	Removed Sediment and Trash	ACE Environmental Services	

CONTECH®
CMP DETENTION SYSTEMS

Support

Drawings and specifications are available at www.ContechES.com.

Site-specific support is available from our engineers.

CONTECH®
ENGINEERED SOLUTIONS
800.338.1122
www.ContechES.com

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122.

Drain Inlet Insert MP-52

General Description

Drain inlet inserts, also known as catch basin, drop inlet or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. There are a multitude of inserts of various shapes and configurations including baffles, baskets, boxes, fabrics, sorbent media, screens, and skimmers. The effectiveness of drain inlet inserts depends on their design, application, loading, and frequency of maintenance to remove accumulated sediment, trash, and debris.

Inspection / Maintenance Considerations

Routine inspection and maintenance is necessary to maintain functionality of drain inlet inserts and to prevent re-suspension and discharge of accumulated pollutants. Maintenance activities vary depending on the type of drain inlet insert being implemented; refer to the manufacturer's recommendations for more information.

Advanced BMPs Covered

Maintenance Concerns

- *Sediment, Trash, and Debris Accumulations*
- *Pollutant Re-suspension and Discharge*

Targeted Constituents*

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

**Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

Inspection Activities	Suggested Frequency
☐ Verify that stormwater enters the unit and does not leak around the perimeter.	After construction.
☐ Inspect for sediment, trash, and debris buildup and proper functioning.	At the beginning of the wet season and after significant storms
Maintenance Activities	**Suggested Frequency**
☐ Remove accumulated sediment, trash, and debris. ☐ Replace sorbent media.	At the beginning of the wet season and as necessary

References

California Department of Transportation. *Treatment BMP Technology Report (CTSW-RT-09-239.06),* April, 2010. http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-09-239-06.pdf.

California Stormwater Quality Association. *Stormwater Best Management Practice Handbook, New Development and Redevelopment,* 2003. https://www.casqa.org/resources/bmp-handbooks/new-development-redevelopment-bmp-handbook.

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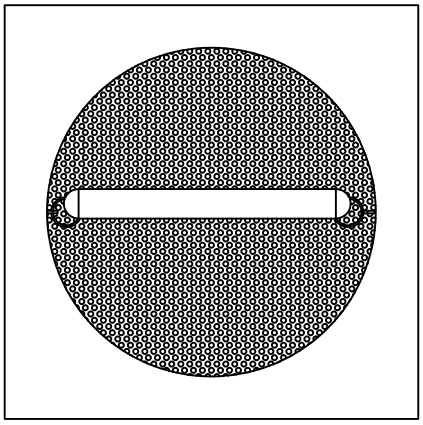
U.S. Environmental Protection Agency, Post-Construction Stormwater Management in New Development and Redevelopment. BMP Fact Sheets. Available at: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=min_measure&min_measure_id=5.

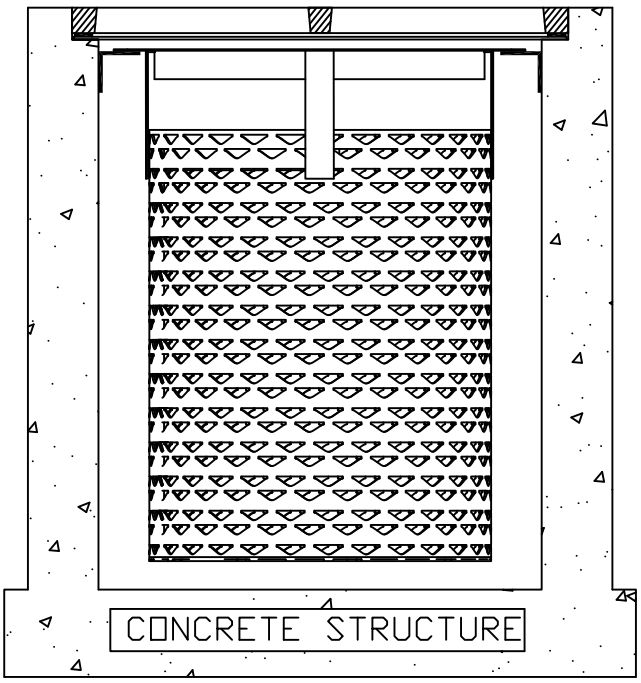
Ventura Countywide Stormwater Quality Management Program. *Technical Guidance Manual for Stormwater Quality Control Measures,* May, 2010. http://www.vcstormwater.org/documents/workproducts/technicalguidancemanual/2010revisions/Ventura%20Technical%20Guidance%20Document_5-6-10.pdf.

BIO CLEAN FULL CAPTURE FILTER

FOR USE IN GRATE INLETS

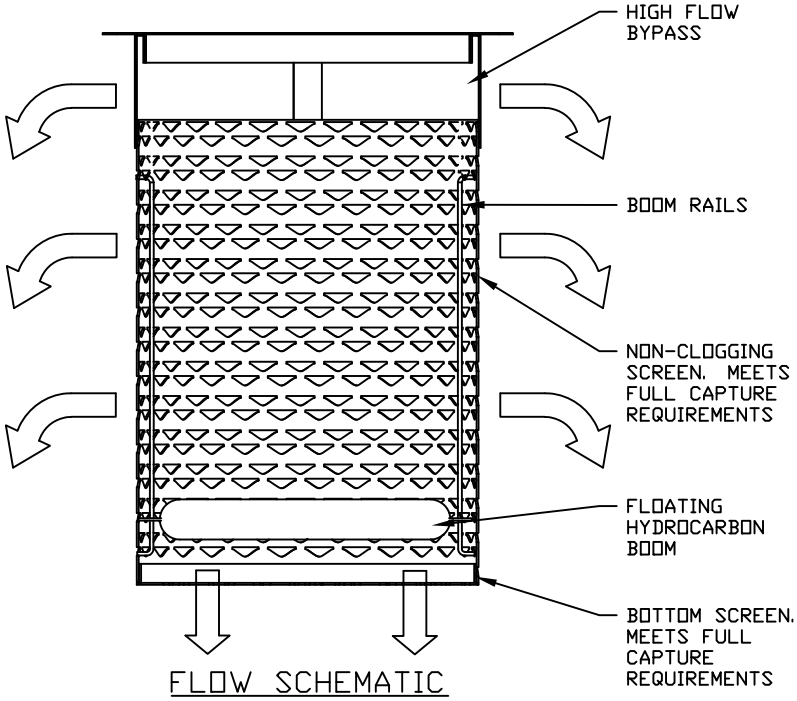


TOP VIEW



NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDIING DEPTH OF 6 INCHES.
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.



FLOW SCHEMATIC

MODEL #	TREATMENT FLOW (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BIO-GRATE-FULL 12-12-12	1.55	1.55	0.27
BIO-GRATE-FULL 18-18-18	4.32	3.68	1.05
BIO-GRATE-FULL 24-24-24	7.67	4.83	2.41
BIO-GRATE-FULL 30-30-24	12.97	6.21	3.98
BIO-GRATE-FULL 25-38-24	13.53	6.59	4.16
BIO-GRATE-FULL 36-36-24	19.64	7.60	5.94
BIO-GRATE-FULL 48-48-18	25.59	10.13	7.92

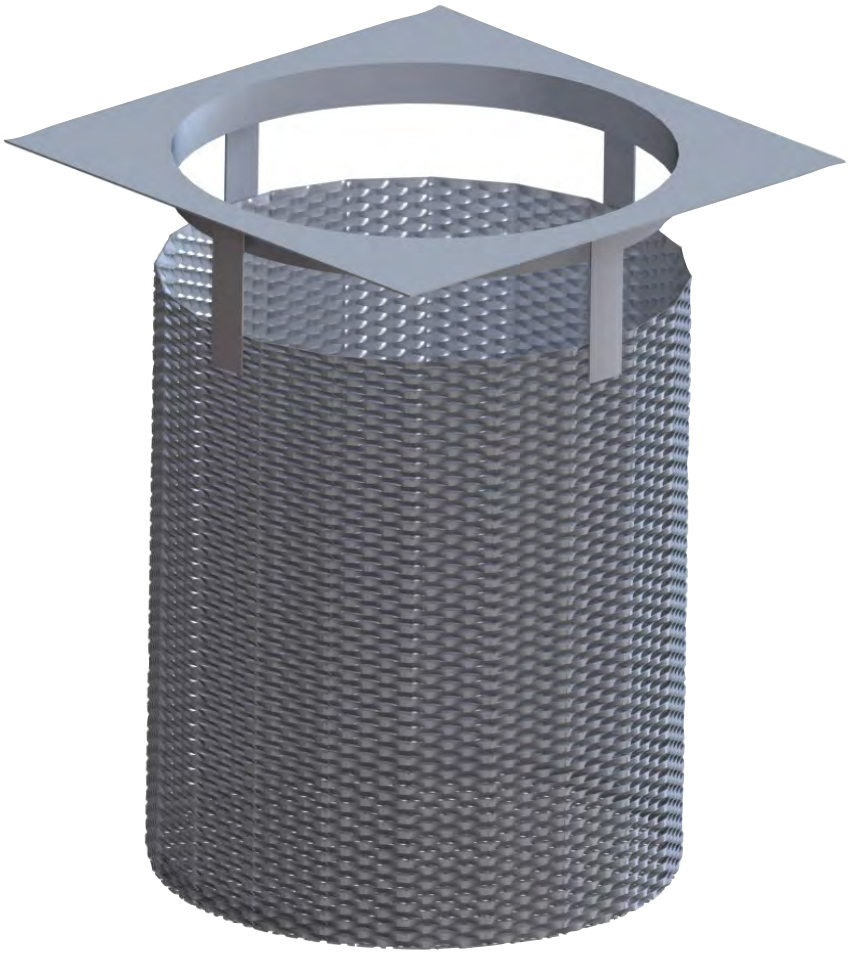
DRAWING: BIO CLEAN GRATE INLET FILTER DETAILS		MEETS FULL CAPTURE REQUIREMENTS	
TYPICAL MODEL DETAIL			
WARRANTY: 8 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640 FAX: 760-433-3176		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 10/12/17	SCALE: SF = 15	REVISIONS:	DATE:
DRAFTER: M.C.P.	UNITS = INCHES	REVISIONS:	DATE:

Bio Clean
A Forterra Company

Grate Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



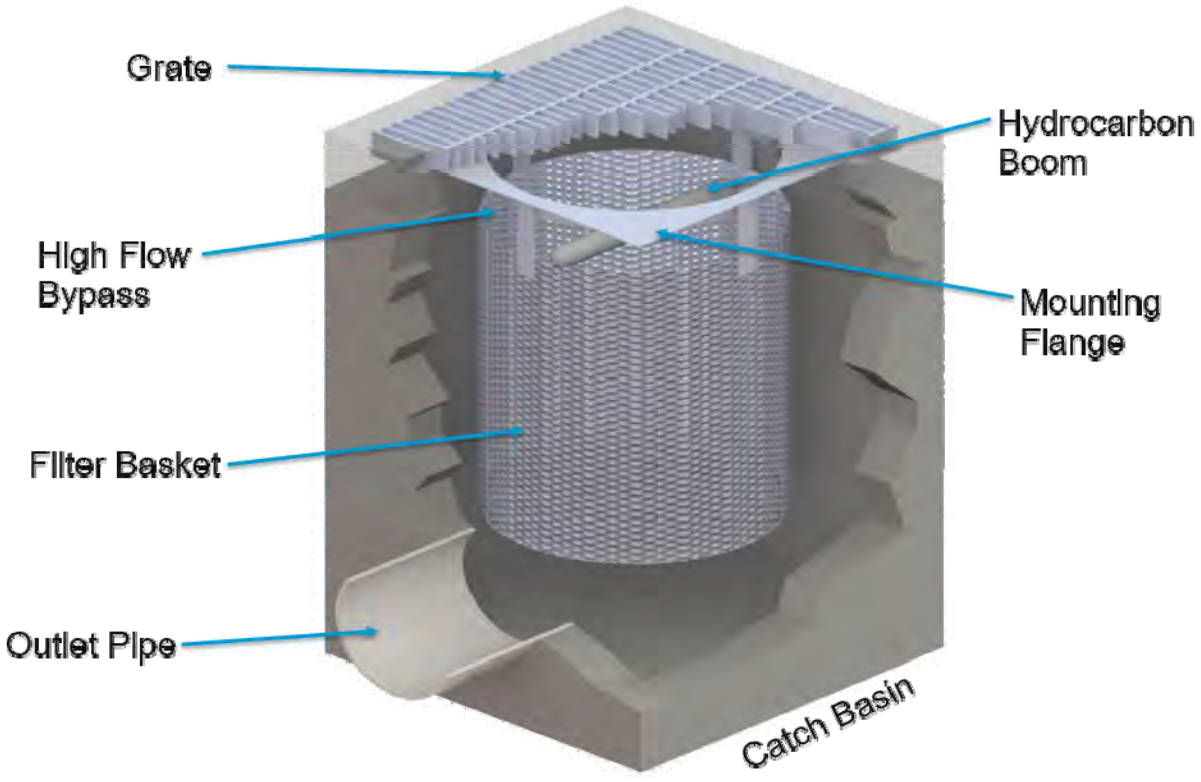
Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

OPERATION & MAINTENANCE

The Bio Clean Grate Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. This filter is made of 100% stainless steel and is available and various sizes and depths allowing it to fit in any grated catch basin inlet. The filters heavy duty construction allows for cleaning with any vacuum truck. The filet can also easily be cleaned by hand.

As with all stormwater BMPs, inspection and maintenance on the Grate Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Grate Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Grate Inlet Filter are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Grate Inlet Filter can be inspected though visual observation. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open grated inlet. Once the grate has been safely removed the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the filter with the grate removed.
- Look for any out of the ordinary obstructions on the grate or in the filter and its bypass. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the filter basket and its bypass.
- Excessive accumulation of trash, foliage and sediment in the filter basket. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-GRATE-12-12-12	10.00	12.00	0.27	0.55
BC-GRATE-18-18-18	16.00	18.00	1.05	2.09
BC-GRATE-24-24-24	21.00	24.00	2.41	4.81
BC-GRATE-30-30-24	27.00	24.00	3.98	7.95
BC-GRATE-36-36-24	33.00	24.00	5.94	11.88
BC-GRATE-48-48-18	44.00	18.00	7.92	15.84

Maintenance Equipment

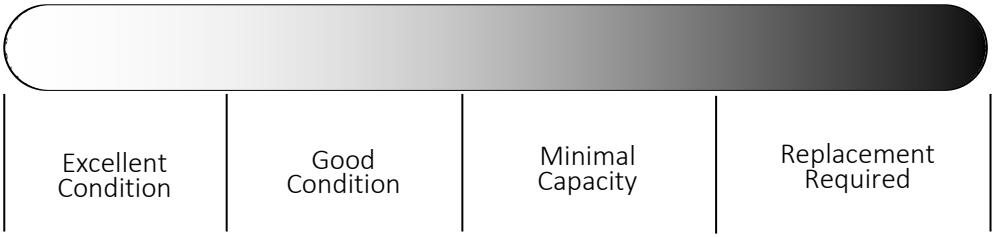
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can easily cleaned by hand:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to remove the grate.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Grate Inlet Filter can be performed utilizing a vacuum truck. Once all safety measures have been set up cleaning of the Grate Inlet Filter can proceed as followed:

- Remove grate (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened catch basin. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. Power wash off the filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

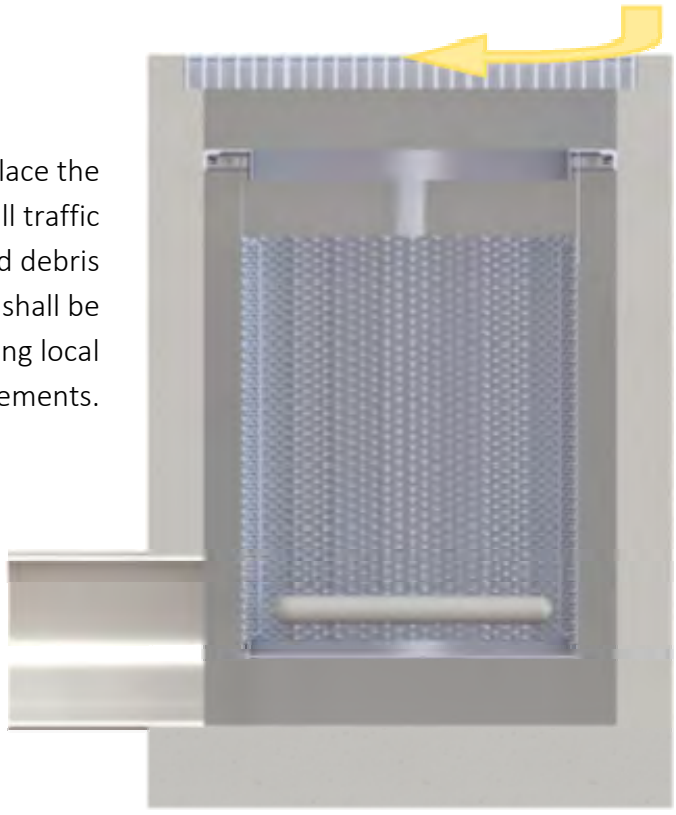
Maintenance Sequence

Remove grate and set up vacuum truck to clean the filter basket.

Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off screens.

Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the grate and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ollow Up ☐omplaint ☐torm Storm Event in Last 72-hours? ☐ ☐s

Weather Condition _____ Additional Notes _____

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(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

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BIO CLEAN FULL CAPTURE FILTER WITH TROUGH SYSTEM

FOR USE IN CURB INLETS

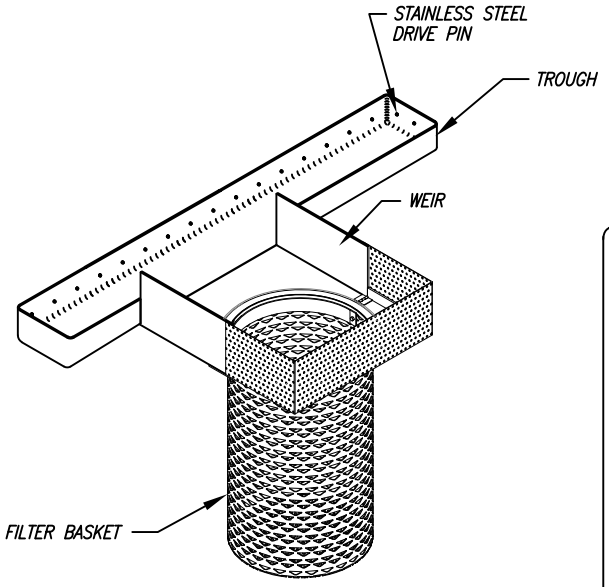


FIGURE 1:
DETAIL OF PARTS

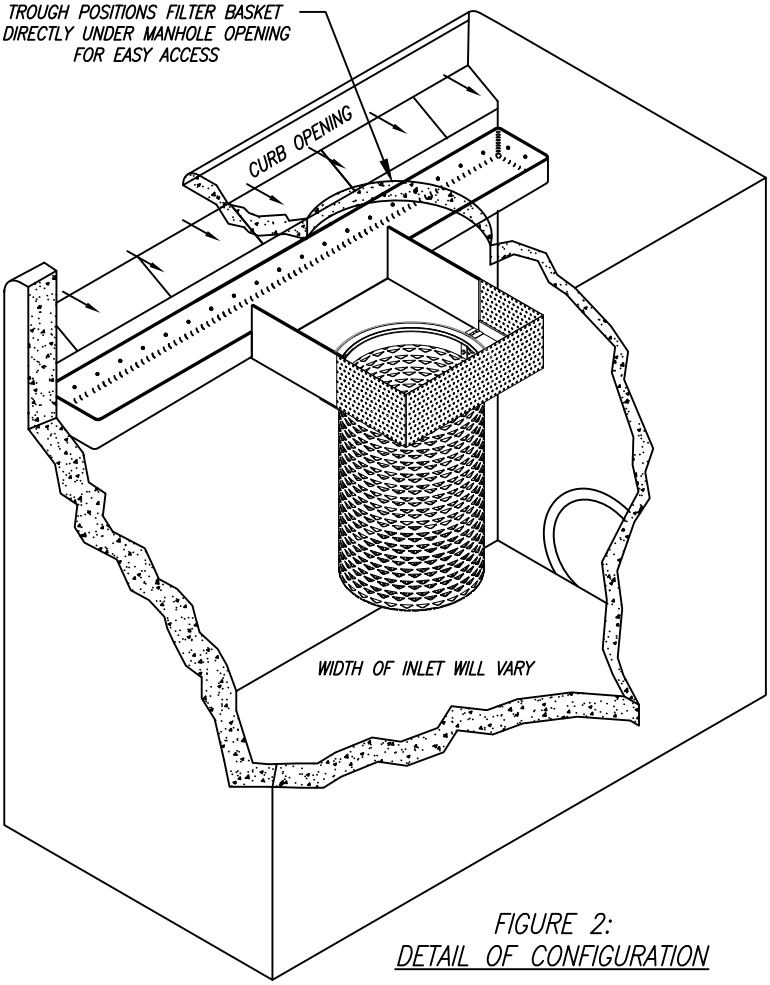


FIGURE 2:
DETAIL OF CONFIGURATION

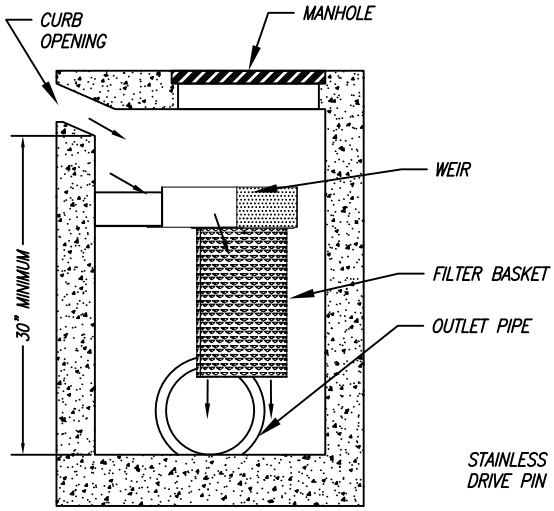


FIGURE 4:
DETAIL OF PROFILE

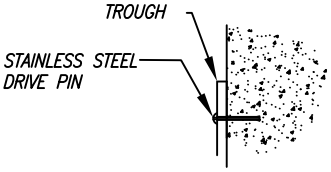


FIGURE 3:
DETAIL OF MOUNTING

NOTES:

1. TROUGH SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO FILTER.
2. TROUGH SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTER MANUFACTURED OF 100% STAINLESS STEEL.
5. FILTER MADE OF NON-CLOGGIN SCREEN WITH 4.7 MM OPENINGS AND MEETS FULL CAPTURE REQUIREMENTS.
6. FILTER CAN BE FITTED WITH HYDROCARBON ABSORBENT BOOM
7. FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE FOR EASY REMOVAL AND MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 2' TO 30'
9. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE - CONTACT BIO CLEAN FOR MORE INFORMATION.
10. CONSIDERS A SAFETY FACTOR OF 2.0
11. BYPASS IS FACILITATED VIA OVERFLOW OF THE TROUGH SYSTEM AND IS EQUAL TO THE CAPACITY OF THE CURB OPENING
12. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
13. ADDITIONAL TREATMENT AND STORAGE CAPACITY CAN BE ACHIEVED BY UTILIZING MULTIPLE FILTER BASKETS.

MODEL NUMBER	TREATMENT FLOW (cfs)*	SOLIDS STORAGE CAPACITY (cu ft)
BIO-CURB-FULL-24	2.85	1.40
BIO-CURB-FULL-18	2.85	1.05
BIO-CURB-FULL-12	2.85	0.70

*SEE PAGE 2 FOR EXPLANATION OF FLOW RATES

DRAWING: BIO CLEAN CURB INLET FILTER DETAILS	MEETS FULL CAPTURE REQUIREMENTS	
TREATMENT FLOW RATE: 2.85 cfs	MODEL #: BIO-CURB-FULL	
WARRANTY: 8 YEAR MANUFACTURERS	PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640 FAX: 760-433-3176	REVISIONS:	DATE:
	REVISIONS:	DATE:
DATE: 10/12/2017 SCALE: NTS	REVISIONS:	DATE:
DRAFTER: M.C.P. UNITS = INCHES	REVISIONS:	DATE:

Bio Clean
A Forterra Company

Curb Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE

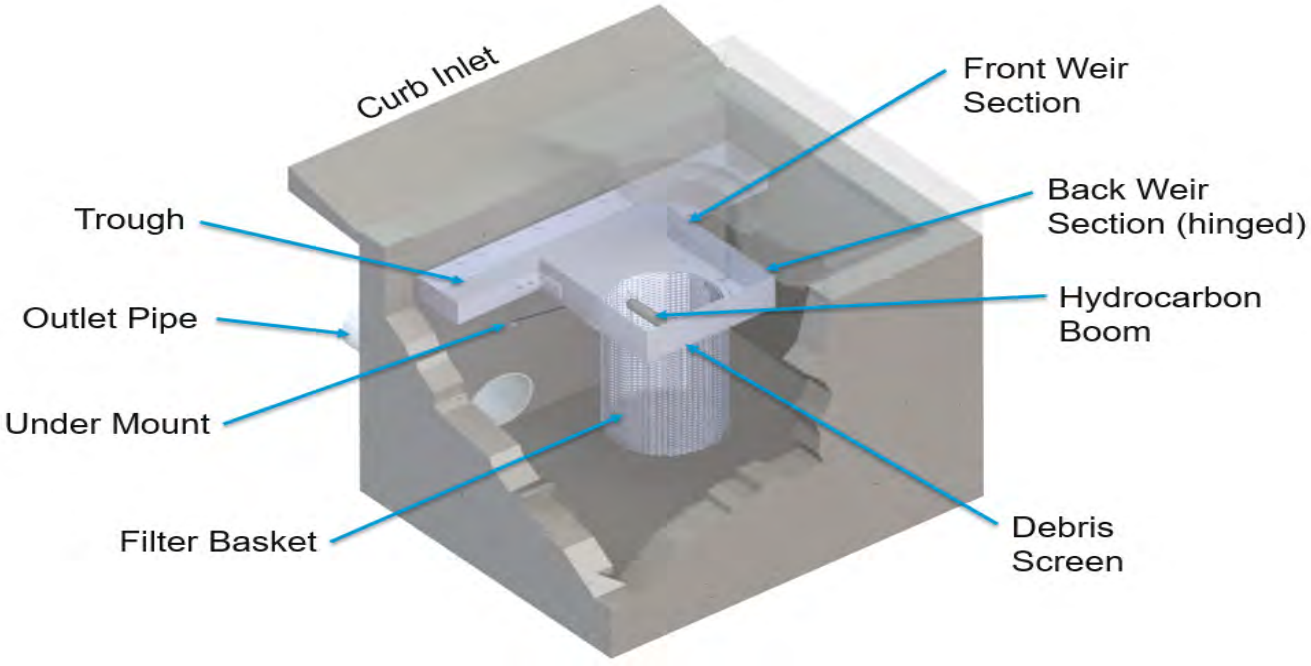
Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

OPERATION & MAINTENANCE

The Bio Clean Curb Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. The innovative trough & weir system is mounted along the curb face and directs incoming stormwater toward the filter basket which is positioned "directly" under the manhole access opening regardless of its location in the catch basin. This innovative design allows the filter to be cleaned from finish surface without access into the catch basin, therefore drastically reducing maintenance time and eliminating confined space entry. The filter has a lifting handle allowing for the filter to be removed easily through the manhole. The weir also folds up to allow for unimpeded access into the basin for routine maintenance or pipe jetting.

As with all stormwater BMPs, inspection and maintenance on the Curb Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Curb Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Curb Inlet Fitler are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Curb Inlet Filter can be inspected though visual observation without entry into the catch basin. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once the manhole has been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the catch basin through the manhole. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the catch basin.
- Look for any out of the ordinary obstructions in the catch basin, trough, weir, filter basket, basin floor our outlet pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the trough, weir, filter basket or catch basin.
- Excessive accumulation of trash, foliage and sediment in the filter basket and/or trough and weir sections. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-CURB-30	18	30	2.21	4.42
BC-CURB-24	18	24	1.77	3.53
BC-CURB-18	18	18	1.33	2.65
BC-CURB-12	18	12	0.88	1.77

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter though it can easily cleaned by hand:

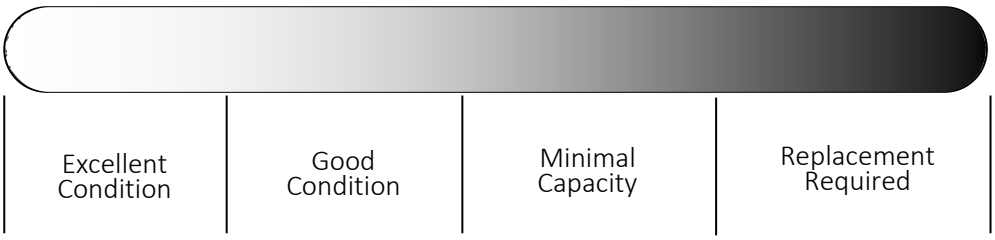
- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Curb Inlet Filter can be performed from finish surface without entry into catch basin utilizing a vacuum truck. Some unique

and custom configurations may create conditions which would require entry for some or all of the maintenance procedures. Once all safety measures have been set up cleaning of the Curb Inlet Filter can proceed as followed:

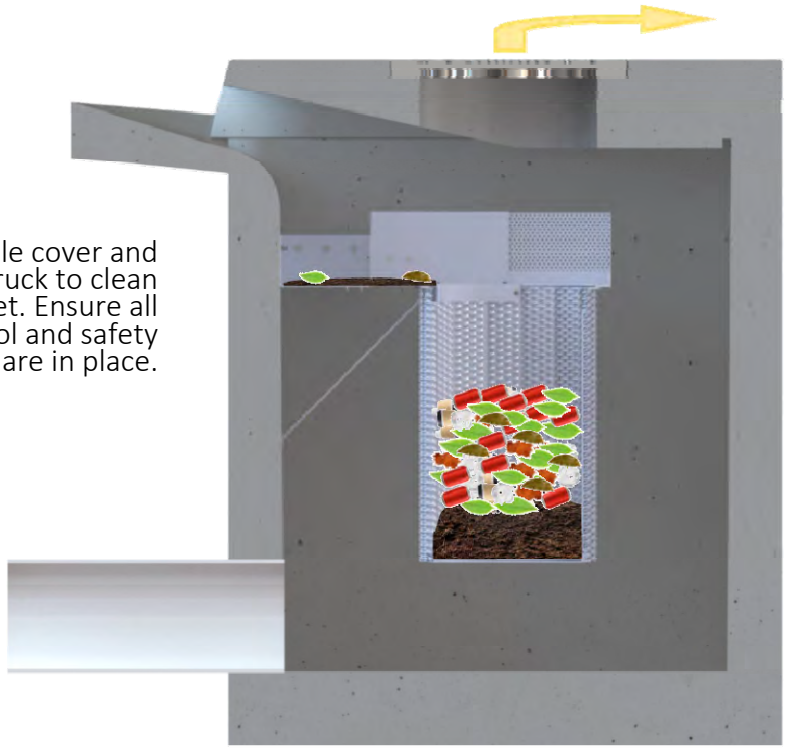
- Remove all manhole cover or access hatches (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened manhole or hatch opening. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. If the filter basket is full, trash, sediment, and debris will accumulate inside the trough and weir sections of the system. Once the filter basket is clean power wash the weir and trough pushing these debris into the filter basket (leave the hose in the filter basket during this process so entering debris will be sucked out). Power wash off the trough, weir, debris screen, and filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



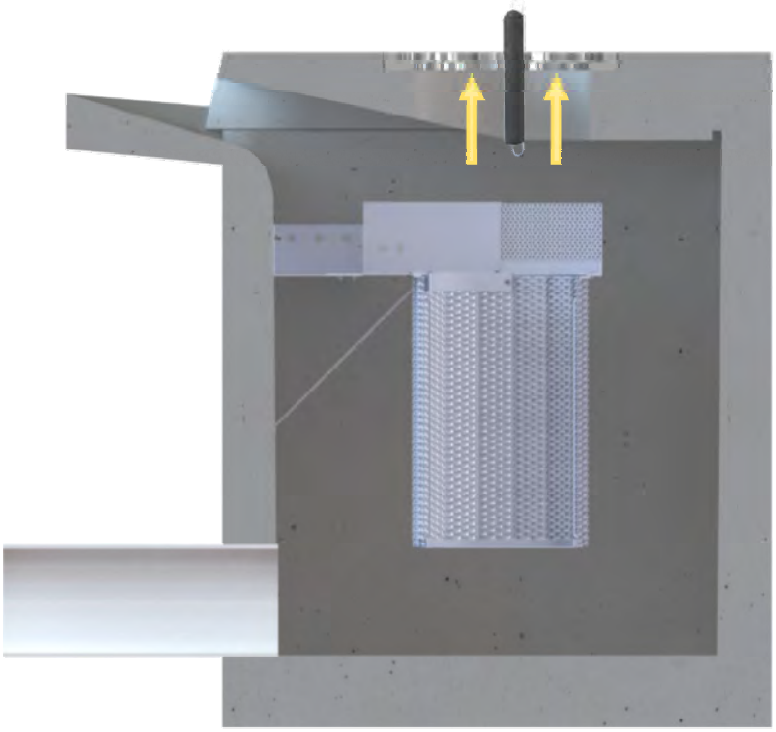
- The last step is to close up and replace the manhole or hatch and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

Maintenance Sequence

Remove manhole cover and set up vacuum truck to clean the filter basket. Ensure all traffic control and safety measures are in place.

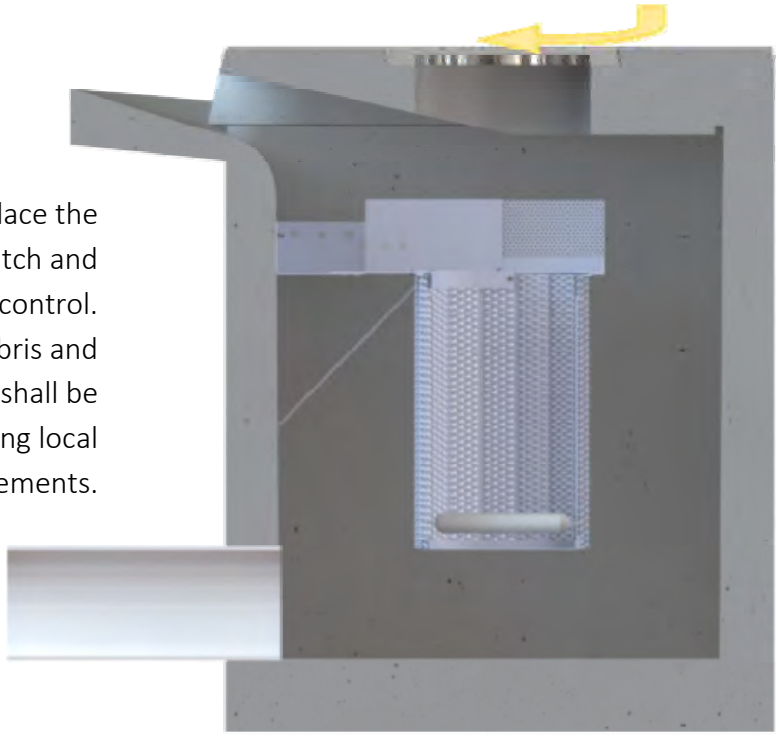


Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off the weir and trough and vacuum out any remaining debris.



Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the manhole or hatch and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ollow Up ☐omplaint ☐torm Storm Event in Last 72-hours? ☐ ☐s

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

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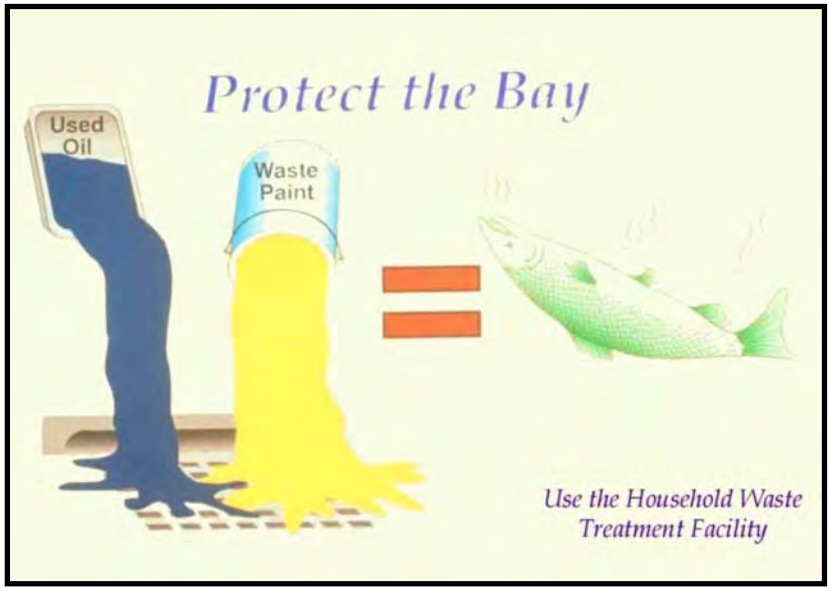
Non-Stormwater Discharges SC-10



Art Credit: Margie Winter

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

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.

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.

CASQA California Stormwater Quality Association

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:

- 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)

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 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

Photo Credit: Geoff Brosseau

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.

CASQA California Stormwater Quality Association

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/

Outdoor Equipment Operations SC-32

Description

Outside process equipment operations and maintenance can contaminate stormwater runoff. Activities, such as grinding, painting, coating, sanding, degreasing or parts cleaning, landfills and waste piles, solid waste treatment and disposal, are examples of process operations that can lead to contamination of stormwater runoff. Source controls for outdoor process equipment operations and maintenance include reducing the amount of waste created, enclosing or covering all or some of the equipment, installing secondary containment, and training employees.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Approach

Pollution Prevention

- Perform the activity during dry periods.
- Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Suggested Protocols

- Consider enclosing the activity in a building and connecting the floor drains to the sanitary sewer.
- Cover the work area with a permanent roof if possible.
- Minimize contact of stormwater with outside process equipment operations through berming and drainage routing (run-on prevention). If possible, connect process equipment area to public sewer or facility wastewater treatment system. Some municipalities require that secondary containment areas be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.
- Dry clean the work area regularly.

Training

- Train employees to perform the activity during dry periods only or substituting benign materials for more toxic ones.
- Train employee and contractors in proper techniques for spill containment and cleanup. Employees should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Have employees trained in emergency spill cleanup procedures present when dangerous waste, liquid chemicals, or other wastes are delivered.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Prevent operator errors by using engineering safe guards and thus reducing accidental releases of pollutant.
- Inspect storage areas regularly for leaks or spills. Also check for structural failure, spills and overfills due to operator error, and/or failure of piping system.

Other Considerations

- Providing cover may be expensive.
- Space limitations may preclude enclosing some equipment.
- Storage sheds often must meet building and fire code requirements.

Requirements

Costs

Costs vary depending on the complexity of the operation and the amount of control necessary for stormwater pollution control.

Maintenance

- Conduct routine preventive maintenance, including checking process equipment for leaks.
- Clean the storm drain system regularly.

Supplemental Information

Further Detail of the BMP

Hydraulic/Treatment Modifications

If stormwater becomes polluted, it should be captured and treated. If you do not have your own process wastewater treatment system, consider discharging to the public sewer system. Use of the public sewer might be allowed under the following conditions:

- If the activity area is very small (less than a few hundred square feet), the local sewer authority may be willing to allow the area to remain uncovered with the drain connected to the public sewer.
- It may be possible under unusual circumstances to connect a much larger area to the public sewer, as long as the rate of stormwater discharges does not exceed the capacity of the wastewater treatment plant. The stormwater could be stored during the storm and then transferred to the public sewer when the normal flow is low, such as at night.

Industries that generate large volumes of process wastewater typically have their own treatment system and corresponding permit. These industries have the discretion to use their wastewater treatment system to treat stormwater within the constraints of their permit requirements for process treatment. It may also be possible for the industry to discharge the stormwater directly to an effluent outfall without treatment as long as the total loading of the discharged process

water and stormwater does not exceed the loading had a stormwater treatment device been used. This could be achieved by reducing the loading from the process wastewater treatment system. Check with your Regional Water Quality Control Board or local sewering agency, as this option would be subject to permit constraints and potentially regular monitoring.

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

Waste Handling & Disposal SC-34

Photo Credit: Geoff Brosseau

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Approach

Pollution Prevention

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

CASQA California Stormwater Quality Association

Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.
- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

Run-on/Runoff Prevention

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training

- Train staff in pollution prevention measures and proper disposal methods.
- Train employees and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations (Limitations and Regulations)

Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs

Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance

- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP

Land Treatment System

Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water
- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site
- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)
- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins
- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

Examples

The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

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

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

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

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

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.

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.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Maintenance Bays & Docks SD-31

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

Appropriate applications include commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

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- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.

- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.

- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.

- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.

- Other features may be 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.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

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.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

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

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

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.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

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.